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“Producer Group and Value Chain Development”

UNIDO/UNDP Component

Annual Report
for the period 1.1. – 31.11.2015

Final Version

Contents

1. Summary

Achievements of 2015

The project activities planned for 2015 were completed successfully, with a strong foundation set for the further development of the selected producer groups. Of the 27 activities in the three project components combined, five were completed, six remain to be started, and 16 were partially implemented. All of the activities in the process of implementation support the continued development of the producer groups into cooperative enterprises.

Table 1: Project Achievements during 2015

Activity	Accomplishments	Plans for 2016
Set-up and overarching activities	- Opening ceremony held - Team recruited - Team expanded: field operation managers FOM,driver & short term consultants; additional admin. assistant - Vehicle purchased - Office rented - Stakeholders' conference held	- Consolidation and further professionalization of team - Purchase of second vehicle - 2016 stakeholders' conference to be organized
Communication	- Strategy drafted& approved - Communication materials developed &used - ENPARD ARM logo revised - Press release issued - Social media presence - Participation and support to visibility events - Visibility video produced - Photo documentationongoing	- Continued social media presence - Continued participation and support to visibility events - Continued press releases - Continued photos and video developed - Success stories/case studies developed and publicized
Component 1		
1.1: Select value chains	- 3+ Value chains selected	- Completed
1.2: Select producer groups	- 55 producer groups selected	- Completed
1.3: Cooperative development trainings	- Cooperative development trainings provided to shortlisted groups (done through FAO component)	- Completed
1.4: Register cooperatives	- Planned for 2016 starting in April	-
1.5: Train producer groups on business skills	- Trainings on basic business skills development to be completed by end of year - Business plans for shortlisted groups to bedeveloped by end of year	- Continued customized trainings to be undertaken in 2016
1.6: Document lessons learned	- Planned for 2016 & 2017	- Documentation of lessons learned to be continual through 2016
1.7: Support access of women, youth and vulnerable groups	- Selected producer groups comply with youth and women participation indicators	- Gender mainstreaming strategy to be developed and implemented in 2016
1.8: Develop business models	- Three business models developed	- Final business models to be developedbased on successful cooperative operations

Component 2		
2.1: Select producer groups	- 16 value adding groups selected	- Completed
2.2: Install appropriate technologies	- Equipment to be identified and by end of year for most VCs - Statement of award for buckwheat hulling lines (2x100.000 USD) given on 23rd of November 2015	- Cheese making, money making and vegetable packaging equipment to be procured, installed, tested - Producers to be trained in usage, and to use equipment to produce value added products
2.3: Study markets and develop products	- Markets studied and products identified by subcontracted consulting companies (all reports expected by end of year)	- Completed
2.4: Improve storage and packaging	- Analysis of storage options for buckwheat completed by consultant and detailed in report	- Cold storages to be constructed in 2016 - Buckwheat storages to be upgraded
2.5: Develop marketing capabilities and link to markets	- Discussions with WFP on bulk buckwheat sales to school feeding program as one of the marketing options	- Link to buyers to be facilitated by project staff, supporting the value adding groups
2.6: Train value addition groups on business skills	- Training providers subcontracted - Business plan development underway	- Complete business plans in early 2016 - Continued trainings as “learning by doing”
2.7: Link to finance schemes	- Financial gap assessment to be identified in business plans - Discussions undertaken with possible financing partners (KFW, SDA, Heifer International)	- Business plans to be shared with financing partners
2.8: Improve compliance with food safety and quality standards	- Food safety and quality norms incorporated into buckwheat processing unit design and equipment selection	- Trainings to be undertaken in 2016 - Food safety and quality norms to be incorporated in designs and equipment for other value chains
2.9: Support clean production and energy saving technologies	- Energy saving techniques incorporated into selection of buckwheat hulling line	- Analysis of further environmental mitigation methods to be planned
2.10: Support access of women, youth and vulnerable groups	- Selected producer groups comply with woman and youth participation indicators - TOR developed for gender mainstreaming consultant	- Gender mainstreaming strategy to be developed and implemented
Component 3		
3.1: Analyze value chains	- Diagnostic studies completed	- Completed
3.2: Support government and actors to support VCs	- Planned for 2016 & 2017	- Necessary trainings & systems to be analyzed and implemented
3.3: Improve producer access to knowledge (GAP, market prices, etc.)	- Manuals for non-traditional vegetables and buckwheat in process of elaboration	- Training on GAP and systems to be developed during the 2016 growing season

3.4: Develop GAP and disaster risk management approaches	- GAP approaches studied and manuals in process of elaboration for selected crops	- Disaster risk management approaches to be developed for selected crops
3.5: Improve access to agricultural inputs and services	- Buckwheat inputs studied;to be procured by end of year - Dairy groups access to quality milk verified	- Inputs for selected crops to be distributed in 2016 - Buckwheat & vegetable groups to be trained on seed selection - Dairy groups to be trained on milk quality assessment
3.6: Improve harvesting, post-harvest & storage techniques	- Harvesting, post-harvest and storage gaps assessed	- Storages to be selected or constructed in 2016 - Trainings to be providedfollowing the agricultural season
3.7: Improve sourcing techniques and networks	- Planned for 2016 & 2017	- Buckwheat hulling factories to organize sourcing from producer groups in 2016 - Dairy groups sourcing to be upgraded if needed - DRR to support dried fruit sourcing
3.8: Support traders, transporters & marketers	- Planned for 2016 & 2017	- Necessary trainings & systems to be analyzed for later implementation
3.9: Develop financing facilities & improve access to capital	- Planned for 2016 & 2017	- Gap to be analyzed in 2016, and possible mechanisms developed
Results management and M&E	- Results chains developed - Strategy drafted - Baseline questionnaires developed & tested - Database for each value chain established - Control groups selected	- Baseline to be implemented and analyzed in early 2016 - Monitoring of producer group agricultural and marketing/financial indicators to begin in 2016

Financial report for 2015

Reserving funds for the most costly implementation phase of the project in 2016, expenditures occurred as planned to finance recruitment, procurement, and the preparation of analytical studies and plans. Expenditures for the EU component were at xxx%.[1] The table below shows the total funds received, total expenditures and the remaining funds. The last column shows the percent of expenditures on project activities compared to the funds received for these activities. All figures include the expenditures expected by the end of the year.

[1] The detailed financial statements are included in the Annex.

Table 2: Provisional Financial report summary

In Euro	Funds received	Expenditures*	Funds remaining	% expenditures to received
EU funded activities				
Component 1	**125,550**	**76,840**	**48,710**	**61%**
Component 2	**402,944**	**357,469**	**45,475**	**89%**
Component 3	**336,600**	**252,487**	**84,113**	**75%**
Total EU funds (including support costs)	**925,651**	**734,872**	**190,779**	**79%**
ADA funded activities				
Component 1	**33,000**	**5,551**	**27,449**	**17%**
Component 2	**344,832**	**95,101**	**249,757**	**28%**
Component 3	**39,200**	**13,841**	**25,719**	**35%**
Total ADA funds (including support costs)	**467,636**	**128,407**	**339,647**	**27%**

* Including actual expenditures and legal commitments

Planning for 2016

UNIDO/UNDP project activities in the following year will focus on implementation and the operationalization of the producer enterprises. The planned rollout of activities is shown below.

Table 3: Planned activities for 2016

<table>
<tr><th>Buckwheat & buckwheat honey</th><th>High value cheese</th><th>Dried fruits & herbs</th><th>Non-traditional vegetables</th></tr>
<tr><td colspan="4">Act. 1.7 & 2.10: Develop gender mainstreaming strategy (Q1)</td></tr>
<tr><td colspan="4">Results management: Undertake baseline study of 29 target groups and 29 control groups, consisting of 290 farmers total (Q1)</td></tr>
<tr><td colspan="4">Act. 2.4: Develop branding and packaging (umbrella brand) (Q1-Q2)</td></tr>
<tr><td colspan="4">Act. 2.5: Develop market entry strategy (Q1-Q2)</td></tr>
<tr><td>Act. 2.2: Support communities to construct factory fa
cilities (Q1-Q2)</td><td>Act. 2.2: Procure and install cheese processing equipment (Q1-Q2)</td><td>Act. 2.2 & 3.6: Procure and install fruit & herb dryers and cold storages (Q1-Q2)</td><td>Act. 3.4 & 3.6: Construct greenhouses and install cold storages (Q1)</td></tr>
<tr><td>Act 3.5: Distribute agricultural inputs and hives(Q2)</td><td></td><td></td><td>Act. 3.5: Distribution of agricultural inputs (Q1)</td></tr>
<tr><td>Outcome: Support farmers to recruit factory management personnel (Q2)</td><td>Act 2.6: Hire cheesemakers (Q2)</td><td></td><td>Act 3.5: Distribution of seedlings to group members (Q2)</td></tr>
<tr><td>Act 2.2: Install cleaning/hulling equipment lines with packaging & honey packaging equipment (Q2-Q3)</td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Act. 3.3& 3.6: Train groups on GAP and post-harvest management (Q2-Q4)</td></tr>
<tr><td colspan="4">Act 1.5 & 2.6:Train groups on business skills (accounting, operations management, marketing, etc.) (Q2-Q4)</td></tr>
<tr><td>Output: Factories become operational (Q3)</td><td>Output: Processing units become operational (Q3)</td><td>Output: Drying units become operational after harvest (Q3)</td><td>Output: Harvest of non-traditional vegetables (Q3)</td></tr>
<tr><td>Outcome: Factories make sales of hulled buckwheat and prepare exports of honey (Q4)</td><td>Outcome: Initial cheese local sales and exports (Q3-Q4)</td><td>Outcome: Fruit and herb groups make sales and bulk for export (Q3-Q4)</td><td>Outcome: Sales of non-traditional vegetables in urban centers (Q3-Q4)</td></tr>
<tr><td colspan="4">Producer groups are registered in the State Registry (Q4)</td></tr>
</table>

2. Introduction

The project was launched in January 2015 and will be implemented over three years. In the first year for which this report renders account, activities focused on value chain selection and analysis, producer group selection, product and market analysis, evaluation of appropriate technologies, and the development of business models and business plans for the selected producer groups. In the second year, the business plans will be implemented, with the producer groups receiving ongoing training on topics such as GAP, observing food safety standards, and business skillsIn 2016, it is also expected that most groups will be able to be register as cooperatives in the State Registry. In the third year, the gains of the second year will be consolidated, while other value chain upgrading activities will be implemented.

For 2016 it is expected that UNIDO/UNDP will successfully accomplish the TAP conditionality of registering 30 new cooperatives, while complying with the project indicators on gender and youth leadership and involvement. In addition, several other more ambitious goals will be partially reached in 2016, with full achievement expected in 2017. Targeted results include:

- Introduce buckwheat as a new crop and a construct a new value chain in Armenia, aiming to provide 10% of national consumption;
- Establish buckwheat honey as a new product for export;
- Upgrade the dairy value chain to produce new varieties of cheese never successfully produced by producer groups, for export and local sales;
- Expand exports of high value products, specifically new types of cheese and dried fruits;
- Implement a model for high-value vegetable production;
- Significantly increase income for over 1,000 farmers leading to a dramatic improvement in the quality of life,and poverty reduction,in rural areas; and,
- Attract significant additional investment for the selected producer groups, and for the future replication of successful projects.

3. Achievements since April 2015

Significant progress was made since the first Project Steering Committee (PSC) in April 2015, during which the Inception Report and the activities completed up to that point were discussed.Below, theactivities implemented since the first PSC are presented.

Set-up and overarching activities

Several set-up activities were completed since April 2015. The UNIDO/UNDP and FAO teams moved into a joint office space. Moving into the office implied furnishing the space, undertaking security upgrades according to UN security guidelines, and ensuring internet connectivity. A vehicle was purchased and a driver hired for the UNIDO component while the UNDP component uses two UNDP-owned vehicles.

In addition to the project staff brought onboard during the Inception Phase, Field Operations Managers (FOM) were hired to support the implementation of the cheese and the buckwheat value chains.. A national administrative assistant will also be hired by year end to support UNIDO. An international food processing consultant, a buckwheat expert agronomist, and a national apiculture expertwere hired for short-term consultancies.

Other relevant meetings and events attended and supported by the UNIDO/UNDP team since the inception phase include the following.

- **Visit to ENPARD Georgia:** Members of the ENPARD Armenia team completed a four day visit to Georgia, to learn about ENPARD Georgia's accomplishments and to exchange experiences with the Georgia team.
- **Meeting with Tufenkian:** The project team met with James Tufenkian and John Antranig Kasbarian, of the Tufenkian group of companies, to explore collaboration in the production and international marketing of honey, based on a cost-sharing basis and mutual interests.
- **Meetings with RA Ministries:** The team met with the Minister of Agriculture to brief him on progress as well as to receive recommendations. A meeting was held with the First Deputy Minister of Economy to explore synergies between ENPARD and the OECD report on exporting, and linking Armenian farmers to global agricultural value chains. The team met the CEO of the Development Foundation of Armenia to discuss collaboration within the structure of export oriented producer associations.
- **Green Lane Harvest Festival:**ENPARD (specifically UNDP) provided financial and organizational support to the Harvest Festival by Green Lane NGO. The Festival was a success, with the participation of selected ENPARD producer groups from the Gargar community of Lori and the Arayi community of Aragatsotn.
- **German Bank for Reconstruction (KFW):**Discussions where held staff of KFW, both regarding their choice of value chains to support, and regarding the ENPARD cooperatives possibly becoming borrowers. Agricultural loans would be available, although at high interest rates, if needed by the producer groups.
- **Review mission:** The UNIDO/UNDP team participated in the review mission hosted by the EUD, including meeting with the evaluators, hosting field missions, and carrying on email discussions regarding approaches and results.
- **Stakeholders' Conference:** The team participated in the planning of the Stakeholders' Conference, and presented the work undertaken in 2015 and planned for 2016. The discussions showed the positive reaction of national stakeholders, especially to the work planned in the buckwheat value chain.
- **Buckwheat seminar:** A workshop on buckwheat agronomy was conducted by the international buckwheat expert with the participation of beneficiaries, agriculture service center representatives from all marzes, agricultural institutes,and the employees of the Agriculture Ministry.

Communication

Several communication events and channels were established and used, to boost visibility of the UNIDO/UNDP component within Armenia. The visibility oriented events are described below. Other communication events, such as the communication aspects of the open call for producer group applications, are discussed in relation to these project activities in the following sections.

- **Europe Days:** ENPARD participated in the Europe Days events held in Vanadzor (May 16), Gyumri (May 17), and Yerevan (May 24), receiving huge interest and fielding questions from the general public.

- **Communication materials:** The UNIDO/UNDP component roll-up and a flyer were designed, reviewed by Publicis Hepta (the PR firm selected by the EUD), improved, and printed. These materials were used at all events.
- **Press conference:** Representatives of UNIDO and UNDP participated in a press conference initiated by the MoA and the EUD, focusing on the launch of the open call for producer groups in the targeted marzes.
- **Logo:** The team reviewed several revisions of the logo and provided recommendations on preferences for a version which more accurately reflects the objectives of ENPARD Armenia.
- **Press release:** A press release announcing the receipt of over 190 applications from farmer groups was developed and published.
- **Social media:** The ENPARD Facebook site was continually updated.
- **Publicity event on cooperative development:**Together with the FAO, UNIDO/UNDP organized and supported a publicity event around the cooperative trainings in Akhuryan, in Shirak marz, with the participation of journalists.
- **Project video:** An international video maker was engaged to develop a video clip to showcase the UNIDO/UNDP component's planned interventions, with a focus on the potential human impact.

Component 1: Strengthen newly established primary producer groups

Significant progress was made on the Component 1 activities, with specific emphasis given to producer group selection,educating producers as to organizational development options and promoting the benefits of cooperatives, developing business models for the establishment of groups, and initiating capacity building trainings to primary producer groups.

Select value chainsin the targeted marzes (Act. 1.1)

During the inception phase, the value chains were selected using UNIDO's multiple criteria rating method. The selected value chains include:

1. High value field crops, including buckwheat and legumes;
2. Berries and fruit;
3. High-value, non-traditional vegetables;
4. Dairy; and,
5. Honey.

During the growing season, buckwheat tests were organized to verify the agronomic potential of buckwheat production in Armenia. The tests were necessary as buckwheat is a new crop being introduced by ENPARD in the country. The growing tests were successful, and proved the viability of buckwheat in Armenia. In October, UNIDO hired an international expert on buckwheat agronomy as a short-term consultant to evaluate the fields identified for buckwheat production, and to recommend good agricultural practices for buckwheat, as well as the relevant types of seeds, fertilizers, other inputs, and machines needed for buckwheat production. His evaluations forecast a high potential for buckwheat in Armenia.

Select existing and potential new producer groups (Act. 2.1)

Sixty nine producer groups were selected in the targeted value chains, with representation in each of the targeted marzes. By marz, 11 groups were selected in Aragatsotn, 12 in Gegharkunik, 4 in

Kotayk, 12 in Lori, 26 in Shirak, and 4 in Vayots Dzor, roughly corresponding to the larger number of applications received by marz. Group breakdown by value chains is as follows:

- **High value field crop buckwheat**: Forty nine primary producer groups were selected, which will be clustered around two to four buckwheat hulling factories. The producer groups will also be supported in the production of buckwheat honey.
- **Dairy**: Five dairy groups will be supported in high-value cheese processing and marketing.
- **Fruits and berries**: Thirteen groups were selected, including 7 to be supported in fruit drying and marketing; and, 4 primary producer groups to be supported with cold storage, packaging and marketing, of which 1 will focus on fruit and 3 on berries.
- **Non-traditional vegetables and herbs**: Four groups were selected, including two primary producer groups to be supported with greenhouses for seedling production, cold storage and marketing, and twogroups engaged in herb collection and drying.

Of the 1,109 total members of the groups, 43% have women leadership. In terms of members, 36% are women and 32% are youth. The 69 selected groups will receive business skills training, resulting in the development of business plans. Their continued participation in the project will be subject to continuous monitoring of their motivation, understanding of the business plans, and follow-through on commitments of co-financing. The number of groups selected is high, to allow for UNIDO/UNDP to meet its target indicators, as some of the groups probably will withdraw or be eliminated later. Of the total applicant pool, 36% were moved forward to the next stage of training and business plan development.

Of the 69 selected groups, primary agricultural production is the main activity of 55 of them. These primary producer groups include the 49 buckwheat producer groups, two non-traditional vegetable producer groups, and three berry producer groups, and one fruit production group. The tables below provide further information on the specialization and location of the selected groups.

Table 4: Selected producer groups by value chain and marz

	Value Chains							Total by Marz	Number of Applications Received	% Selected
			Fruit							
	Buckwheat	Dairy	Dried Fruits	Cold Storage	Berries	Non-traditional vegetable	Herbs			
Aragatsotn	6		4	1				11	33	34.4
Gegharkunik	10	1					1	12	42	28.6
Kotayk	4							4	20	20
Lori	4	1	2		2	2	1	12	39	30.8
Shirak	23	2			1			26	46	60.5
Vayots Dzor	2	1	1					4	18	22.2
Total	49	5	7	1	3	2	2	69	198	35.6

Table 5: Producer group data

	Number	%	Target Indicator
Selected farmer groups	69	100	30 co-ops
Groups with woman coordinator	30	43.5	40.0%
Existing cooperatives	7	10.1	
Existing non-registered groups	15	21.7	
New groups	47	65.2	
Total number of members	1109	100	
Number of women members	402	36.2	30.0%
Number of youth members	415	37.4	30.0%

A series of steps were implemented during the producer group selection process, resulting in the selection of 69 groups. The producer group selection process was initiated in April, as value chain selection was concluded. The application materials, including the informational flyer and detailed application were developed by the team earlier. The application was tested on several producer groups to verify their understanding and minimize the complexity of the questions. Communication methods were developed for outreach and to publicize the open call, including the use of local authorities such as the governors and mayors, as well as media channels. During the earlier visits to marz authorities, the UNIDO/UNDP team had explained the project to generate support for the open call in the targeted marzes. The steps in producer group selection included the following.

- **Open call in Lori marz:**The open call for producer group applications was piloted in Lori marz during the Inception Phase, with a deadline of May 15. Thirty nine applications were received. Following the Inception Phase, the effectiveness of the communication methods used was evaluated by calling 20 communities and visiting 5 communities, all in different areas of the marz. About 70% of the rural communities in Lori were aware of the open call. Direct communication through the mayors' offices, agricultural service centers (GAMKs), other NGOs, and by the project team proved the most effective method of generating applications, while local TV and radio channels were less impactful. The evaluation of the Lori open call showed the importance of face-to-face meetings with farmers, allowing the team to explain the project, as well as to describe the value chain selection.
- A pilot open call was launched in Lori marz in April with a May 15 deadline. Also in May, the results of the pilot open call and the communication methods used were evaluated and deemed successful. Following the successful pilot open call in Lori,
- **Business model development:**In May and June, the team developed business models for buckwheat, lentils, and non-traditional vegetable (broccoli) production. These models, which are among the innovations the ENPARD project will introduce in the agricultural sector in Armenia, were described to farmers in subsequent community visits to promote the open call. Developing the buckwheat business model was especially critical as the UNIDO/UNDP team intends to introduce a new crop and to construct an entirely new value chain in Armenia. Therefore, a careful analysis needed to be made of the proposed business idea, to ensure that it would be profitable at every level, before introducing it to farmers.

- **Mapping the highest potential communities by value chain:** The first draft of a mapping was developed, showing the communities most suited for value chain interventions. The mapping took into consideration criteria such as elevation, precipitation, average yields, availability of arable land, availability of irrigation, and the minimum land holdings of farmers, among others. The mapping was used as a tool to selected communities to visit to promote the open call for producer group applications.[2]
- **Open call rollout:** Based on the successful pilot in Lori, the open call for producer groups was rolled out in the remaining targeted marzes (Shirak, Aragatsotn, Kotayk, Gegharkunik, and Vayots Dzor). The open call was launched in the remaining marzes at the end of May, with a 1.5 month application period and a deadline of July 15.
- **Open call promotion to mayors:** In addition to being promoted through the governors' offices, agricultural service centers, and media channels, the open call application packet was sent directly to all of the mayors in the target marzes. Follow up with the mayors regarding their understanding and dissemination of the application materials improved outreach.
- **Community targeting visits:**The team presented the open call in all of the targeted marzes. The visits were undertaken over 11 weeks in June and July, averaging three field visits, and nine community visits, per week. The field visits were organized using the previously created community mapping by value chain. During these meetings members of the project team presented the opportunity to apply for ENPARD support, as well as explaining the approach of the project with an emphasis on value addition, and the specific business models designed and promoted by the team.
- **Application deadline:** Applications were received from 190 producer groups, with a total of 4,328 members, of which 1,474 are female and 1,299 are young. Although the deadline has expired, applications continue to be received, reaching a total of over 200 applications.
- **Selection methodology:** A methodology was developed to guide the selection of the most suitable producer groups from the larger number of applicants. This methodology consists of three sections: mandatory criteria, socio-economic and environmental impact criteria, and final interviews and training results. The three step methodology for the evaluation of applications was developed prior to launching the open call, and revised as the open call was ongoing.
- **Applicant database:** A database of the applications received was created to provide easy access to information about the groups and to facilitate the other steps in producer group selection.
- **Producer group evaluation and initial shortlist:**The applicant producer groups were evaluated according to the mandatory criteria and scored based on the socio-economic and environmental impact criteria, to generate an initial short list of groups. Since the evaluation criteria were already defined, the groups were analyzed immediately after the application deadline. By August the groups to be visited for further in depth interviews had been selected.
- **Evaluation and due diligence:** Field visits were organized to the 91 groups which scored highly on the socio-economic and environmental impact criteria,during which time the team performed due diligence, discussed business concepts, evaluated group motivation,and

[2] The mapping for each value chain is included as Annex 2.

checked the accuracy of the data reported in the applications. These visits took place for over 8 weeks, in August and September. A final shortlist of 69 groups was developed based on these visits. The 69 groups consist of 1,109 farmers, of which 402 are women, and 45 are young.

Educate producers as to organizational development options (Act. 1.3)

Activity 1.3, to train producer as to organizational development options and promote the benefits of working as farmer groups/cooperatives, overlaps with a similar activity of the FAO and a conditionality of the FAO in the ENPARD TAPs. As a result, during the first Project Steering Committee, in April, it was decided that the responsibility for conducting these trainings would be transferred to the FAO. The UNIDO/UNDP team provided the full list of farmer group applicants to FAO for training. The team also supported the FAO by scheduling and calling the farmers to arrange the trainings. The trainings were targeted at the leadership of the applicant producer groups.The FAO trained a total of 307 leaders of the producer groups, from 68 communities, including 116 women. A few of the selected producer groups were not included in the trainings; trainings will be organized for these groups before the end of the year.

Establish new producer groups (Act. 1.4)

All of the producer groups which are not currently registered as cooperatives will be registered during 2016. According to the best practices in cooperative development, the groups will be registered after their business activity is underway, and ideally after they have begun to generate earnings. The UNDP undertook a recruitment process to select an individual who would be responsible for the institutional development of the cooperatives, but a suitable candidate is still to be identified. Sorting out the legal aspects of group registration will be given into the hands of legal consultants in 2016, with project staff responsible for the organization in the communities.

Develop capacities of producer groups (Act 1.5)

A subcontractor was recruited to develop business plans, and provide trainings on business skills to the shortlisted groups. UNDP's subcontractor will develop business plans and train the 49 buckwheat primary producer groups, the two non-traditional vegetable groups, the three berry producing groups, and the one fruit producing group.The business plans will include a projection of costs and expected earnings, the expected co-financing amounts, and a training and development plan. The subcontractor will use a participative approach during meetings with each of the groups to develop the business plans jointly with the farmers, with the end goal of ensuring the farmers' buy-in and understanding of the business objectives put forth in the plans.

Document lessons learned for appropriate legislation (Act 1.6)

Documentation of lessons learned will begin following the successful launch of the producer enterprises.

Promote participation of women, youth and vulnerable groups (Act 1.7)

As discussed above, the selected groups meet the criteria in the logframe of the project document with over 40% woman leadership, and over 30% participation of both women and youth. In early 2016 the team plans to commission the gender assessment, as well as to develop a gender mainstreaming strategy to be implemented during 2016 and 2017.

Develop business models for establishment of producer groups (Act. 1.8)

Business models were developed by the team for high-value field crops (buckwheat and lentils) and non-traditional vegetable (broccoli) value chains. The business models integrate financial analysiswith market research and the technical specifications required for production and processing. Brief financial models for high-value cheese production were developed by the international food processing consultant. These models will be used by the subcontractors who will develop the business plans for each of the selected producer groups. All business models estimate at least a doubling of producer income due to the project intervention. The development of the buckwheat and non-traditional vegetables business models (and rough calculations for the other value chain business models) can be considered the initial phase of profitability analysis, undertaken in parallel with producer group selection. If the business models had failed show profitable business operations for farmers, these value chains would not have been selected.

Component 2: Producer groups effectively engaged in value addition

As in Component 1, the value addition groups were selected. The equipment necessary to run all of the processing operations was analyzed and identified. The procurement of the buckwheat processing lines is underway. Subcontractors hired by UNIDO recommended specific products and developed marketing plans, and initial preparations were undertaken for the successful execution of the other activities.

Identify business-oriented producer groupsaiming to engage in value addition (2.1)

The value chains already discussed were selected during the Inception Phase. The producer groups engaged in value adding activities includetwo buckwheat cleaning/hulling operations, five high-value cheese producers, and seven fruit and two herb dryers, altogether 16.

Install appropriate technologies/equipment (2.2)

The installation of all of the processing equipment (and equipment for the other forms of value addition) will be undertaken in 2016. In order to purchase this equipment, UNIDO hired an international food processing expert to provide advice on the technology needed in the high value cheese, honey and fruit/herb drying value chains. The equipment for the buckwheat and high value cheese value chains has been selected, based on the advice of international consultants in buckwheat and food processing. The necessary equipment for fruit and herb drying and honey production will also be finalized before the end of the year, with the advice of expert consultants. The necessary world class equipment, with specific applicability to the taste preferences of the post-Soviet marketwas identified and procurement initiated.A trip by UNIDO team members to Russia is planned to clarify the technical requirements for buckwheat hulling. The buckwheat hulling lines will be procured in 2015, to be delivered in 2016.

Study existing and potential markets and support new product development (2.3)

Three market studies were commissioned to analyze the domestic and international market for products to be produced by the ENPARD supported producer groups. Market studies were undertaken for buckwheat honey, high value cheese and dried fruit, as the marketing of buckwheat and non-traditional vegetables was already researched by the team. These studies were commissioned in September, immediately after the selection of the producer groups was complete, as the specific products which UNIDO/UNDP would support became clear. The studies will be finished by December. The subcontracts include product testing for buckwheat honey, the recommendation of specific products, and the development of marketing plans for the recommended products. The commissioned market studies include: buckwheat honey; high value cheese; and dried fruit, berries, vegetables and herbs. Market studies were not commissioned for buckwheat or non-traditional vegetables, as the market analysis of these crops was undertaken by team and included in the business models.

Improve producer groups' capacities in storage and packaging (2.4)

Improving the capacities of the producer groups in storage and packaging will be a focus in 2016 . However, in 2016, related tasks were undertaken, such as hiring the buckwheat agronomist whoevaluated the available processing technologies and recommended those which should be used in the future.

Help producer groups develop marketing capacities and link them to buyers (2.5)

While the bulk of Activity 2.5 will be undertaken in 2016, when the producer groups launch production and begin to market their products, one major activity was initiated in 2015. Anticipating the large production of buckwheat in 2016, the UNIDO/UNDP team undertook discussions with the World Food Program (WFP) regarding the bulk purchase buckwheat for its school feeding program. The sales to the WFP will represent around 10% of the total expected sales, and assist the processing factories to gain initial cash flow. The WFP was optimistic that the purchasing volumes would increase in the future with purchases from the national government's school feeding program.

Build entrepreneurial and business planning capacities of value addition groups (2.6)

UNIDO recruited a subcontractor to develop business plans for the two buckwheat cleaning and hulling factories, five high-value cheese producers, seven fruit drying groups, and two herb drying groups. The development of the 16 business plans will be undertaken through a participative process. These discussions will help farmers to have a clear understanding of the investment necessary to make their processing businesses operational, as well as the expected profits. The business plan development process will last about three months as the subcontractor awarded the activity will meet regularly with the producer groups to develop the plans with their full understanding and participation. The business plans will include and integrate information provided in the value chain diagnostic studies, the market analyses, and the investment and running costs of the recommended equipment. These will be finalized in early 2016, at which point the producer groups will have committed to co-financing and the objectives outlined in the plans. At this moment, the rest of the equipment and technologies to be installed in the producer group businesses will also be procured. Co-financing on the part of the producer groups will differ by value chain. It is expected that each member of the buckwheat groups will contribute an ownership share of 100 USD, which will constitute an initial working capital fund for the hulling factories. In addition, the communities in which the factories will be based will construct the buildings with their own funds. The co-financing by the dairy cooperatives will surpass the financial support provided by UNIDO, and will depend on the requirements and planned capacities of the processing operations. In the other value chains, UNIDO/UNDP will finance approximately 80% of the investment costs. Further training on specific business skills, to fill capacity gaps, will be conducted throughout 2016.

Link producer groups to existing finance schemes (2.7)

Several meetings were held with the German Development Bank (KFW) regarding its project focusing on value chain financing in Armenia. If the producer groups will require loans, for initial working capital for example, short and medium term finance will likely be available. Initial discussions were also conducted with organizations which could act as co-donors with ENPARD to the dairy groups, including with Heifer International and the Strategic Development Agency (SDA), which is implementing a livestock development project in Syunik and Vayots Dzor.

Improve groups' capacities to comply with food safety and quality standards (Act 2.8)
All of the processing equipment under consideration for purchase, to be installed for use by the value addition groups, will enable the production to meet national and international food quality standards. Increasing the capacity of groups to comply with standards via training and on site demonstration will be a focus in 2016, when processing operations are underway.

Support use of cleaner production and energy saving technologies (Act 2.9)
Specific analyses and implementation of cleaner production and energy saving technologies will be a focus later in the project. However, in selecting the buckwheat cleaning/hulling equipment, the team specifically selected a processing line which uses the waste (hulled shells of buckwheat), as biofuel to power the parboiler. In this set up, the waste can also be used to warm the factory, simultaneously eliminating the need to dispose of mountains of hulled shells. Additionally, discussions were undertaken with a biofuel project supported by the EUD in Armenia, which may lead to their installing biofuel powered heaters in the greenhouses to be constructed for non-traditional vegetable seedling production.

Promote participation of women, youth and vulnerable groups (Act 2.10)
Three women staff members and two project beneficiaries (who applied to the project in the dairy and fruit value chains) are participating in a training program entitled *Agribusiness –A Tool for the Empowerment of Rural Women*. The training program is currently underway, from November 16-December 9, 2015, in Haifa, Israel. The staff members will use their learnings to improve their engagement with producer groups. The project beneficiaries will use their new capabilities in the management of their future cooperative enterprises.

Component 3: Value chains strengthened and providing better quality food

Value chain analysis (Act. 3.1)
Consultants were hired to undertake the value chain analyses, including (1) high value field crops (buckwheat and legumes), (2) milk and dairy, (3) fruit and berry, and (4) non-traditional vegetables. Intensive support was provided to the consultants undertaking these diagnostic studies, on the development of their research guidelines and approaches. The value chain diagnostic studies were commissioned in June, following the consultant selection process which took place in May.

Develop Good Agricultural Practices and Disaster Risk Management Approaches (3.4)
The international consultant buckwheat agronomist provided clear guidelines in the form of a production manual on good agricultural practices for buckwheat production. He also provided initial trainings to lead farmers, which will be reinforced in 2016 with more in depth and practical trainings to be delivered during the growing season. In addition, still in 2015 UNDP will commission the development of production manuals for several other crops which the farmers in the producer groups can grow to increase incomes, including: berries, legumes, high value vegetables and others. Additional production manuals, such as for dried fruit production, will not be necessary to

commissionas these have already been created and distributed to farmers by UNDP or other organizations.

Improve access to better quality production inputs and related services (3.5)

The buckwheat agronomist recommended the most suitable agricultural inputs for the buckwheat farmers, including seeds, fertilizers, and other inputs. He also analyzed the agricultural machinery, such as combine harvesters, available in the communities, and recommended the best methods through which these machines can be used to harvest buckwheat. UNDP will provide certain agricultural inputs to the farmers in 2016, and the farmers will recycle the seeds and use their income from the first year to continue cultivation in subsequent years (using the same financing sources as they do currently for wheat production.

The supply of raw milk was analyzed when selecting each of the groups which will produce high value cheese; and, reinforcement to their collection systems will be provided in 2016. Upgrading the supply mechanisms and sources of available supply to the other cooperatives (such as the production of quality seedlings for non-traditional vegetable production) will be part of implementation in 2016.

Other Component 3 activities

The other component three activities will be undertaken as relevant during implementation in 2016, and when upgrading the operational environment of the future cooperatives in 2017.

3 Results management

Several core activities were undertaken in results management and monitoring and evaluation, consisting primarily of developing the approach to M&E and the management of results, as well as testing the baseline study and selecting control groups.

- **Results measurement and M&E strategy:** The overall results management strategy was drafted. The strategy describes how the various components of the results management and M&E system fit together, as well as how baseline, mid-term and final evaluation data will be collected and used to guide project implementation.
- **Results chains:** Results chains were developed for each of the value chains, as a logical framework, showing how the different project activities are to be implemented as a series of steps leading to the targeted outcomes and indicators. A results measurement tool was created in Excel to track progress on each of these steps.[3]
- **Baseline questionnaires:** The baseline survey questionnaire was developed and tested in four communities to be engaged in the buckwheat and non-traditional vegetable value chains. These test surveys proved successful and provided a clear picture of the economic situation of the target beneficiaries. Most often household's end the year with a positive balance of one to two million AMD, while the baseline data of other families showed an annual net loss, due to the low productivity of small plots and credit owed to banks. The baseline questionnaire also collected information on the assets owned by the household, the sources of income, and demographic information, as well as including a gender assessment.

[3] Theresults chains are included as Annex 15.

- **Control groups:** Following the selection of the 69 producer groups, the project team began to select control groups in the different regions of each marz, and for each value chain. In total, the project will collect M&E data on 29 target groups and 29 control groups, consisting of a total of 290 farmers (145 target beneficiaries, and 145 control farmers).

4. Financial Reporting: spending since January 2015

An economical approach was used to reduce spending in 2015, in order to reserve additional funds for 2016, when the maximum of funding will be needed to render the selected producer groups operational.Expenditures of the EU funds surpassed the 70% minimum, requiredto receive the tranche of funding for 2016.

EU Funded Project Component

With 61% of the Component 1 budget expected to be expended by year end, 89% of the Component 2 budget by the PSC, and 75% of the Component 3 budget by year end, the 2015 fund expenditure for the UNIDO/UNDP component will be75%.

The funds were spend on the activities described above, specifically on recruitment costs (for 2015 and partially for 2016 contracts), market studies, business plan development, procurement of buckwheat hulling lines, and the other undertakings discussed.

Table 6: EU Component Preliminary Budget – Commitment vs. Actual

In Euro

	Received in February 15 (90% of 1st year budget)	Expenditure till 18 Nov 2015	Balance	% from received
Output 1: Strengthened and newly established producer groups				
International consultancies	-	-	-	
Local support staff and travel	3,150	2,712	438	
Headquarters travel	-	-	-	
National consultants	65,700	37,968	27,732	
Subcontracts	25,200	18,080	7,120	
Training workshops	20,700	9,040	11,660	
Equipment	-	-	-	
Sundries	10,800	9,040	1,760	
Total output 1	**125,550**	**76,840**	**48,710**	**61%**
Output 2: Producer groups effectively engaged in value addition				
International consultancies	140,916	127,259	13,657	
Local support staff and travel	8,000	5,427	2,573	
Headquarters travel	5,400	3,638	1,762	
National consultants	20,578	20,658	80	
Subcontracts	72,000	62,191	9,809	
Training workshops	9,550	121	9,429	
Equipment	121,500	17,656	3,844	
Sundries	25,000	20,520	4,480	
Total output 2	**402,944**	**357,469**	**45,475**	**89%**
Output 3: Access to affordable food and value chain organization is improved				
International consultancies	13,500	-	13,500	
Local support staff and travel	3,150	1,808	1,342	
Headquarters travel	-	-	-	
National consultants	62,550	70,512	7,962	
Subcontracts	28,800	13,108	15,692	
Training workshops	15,750	5,243	10,507	
Equipment	76,500	75,936	564	
Sundries	10,800	9,040	1,760	
Total output 3	**336,600**	**252,487**	**84,113**	**75%**
Indirect Costs UNIDO	28,206	25,023	3,183	
Indirect Costs UNDP	32,351	23,053	9,298	
Grand total EU Component	**925,651**	**734,872**	**190,779**	**79%**

ADA Funded Project Component

With 17% of the Component 1 budget expected to be expended by the year end, 28% of the Component 2 budget by the PSC, and 35% of the Component 3 budget by year end, the expected 2015 fund expenditure for the UNIDO/UNDP component is 27%. The funds were spend on the activities described above, specifically on recruitment costs (for 2015 contracts), business plan development, procurement of buckwheat hulling lines, and the other undertakings discussed.

Table 7: ADA Component Preliminary Budget – Commitment vs. Actual

ADA

	Received in Oct 14 (total 3 year budget)	Expenditure till 18 Nov 2015	Balance	% from received
Output 1: Strengthened and newly established producer groups				
International consultancies	-	-	-	
Local support staff and travel	-	-	-	
Headquarters travel	-	-	-	
National consultants	23,000	3,965	19,035	
Subcontracts	4,000	-	4,000	
Training workshops	3,000	-	3,000	
Equipment	-	-	-	
Sundries	3,000	1,586	1,414	
Total output 1	**33,000**	**5,551**	**27,449**	**17%**
Output 2: Producer groups effectively engaged in value addition				
Staff & Intern Consultants	18,000	14,491	3,509	
Local travel	3,000	3,239	-239	
Staff Travel	6,000	2,426	3,574	
Nat.Consult./Staff	71,050	59,389	11,661	
Contractual Services	84,000	8,372	75,628	
Train/Fellowship/Study	8,250	3,367	4,883	
Equipment	151,000		151,000	
Sundries	3,532	3,817	-259	
Total output 2	**344,832**	**95,101**	**249,757**	**28%**
Output 3: Access to affordable food and value chain organization is improved				
International consultancies	-	-	-	
Local support staff and travel	-	-	-	
Headquarters travel	-	-	-	
National consultants	13,000	-	13,000	
Subcontracts	4,000	-	4,000	
Training workshops	4,200	-	4,200	
Equipment	15,000	11,895	3,105	
Sundries	3,000	1,586	1,414	
Total output 3	**39,200**	**13,841**	**25,719**	**35%**
Total net acroos 3 outputs	**417,032**	**114,493**	**302,925**	
Support cost UNIDO	**44,828**	**12,363**	**32,468**	
Support cost UNDP	**5,776**	**1,551**	**4,253**	
Grand total ADA component	**467,636**	**128,407**	**339,647**	**27%**

5 Outlook for 2016

With the strong foundation provided by the in depth selection processes of value chains and producer groups, and the analytical studies already completed, the outlook for the ENPARD producer groups is positive. Over the course of 2016, all of the producer groups will be established, begin operations, and will be registered in the State Registry. UNIDO/UNDP activities in 2017 will focus on consolidating gains and other focused value chain upgrading activities. Considering the activities to be implemented, the year will begin with some marketing focused activities and infrastructure development, and finish with the independently operating cooperatives registering cash income, as described below.

First quarter

In the first quarter UNIDO/UNDP will subcontract the development of an umbrella brand that prominently features the donors' logos. The same subcontractor will also work on focusing the marketing plans already undertaken into specific market entry strategies, with clear sales opportunities for the farmer groups. Simultaneously the baseline study will be conducted, using the baseline questionnaire already developed, targeting the already selected target and control groups. Additionally, a gender specialist will be recruited to ensure that the baseline includes a through gender assessment, to train the team to be more aware of gender issues in agribusiness development. The specialist will use the baseline data to develop a strategy for gender mainstreaming to be implemented over the remaining years of the project.

Also during the first quarter, all of the sites necessary for primary production activities, and value addition/processing activities, will be constructed or refurbished. Procurement will be initiated for the buckwheat cleaning/hulling equipment (to include parboiling and packaging machines) and for the agricultural inputs needed for buckwheat productionin 2015. However, the complete materials and equipment needed in the other value chain will be purchased in early 2016. In total, these materials include:

- Buckwheat cleaning and hulling equipment, including parboilers and packaging machines;
- Mobile buckwheat seed cleaners;
- Hives and honey extraction tools and clothing (which may be donated by an implementing partner);
- Honey processing and packaging equipment;
- High value cheese equipment, most likely to include cheese vats and/or cheese molds and cheese presses, with the other equipment used in cheese processing to be purchased by the producer groups;
- Fruit/herb dryers, most likely hybrid solar/gas dryers to minimize production costs;
- Greenhouses for non-traditional vegetable seedling production;
- Cold storages for producer groups in fruit drying and vegetable production.

Agricultural inputs for buckwheat production and non-traditional vegetable seedling production will need to be distributed in the first quarter as well—through an organized system implemented through the group leaders—in order for the farmers to be ready to plant on time for the season. These fully subsidized inputs will reduce the cost of production, while the producers will cover other costs such as plowing and harvesting. It will be important to reduce the farmers' risk as buckwheat is a new crop being introduced by ENPARD.

As the facilities for the buckwheat processing are being constructed by the respective communities, UNIDO/UNDP will assist the farmers to structure cooperative and HR processes necessary to efficiently operate the hulling "cooperative of cooperatives." The key managers who will work for the hulling factories will be recruited, including a manager/accountant, a supply/stock manager, a marketing manager, and the workers to operate the hulling equipment. These employees will be paid by the hulling factories, while UNIDO will assist in recruitment and training. The production and processing operations of the producer groups in the other value chains will be undertaken by the members of the groups.

Second quarter

In the second quarter, the equipment, as listed above, will be installed in the remodeled/prepared production and processing premises.Additionally, the primary producer groups will begin their farming activities. As the agricultural season starts, farmers in each of the value chains will receive training in GAP. They will likewise receive training in the necessary business skills, as these competencies become necessary and gaps emerge. The UNIDO/UNDP team anticipates subcontracting some of these trainings, and hiring other national consultants to work specifically with the producer groups on relevant issues such as accounting or marketing.

Third quarter

All of the value addition groups will begin production/processing in the third quarter of the year, as well as beginning to make contacts for future sales. Concrete research and contacts will also be made targeting export markets.

Fourth quarter

In the fourth quarter, all of the producer groups and value addition groups will make their first sales. They will be officially registered in the State Registry, as they register income and experience success as businesses. A mid-term monitoring and evaluation study will be conducted to analyze the impact of the launch of operations of the cooperatives, likely in early 2017.

Annexes

Annex 1: List of team members

UNIDO Component (core staff)

Name	Title	Main responsibilities
Severin OMAN	Project Coordinator	○ Coordinate project implementation overall, with regard to meeting objectives, indicators and deadlines, and contribute to the overall strategic approach. ○ Liaise with UNIDO headquarters to ensure full contribution of UNIDO technical expertise.
Margarita GASPARYAN	Results Manager	○ Develop the project monitoring and evaluation (M&E) approach and specific results chains for each of the value chains selected as the focus of the project; ○ Ensure periodic data collection through project staff and beneficiary groups (including frequent visits to the field); ○ Report on results and discuss progress and challenges with project staff.
Sergey MATEVOSYAN	Component Leader	○ Lead the identification of value adding producer groups; ○ Oversee the provision of equipment and technical skills for the production of higher quality and higher value products by the identified producer groups; ○ Ensure the provision of support (through training and technical expertise) to producers groups to invest in appropriate packaging solutions and storage facilities and develop effective entrepreneurial and business capacities.
Garnik SEVOYAN	Field Operations Manager	○ Coordinate the field implementation of the processing related activities in the buckwheat value chain; ○ Overall responsibility for factory organization and set-up, facilitating support to the groups, and supporting buckwheat marketing and sales.
Luiza Sevuni	Field Operations Manager	○ Coordinate the field implementation of the dairy/high value cheese value chain;

		○ Overall responsibility for factory organization and set-up, facilitating support to the groups, and supporting cheese marketing and sales.
Emma PETROSYAN	Project Assistant	○ Provide administrative support to subcontracting and procurement procedures; ○ Ensure the implementation of the project's communication and visibility strategy.
Tatevik SIMONYAN		○ Provide administrative support to the ongoing operations of the office.
Rafael TSARUKYAN	Driver	○ Provide reliable and safe driving services; ○ Ensure proper day-to-day maintenance of the vehicle.

Short-term Consultants:

David POOCH, International Food Processing Consultant

Boris VORONICHEV, Buckwheat Agronomy Expert

Karen AVETISYAN, UNIDO Honey Production/Beekeeping Consultant

Market study services (subcontract)

In-depth market study and value chain analysis of buckwheat honey - EREKAR STRATEGY LLC

In-depth market study and value chain analysis of high value cheese - EREKAR STRATEGY LLC

In-depth market study and value chain analysis of dried fruits, berries, vegetables and herbs in Armenia - AM PARTNERS CONSULTING COMPANY LLC

Business plan development and farmer training services - AM PARTNERS CONSULTING COMPANY LLC

UNDP Component (Core staff)

Name	Title	Main responsibilities
Babken BABAYAN	Component leader	○ Ensure implementation of the UNDP component in accordance with relevant rules and regulations; ○ Lead identification of primary producer groups; ○ Oversee provision of capacity building (trainings) for the farmers groups; ○ Oversee provision of inputs (seeds, fertilizers, greenhouses, cooling equipment, drip irrigation, hail nets, etc.) to farmers groups.
Paruyr ASATRYAN	Expert/Planner	○ Provide overall expert support for UNDP component; ○ Support in identification of primary producer groups; ○ Preparation of value chain business models; ○ Support in identification of farmers group's needs; ○ Preparation of relevant specifications for procurement inputs; ○ Monitor operation of the farmer groups.
Irena GRIGORYAN	Project assistant	○ Provide overall administrative support in procurement, financial, HR and other issues; ○ Support implementation of project's communication and visibility strategy.
Tigran MANUKYAN	Logistics clerk/Driver	○ Provide overall clerical and logistical support; ○ Provide reliable and safe driving services; ○ Ensure proper maintenance of the vehicle.
Arthur KHACHATRYAN	Driver	○ Provide reliable and safe driving services; ○ Ensure proper maintenance of the vehicle.
Ani ARSHAKYAN	Intern	○ Provide overall support to project; ○ Entering information about applicants into the database; ○ Making telephone calls to farmer groups.

Market study services (subcontract)

Business plan development and farmer training services – BSC/AVENUE CONSULTING JOINT PROPOSAL

Annex 2: Producer Group Selection Report

Introduction

Following the value chain selection process, the UNIDO/UNDP team selected the producer groups to be supported throughout the project. The producer group selection process occurred over five months, with intensive field visits undertaken during four of these months—first to explain the project to the potential beneficiaries to mobilize applications, and second to evaluate the applicant groups. The selection process included a pilot and a rollout, a three phase methodology of selection criteria, and other underlying activities such as community mapping and business model development.

The table below summarizes the groups which were selected as a result of this process, as well as the number of applications received by marz in total. Finally, 35.6% of the applicants were selected.

Table 1: Producer group selection summary results

	Value Chains							Total by Marz	Number of Applications Received	% Selected
	Buckwheat	Dairy	Fruit: Dried Fruits	Fruit: Cold Storage	Berries	Non-traditional vegetable	Herbs			
Aragatsotn	6		4	1				11	33	34.4
Gegharkunik	10	1					1	12	42	28.6
Kotayk	4							4	20	20
Lori	4	1	2		2	2	1	12	39	30.8
Shirak	23	2			1			26	46	60.5
Vayots Dzor	2	1	1					4	18	22.2
Total	49	5	7	1	3	2	2	69	198	35.6

The following table provides additional data on the groups, such as the number and percentage of groups with woman leadership, the composition of members, and the institutional structures of the groups. The percentages of woman leadership, and youth and women participation, exceed those required by the project document.

Table 2: Producer groups summary data

	Number	%	Target Indicator
Selected farmer groups	69	100	30 co-ops
Groups with woman coordinator	30	43.5	40.0%
Existing cooperatives	7	10.1	
Existing non-registered groups	15	21.7	
New groups	47	65.2	
Total number of members	1109	100	
Number of women members	402	36.2	30.0%
Number of youth members	415	37.4	30.0%

Methodology

The applications submitted by the farmer groups were evaluated in 3 phases. This methodology of selection criteria was applied to each of the 198 applications received by the ENPARD, through which process the 69 producer groups were selected.

Phase 1: Evaluation by the mandatory requirements of the project;
Phase 2: Evaluation by socio-economic and environmental aspects;
Phase 3: Evaluation by interviews and training results.

Phase 1: Evaluation by the mandatory requirements of the project

Based on the main objectives of the project, the following criteria are defined as mandatory for the selection of farmer groups.

1. Groups are comprised of a minimum of 5 farmers from different households;
2. Groups are comprised only of rural households/farms (residents must live and are residents in the village);
3. Project participants (producers and processors) should already be involved in farming and/or processing;
4. Participants show a willingness to learn/ to receive training;
5. Participants agree to contribute financially;
6. Participants agree to become registered as a cooperative or other legal entity.

The applications of the groups that were already registered legal entities were considered separately in order to evaluate their potential to be involved in the processing component of the project. The groups which did not meet the 1st, 2nd and 3rd mandatory requirements of the selection, were not be considered. In the case that the groups did not meet the 4th, 5th and 6th mandatory requirements, negotiations were conducted with them in order to suggest revising their approach. Those groups that did not amend their approaches after the negotiations were not be considered in the further selection process.

Phase 2: Evaluation by socio-economic and environmental aspects

The following 7 criteria are defined for the second phase selection.

1. Correspondence of the group's proposal to the project objectives;
2. The level of project innovation
3. Economic aspects
4. Social aspects
5. Environmental aspects
6. Marketing potential
7. Opportunity for replication of the project by others

Each of the criterions has several sub-criterions, against which the evaluation of the applications wascarried out. The sub-criterions below were rated using a 5 point scoring system, weighted through 1 (minimum) 5 (maximum). The weights of points awarded for each sub criterion (5 or 3) were defined by the ENPARD team and reflect the importance attributed to the sub-criterion in the project.

The evaluation considered the data provided in the groups' applications, as well as any supplementary research undertaken by the ENPARD team. The evaluation occurred by scoring the following sub criterions

Criterion 1: Correspondence of the group's proposal to the project objectives

Evaluation sub-criterions	Score	Weight
1.1.Correspondence with the priority value chains of the Project	• High compliance-5 • Middle compliance-3 • Low compliance-1	5
1.2. Potential of creating added value	• High potential-5 • Middle potential-3 • Low potential-1	5
1.3.Legal form of the group	• Non formal or new group – 5 • Legal entity - 3	3

Criterion 2: The level of project innovation

Evaluation sub-criterions	Score	Weight
2.1.New technology and/or new product	• Innovation on the national level-5 • Innovation on marz level-3 • Replication of other successful projects-1 • No innovation-0	3

Criterion 3: Economic aspects

Evaluation sub-criterions	Score	Weight
3.1.Income increase of group members due to the project	• More than 20% - 5 • 10-20% - 3 • 1-10% - 1 • No increase-0	5
3.2.Creation of new employment (including group members)	• More than 20 workplaces – 5 • 11-20 workplaces -3 • 1-10 workplaces - 1 • No new workplace-0	5

Criterion 4: Social aspects

Evaluation sub-criterions	Score	Weight
4.1.Participation of women	• Women led groups-5 • Men led groups-1 • Men led groups with +=30% of women participation-5 • Men led groups with 20-30% of women participation-3 • Men led groups with up to 20% of women participation-1	5
4.2.Participation of youth	• More than 30%-5 • Up to 30%-3 • No youth-1	5

Criterion 5: Environmental aspects

Evaluation sub-criterions	Score	Weight
5.1.Impact on the environment	• Only positive impact - 5 • Mostly positive impact - 3 • Mostly negative impact – 0	2

Criterion 6: Marketing potential

Evaluation sub-criterions	Score	Weight
6.1.Market potential	• High potential-5 • Middle potential-3 • Low potential-1 • No potential-0	3

Criterion 7: Opportunity for replication of the project by others

Evaluation sub-criterions	Score	Weight
7.1.Simplicity of technology insertion/replication	Easy-5 Middle-3 Not easy-1	3
7.2.Necessity of finance for replication	• Low – 5 • Middle – 3 • High - 1	3

Maximum score – 235 points.
Potential for including in Project:
Low level – up to 117 points (235*50%)
Middle level – 117-156 points
High level – more than 156 points (235*66.7%)

Groups that have scored less than 117 points are not considered for the next selection phase.

Phase 3: Evaluation by interviews and training results

The final selection of the groups was done through individual meetings and interviews with the groups that made it to the 3rd phase. The results of the trainings was also considered in this phase. The interviews refered to the following:

1. Existing skills of farmers/processors will be evaluated;
2. Groups have a track record of collaboration (within the group or on other projects);
3. Groups have a dedicated community connection;
4. Participants show self-initiative, motivation, ambition and business-orientation;
5. Participants have a willingness to learn, expand, and increase profit through value addition or processing;
6. Famers/processors are performing or willing to perform joint activities (as a cooperative, association, limited liability company, other legal entity) as a primary source of household income;

7. Groups have a readiness/capacity for co-financing;
8. Additional criteria for processors include: (1) a secure source of primary products, processing premises and capacities, available working capital; (2) available skills and technology, including specialists responsible for production processes, (3) dedicated markets/buyers.
9. Groups operate in one shared premises (newly established facilities should belong to all members of the cooperative).

Phase 4: Selection

Groups that passed all three phase of the process were selected to receive business training and business plan development. All of these groups will have the opportunity to receive support from ENPARD, although some of they may be eliminated or withdraw on their own at a later date.

Rolling out the Group Selection Process

The producer group selection process began in April 2015. The application materials, including the informational flyer and detailed application had been developed by the team during the inception phase. Prior even to piloting the application, it was tested on several producer groups to verify their understanding and minimize the complexity of the questions. Communication methods were developed for outreach and to publicize the open call, including the use of local authorities such as the governors and mayors, as well as media channels. During the earlier visits to marz authorities, the UNIDO/UNDP team had explained the project to generate support for the open call in the targeted marzes. The steps in producer group selection included the following.

Open call in Lori marz

The open call for producer group applications was piloted in Lori marz during the Inception Phase, with a deadline of May 15. Thirty nine applications were received. Following the Inception Phase, the effectiveness of the communication methods used was evaluated by calling 20 communities and visiting 5 communities, all in different areas of the marz. About 70% of the rural communities in Lori were aware of the open call. Direct communication through the mayors' offices, agricultural service centers (GAMKs), other NGOs, and by the project team proved the most effective method of generating applications, while local TV and radio channels were less impactful. The evaluation of the Lori open call showed the importance of face-to-face meetings with farmers, allowing the team to explain the project, as well as to describe the value chain selection.

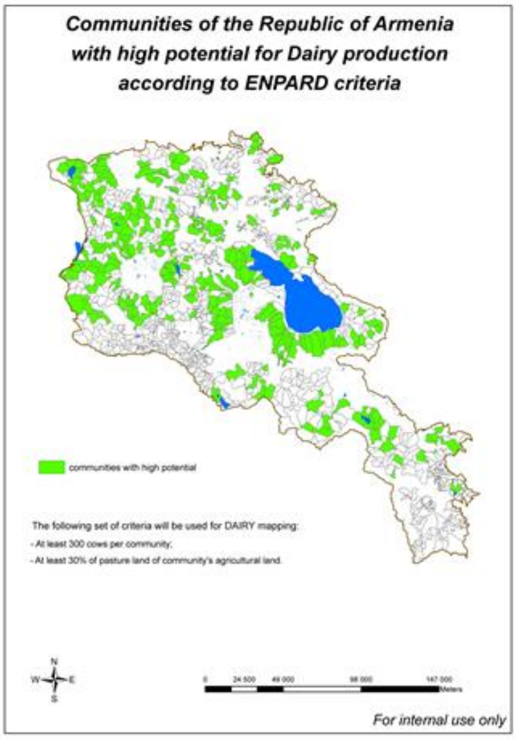
A pilot open call was launched in Lori Marz in April with a May 15 deadline. Also in May, the results of the pilot open call and the communication methods used were evaluated and deemed successful. Following the successful pilot open call in Lori,

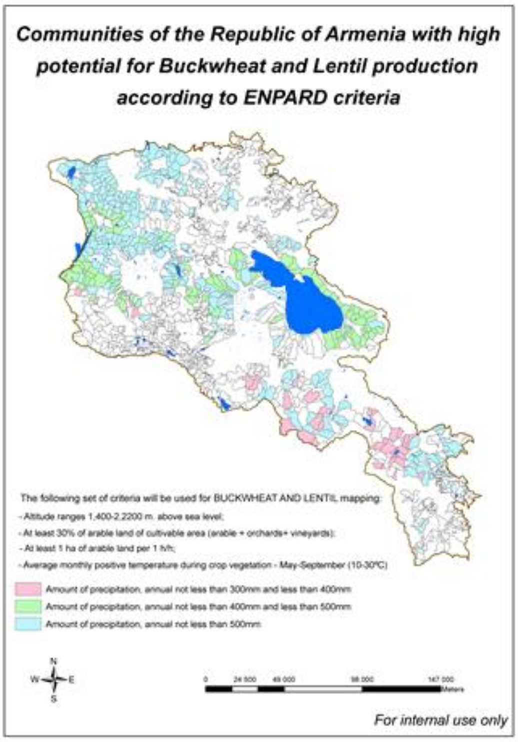
Business model development

In May and June, the team developed business models for buckwheat, lentils, and non-traditional vegetable (broccoli) production. These models, which are among the innovations the ENPARD project will introduce in the agricultural sector in Armenia, were described to farmers in subsequent community visits to promote the open call. Developing the buckwheat business model was especially critical as the UNIDO/UNDP team intends to introduce a new crop and to construct an entirely new value chain in Armenia. Therefore, a careful analysis needed to be made of the proposed business idea, to ensure that it would be profitable at every level, before introducing it to farmers.

Mapping the highest potential communities by value chain

The first draft of a mapping was developed, showing the communities most suited for value chain interventions. The mapping took into consideration criteria such as elevation, precipitation, average yields, availability of arable land, availability of irrigation, and the minimum land holdings of farmers, among others. The mapping was used as a tool to selected communities to visit to promote the open call for producer group applications. The following maps show the communities based on the defined criteria by value chain. The mapping exercise provided direction for the community mobilization visits to promote the open call. While the maps include important agricultural indicators, inclusion on the maps was not a prerequisite for a producer group to be selected for





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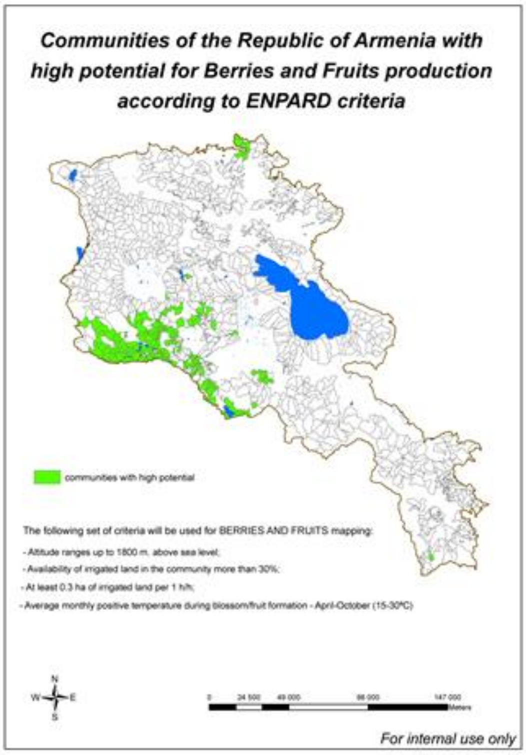
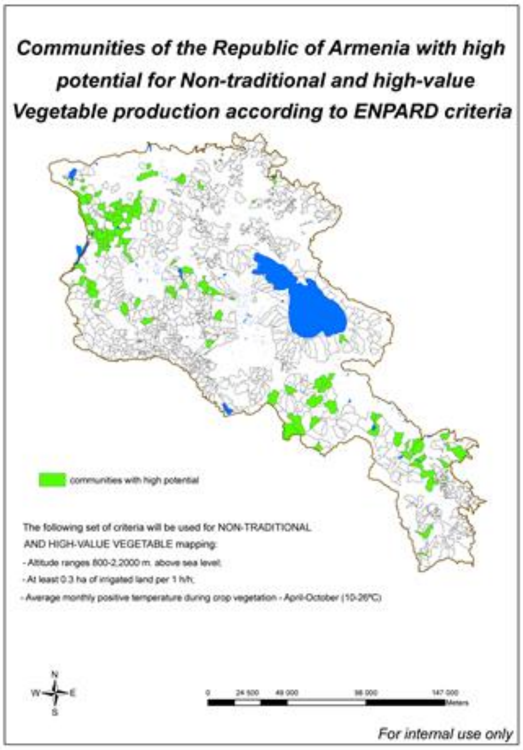




Open call rollout

Based on the successful pilot in Lori, the open call for producer groups was rolled out in the remaining targeted marzes (Shirak, Aragatsotn, Kotayk, Gegharkunik, and Vayots Dzor). The open call was launched in the remaining marzes at the end of May, with a 1.5 month application period and a deadline of July 15.

Open call promotion to mayors

In addition to being promoted through the governors' offices, agricultural service centers, and media channels, the open call application packet was sent directly to all of the mayors in the target marzes. Follow up with the mayors regarding their understanding and dissemination of the application materials improved outreach.

Community targeting visits

The team presented the open call in all of the targeted marzes. The visits were undertaken over 11 weeks in June and July, averaging three field visits, and nine community visits, per week. The field visits were organized using the previously created community mapping by value chain. During these meetings members of the project team presented the opportunity to apply for ENPARD support, as well as explaining the approach of the project with an emphasis on value addition, and the specific business models designed and promoted by the team.

Application deadline

Applications were received from 190 producer groups, with a total of 4,328 members, of which 1,474 are female and 1,299 are young. Although the deadline has expired, applications continue to be received, reaching a total of over 200 applications.

Selection methodology

The methodology discussed above was developed to guide the selection of the most suitable producer groups from the larger number of applicants. This methodology consists of three sections: mandatory criteria, socio-economic and environmental impact criteria, and final interviews and training results. The three step methodology for the evaluation of applications was developed prior to launching the open call, and revised as the open call was ongoing.

Applicant database

A database of the applications received was created to provide easy access to information about the groups and to facilitate the other steps in producer group selection.

Producer group evaluation and initial shortlist

The applicant producer groups were evaluated according to the mandatory criteria and scored based on the socio-economic and environmental impact criteria, to generate an initial short list of groups. Since the evaluation criteria were already defined, the groups were analyzed immediately after the application deadline. By August the groups to be visited for further in depth interviews had been selected.

Evaluation and due diligence

Field visits were organized to the 91 groups which scored highly on the socio-economic and environmental impact criteria, during which time the team performed due diligence, discussed business concepts, evaluated group motivation, and checked the accuracy of the data reported in the applications. These visits took place for over 8 weeks, in August and September. A final shortlist of 69 groups was developed based on these visits. The 69 groups consist of 1,109 farmers, of which 402 are women, and 45 are young.

Groups Selected

The 69 selected groups are listed in the table below. The table shows the institutional structure of the groups, as well as the composition of membership. The final column provides some description information per group. The data in this stable in summarized in the tables in the introductory section of this report.

Marz	Community	Group leader is woman	Institutional structure			Membership of groups			Value chain	Notes
			Co-op	Informal	New group	Total	Women	Youth		
Aragatsotn	Zarinja	Yes			Yes	12	4	0	Buckwheat	All eligible applicant groups selected
Aragatsotn	Tatul				Yes	5	1	2	Buckwheat	All eligible applicant groups selected
Aragatsotn	Artik				Yes	5	0	2	Buckwheat	All eligible applicant groups selected
Aragatsotn	Suser				Yes	13	1	2	Buckwheat	All eligible applicant groups selected
Aragatsotn	Tsamaqasar	Yes		Yes		21	1	2	Buckwheat	All eligible applicant groups selected
Aragatsotn	Zovasar	Yes		Yes		9	1	2	Buckwheat	All eligible applicant groups selected
Aragatsotn	Aragatsavan			Yes		11	4	1	Dried fruits	IFAD established orchards and will construct drip irrigation. ENPARD will establish fruit drying, packaging and marketing.
Aragatsotn	Ujan			Yes		5	4	3	Dried fruits	Group in process of identifying area for drying facility.
Aragatsotn	Saghmosavan	Yes			Yes	5	5	3	Dried fruits	Group is prepared to purchase land for drying facility. Members who do not agree to co-financing have withdrawn from group.
Aragatsotn	Katnaghbyur			Yes		5	2	1	Dried fruits	The group is prepared to purchase land for drying facility.
Aragatsotn	Arayi	Yes		Yes		15	15	2	Fruit (cold storage)	The group produces berries, apple, and pear. The cold storage will ease a fruit marketing constraint.
Ararat	Ararat				Yes	8			Agro-machinery	Group of handicapped farmers to be supported with adapted tractor.
Gegharkunik	Sotq	Yes			Yes	5	3	5	Buckwheat	All eligible applicant groups selected
Gegharkunik	Varser				Yes	6	2	1	Buckwheat	All eligible applicant groups selected

Geghar kunik	Tsovagyugh	Yes		Yes		148	17	87	Buckwheat	All eligible applicant groups selected
Geghar kunik	Azat				Yes	13	2	2	Buckwheat	All eligible applicant groups selected
Geghar kunik	Kakhakn				Yes	5	2	1	Buckwheat	All eligible applicant groups selected
Geghar kunik	Kut				Yes	6	3	1	Buckwheat	All eligible applicant groups selected
Geghar kunik	Landjaghbyur				Yes	7	0	1	Buckwheat	All eligible applicant groups selected
Geghar kunik	Norabak	Yes			Yes	5	3	1	Buckwheat	All eligible applicant groups selected
Geghar kunik	Geghamavan	Yes			Yes	5	2	1	Buckwheat	All eligible applicant groups selected
Geghar kunik	Shatvan	Yes			Yes	23	15	6	Buckwheat	All eligible applicant groups selected
Geghar kunik	Khachaghbyur		Yes			31	12	18	Cheese	The group coordinates the collection of 15 tons of milk daily in the season, has a production facility, and experience in cheese making. The group is ready to contribute both in construction and equipment.
Geghar kunik	Dprabak	Yes			Yes	5	4	2	Dried Herbs	Refugee women collect wild herbs and berries. ENPARD will support drying, packaging and marketing.
Kotayk	Solak	Yes			Yes	27	6	2	Buckwheat	All eligible applicant groups selected
Kotayk	Lernanist				Yes	5	1	2	Buckwheat	All eligible applicant groups selected
Kotayk	Qaghsi				Yes	10	3	1	Buckwheat	All eligible applicant groups selected
Kotayk	Alapars	Yes			Yes	17	2	3	Buckwheat	All eligible applicant groups selected
Lori	Shamlugh	Yes				35	35	2	Berries	The members were suggested to join the Akhtala group.
Lori	Kurtan	Yes			Yes	20	15	15	Berries	The group would like to transition from backyard cultivation of berries to group cultivation on a 0.5 ha plot. ENPARD will support with drip irrigation, and the groups will construct the fence.
Lori	Mets Parni	Yes			Yes	17	3	3	Buckwheat	All eligible applicant groups selected
Lori	Saralanj	Yes			Yes	8	3	0	Buckwheat	All eligible applicant groups selected
Lori	Lernancq	Yes			Yes	5	2	1	Buckwheat	All eligible applicant groups selected

Lori	Tsaghkaber		Yes			31	19	18	Buckwheat	All eligible applicant groups selected
Lori	Agarak		Yes			96	64	86	Cheese	The cooperative collects 10 tons of milk in the season, and would distribute profits to members.
Lori	Shnogh		Yes			14	0	1	Dried fruits	The group has 15 ha of peach orchards and difficulties selling the product. Heifer is establishing a 250m^3 cold storage; ENPARD will support with fruit drying.
Lori	Mets Ayrum		Yes			12	1	5	Dried fruits	Shen NGO supports this group to produce dried fruit with solar dryers. Cloudy weather spoils the dried fruit production; in addition there are losses at harvest. The group has a 120m^3 capacity cold storage. ENPARD will support with cabinet drying.
Lori	Akhtala	Yes		Yes		6	6	2	Herbs	The farmers were suggested to join the Shamlugh group.
Lori	Gargar	Yes		Yes		25	20	8	Non-traditional vegetables	The group has 5 years of experience in non-traditional vegetable production, and access to a cold storage. ENPARD will support with a greenhouse for seedling construction (a constraint), and increased production.
Lori	Mets Ayrum			Yes		10	7	5	Non-traditional vegetables	The community (at a very high elevation) has fruit experience, but not with non-traditional vegetables. Heifer has established a 200 m^3 cold storage.
Shirak	Bavra	Yes			Yes	6	6	5	Berries	ENPARD will support with garden construction and marketing.
Shirak	Lernakert				Yes	6	1	0	Buckwheat	All eligible applicant groups selected
Shirak	Tufashen				Yes	5	1	1	Buckwheat	All eligible applicant groups selected
Shirak	Haykasar				Yes	5	1	3	Buckwheat	All eligible applicant groups selected

Shirak	Hayrenyac				Yes	6	1	1	Buckwheat	All eligible applicant groups selected
Shirak	Ghazanchi			Yes		41	1	10	Buckwheat	All eligible applicant groups selected
Shirak	Tavshut	Yes		Yes		44	20	8	Buckwheat	All eligible applicant groups selected
Shirak	Mets Sepasar				Yes	16	0	8	Buckwheat	All eligible applicant groups selected
Shirak	Bavra	Yes			Yes	93	30	30	Buckwheat	All eligible applicant groups selected
Shirak	Sizavet			Yes		6	0	2	Buckwheat	All eligible applicant groups selected
Shirak	Akhuryan	Yes		Yes		6	1	1	Buckwheat	All eligible applicant groups selected
Shirak	Nor Kyanq				Yes	6	1	1	Buckwheat	All eligible applicant groups selected
Shirak	Alvar	Yes			Yes	8	5	0	Buckwheat	All eligible applicant groups selected
Shirak	Zuygaghbyur	Yes			Yes	17	4	3	Buckwheat	All eligible applicant groups selected
Shirak	Goghovit				Yes	9	2	4	Buckwheat	All eligible applicant groups selected
Shirak	Shirakavan	Yes			Yes	9	7	1	Buckwheat	All eligible applicant groups selected
Shirak	Jrapi	Yes			Yes	9	1	0	Buckwheat	All eligible applicant groups selected
Shirak	Musaelyan				Yes	5	0	1	Buckwheat	All eligible applicant groups selected
Shirak	Krasar				Yes	7	1	2	Buckwheat	All eligible applicant groups selected
Shirak	Karmravan	Yes			Yes	8	2	0	Buckwheat	All eligible applicant groups selected
Shirak	Hartashen				Yes	6	1	1	Buckwheat	All eligible applicant groups selected
Shirak	Ashotsk				Yes	5	1	1	Buckwheat	All eligible applicant groups selected
Shirak	Qeti				Yes	6	4	3	Buckwheat	All eligible applicant groups selected
Shirak	Pokr Sepasar				Yes	18	7	4	Buckwheat	All eligible applicant groups selected
Shirak	Mets Mantash	Yes			Yes	5	5	2	Cheese	The group jointly collects milk cow and sheep milk, and is building a production facility. Group members have cheese production experience.
Shirak	Berdashen			Yes		5	0	0	Cheese	Remote community inhabited by the migrants from Georgia. Livestock is the core activity of the community. The group is building new production facility for cheese.
Vayots Dzor	Zaritap		Yes			15	0	4	Buckwheat	All eligible applicant groups selected
Vayots Dzor	Martiros				Yes	8	1	1	Buckwheat	All eligible applicant groups selected

Vayots Dzor	Yelpin		Yes			21	6	15	Cheese	The cooperative has been producing local cheeses for more than 1 year. ENPARD will support upgrading to high value cheeses and marketing.
Vayots Dzor	Rind				Yes	5	2	3	Dried fruits	The group will identify area for processing facility, and ENPARD will support with drying and marketing.

Annex 3: Value Chain Analysis: Milk and Dairy/Final Analytical Report

Authored by: Vahe Mambreyan

September 28, 2015

List of abbreviations

ADC	Austrian Development Cooperation
APIU	Agricultural Projects Implementation Unit
CARD	Center for agricultural and rural development
EBRD	European Bank for Reconstruction and Development
ENPARD	European Neighborhood Programme for Agriculture and Rural Development
EU	European Union
FAO	Food and Agriculture Organization
FI	Financial Institution
GoA	Government of Armenia
GIZ	German Technical Cooperation
IFAD	International Fund for Agricultural Development
MASC	Marz Agricultural Support Center
MFI	MicroFinance Institution
MoA	Ministry of Agriculture
MoE	Ministry of Economy
NGO	Non governmental organization
RA	The Republic of Armenia
SDC	Swiss Development Cooperation
SME	Small and medium enterprises
SSFS	State Service for Food Safety
ToR	Terms of Reference
UCO	Universal credit organization
UNIDO	United Nations Industrial Development Organization
UNDP	United Nations Development Program
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VC	Value Chain
WB	The World Bank

Introduction

Program Background

With funding from the European Union (EU), the European Neighborhood Programme for Agriculture and Rural Development (ENPARD) supports the Government of Armenia (GoA) in ensuring an efficient and sustainable agriculture that contributes to better living conditions in rural areas. Within ENPARD - Armenia a technical assistance component focuses on producers and value chain (VC) development. This component is implemented by UNIDO and UNDP[4]. In particular the Project aims to strengthen producer groups, effectively engage them in value addition, strengthen VCs that provide improved access to affordable, better quality food, contribute to development of rural areas and improve access to local and international markets, and ensure the introduction of environmentally - friendly farming and food processing practices. Direct beneficiaries of the Project include agricultural producers, SMEs along the VCs as well as local consumers. The Project also will focus on women, youth, and other vulnerable groups.

The technical assistance component of ENPARD has three primary outputs:

- **Output 1: Strengthened and newly established primary producers**. Within the targeted VCs and marzes, the Project will develop effective, sustainable new producers, as well as assist and strengthen existing ones in the various stages of their development.
- **Output 2: Producers effectively engaged in value addition**. The Project will support the building of physical infrastructure as well as human capacity and skills that enable producers to add value to primary agricultural production.
- **Output 3: Strengthened VCs that provide improved access to affordable, better quality food**. The project will identify and develop key intervention points at any level within the selected value chains that will benefit not only stakeholders of those value chains but also Armenian consumers locally and nationally.

1.2 Assignment Background

1.2.1 Purpose and objectives

1.2.1.1 Assignment task

This consultancy is situated within Output 3, described above, with the objective of producing a comprehensive analysis of the selected milk VC, including the segments of primary (raw) milk production, initial storing and delivery to processors, processing to selected end-products (dairy and cheese), supply of end-products to retail networks and exports. The milk VC analysis report will provide the supporting review and information to enable the design of the activities and interventions which will be undertaken in Output 3 to resolve milk VC development constraints and to boost the income generation for various actors.

1.2.1.2 Theoretical guidance

The UNIDO's methodology for VC analysis was applied for the implementation of the assignment. The current report conforms entirely to the structure discussed in this methodology. UNIDO's methodology is introduced in *Diagnostics for Industrial Value Chain Development: an Integrated Tool* document. This

[4]With funding from the EU €2.4 million and co-funding from the Austrian Government - €1 million

document offers a tool for diagnosing industrial VCs. It provides guidance on defining the elements necessary for the development and upgrading of entire VCs, not just parts of them. The focus is on VCs, meaning those that engage in the processing and transformation of primary products into consumable goods and thereby generate value added. Unlike conventional VC analysis, this tool places particular emphasis on the processing and manufacturing segment.

1.2.2 Methodological approach applied

1.2.2 .1 Assignment implementation process

In general, the consultant's work included research and analysis, in the following phases:

- **Desk research**: Using existing information sources, the consultant undertook literature review to filter information into the structure of the VC analysis described in UNIDO's methodology.
- **Interviews with experts**: Specific information was collected through interviews with experts in the public, private and civil society sectors.
- **Field interviews**: Discussions with farmers and other VC operators were applied to collect related information directly from primary sources.
- **Analysis and reporting**: Using the information collected, the consultant will conduct a comprehensive analysis, and present the results as it is required by UNIDO's methodology.

1.2.2.2 Information collection sources and methods

A number of various sources were envisaged for the collection of information before the start of the current analysis. Further work revealed that the most of sources are useful just marginally. Information on operation of milk VC in Armenia was collected by small pieces from different sources, for being cross-checked, collated, incorporated, and analyzed. Among others, the following information sources have been addressed during the information collection:

- formal statistical materials[5];
- secondary materials available from various similar projects funded/implemented by the WB, UN organizations, GIZ, USDA, USAID, ADC, IFAD, and many other organizations[6];
- The RA State agencies - national level[7];
- The RA State agencies - regional level[8];
- Sectoral unions and associations[9];
- Specialized NGOs and organizations[10];
- Experts: technologists and veterinarians, food safety expert;
- Milk processors: dairy and cheese producing enterprises;
- Animal breeding farmers;
- Retail outlets: supermarkets[11] and shops.

[5] www.armstat.am, www.armdevinfo.am; www.armstatbank.am/
[6] Most of documents have been prepared and kindly provided by AM Partners Consulting Company
[7] The RA Ministry of Agriculture, the RA Ministry of Economy, the RA Customs Service,
[8] Governorates and Marz Agricultural Support Centers (MASCs)
[9] Unionof milk processors and "Larry" union of cheesemakers
[10] Center for agricultural and rural development (CARD)
[11] Yerevan-City and SAS

3 major methods of information collection have been applied:

a) Desk review (of secondary materials, public media publications, interviews of operators, etc.);
b) Face-to-face qualitative interviews with experts and informed persons;
c) Direct observations.

1.2.2.3 Information processing and analyses

All the collected data was classified by topics and themes they related to, compared, cross-checked and verified, justified and elaborated. Once all contradictions were uncovered and rectified, the analysis began. In some cases, pieces of identified information are not totally clear and unambiguous, due to total absence of any regular information collection practices, shadowed operation of almost all enterprises of milk VC, etc. Anyhow, even providing those reservations, the analysis seems to be quite comprehensive, understandable and user friendly.

1.3 Expected Results and Deliverables

The major expected results of the current analysis are the conclusions on the constraints for development of milk VC operators, recommendations for overcoming those constraints, segregation of the mentioned conclusions and recommendations by the 7 dimensions of VC analysis in accordance with the methodology and approach suggested by the UNIDO.

The only deliverable of the assignment is the current report (including Annexes).

2 MILK AND DAIRY VALUE CHAIN ANALYSIS

2.1 Mapping

2.1.1 Product

Based on Armenian market realities the current Value Chain (VC) analysis mainly concentrates on the following widely known **dairy products**: pasteurized milk, matsun, sour-cream, and curd, including their sub-products and varieties (carious contents of fat, kefir and tan, yogurt, mixes of several products, etc.). Additionally, the scope of the current VC analysis contains also **cheeses** (of different types) and in this segment special accent will be made on opportunities of high-value cheeses production.
No special focus on any exact end-product has been made during the analysis. In the meantime, two aspects were taken into account: a) identification of general gaps and shortcomings related to the whole sector (instead of addressing small problems) and wider list of end-products (instead of addressing a narrow-market end-product) was targeted; b) special accent was made on high-value products and opportunities of their elaboration (especially concentrating on exporting opportunities).

2.1.2 Value chain actors and their functions

Common functions in VCs are input supply, production, assembly, processing, wholesale, export, retail, etc., and sub-functions may be defined in each. However, each VC has its specificities conditioned by specific market realities and/or concrete end-products' features. In the Armenian market, the following core functions (i.e. processes of the primary and intermediate products' transformation) are being conducted within the VC being analyzed:

1. Production of the main primary product/input (i.e. milk) and supply;
2. Collection (at the collection points) and cold storing;

3. Collection from primary producers and cold storing facilities via specialized vehicles and transportation to a larger collection points[12] and/or milk processing (e.g. dairy and cheese production) facilities;
4. Dairy and cheese production and packaging, including quality control measures;
5. Exports;
6. Distribution to retail network;
7. Sales of products to end-consumers through the retail trade networks.

Understandably, each function consists of several different sub-functions. For example, the function of the collection of milk usually consists of initial analysis and quality checking of milk, cold storing it in the special milk containers, delivery (sometimes even transportation) to milk processors (or their collectors). Moreover, the same actors may sometimes conduct certain (sub-) functions and sometimes skip due to conjuncture in the market, quantity of products, etc.

Usually, VC actors (also referred as operators or participants) are the firms and/or individuals who conduct different functions in the VC, engaging directly in different processes of primary and intermediate products' transformation. Strict demarcation of VC actors by their functions may not be always possible. Sometimes, the same operators may conduct several functions. Moreover, there may be cases, when the primary product producer (e.g. animal husbandry farm producing milk) possesses also sufficient facilities for initial storing, production and distribution of its products. There are examples of such VC actors in Armenian market, too – Arzni, Marilla Dairy, Bandivan-Kat, Dili (though questioned in the past few years), Multi-Agro. However, the major groups of milk and dairy products' VC actors are the following:

1. Individual farmers and larger[13] (business-wise) farms engaged in animal husbandry and milk production;
2. Milk collection points usually established by (for) a group of farmers (largely by the support of various development initiatives funded by the international donor organizations) operating mainly under the status of cooperative or informal group of farmers;
3. Intermediaries collecting milk from farmers and milk collection points by their vehicles and transporting the milk to milk processors;
4. Milk processors (dairy and cheese producers);
5. Retail network including chains of supermarkets, stand alone shops, smaller trade outlets, individual sellers, public food entities (mainly restaurants), etc.

As mentioned above, some actors may perform several functions. However, each actor performs certain function(s) more intensively/regularly; other functions are being conducted rather occasionally or in certain circumstances (such as a big surplus of primary product is not stored but transported). Thus, the following matrix illustrates the intensity of functions performed by specific groups of VC actors:

[12] Such as in case of collection points established by large processors (Ashtarak-Kat)
[13] Farms and farmers breeding around 30 heads and more of milky cows are assumed to be large (though subjectively)

Table 1 - Milk and dairy VC actors and functions they perform

Functions ↓ Actors →	Farmer	Cooperative / Group	Interme-diary	Processor	Importer	Retail network
Milk production and supply	xxx	x	x	x		
Milk collection and cold storing	x	xxx	xx	xxx		
Intermediary collection and transportation	x	x	xxx			
Milk processing, dairy/cheese production	xx	x		xxx		
Dairy and cheese exports				xxx		
Dairy and cheese distribution	xxx			xxx		
Dairy and cheese retail trade	xxx	x			xxx	xxx

Where:

X - rarely implemented functions

XX - less intensively implemented functions

XXX - intensively implemented functions

Milk VC operation varies permanently due to many factors, such as availability of milk, prices of milk, establishment of new cooperatives and ceased operations of other, number of milk processors producing dairy and cheese, intensity of their operations, situation at export markets of dairy and milk powder, etc. Due to continuous changes in the market the number of actors in each segment of the VC can be estimated only approximately. Thus, the picture is the following:

1. **Milk producers - 170,000 farms approximately**. The current tendency of the number of milk producers (and cattle breeders in general) is rather decreasing due to difficulties of animals feeding (expensiveness of forage) and sales of the produce (low prices of milk since the spring 2015). The dominating areas of milk production in Armenia are Gegharkunik, Shirak, Aragatsotn, Syunik, and Lori regions. The dominating bred of cows is the Caucasus Grey, although some highly productive breeds have been imported in the recent period, too. More than 10 pedigree farms do operate in Armenia; the leaders are "Agroholding Armenia", "Vamaks", "Arzni pedigree farm" and "Multi Agro".
2. **Milk collection points (intermediaries)** - At least 4 tens of milk collection points (despite those operating within processing facilities) have been established in Armenia after independence. The most concentrations are in Lori, Gegharkunik, Shirak, Syunik, and Tavush regions. However, almost half of those points are not currently operational.
3. **Milk processing companies – about 70 enterprises** out of which comparatively large ones are "Ashtarak Kat", "Ani-Kat", "Dustr Marianna", "Multi-Agro", "Arzni Kat", "Tamara and Ani", "Biokat", "Bonilat", "Chanakh", "Dustr Melania", "Igit", "Araks-2", etc. Annual total production capacity of all milk processors(excluding population) is about 490,000 tons. In the meantime, an important reservation should be made in regard of dairy producers: (tens of) thousands of individual farmers perform production of dairy (mainly milk and matsun) and cheese production in home conditions and sell substantial part of their produce at their local, or neighboring towns, and even at Yerevan's open air markets, shops, and even directly to final consumer via "At-door" sales.
4. **Importers** - Volume of dairy and cheese imports is not big. Main imported products are yogurts, sweet curds, and high-value cheeses. The number of importers is around a dozen and the major actors are

"Yerku Eryak", "Lactalis Arma", "Andako", "Uniform (Texworld)", "Derjava", "Catherine Group", "Brand Leader", etc.

5. **Retail network** - Dairy products are among everyday consumption food products involved in the formal "food basket" of necessary meal and people consume them almost every day. This does not mean that consumers buy dairy products every day, but they do it very often and regularly. It can be surely stated that all retail outlets (supermarkets, large food shops, small trade outlets, open air markets, etc.) do perform retail trading of dairy products and cheese. The number of retail trade outlets varies permanently. The number of retail trade outlets as of the end of the 2015 first semi-annual comprises approximately 16,400 (55% concentrated in capital Yerevan), but this figure contains not only food trading entities. It can be estimated that the number of trade outlets retailing with dairy products comprises beyond 10,000. The number of supermarkets totals to less than 200 and their substantial part is concentrated in capital Yerevan.

213 Flow of products and end-markets

Often different end-markets source dairy products and cheese through different combinations. Variety of sourcing channels and intensity of using this or that channel heavily depend from the type of sourcing end-market, i.e. retail trade entity and type of end-product they source. Large retailers (supermarkets and big shops) do procure end-products directly from producers only and certain practices are applied. This is largely conditioned also by the strict control applied by the State agencies ensuring food safety for the larger trade outlets. Large retailers prefer to stay on a safe side and source dairy and cheese mainly formally and from known producers. This statement is not applicable to smaller "next-door" shops and open air markets. The source of products at these retailers is not traceable and the same refers to the quality and safety of traded dairy products. However, in almost all cases the supply of dairy and cheese to the retail networks is conducted by producers.

2.1.4 Business interactions

Main transactions that appear among participants of milk and dairy VC actors are the following (except of smaller scale and irregular intermediary sub-transactions):

1. Collection of milk (between farmers and collection points);
2. Supply/procurement of milk (between farmers and processors or collection points and processors);
3. Supply/procurement of end-products (between producers and retailers).

However, sub-transactions should not be totally neglected, too. Some sub-transactions do exist between farmers/collection points and intermediaries that conduct wholesale buying function and benefit on the margin of prices paid to the milk producers and received from milk processors. Similarly, some smaller retailers are not being supplied by the processors directly due to their very small turnover and economic efficiency of working with them. This especially refers to regional retailers. Such traders usually procure dairy products from distributors or limit their product assortment with few types produced by local processors in the neighborhood. However, the share of such transactions is very limited and they are actually neglected in milk VC organogramma.

Collection of milk from milk producers (i.e. farmers engaged in production of primary agricultural products) is almost not formalized. The sphere of primary agricultural production is totally tax exempted and there is no formal accountancy and reporting requirements. Thus, almost no formal contractual arrangements do exist between farmers and milk collection points, and farmers and processors. Procurers usually register the procurement of milk as “procurement from the market” which is usually enough for accounting purposes. The other relations are being regulated on the “shadow side” mainly in the form of cash payments to producers/suppliers of milk. The volume of formal arrangements in the segment of milk supply/procurement has never exceeded 5-10% of total[14].

Formal relations start from procurement of collected milk from collection points by processors. However, these arrangements are not very strong either, except of those collection points that have been established directly by concrete processors (such as collection points established by Ashtarak-Kat). In all other cases (i.e. when milk suppliers and procurers are sufficiently independent from each other) all the rules become a subject for regular revision. None of parties is obliged to supply/procure the milk in certain quantities and quality, at certain price, etc. Terms and conditions of such arrangements are changing so fast and so often that the term “arrangement” becomes quite ambiguous. All participants of the arrangements are for profit units and may easily change/skip any arrangements once they observe better opportunities for additional income generation. On the other hand, this means that both sides suffer from the lack of long-term stability and should ensure reserve scenarios, such as processing the excessive milk internally for the collection points, or using the imported dry milk for the processors.

Relations between dairy producers and retailers are formally arranged to a large extent. There are general procedures applied for practical cooperation including arrangements on product features (assortment, quality, quantity, labeling, perishability, etc), prices (trade margin added-on by the retailer) payment terms, return of overdue/spoiled products, etc. In this regard, the toughest arrangements/requirements the producers do face in their relations with large networks of supermarkets. Inter alia, those arrangements include in-kind lending, special wholesale prices, additional guarantees for the quality, flexibility in delivery quantities and timing, etc.

2.1.5 Service provision

Inter alia, services may include transportation, packing and handling, consulting and accounting, quality and process certification, financial support, etc[15]. However, only few services are provided to the milk and dairy VC actors in Armenia (or rather there is a demand for very few services). Actually, the list of services feeding into the VC is limited to food quality and safety control and certification, financial support, extension services, and some business advisory.

22 banks and more than 30 credit organizations offer financial services in Armenia. Almost all of these institutions do offer financial services and (loan) products to the actors of milk and dairy VC. However, operators in the markets of primary milk production and dairy (and cheese) production are different. The most active players are ACBA Credit Agricole Bank, Anelik Bank, Armeconombank, ACBA Leasing UCO, CARD AgroCredit UCO, Farm Credit Armenia UCO, Nor Horizon UCO, Kamurj UCO, Aniv UCO, etc.

Extension services are being offered and delivered to farmers in Armenia by a network Marz Agricultural Support Centers (MASCs), but they largely refer to land cultivation issues. In the field of animal husbandry, farmers receive mainly veterinary services. Since 2012 these services (including activities for prevention of livestock diseases) have been implemented by Service Center for Veterinary Sanitary, Food Safety and Phytosanitary (SCVSFSP) affiliated to the RA MoA through 630 veterinarians working in all communities. However, the animal breeders seem to be not very satisfied with the quality of received veterinary services, which left a corridor for the entry of private providers of veterinary and zoological services. In

[14] As mentioned by the number of dairy and cheese producers
[15] Direct suppliers and service providers are not considered, since they appear as VC actors

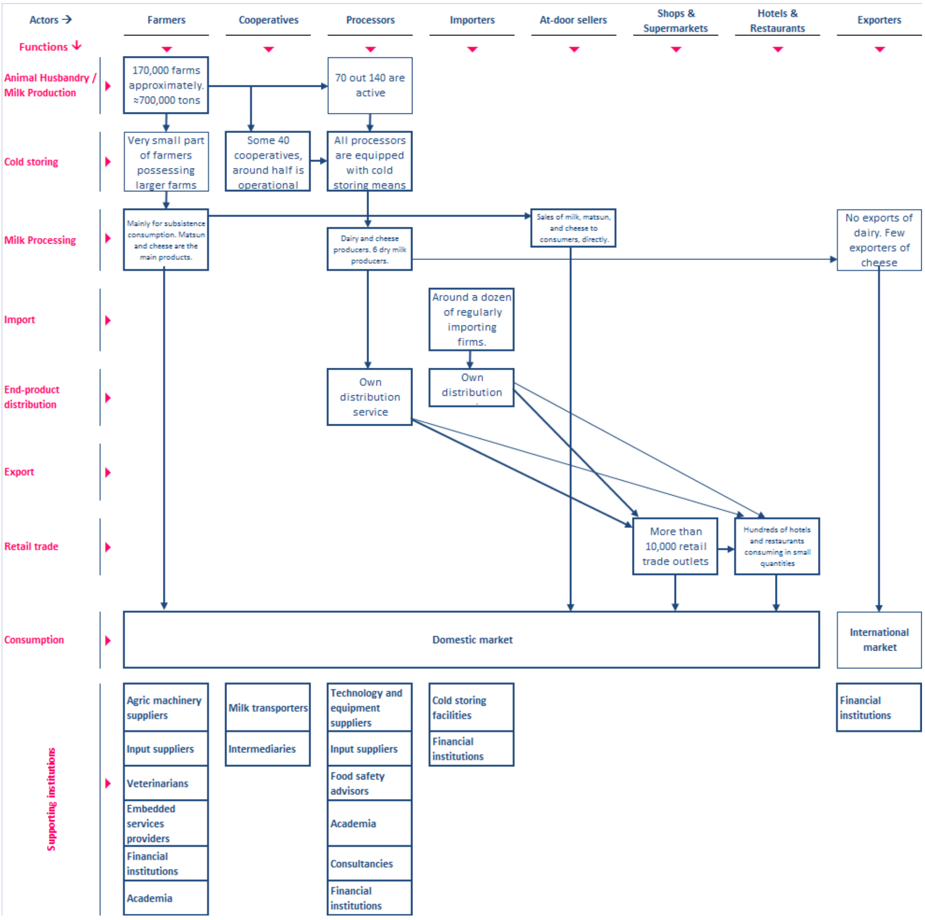
particular, substantial intervention was made by CARD Foundation, which successfully implements its program of establishing about 15 farm and veterinary service centers in all over the country. Though these centers offer paid and sometimes quite expensive services, but they ensure better quality and results and many farmers prefer services offered by these entities.Finally, some support services are offered by (auxiliary) inputs' suppliers (mainly in a form of embedded services) that provide packaging, ferments, food chemicals, etc., but this support is of rather marginal usefulness in the current context.

Business advisory services to producers of dairy and cheese products are offered by the quazi governmental SME DNC and private business consultancies. However, the SME sector of Armenia does not appreciate the services offered by various consultancies much and is not usually ready to spend much resource for that purpose. Instead, it more than 15 years huge efforts in this field are being invested by various international donor organizations, such as WB, IFAD, EBRD, UNDP, FAO, USDA, USAID, GIZ, ADC, SDC, etc. Armenian producers of dairy and cheese got used to receiving "easy" support in terms of qualified technical assistance from those organizations and consider useless to invest their own funds for that.

2.1.6 Value chain map

The organogramma of the milk and dairy VC map below depicts major actors and functions they perform, product flows and their intensity, end-markets, service providers and services they offer, etc.

Picture 1 - Milk value chain structure (Armenia 2015)[16]



The above presented organogramma is largely self-explanatory. However, some summarization will not be useless:

1. Almost half of all rural households are involved in milk VC;
2. Almost all animal husbandry farms make processing of milk at home conditions, but the major part of processed products are envisaged for internal/subsistence consumption. Part of processed products (mainly milk and matsoun) is being sold via "at-door" sales.
3. Substantial part of cooperatives possessing milk cold storing facilities, established since the independence, is not operational.
4. Some 70 milk processing enterprises (out of total 180) are operational currently. Most of cheese producers ceased their operations in 2014-2015.
5. All the end-products are being distributed by own distribution services. Costs of distribution are directly attributed to the COGS of end-products.
6. The number of importing firms is small. In case of dairy they just work on ensuring assortment. Deeper specialization is on imports of high-value cheeses, but total volume of imports is not substantial.
7. Sales of end-products are conducted mainly through the retail networks and small shops. The most challenging aspect is the requirement of large working capital for working with known chains of supermarkets.

[16] Theoretically, we could suggest having a another box which indicates processors' involvement in cheese exports. However, the idea is not very strong, since real exporters of cheese are few and some of them may even cease their operations in 2015

8. Almost no export of dairy products exists currently. Exports of cheese dropped due to severe price competition in Russian market and dropdown of the Russian Ruble's purchasing parity.

2.2 Dimension 1: Sourcing of Inputs and Supplies

2.2.1Input supplies' characteristics

2.2.1.1 *Animal husbandry*

Animal husbandry is one of the major sectors of Armenian agriculture and of Armenian economy in general. Over the last years slightly less than 40% of the country's agricultural gross product and around 8% of GDP is received from animal husbandry activities.

Table 2 - Role of animal husbandry in Armenian economy, million AMD

Statistical information items	2012	2013	2014
GDP	4,000,722	4,555,638	4,843,153
Agriculture	841,510	919,089	993,370
Animal husbandry	328,931	345,716	387,637
Animal husbandry share in agriculture	39.1%	37.6%	39.0%
Animal husbandry share in GDP	8.2%	7.6%	8.0%

Growth trends of Armenian agricultural production (at current prices) is rather stable in the range of 8-9%, while in animal husbandry sector the dynamics is not so smooth. The share of animal husbandry products in total GDP is rather stable and notable. Legitimately, the basis for animal husbandry activities is the availability of cattle livestock. Quantitative dynamics of Armenian cattle livestock is presented below.

Table 3 - Cattle livestock dynamics in Armenia, heads

Cattle livestock	2012	2013	2014	2015	As of 01.01.2015	
					At farming households	At farming organizations
Yerevan	2,523	2,673	3,750	2,711	2,456	255
Aragatsotn	75,702	85,161	85,263	86,706	86,634	72
Ararat	41,434	44,225	46,376	46,492	46,419	73
Armavir	47,730	54,984	55,796	58,145	57,895	250
Gegharkunik	98,486	112,265	115,619	120,904	120,690	214
Lori	74,267	81,540	81,850	81,003	80,793	210
Kotayk	54,247	59,455	61,464	59,351	56,580	2771
Shirak	99,683	105,729	107,097	107,847	107,547	300
Syunik	52,508	56,273	60,548	63,321	62,421	900
Vayots Dzor	18,527	22,738	22,749	24,939	24,939	0
Tavush	34,136	35,960	37,072	37,134	36,823	311
Total	**599,243**	**661,003**	**677,584**	**688,553**	**683,197**	**5,356**

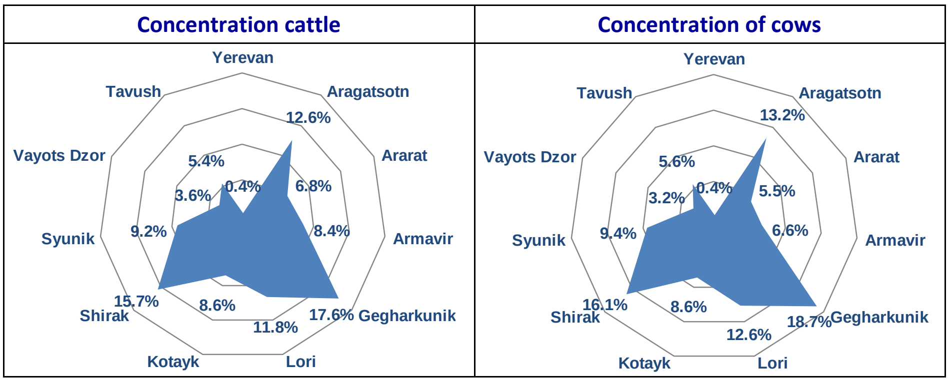
Regional concentration of the livestock is not at all surprising: animal husbandry activities are traditionally well developed in Gegharkunik, Shirak Aragatsotn, and Lori regions that account about 58% of total livestock of Armenia as of the beginning of 2015. And one final observation related to animal husbandry activities in Armenia - the overwhelming majority of the livestock is concentrated at and being bred by individual farming households. Less than 1% of the livestock is bred by farming organizations.

Table 4 - Cow livestock dynamics in Armenia, heads

Regions	2012	2013	2014	2015	As of 01.01.2015: At farming households	As of 01.01.2015: At farming organizations
Yerevan	1,146	1,166	1,271	1,317	1,213	104
Aragatsotn	36,920	40,326	40,350	41,514	41,514	0
Ararat	16,482	17,321	17,721	17,326	17,281	45
Armavir	18,212	19,972	20,143	20,637	20,535	102
Gegharkunik	52,035	54,271	56,735	58,601	58,503	98
Lori	36,143	39,127	39,193	39,694	39,627	67
Kotayk	26,004	27,434	28,152	26,939	25,303	1636
Shirak	45,916	50,152	50,567	50,603	50,458	145
Syunik	25,727	26,742	28,281	29,570	29,180	390
Vayots Dzor	8,326	9,576	9,676	10,118	10,118	0
Tavush	16,438	17,190	17,527	17,553	17,391	162
Total	**283,349**	**303,277**	**309,616**	**313,872**	**311,123**	**2,749**

Situation is largely the same in terms of cows that are actually the base of the milk and dairy VC. Concentration of cow livestock is observed exactly in the same regions and the only difference is in the share of leading 4 regions that totals to almost 60% of total livestock of cows in Armenia.

Table 5 - Concentration of cattle (including cow) livestock in regions of Armenia



The share of cows bred by commercial agricultural organizations is again about less than 1% of total. These are mainly pedigree farms and mainly those having affiliated processing facilities. Concentration of the livestock at presented regions is not occasional; those are regions having large territories for grazing herds of cattle and collecting grass and hey for their feeding.

Main forages used by farmers for feeding their cows are grass, grain, alfalfa, hey, and limited quantity of other feeding. Almost all farmers possess/lease lands in their communities that they use for growing and collection of grass. Some farmers have excessive production of grass, others must procure it. Actually, grass is the most important and main component of animals' feeding. Lack or non-affordability of grass caused ceasing of animal husbandry activities for many farmers. The unit of grass in Armenia is counted as "bale" - bunch of grass with the weight of 18-20 kg. However, the prices of grass vary in the range of 50-60 AMD/kg or 1,000-1,200 AMD/bale, though in certain periods the price jumps substantially higher - to 70-80 AMD/kg or 1,400-1,600 AMD/bale.

Annual consumption of the main types of forages vary substantially depending on the region, capacity of the farmer, number of cows bred, availability of own forage base, etc. There is no common formula of animal feeding. Each farmer uses those forages more available and affordable for him.

“Adjacent” and “remote” pastoral systems are applied in Armenia. The "adjacent" system is when the pasture is close to the community: farm-yard or household. In that case the animal is driven to the farm-yard for milking and night’s lodging, as well as for feeding and drinking. If the pastures are far from the household, the animal is driven there for the whole grazing period; this system of pasture grazing is called "remote".

Pasture/grazing period in Armenia starts in April/May and lasts until November/December. The stalling period lasts for 4-5 months, although it should last longer. Armenian farmers used to take animals to pastures for grazing quite early, when the grass is not yet sufficiently up. Another factor causing to the nature conservation risks is the overuse and degradation of adjacent areas of villages. Farmers prefer keep animals closer to villages for avoiding time and finance saving reasons, but that practice harms the condition of soil and grass cover on lands close to the communities very much.

The situation becomes even worse when the condition of remote pastures is reviewed. Most of remote pastures are hardly accessible for farmers (no roads), lack herd watering facilities, and have no conditions for staying of shepherds. This issue is in the center of respective agencies’ attention. With the financial support of the WB, the RA MoA implements development initiatives directly relating to this issue, i.e. supporting the rehabilitation of remote pastures in Armenia. As of the end of August 2015, 80 communities benefited from the WB funded projects, 120,000 ha of not used or insufficiently used remote pastures became accessible for farmers. However, the problem is far not resolved, yet.

While talking about availability of animal forage in Armenia it would be wiser to split the issue into accessibility and affordability of feeding. There are no major limitations of the forage accessibility in Armenia; at least for smaller scale farmers who are the absolute majority of all cattle breeders in Armenia. Local disputes between authoritative large business-style farms and smaller farmers always exist, but alternative options do exist always. The situation becomes totally different when the issue is analyzed through the prism of affordability. Most of farmers simply cannot afford feeding their cows with more expensive grains, succulent feed, food supplements, etc. Though available in the market, this forage is quite expensive and unaffordable for the overwhelming majority of farming households.

The major provision of veterinary services in Armenia is conducted through the RA MoA “Center of services for veterinary-sanitary, food security, plant sanitation sectors” SNCO. Since 2012 more than 600 veterinarians of this entity conduct the activities for prevention of agricultural livestock diseases. Everyday responsibilities of veterinarian first include prevention of contagious diseases and activities for disease control. Given to difficult epidemiological situation regarding infectious animal diseases overall in the region and particularly in the country the RA MoA undertakes measures for preventing infectious animal diseases, including diseases common for animals and human, particularly for the following diseases: brucellosis of agricultural livestock, tuberculosis of big cattle, anthrax of agricultural livestock, brad sot of small cattle, murrain of small cattle, pasteurellosis, blackleg, malarial fever of big cattle, etc.

Despite the large scale of efforts invested by the Armenian government the room left for the initiatives of other organizations (such as FAO[17], ADC[18], SDC[19], etc.) is still quite large. Various projects in the field of animal health management have been implemented also with the funding of the WB[20]. CARD Foundation is the flagman of the provision of veterinary and related services from the private sector. Interestingly, the

[17] See - http://www.fao.org/armenia/news/detail-events/en/c/201738/
[18] See- http://www.entwicklung.at/en/news/animal-health-management/
[19]See - http://www.sda.am/index.php?id=101
[20] See- http://www.arspiu.com/

success of the CARD bases on dissatisfaction and missing that public/state entities leave in the frame of the veterinary services' provision. CARD's main objective is to facilitate the delivery of veterinary services by private sector at the community through the establishment of well-functioning farm and veterinary service centers (FVSCs). These entities target: 1) provision of veterinary knowledge and skills, 2) social networking among regional animal health stakeholders, and 3) increased availability of high quality medicines and supplies.

Farmers have easy access to veterinary services, but the quality of services delivered by State veterinarians is not always satisfactory for them. This relates to almost all aspects of their work, starting from preventive measures under the State funded programs and finished with artificial insemination services. Better quality services are offered by private veterinarians and/or various development initiatives. Both options have their pros and problems. Quality of services in case of private veterinarians is better, but the affordability is questioned (i.e. those services are often not affordable for farmers). In case of development initiatives' support everything is very good, but sustainability of those services is not guaranteed. Besides, development initiatives used to have localized impact and do not cover large area.

Cows' treatment conditions in Armenia can be strictly divided into two types: a) good conditions at modern farms ensuring advanced treatment conditions for cows, and b) so-so conditions at farming households using old/somehow reconstructed stalls inherited from soviet period or farm-yard stalls with no proper housing for animals. In the current context the term "conditions" should be assumed at its widest scope and refer to the whole cycle of animals treatment starting the conditions at stalls (light, water, ventilation, manure removal, feeding equipment, etc.) continued with provision of veterinary and breeding services, milking, and on farm cold storing of milk.

The first group of animal husbandry farms does apply best practices and are well equipped with a wide variety of necessary equipment and instruments. The second (but much larger by all means) group of farmers are equipped with minimum necessary conditions. The livestock of animals they breed is also big reaching and exceeding hundreds of heads. The following organizations can be mentioned among advanced and well equipped farms engaged in animal husbandry activities: "Bandivan Kat", "ECO Farm" of Gndevaz village, "Vamaks", "Arzni Pedigree Farm", "Multi Agro", "Himnatavush Foundation", "Agroholding Armenia", etc. These organizations apply good practices for stalling, feeding and watering, automated milking, etc. All these organizations are equipped with cold storing facilities for milk, and quite often also possess milk transportation means. Moreover, such organizations apply transportable milking equipment; create/maintain housing and watering facilities in remote pastures, etc. However, such advance farms in Armenia are really few - up to 20 organizations can be attributed to this group.

Small farming households breeding few cows comprise the absolute majority of breeders. Less than 1% of cows are bred in advanced organizations. Farming households do possess neither advanced production means nor facilities, not financial resources for procuring such means. Farming households largely rely on labour in all stages of animal husbandry and milk production. Most often, these farmers do not have proper conditions for cold and hygienic storing of milk. However, there are exceptions in terms of the livestock, too. Some farming households possess and breed quite large livestock of cattle/cows. Some Yezidi farmers breed hundreds of animals, but the facilities and means of treatment (and milk production) remain in the same traditionally bad conditions.

Breeding (pedigree) practices are among the most important activities in animal husbandry largely conditioning the improvement of the livestock features and the efficiency and productivity of activities. Two major activities on this side take place in Armenia: a) importation of highly productive cattle from abroad and b) artificial insemination of local animals. For development of animal husbandry in Armenia, the GoA approved "Animal Husbandry" project in the frame of which 2,000 heads of Holstein, Brown Swiss, and Simmental pedigree heifers were imported and provided to 60 private business entities subject to payment by installments. Annually 1,500 heads of high value calves are produced a part of which is used for reproduction of herds and the rest is sold in the country to other cattle breeding farms.

Artificial insemination is applied for the absolute majority of cows bred in advanced farms introduced above. Owners and managers of these farms very well understand the necessity and usefulness (prevention of diseases, improvement of productivity, purity of bred, etc.) of this practice, regardless higher costs related to it. Advanced farms usually delegate the implementation of artificial insemination to specialized and well-known organizations such as CARD Foundation. This organization started providing of artificial insemination services for cows in 2004 (actually operating as USDA MAP project) and since 2006 ten thousand artificial insemination doses were sold every year. Prices for artificial insemination vary in the range of 5,000 AMD (including the semen and process).

Farming households can be divided into 3 groups in terms of cows' insemination. Overwhelming majority of farmers (above 96%) use natural insemination and even pay to the owner of the bull for that. Average prices for natural insemination vary much and impossible to measure. In many cases, that is provided for free of charge by the owners of bulls. Smaller share of farming households realize the necessity and usefulness of artificial insemination, but are not ready to pay much for that. These farmers do apply to local veterinarians and zoologists with the request of carrying out artificial insemination and pay 2,500 AMD for that. Practices applied by these farmers are surely more advanced but the results are not of very high quality in terms of fertility rate, improvement of productivity features. This is first of all conditioned by the quality of semen used by the mentioned practitioners.

Only several hundreds of farming households behave themselves as advanced animal husbandry organizations and apply to specialized organizations (such as CARD) offering artificial insemination services regardless the comparative expensiveness of their efforts. Such farmers are offered to pay about 10,000 AMD per cow. Finally, farmers of certain areas may benefit from the implementation of sectoral development projects. Good examples are selected villages in Shirak and Lori regions where ADC funded Animal Health Management Project was implemented by the CARD Foundation, or communities of Syunik region where the SDC funded the implementation of a similar project.

Despite the differences of funding animal husbandry and milk production activities at large (business style) farms and smaller farming households, the sources are logically similar. Animal husbandry farms finance their activities either from internal cash flows and savings, or by means attracted from financial institutions. In the grazing period (from April/May to October/November) farmers enter into regular relations with milk collectors and procurers and cut-off expenses that they make on procurement of forage, since animals are grazing. Internal resources do satisfy needs in this period. Farmers need external resources for funding their animal breeding activities in late autumn, when they should procure and store winter stocks of forage - grass, hey, grains, etc. In this period, farms either attract external funding from banks and UCOs or agree with forage suppliers on delayed payments. Accessibility of external funding options is not a large problem for farmers, unlike the expensiveness of that funding. Financial institutions usually suggest short-term high interest rate micro-loans to farming households and purposeful mid-term and mid-size loans to organizations.

A number of development initiatives in the field of primary agriculture (and specifically animal husbandry sector) development were being implemented in Armenia right after the announcement of the country's independence. Currently, the major operators in the field of development initiatives in Armenia are:

- **World Bank (WB)** funds implementation of CARMAC and CARMAC II Projects. CARMAC builds on WB experience and successes in agriculture, rural development, pastures and livestock management, and participatory community development. CARMAC II consists of four components: a) develop and support the implementation of participatory management plans to improve productivity and sustainability of pasture and livestock systems (this will extend the coverage of the pasture-based livestock system); b) support the development of selected value chains to help strengthen links between producers and processors, promote food safety, and support processing and marketing; c) improvement of the capacity of public sector institutions that can support improved market access and selected value chain development; and d) Project management.
- **International Fund for Agricultural Development (IFAD)** strategy in Armenia contains poverty alleviation through agricultural growth and a focus on the poorest rural areas in the country, mainly in the highlands and border areas. IFAD also builds and strengthens local institutions by involving grass-roots groups in implementing and managing activities, and by making them responsible and accountable for those activities. Currently IFAD funds implementation of 2 projects in Armenia, but none of them focuses on animal husbandry sector.
- **Austrian Development Cooperation (ADC)** funded animal health management initiatives in Lori and Shirak regions through improvement of animal husbandry and health control practices and, therefore providing better conditions for their economic activities. The Project focused on shifting from traditional farming to new animal husbandry approaches, such as (a) herd and labour management; (b) reproduction; (c) housing and environment; (d) nutrition; (e) calf rearing; (f) trans-boundary animal diseases prevention and control and such that may lead to development of a more diversified rural economy.
- **Swiss Development Cooperation(SDC)** funds the implementation of the Technical and Institutional Support to Veterinary Services in Armenia Project having an overall goal to strengthen veterinary services, contributing to the improvement of the food safety system and sustainable agricultural development in Armenia. The Project will assist in building a more efficient system of controlling brucellosis in animals and therefore will limit the risk for infection in humans, in addition to serving as a useful model for a future sustainable National Brucellosis Control Programme.
- **US Agency for International Development (USAID)** funds implementation of the "Partnership for Rural Prosperity" (PRP) and the "Advanced Rural Development Initiative" (ARDI) programs. PRP promotes rural economic development in Armenia and the ARDI will develop competitive rural value chains to increase incomes and improve livelihoods of 48 rural communities in Syunik, Shirak and Lori marzes of Armenia.
- **United Nations Development Program (UNDP)** implements CDP and ISRC projects in the field of rural development. Though supporting primary agricultural production and community development, none of them targets exactly milk production sector.
- **Local implementing organizations** (CARD, HEIFER, etc.). CARD Foundation is obviously the leading local organization in Armenia providing support services and implementing development projects for animal husbandry sector. CARD assists farmers and agribusinesses in the production and marketing of food and related products, designs and implements development programs on a) promoting application of advanced agricultural technologies; b) supporting agricultural processing and the development of competitive food products for domestic and export markets; c) improving food safety and food security

at the production, processing and service level; d) promoting animal genetics, improvement of animal health and husbandry practices; etc. Among other local organizations more or less specializing on supporting animal husbandry farms in Armenia are HEIFER, SDA, World Vision, OXFAM GB Armenia, etc.

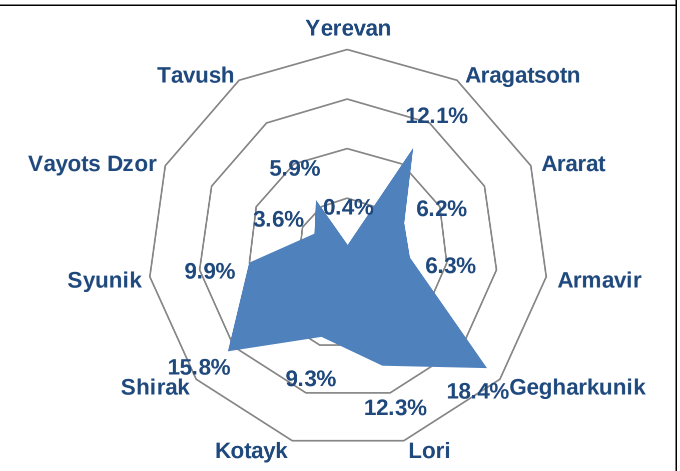
2.2.1.2 Milk production

Volume of milk production in Armenia is steadily growing in recent years. However, volumes of production are far behind the maximum of potential both in terms of extensive threshold and productivity. Total volume of milk production in Armenia distributed by regions is presented below.

Table 6 - Milk production volumes in Armenia, thousand tons

Regions	2011	2012	2013	2014
Yerevan	2.0	2.2	2.5	2.7
Aragatsotn	74.8	76.5	79.9	84.6
Ararat	36.5	38.2	40.1	43.4
Armavir	36.1	37.4	40.5	43.9
Gegharkunik	114.5	116.3	120.7	128.6
Lori	76.2	77.7	81.3	86.0
Kotayk	51.8	53.5	57.9	64.8
Shirak	98.8	101.5	107.6	110.5
Syunik	55.9	57.2	62.2	69.4
Vayots Dzor	20.0	21.1	24.8	25.5
Tavush	34.9	36.6	39.5	41.0
Total	**601.5**	**618.2**	**657.0**	**700.4**

Regional concentration of milk production in Armenia, 2014



As in case of cattle/cows livestock, the leading regions are Gegharkunik, Shirak, Lori, and Aragatsotn. Leadership of these regions is traditional and most probably will continue in observable future, too.

Table 7 - Milk productivity in Armenia, kg/year

Regions	2011	2012	2013	2014
Yerevan	1,745	1,887	1,967	2,050
Aragatsotn	2,026	1,897	1,980	2,038
Ararat	2,215	2,205	2,263	2,505
Armavir	1,982	1,873	2,011	2,127
Gegharkunik	2,200	2,143	2,127	2,195
Lori	2,108	1,986	2,074	2,167
Kotayk	1,992	1,950	2,057	2,405
Shirak	2,152	2,024	2,128	2,184
Syunik	2,173	2,139	2,199	2,347
Vayots Dzor	2,402	2,203	2,563	2,520
Tavush	2,123	2,129	2,254	2,336
Total	**2,123**	**2,038**	**2,122**	**2,231**

Stable growth of milk productivity was registered in recent period, too. However, some experts provide much worse estimation to the milk productivity figures versus official figures. Their estimations vary in the range of 1,600-1,800 kg/year per cow. The major problem lays in gaps of agricultural information collection methods; actually no figure is traceable due to special preferable regime of agricultural operations in Armenia: almost no primary production is registered; farmers are exempted from any taxation, etc. Thus, in order to construct any analysis, the official volumes of milk production will be assumed as conditionally accepted information within the frames of the current report.

Volume of milk used by milk processors is another shadowed aspect of milk VC in Armenia. Processing organizations are not at all obliged to provide any information about the volume of procured and processed milk. The volume of processed milk can be back-calculated on the bases of end-products' production quantities, but those quantities also are subject for being suspended. Recent efforts of State authorities towards bringing the milk-processing sector operators are quite effective, but far not sufficient for resolving the problem completely.

The share of products sold for cash by primary producers is defined to be the commercialization level of that product. This level of commercialization in Armenia is defined to be 56.6% as of the end of 2014.

Table 8 - Commercialization level of milk and dairy products produced by farmers

Regions	2011	2012	2013	2014
Yerevan	-	-	-	-
Aragatsotn	61.0%	60.8%	29.2%	40.1%
Ararat	53.2%	57.3%	61.3%	64.4%
Armavir	71.4%	65.6%	65.3%	73.8%
Gegharkunik	39.5%	33.6%	30.6%	81.6%
Lori	52.4%	52.8%	52.8%	51.9%
Kotayk	64.8%	62.3%	79.0%	57.3%
Shirak	42.9%	43.6%	49.7%	56.8%
Syunik	43.2%	45.5%	51.6%	54.6%
Vayots Dzor	10.5%	15.3%	14.8%	22.0%
Tavush	22.1%	24.5%	24.0%	24.1%
Total	**46.6%**	**45.1%**	**44.7%**	**56.6%**

Interestingly, the leadership of regions producing more milk is not so obvious in case of the commercialization of that milk. Moreover, it would be wiser to avoid looking for any tendencies. The commercialization of milk drastically grew for almost 12 percent points in 2014, which is a subject of another large study.

Ceteris paribus, this jump of commercialization (calculated on another notably grown figure of milk production in 2014) may have 3 explanations: a) either processors substantially increased the volume of milk procurement and production of dairy and cheese based on increase of already quite high consumption, b) increase of the milk and dairy consumption procured by end-consumers directly from farmers, and c) both factors together. However, all scenarios seem to be quite suspicious providing the recent/current trends of migration in Armenia, quite high level of per capita consumption of milk VC products, etc.

The market of milk in Armenia is an open and competitive market with sufficiently large number of both suppliers and procurers. The price for primary milk is formed in the market based on market demand and supply. None of market operators may influence the prices for a notable period of time. Discussions on milk prices (between procurers and producers of milk) in Armenia traditionally start in the beginning of March and depending on year may last until the end of May. If nothing extraordinary happens, the procurement prices of primary milk reach the balanced point in the end of May and work until the end of September. 60-65% of primary milk is being produced in Armenia in the period of May-August (inclusive), and prices go down to the possible minimum for a year.

Starting from the beginning of October, the cattle are being brought down to stall from the pastures. Prices start changing (say growing) exactly on the moment when cows enter the stalls and start eating stored (say expensive) forage. In the winter period the volume of primarily produced milk becomes very low, quality drops/varies substantially, and procurement price reaches its peak, and become unaffordable (useless) for many processors. Due to lack of milk, many producers (of cheese especially) almost cease their production.

Table 9 - dynamics of milk prices in recent years, AMD/kg

Periods	2009	2010	2011	2012	2013	2014
Summer period	90-100	110-120	120-130	130-140	140-150	160-170
Winter period	110-120	120-130	130-140	140-150	150-160	170-180

Increase of milk prices in the recent period was conditioned by various factors, but main ones are the following: a) gradual change in processors' policy in regard of using dry milk in their production technologies, b) increasing demand of milk from the side of cheese and dry milk producers that identified some opportunities for exporting their products (mainly to Russia).

Situation changed in the end of 2014, when the financial markets of Russia and Armenia registered drastic fluctuations and instability. Russian ruble and Armenian dram devaluated significantly. Substantial inflation was registered in consumer products' markets. Armenian cheese and dry milk became not at all price competitive in Russian market, which almost killed Armenian companies' exports. This negative trend continued in 2015. In the beginning of pasture season the processors announced about drop of procurement prices for 30-40 AMD/kg. Some local players (used their position of main procurers in certain areas) and dropped prices to the level of about 100 AMD/kg. This caused widespread complaints and tensions among farmers. Simple civil complaints escalated to actions of protests, in some regions (In Lori, Gegharkunik, etc.) farmers even closed main highways requiring the State bodies to intervene and influence the processors.

Response from the side of the RA MoA followed immediately: high ranking officials met with representatives of dairy market and "strongly recommended" them to stop the drop of milk procurement prices. Despite the inappropriateness of such methods of distorting the market conjuncture, the processors met the request of the government and procurement prices balanced on the level of 120-130 AMD/kg for the milk with basic fat content of 3.6%. In other equal conditions, this level of procurement prices may allow to restart the attempts of exporting cheese to Russian market, providing that financial market of Russia will not collapse again.

The procurers' most preferable areas for sourcing milk are Chambarak sub-region of Gegharkunik marz, Tashir sub-region of Lori marz, Amasia area of Shirak marz, and Aparan sub-region of Aragatsotn marz. Milk collected from the presented territories is separated for its high-quality features conditioned by the location of pastures and grasslands, the altitude (certain height above sea level, local fauna, humidity, etc.). Traditionally, prices of milk from these regions are the highest; they grow very fast and almost do not decrease, etc. However, ranking the milk from the mentioned territories as the best is rather subjective, since during the peak of the season any milk is highly valued and demanded in Armenia.

Control of milk in Armenia is conducted mainly during the collection of the primary produce from farmers and during the procurements from collection points by processing companies. The term "quality" in Armenia is mainly associated with following features of milk: a) fat content, b) acidity, and c) content of dry residuals. The basis for the measurement of fat content is the 3.6% fat content, which is being checked either mechanically (by centrifuge) or electronically (by milk analyzers). The price of 1kg milk is actually being calculated by a formula basing on 3.6% fat content. The higher the figure the more expensive is milk.

Acidity of milk is being measured via Terner method should not exceed 18^0, and 6.5^0 via measuring the acidity in PH. Cleanness and acidity of milk are serious problems, but of rather technical nature. Mitigation of those risks is comparatively easy, though requires substantial efforts, such as proper (clean) milking conditions, clean, cool and safe transportation of milk, etc.

Mentioned aspects of ensuring milk quality issues are mainly addressed by major operators of milk VC. Some smaller organizations sometimes lack necessary facilities and equipment, knowledge and experience for meeting milk quality requirements, but they do not comprise notable share of the market.

In the segment of processing of milk VC only two inputs may largely replace each other - fresh milk and dry milk. However, this statement is true only for dairy producers. Dry milk cannot be used for production of cheese, due to damage that proteins of milk face during intensive thermal processing of being dried. Protein junctions decrease significantly, which affects the elasticity of the final product, which is one of the key oligoleptic features of cheese. Thus, the only protein basis of cheese is fresh milk.

Limited replacement is possible also in types of used ferments and yeasts, as well as fat components - butter, cocoa fat, etc. Processors are cautious in using replacing products since some of them are not allowed by law and not only in Armenia.

Processing companies invested a lot of means in recent years for improving the cleanness and quality of milk collection and processing in Armenia. Currently, at least 70% of milk is being processed at proper conditions and meets all quality requirements[21]. In fact, the major problem faced both by suppliers and collectors/procurers/processors currently is prompt transportation of milk from field to the collection point and from the collection point to the processing factory.

Calculation of net profit margin of farmers engaged in milk production is quite a challenging task due to substantial fluctuations of almost all components of the cost starting from prices of inputs and finishing with the price of milk itself. The following calculation should serve rather as a template or example for calculation of net profit in 1kg of milk. From the very beginning an assumption is made that calculation was made for a farm breeding 5 cows, with average annual milk productivity of 1,500kg, and fat content of 3.8%. The calculation model is the following:

Table 10 - Calculation of costs of treatment of 5 cows (model)

Cost item	Unit	Quantity	Price, AMD	Amount, AMD
Pasture lease	head	5	6,000	30,000
Grassland tax	ha	5	11,000	55,000
Grass cutting	ha	5	20,000	100,000
Grass harvesting,	ha	5	10,000	50,000
Grass pressing/cubing	cube	150	750	112,500
Grass transportation	trip	5	10,000	50,000
Remuneration of milkers	month	10	15,000	150,000
Shepherd remuneration	cow/month	40	2,000	80,000
Grazier remuneration	month	12	40,000	480,000
Veterinary services	cow/month	60	200	12,000
Electricity and water expenses	cow/month	60	300	18,000
Other inputs	cow/month	60	500	30,000
Total expenses				**1,167,500**

[21] According to heads of unions of dairy and cheese producers, also confirmed by officials of the RA MoA and

Table 11 - Calculation of COGS per 1kg of milk

Calculation items	Quantity
Production of milk (3.8% fat content) per cow, kg	1,500
Production of milk (3.6% fat content) per cow, kg	1,583
Number of cows, head	5
Total production of milk, 5cows, kg	7,915
Cost per 1 kg of milk, AMD	**147.5**

If the presented calculation is made taking into account the average milk productivity level as 2,300 kg/year per a cow (which is calculated on the basis of officially announced volume of milk production and number of cows) the COGS of 1 kg milk will comprise around 100 AMD/kg. Current procurement prices of milk in Armenia vary in the range of 110-130 AMD, but for summer season. In autumn and winter seasons the price will grow and profitability of farmers will also rise.

Perishability of end-products is among the most important food safety issues in dairy and cheese production organizations. However, the issue should be addressed even for earlier period of delivering milk to initial cold storing facility (e.g. milk cooling tanks at collection point). This period should not exceed 2 hours when acidity of milk does not change. Milk can be stored in cooling tanks for 24 hours under the thermal regime of $+4^0$ Celsius. Sanitary and hygienic conditions and period of storing fast spoiling products are defined by the Order of the RA Minister of Healthcare, N 2-III-4.4-1, December 28, 2011. The perishability periods of processed products are presented below:

Table 12 - Perishability period of end-products

Products	Period (expert technologists' assessment)	Thermal regime, Celsius
Pasteurized milk cream	36 hours	$+2^0$ to $+6^0$
Matsoun	48 hours	
Kefir	36 hours	
Tan	36 hours	
Sour-cream	72 hours	
Diet sour-cream	48 hours	
Curd with different fat content	24-36 hours	
Soft and salt-water cheese, without maturing	48 hours	
"Lori" cheese, matured	12 months	
"Chanakh" cheese, matured	8 months	
Hard cheese	6-12 months	
Pastafilata cheeses (mozzarella, suluguni, fiber (tel), etc.)	15-90 days	
Dry milk	8 - 24 months	up to $+10^0$

It is important to note, that there is no regulation exactly defining perishability period of dairy products and cheese. Producers have 2 options: they can either follow GOST requirements, or develop their own so called Technical Conditions (TCs) for each product, get confirmation on those TCs at respective State agency and follow the requirements of those TCs during the production. hat is why, the perishability period of curd produced by one company may differ from that period applied by other producers.

According to official sources the quantity of milk produced in Armenia was steadily growing in recent years. As mentioned, there is a well-expressed seasonality in production cycle. 60-65% of total volume is being produced in the period of May-August. Quality features of milk in this period are quite high, though practices of milk collection, storing and transportation are still quite challenging in terms of milk quality and safety. External quality-related risks usually decrease in winter period, when livestock is kept in stalls, but the composition of milk is not the best in that period due to accent on dry feeding. However, the general trend of quality is also positive.

The situation is different with prices; until the beginning of 2015 the prices were slowly, with some fluctuations, but steadily growing for 10-20 AMD/kg for the last 5-6 years. This trend was broken in the beginning of 2015, when prices of milk dropped to the level of 2009-2010.

Best-quality milk in Armenia is being produced in Chambarak sub-region of Gegharkunik marz, Tashir sub-region of Lori marz, Amasia area of Shirak marz, and Aparan sub-region of Aragatsotn marz, and partially in Sisian sub-region of Syunik marz. Collection prices in these areas are actually the same as in all others in the country (or higher for maximum 10 AMD/kg); the major difference is in duration of reaching and remaining on the highest level of prices. Milk price in these territories is growing the first and very fast and dropping very slowly and the last. According to experts' estimation total volume of high-quality milk produced in these territories is about 50,000 tons per year.

Milk is the major input used for production of dairy and cheese products. The share of milk in costs of dairy products comprise comprises around 50%, while in cheese it reaches to 80%. The list of other main inputs includes:

- Ferments and yeasts;
- Fat (in different forms);
- Dry milk (as alternative to milk in big quantity or just for ensuring density of product);
- Plastic (also glass though in smaller quantity and rarer) packaging for dairy products;
- Cheese packaging vacuum bags and plastic packs.

All inputs are sufficiently accessible in Armenia; there is no unmet demand of the above mentioned inputs. In the meantime, the overwhelming majority of almost all inputs are being imported and high dependence from external markets may become a risk factor. This is especially well-expressed in case of packaging (100% in case of cheese) and bacteria/ferments (more than 90%). Packaging of dairy products is manufactured in Armenia, but the inputs for the produced plastic are totally imported, too. CARD AgroService[22], Larry Union of Cheese Producers, Oval Plastic[23], and MoksPlast organizations can be mentioned among suppliers of necessary inputs for dairy and cheese producers.

2.2.2 Characteristics of primary producers and input providers

2.2.2 .1 Milk producers

The number of animal husbandry farms producing milk in Armenia is estimated to be 170,000 farms approximately. The current tendency of the number of milk producers (and cattle breeders in general) is rather decreasing due to difficulties of animals feeding (expensiveness of forage) and sales of the produce (low prices of milk since the spring 2015). The dominating areas of milk production in Armenia are Gegharkunik, Shirak, Aragatsotn, Syunik, and Lori regions. The dominating bred of cows is the Caucasus Grey, although some highly productive breeds have been imported in the recent period, too. More than 10 pedigree farms do operate in Armenia; the leaders are "Agroholding Armenia", "Vamaks", "Arzni pedigree farm" and "Multi Agro".

The market of milk in Armenia is fully open and competitive, consists of sufficiently big number of suppliers and (ultimate and intermediary) procurers. None of market participants, even giant players (such

[22] www.card.am
[23] www.ovalplast.am

as Ashtarak-Kat and Marianna) covering more than dairy market of Armenia, can really influence the whole milk market for sufficiently long period. Farmers may face challenges in selling their milk only due to price fluctuations that take place not by the wish of processors but for market-related reasons (over-production in summer period, availability of cheap alternative of imported dry milk, changes in taxation of processors sector, etc.). Challenges are possible only in very small localities producing smaller quantities of milk and having few alternatives for selling milk, only.

The number of really large farms breeding several hundreds of animals is really few - a couple of tens. Almost all of them transformed into formally registered businesses and most of them established (or plan to establish) their own processing facilities. Best examples are Arzni Pedigree Farm, Vamaks, Multi Agro, etc. In the meantime, no animal husbandry (i.e. milk producing) farm has market domination in Armenia. No milk producer can dictate milk prices in the market.

Overwhelming majority of cattle (including cows) in Armenia is treated/bred by farming households. The share of livestock bred by organizations comprises 0.7-0.8% of total. In the meantime, only some of those business style large farms more or less provide Good Agricultural Practices (GAPs) of animals housing, feeding, watering, milking, breeding, etc. Some quite small portion of farming households are also applying some GAPs within the frames of various development initiatives funded by international organizations and implemented by specialized local entities, such as APIU, CARD, Heifer, FAO, etc. More than 95% of farmers apply those practices, inputs, and other resources, which are affordable for them and what they know about (mainly traditional behavior), i.e. those farmers have *ad hoc* approach.

Milking of cows at the overwhelming majority of animal husbandry farms is not organized properly, i.e. in compliance with food safety and quality control requirements. Hand milking is the main method applied, and it is being conducted usually at the same places where the animals are housed. Modern and appropriate equipment is used in large farming organizations, but their number (and respective number of livestock they breed) is marginal in total. Despite the availability of modern safe and efficient milking equipment, it is usually not affordable for farmers, and they have to and used to applying hand milking.

Are there any areas of the country which seem to be systematically ignored by buyers (processors)? Dairy and cheese producers collect/procure milk from all over Armenia without exclusion of any area. Especially during the out of season periods (late autumn to early spring) any milk is welcomed. However, cheese producers avoid procuring the milk produced in certain areas of Baghramyan sub-region of Armavir marz in July-August months. According to some technologists that milk causes gases in cheese. Nevertheless, dairy producers do not have any problems with pro

curing that milk.

2.2.3 <u>Contractual arrangements</u>

Relations between milk producers and procurers (intermediaries and processors) are almost totally being arranged informally, based on verbal agreements. In some rare cases it may happen that formal document is concluded, but in reality nobody follows the clauses of that document.

Arrangements between farmers and milk collectors/processors are achieved on all important issues related prices, quantities, payments, logistics, etc. In the meantime, the arrangements are of rather general nature, i.e. farmers agree to sell and procurers agree to buy milk. Details of cooperation are being continuously adjusted on monthly, weekly, and even daily bases. In cases when collection points are established by processors the “weight” of processors arguments usually prevail, and vice versa.

2.2.4 Logistics (transportation)

Supply of milk should and is being conducted quite often and regularly regardless who is the recipient of the shipment. This is due to qualitative nature and perishability requirements of milk - it can be cooled at collection points 24-48 hours the maximum before getting spoiled. The most applied option is the following: farmers milk cows in the morning and evening and deliver in the morning of next day without mixing with the milk of the morning of the second day.

For quite long time, the processors have been collecting milk from collection points via their transportation means - milk tankers. Some local processors invested notable amounts for procurement of modern tankers. However, in the recent period the situation changed and many collection points (30-40% of total) handled the function of transportation by applying their own milk tankers. They do not use as new and modern vehicles; they were able to invest just for old soviet or modern Russian milk transportation means. However, that is not much affecting on the quality of milk delivery process and is mutually beneficial both for processors and milk connection points. In particular, processors got rid of the necessity of keeping a large transport park and invest efforts on organization of logistics, collection points got an opportunity to optimize their operations and earn some small amounts in providing also delivery services.

Quality specificities of milk leave no room for any delays in transportation. Delayed milk is spoiled milk and cannot be processed any more. Everybody understands this very well and delays were brought to the possible minimum. Real delays are possible only in case of technical problems with the milk tanker. Even in that case the problem is solvable via replacing it with another tanker. Currently, the losses of milk are brought to the very minimum level lost during loading and unloading processes.

2.2.5 Infrastructure and transport facilities

2.2.5.1 Collection of milk

The number of collection points in Armenia is roughly estimated to be around 40-50 in all marzes of the country. Establishment of milk collection points in Armenia was funded via 2 main channels: either by large processing companies (such as Ashtarak-Kat, Marianna, etc.) or by development initiatives funded by almost all international organizations. Some small number of collection points has been established via financial support of local NGOs, Diaspora Armenians, etc.

In the meantime, about half of collection points are not operational, currently. The major reason lies in funding of operational expenses for those collection points, e.g. communal expenses (electricity, water), cooling inputs, salary, etc. Practically, a milk collection point is being established for a sufficiently large group of farmers, lead by 1 or 2 large breeders (usually mayors of villages or their affiliates) keeping at least 60-120 heads of cows in total. The funding organization usually invests in procurement of the collection and cool storing tank, construction of facilities where the tank will be installed and delivers the collection point to local farmers (informal group, cooperative, union, etc.). After that, farmers should undertake the responsibility of funding the operational expenses in amount of 15-20 AMD/kg of milk (including 0-5 AMD/kg of profit) at least for 6-8 months of intensive operation. Milk collection centers (and their sub-points) that were established by processing companies and are affiliated with them usually overcome the mentioned financing difficulties, since the processors largely covers all expenses. But, in other cases, farmers being members of mentioned cooperatives and unions simply reject paying the commercial margin and stop using the milk collection point. Thus, tens of collection points (in Syunik, Tavush, Gegharkunik and other marzes) are not operational.

CARD AgroService is the leader in supplying Armenian farmers with milk collection and cooling tanks, as well as with embedded consultancy. Since 2005[24], this organization provided about 50 milk cooling tanks of different (mainly small) capacities. Currently, CARD AgroService offers maybe the best cooling tanks available in Armenia of Delaval brand. Cooling tanks of this brand lower the cost of cooling operations, improve the quality of milk and maximize profits. Core benefits are:

- Rapid cooling optimizes milk quality,
- Easy cleaning,
- Fish tail agitator preserve fat cells,
- Reduces energy costs by 10-15%,
- Compact tank,
- Plug & play solution,
- Better insulation and hygienic, easy to clean, silent and ergonomic,
- Capacity range is 200 to 1,850 liters.

Although fresh milk has a certain natural resistance to bacteria, it will start to deteriorate over time as bacteria starts to take hold in the milk. Cooling the milk to around 4-6° C within two to three hours after milking will essentially stop the process of bacterial growth and chemical changes, and allow more time for the product to be delivered to the customer in top condition. Losses are minimal and limited to small quantities spoiled during load/unload of milk. This, surely, does not refer to “techno-gen” problems, such as accident on electricity provision line. Understandably, the milk will be spoiled without being cooled and should be immediately transported to processors or another storing facility.

Currently, facilities of cold storing of milk are fully sufficient and even exceeding, since tens of collection points remain non-operational. However, the situation may change very rapidly. Establishment of even a mid-size farm breeding 50-100 cows may boost the need/demand for establishment of milk collection center. The entry of such an anchor player may serve as catalyst for local farmers to gather and form a group/cooperative with total livestock of several hundred heads, which will be a very interesting potential supplier/partner for any processing factory in Armenia.

2.2.5.2 Transportation

Transportation of milk from milk collection centers to processing facilities is usually being conducted via special machinery - milk tanker. This vehicle can also carry drinking and mineral water, vegetable oil, ether liquid food stuff. Thermal insulation of the tank allows the milk tanker to transport milk for 10 hours at ambient temperature[25] up to 35^0 degrees. Body milk tanker is designed as a tank or hopper made of stainless steel. In the USSR, due to insufficient levels of industrial production tanker trucks for transportation of milk made from aluminum alloys. The problem of aluminum alloys is that they do not meet sanitary requirements for the transportation of food products, the main reason - the oxidation. The only material which is not exposed to oxidation in contact with food is stainless steel.

[24] Though acting under the mandate of the USDA/MAP or CARD Foundation
[25] Temperature of the surrounding environment; temperature of the air surrounding a power supply or cooling medium

Very few comparatively rich processors in Armenia can and do afford using of modern, western made milk tankers collecting milk from milk collection centers/points and large farmers. The majority of processors and collection points use comparatively new milk tankers of Russian GAZ brand of different capacity. The newcomers or smaller processors do even apply old/soviet milk tankers despite their obsolete conditions and safety problems they may cause.

Main infrastructure related to transportation of milk is the network of roads, which is in really bad condition especially in remote villages. In some places drivers prefer using ground roads than broken “asphalt-covered” passes. This definitely causes problems for transportation of milk in terms of possible delays, shaking of milk in the tank, etc. On the other hand, operators of milk VC got used to solution of all those problems. Milk tankers are equipped with special technologies that minimize negative impact of shaking the milk (sectional division of milk tanks), vehicles are strengthened, delivery is organized earlier, etc. The only major problem is high cost of maintenance and depreciation of milk tankers.

2.2.6 Communication

Contacts between milk producing farmers and milk collection points are conducted on daily basis. Producers deliver their milk in special milk cans, which is being analyzed in the collection center and mixed to already collected volume in milk collection tank. The quantity and quality of delivered milk is being registered for being paid at agreed price. Most collection points pay for collected milk once they got their payment from the processing factories that procure the milk from collection points. However, in the recent period some collection points and intermediaries developed enough for filling the financial gap for a short period when the processor did not yet pay, but payments to farmers were already made. For this service (and for other intermediary services) such participants of milk VC charge fees and commercial margins of 20-30 AMD/kg.

Interrogations between collection points and processors start at early spring and last until late autumn. In the beginning of milk season the VC can be defined as “buyers’ market”, where the quantity of product tend to gradually grow and procurers have a chance to bargain better conditions. Closer to the end of milk season the VC becomes more alike the “sellers’ market”. Due to declining tendency of milk quantity prices start growing and farmers receive more offers from different processors.

However, despite big negotiation events, regular two-week or monthly contacts are conducted between sellers and buyers of milk. The major purpose is receiving the payment for the milk delivered. Usually, processors do their best to conduct clearing payments bi-weekly, though not always successfully. Even large processors (such as Ashtarak-Kat) significantly delay making payments sometimes. In some cases farmers had to apply to the regional authorities and the RA MoA with the request to influence processors and make them pay their debts (though none of mentioned entities has a real mandate for such intervention in private relations).

There is one more aspect of unfair treatment of farmers by processing factories. Especially during the periods of market fluctuations, processors “love” forgetting initial arrangements; they start procuring all milk without applying the formula for fat composition, or reject buying milk arguing its freshness having no proof for that, etc. For the farmer with quite a big quantity of milk at hand, which may get spoiled, nothing is left than to agree with any caprice of procurers.

2.2.7 Major constraints and proposed solutions

Major constraints for effective production of milk in Armenia can be divided into following major groups:

1. Gap in sizes and structure of animal husbandry farms;
2. Gap in animals' quality/productivity features;
3. Gap in farmers' access to and affordability of animal feed, other inputs,
4. Gap in farmers' access to remote pastures;
5. Gap in farmers' access to and affordability of veterinary and other services;
6. Gap in farmers' knowledge and application of proper animal husbandry practices;
7. Gap in automatization of animal husbandry processes.

Animal husbandry and milk production in Armenia is concentrated in small-scale farming households except of a couple of tens of larger and business styles farms and organizations. Fixed costs of breeding 3-5 heads of cattle/cows is not much different of fixed costs spent on twice as much livestock. This makes the operation of overwhelming majority of farming households inefficient in terms of very low profitability, if at all. Besides, the quantity of milk produced in such small farms is respectively small and not interesting for any collector/buyer.

It is widely known that pedigree features of Armenian cows (Caucasian Grey initially) dropped significantly, seriously affecting productivity features of animals. The milk productivity potential of this cow reaches 3,500 kg/year, while in Armenia the figure comprises 1,200-1,600 kg/year according to estimations of various experts (though official statistics announces up to 2,300 kg/year). Main reason causing this gap is well-known - low application of pedigree activities, particularly artificial insemination.

The main feeding of animals in pasture season is fresh grass. In stalling period the major components of animals' ration are hey and dry grass. Small quantities of alfalfa, juicy forage, grains, complex feeding fed to animals are too small for having a real influence on productivity. Reasons causing this gap are low accessibility and affordability of proper feeding. Low supply of better quality feeding (not even talking about modern supplements) causes unmet demand and, consequently, high prices. The final statement is true also for other inputs - instruments, quality medicals, pedigree semen, etc.

In the recent period Armenian farmers very much "succeeded" in overloading the close/adjacent pastures located next to their farms. This overgrazing starts in early spring (much earlier than allowed) and continues all the year causing vital harm to environment and biodiversity (overgrazing is among the major reasons of land degradation and desertization). In the meantime, farmers explain that use of remote pastures is impeded with very bad situation of roads to high mountain pastures, lack/absence of animals' watering and housing facilities, movable milking machines and cold storing facilities in remote pastures, etc.

Veterinary services are largely available at all rural communities of Armenia. These services are provided by veterinarians of the State agency and largely funded by the State budget. However, recent pilots conducted with the funding of international donor organizations attested the need for reforms. Animal health management projects implemented by CARD Foundation and FAO showed gaps in State system of providing veterinary services that were immediately filled-in for example by establishment of about 10 Farm and Veterinary Service Centers. Though services offered by these private institutions are expensive in comparison to those provided by ordinary veterinarians, many farmers prefer them for much better quality and ultimate results.

As almost in all other agricultural activities, Armenian farmers substantially lack the knowledge on proper implementation of animal husbandry activities. They are willing to participate any training and knowledge transfer activities only if they are free and nicely organized by various development initiatives, i.e. they consider the process as an option of entertainment (though not always). In any case, farmers (with very rare exceptions) are not ready to finance such activities.

Except of the mentioned larger farms, animal husbandry farmers widely rely on hand work (manpower) in almost all stages of husbandry. Application of automation is on very low level at ordinary and small farms. This, obviously, increases costs and efficiency of milk production activities, causes food safety problems, etc.

Overcoming of the mentioned constraints is of very high importance and the need for it is urgent. Respective measures are again widely-known and were discussed many times. The following specific activities are recommended for overcoming constraints and barriers of milk production:

1. Promote enlargement of animal husbandry farms via implementation of direct (e.g. subsidies for sales and procurement of animals for further breeding) and indirect (affordable/subsidized and really accessible loans for procurement of animals) interventions implemented with funding and/or support of the State and international development organizations. Continuation of the process of consolidation of small and scattered farms, support to establishment of cooperatives, i.e. extensive growth of the production base of commercial milk.
2. Introduction of a set of measures promoting artificial insemination, such as motivation schemes and banning regulations. Promotion of localized and countrywide projects implemented by specialized organizations in the field of pedigree activities' application. Support for the establishment of modern genetic stations involved in import and expansion of the use of best foreign pedigree species' semen.
3. Promotion of animal feeding production in Armenia. Measures applied in the frames of WB funded support initiatives are good examples (provision of agricultural machinery and mechanization to newly established cooperatives, subsidizing the expenses of production of technical crops and animal feeding, introduction of crop rotation, etc.) for replication.
4. Gradual continuation of the uptake of remote pastures funded by the WB and implemented under the aegis of the RA MoA. Elaboration and real application of modern pasture and herd management plans. Use of already damaged and endangered pastures should be stopped for several years and special recovery activities (rehabilitation, fertilization, etc.) should be implemented to avoid further degradation.
5. Implementation of independent/external professional evaluation of the work of the State veterinarians and assessment of farmers' needs of veterinary services in terms of types, regularity, quality, and prices. Wide support to the development of the provision of veterinary services by private institutions.
6. Launching and/or re-vitalizing the provision of knowledge transfer and training on modern animal husbandry practices via the agricultural extension services. Marz Agricultural Support Centers may serve as bases for launching a special program. Special scheme of motivation should be invented to convince farmers to participate.
7. Promotion of modern/innovative automated solutions for animal husbandry. This may include modern solutions for animal housing (ventilation, manure-removal, feeding and watering, automated milking (also in pasture), use of electronic shepherds, etc.).

2.3 Dimension 2: Processing Capacity and Technology

2.3.1 Processing capacity

The assortment of dairy products and cheese produced in Armenia is quite wide. In particular, the following main products are being produced by local dairy producers:

- Pasteurized milk (1.5-3.2% fat, 0.5-1 liter plastic packs and bottles);
- Matsoun (kefir and tan) (1-5% fat, 0.5-2 kg plastic packs);
- Sour-cream (10-20% fat, 90-1,000 gram in plastic packs);
- Curd (0-18% fat, 150-200 gram in plastic packs);
- Other dairy products (melted cheese, yogurt, curd and sour-cream mixes, etc.).

The assortment of local cheeses includes:

- Semi-soft and soft cheese (Lori, Chanakh, etc.) (including those with spices) (25-50% fat in dry materials);
- Semi-hard and hard cheese (Gouda, Akunk, Holland, etc.) (around 40% fat in dry materials);
- Pastafilata cheese (string cheese, suluguni, chechil, tel, mozzarella, etc.) (around 40-50% fat in dry materials);
- Roquefort (around 40-50% fat in dry materials);
- "Buried" cheese (30% and 45% in dry materials)

Milk processing in Armenia is being conducted either at farming households, or at processing dairy companies. Understandably, homemade products do not pass the same sophisticated technological processes; no control is applied for food safety and quality assurance issues. Instead, homemade products are of much cheaper price and are highly demanded in the market. This especially refers to "fresh" milk, matsoun, and cheese. Other products such as curd, "rejhan" (high-fat sour-cream) are offered by farming households much rarer and in marginal quantities.

Situation is different with industrial organizations involved in processing segment of milk VC. Here the production is organized in accordance with respective technological requirements and regulations, food safety rules, and internal control measures. Processing of each end-product is being conducted through a multiple technological steps, but all processors do conduct all those steps internally, within their enterprises. Even if primary and secondary processing actions are applied (quite rarely practiced), they are applied within the same facilities of organizations.

In the meantime, there is one specificity of milk VC that worth mentioning in the current content. There are 6 organizations in Armenia that produce dry milk[26]. At least for 4 of them the production of dry milk serves as primary processing of milk. They conduct thermal processing of milk and store it in summer period and recover/use in winter period, thus solving the problems of milk availability and affordability. However, in this case also, the primary and secondary processing of milk is being conducted within the same organization.

Discussions with various experts and technologists of milk sector resulted in comprehension of ambiguity of judgments about the quantity of milk used for production of different dairy products and cheeses. In case of pasteurized milk and matsoun the coefficient of transformation of milk into dairy products comprises varies around 1; in all other cases that coefficient largely depends on the composition of the

[26] Ashtarak-Kat, Marianna, Ani Dairy, Tamara, Stepanavan Factory, Katnarat Factory

end-product (such as fat, protein, dry mass and other stuff content). Moreover, technologies of dairy production mainly assume so called milk normalization and adding of fat. However, average uses of milk for production of different end-products are presented below.

Table 13 - Milk transformation coefficients for dairy and cheese products

End-products	→	Milk quantity, kg
In order to produce ***1 kg of pasteurized milk***	→	***1 kg*** of raw milk is needed
In order to produce ***1 kg of matsoun***	→	***1 kg*** of raw milk is needed
In order to produce ***1 kg of sour-cream***	→	***1-6 kg*** of raw milk is needed*
In order to produce ***1 kg of curd***	→	***0-7 kg*** of raw milk is needed**
In order to produce ***1 kg of cheese***	→	***8 -12 kg*** of raw milk is needed

* - Sour-cream can be produced with a ratio of 1:1 just adding some fat

** - 0% fat curd can be produced from the milk whey resided after cheese production

Table 14 - Production volumes of end-products, 2011-2014, ton (formal)

Und products	2011	2012	2013	2014
Milk*	315,800	324,100	362,700	386,500
Matsoun	3,519	3,120	3,453	3,961
Kefir	275	247	222	305
Yogurt	549	373	372	439
Sour-cream	2,864	3,389	3,549	4,721
Curd	950	840	1,011	922
Curd cake	116	106	93	104
Cheese**	17,614	17,629	17,375	18,317
Dry milk***	177	597	631	971

* - Total volume of commercial milk production by farmers. Does not mean only pasteurized milk, but includes also volumes used for processing into other dairy products.
** - Presented quantity does not include cheese produced and sold at farming households.
*** - Dry milk also was mainly used as primary processed product, which was re-processed into dairy

Information presented in the table above needs much closer review and analysis; serious reservations should be made on some issues. Explanations will base on formal volumes of milk production in 2014. Total volume of milk production in Armenia comprised approximately 700,000 tons. Commercialization level of milk production is announced to be about 56%, which means that some 387,000 tons of milk was sold in the market: to processors for being transformed into dairy or cheese, and directly to consumers in the form of milk, matsoun, or cheese. Based on 2 reservations/references made for the information provided in the table above, various experts have been asked to estimate the volume.

Table 15 - Use of milk for processing (average estimation)

End-product	Milk quantity used, ton	Share in milk quantity
Milk (pasteurized)	10,000	4.3%
Matsoun	3,961	1.7%
Kefir	305	0.1%
Yogurt	439	0.2%
Sour-cream	23,605	10.1%
Curd	6,454	2.8%
Curd cake	624	0.3%
Cheese (estimated)	176,000	75.5%
Dry milk	11,652	5.0%
Total	**233,040**	**100.0%**

As mentioned, some figures presented above (such as quantity of milk and dry milk,) contained duplications (double count) and exclusions (such as cheese). Respective adjustments have been provided based on estimations of milk sector experts. Estimations of various experts vary heavily, but all of them are in the range of 180-250 thousand tons of processed milk. This means, that in the best case, the volume of milk used for being processed into dairy products by farmers and supplied directly to consumers should comprise not less than 150,000 tons of milk (processed to dairy and cheese) approximately, which is not realistic, at all. Unfortunately, in the current situation adjustment of presented figures seems to be impossible.

As mentioned above, there is no reliable statistics or even accurate estimation on milk quantities used for production of specific end-products. However, sector participants roughly estimated that following approximate shares of milk are directed for production of end-products (at processing companies):

- Milk (pasteurized) - 4%;
- Matsoun (similar) - 2% (though consumption is several times more);
- Sour-cream - 10%
- Curd - 3%
- Cheese - 75%
- Other - 6%

The only comment refers to the production volume of matsoun. Big quantity is being produced by farmers and sold directly to consumers. According to rough estimations, those direct sales totals to 6-10 thousand tons of matsoun (i.e. milk processed). This will slightly decrease the volume of unjustified milk at farms, but questioned quantity still remains very big.

In total, up to 180 entities dealing with milk storing and processing were identified in Armenia. It is difficult to make unambiguous judgments about exact number of operational enterprises and units of milk VC, since most of them are of very small size (this especially refers to milk collection points and small-scale cheese manufacturing facilities) and is very easy to switch on and off. However, some 70 milk processing enterprises are surely operational (not counting the collection points and centers that may also have small and irregular volume of dairy or cheese production). Distribution of mentioned enterprises and entities by regions is the following:

Table 16 - Number of milk collectors and processors (with reservation on regularity)

Regions	Dairy	Cheese	Mixed	Ice cream	Points	Other	**Total**	Formally working
Yerevan	14	-	-	3	-	1	**18**	8
Aragatsotn	7	7	4	-	3	-	**21**	16
Ararat	4	3	-	-	-	-	**7**	4
Armavir	9	-	-	-	3	-	**12**	2
Gegharkunik	1	5	2	-	5	-	**13**	5
Lori	7	-	9	-	8	-	**24**	6
Kotayk	8	-	-	1	1	1	**11**	5
Shirak	8	1	3	-	5	-	**17**	11
Syunik	1	23	7	-	5	-	**36**	4
Vayots Dzor	4	-	2	-	3	-	**9**	3
Tavush	3	2	2	-	5	-	**12**	6
Total	**66**	**41**	**29**	**4**	**38**	**2**	**180**	**70**

Leading producers of dairy and cheese in Armenia are the following:

Table 17 - Leaders of milk processing sector

N	Dairy producers	N	Cheese producers
1.	Dustr Marianna	1.	Dustr Melania
2.	Ashtarak-Kat	2.	Dumikyan Exbayrner
3.	Chanakh	3.	Arax -2 (Eco-Kat)
4.	Multi-Agro	4.	Aparan Cheese Factory
5.	Arzni Dairy	5.	Ashotsk Cheese Factory
6.	Tamara	6.	Amasia Cheese Factory
7.	Marila	7.	MastaraChedo
8.	Ani Dairy	8.	Alagyaz Cheese Factory
9.	Aparan Group	9.	Golden Goat
10.	Bio-Kat	10.	HimnaTavush Fund
11.	Bio Food	11.	Borisovka
12.	Khak	12.	Igit
13.	Bonilat	13.	Gnel Khachatryan
14.	Bandivan Kat	14.	Van (Gyumri)

The term leader in the title of presented table should be referred with serious reservations. In case of dairy products market, 3 relatively big processing companies (Dustr Marianna, Ashtarak-Kat, followed by Chanakh) can be named leaders since they capture 60-70% (depending on type of end-product) of total market. Moreover, both of them expanded their production also in the sector of cheese production.

However, the stability and sustainability of operations in organizations of milk VC is threatened, though to a much less extent for dairy producers. Main players of dairy market are more or less well equipped with necessary machinery (in accordance with HACCP, ISO, and GAP standards), established and sustained reliable cooperation with milk suppliers, some of them succeeded in establishment of their own supply of milk (i.e. founded animal husbandry farms), etc. Everyday cooperation with other participants of the VC polished their relations with various partners and ensured more or less profitable operations.

The situation is slightly different for cheese producers. There are no obvious leaders in the market. Ashtarak-Kat, Dustr Melanya, Arax-2, Igit are comparatively large producers capturing up to 50% of the market. In case of cheese, industrial organizations face serious pressure from the side of farming households, which is not so heavy for dairy products (except of matsoun). Easily applicable technologies and cheap supply comprise very strong competition for organizations in the market. Finally, launching and ceasing of cheese production is much easier, perishability period of cheese is much longer than in case of dairy. Many cheese producers do operate irregularly, during just few months in a year, selling produce spontaneously, etc. As a result, the number of producers jumps up and down all the time.

Assessment of the capacity of milk processing enterprise or total capacity of the sector is quite a subjective (if not wrong) exercise. As experts of the sector (managers and technologists of processing companies) explained, the volumes of production may be multiplied within a very short period of a couple of weeks by installing few machines and containers. Or the capacity may be increased even within a couple of days by introducing 1.5 or 2 shifts of production if needed. Finally, in milk processing enterprises the same production lines and machinery is being used for production of different products. Depending on production of exact end-product, the volumes of processing may change.

However, it was formally estimated that full capacity utilization in Armenian sector of milk processing as of 1990 comprised up to 65%. Gradually decreasing in following years it dropped to around 15% in the beginning of 2000s, and started slowly growing. Importantly, some old and obsolete (soviet) facilities ruined and were cut-off the volume of total capacity. The greatest growth was registered at dairy production enterprises. Experts conditionally estimate the use of capacities at leading dairy enterprises on the level of up to 70%. Having the major basis for production operational, these producers gradually add new equipment and machinery meeting the growing demand (if any).

The situation is not so positive in the sector of cheese production. Enterprises of this sector utilize only up to 50% of their capacity, though this estimate is rather conditional. This underutilization of the capacity has certain reasons. In certain months (such as the peak of December) dairy producers must meet drastic jump of market demand; the production (and related storing) capacity use reaches the maximum possible level in this period. But this happens due to short perishability period of dairy products. The better is equipment, the easier they face peaks of demand. The situation is different in case of cheese producers. Perishability of the product is much longer; cheesemakers can smoothly produce their products and store them for several months avoiding any peaks.

Enterprises involved in dairy production (except of few large processors such as Ashtarak-Kat and Arzni Pedigree Farm), as well as large producers of cheese mainly have legal status of Limited Liability Companies. Smaller producers of cheese mainly operate under the status of Sole Entrepreneurs. Milk collection points usually are being established as Consumer or Production Cooperatives. In the meantime, very few organizations put a special logic under the selection of this or that legal status. Most of them prefer the easiest way, i.e. less paperwork, smaller formal turnover, less tax paid, etc.

Reasons of capacity underutilization in milk VC enterprises are many and various. *Inter alia*, lack of finances, unsustainable relations with milk suppliers and difficulties for procurement of milk, lack of knowledge and skills, old technologies and equipment and others can be mentioned.

Milk processors lack financial resources permanently. Milk producers/suppliers always tend to cooperation with those processors that pay higher price, but may prefer those who pay more often and regularly. In order not to lose regular supplies, almost all processors have to and do attract external funding for the procurement of primary inputs. Providing possible fluctuations in financial market of Armenia and respective mitigation measures applied by financial institutions (increase of interest rate, avoiding local currency loans, etc.), it becomes quite risky and expensive for processors to take loans from banks. On the other hand, most of ongoing businesses have no big problem for attracting loans for renovation of their production base, i.e. procurement of machinery and equipment. Terms and conditions of such financial products offered in the market by several financial institutions are much better and affordable.

It was already mentioned that milk processors may fully rely on only those milk suppliers that are somehow affiliated with them, such as in case of milk collection points/centers established by the funding of a certain processor. In all other cases the debate on prices and quality of milk are in place. By the way, in the beginning of milking season, the processors dictate their conditions, and vice versa in the end of season.

Experts of milk VC heavily emphasize the lack of knowledge and skills among professional personnel, mainly technologists, microbiologists, etc. It was estimated that less than 5% of graduates of academic institutions are ultimately becoming good practitioners in the milk sector. Roots of this shortcoming are very deep and reach to the methodology of education. It was mentioned that systemic reforms should be made in educational sphere to somehow save the situation (if possible at all).

Unlike a decade ago, there is no issue of accessibility of technologies and equipment in the current period. The major sources of supply are Russia, Europe, and a little - Turkey. The issue becomes different when the affordability of those technologies and equipment is assessed. Expensiveness of production facilities stops many processors from doing investments and renovation of assets. Only 30-50% of all operators of the production segment of milk VC can afford procuring new technologies and equipment even providing the availability of a wide choice of financial intermediary services. Thus, the majority of processors prefers continuing the utilization of old soviet equipment though at the expense of product quality, assortment, and appearance.

Among dairy producers, almost full technological renovation was conducted at Dustr Marianna; almost full at Ashtarak-Kat, Ani-Dairy. Among cheese producers the renovation of equipment and technologies was conducted at Dustr Melania, Elola, Igit, Eco-Kat, Ashotsk Cheese Factory, etc.

Main inputs used for production of dairy products and cheeses are:

- Milk,
- Ferments/yeast, and
- Packs (for dairy) and packaging (for cheese).

All the necessary quantity of primary milk is being produced in Armenia. All quantitative and qualitative issues related to milk production and supply in Armenia were sufficiently addressed in previous chapters. The only uncovered issue relates to the limited use of dry milk in technological process. First of all, cheese producers do not use dry milk, at all. Use of dry milk by dairy producers is twofold - either for "ensuring density" of dairy products using it in parallel with milk, or for replacing fresh milk input in low season period. As already mentioned, 6 dairy producers including the leaders of dairy market do produce dry milk in Armenia and mostly fulfill their demand end even supply other producers, too. However, some processors also use imported dry milk, though the overwhelming majority of imported dry milk goes for ice-cream production.

Ferments/yeast used in milk processing technologies is being imported almost completely. The reason of not producing it in Armenia is threefold: insufficient technologies, insufficient equipment, and, most importantly, lack (if not absence) of specialists. In the meantime, it should be noted that all 3 aspects do exist in Armenia, but they are not sufficient enough. At least 2 entities, the RA NAS Institute of

Microbiology and Vitamax-E have the minimum potential of launching the production of ferments/yeast in Armenia.

Packs (mainly plastic and some carton) and bottles (plastic) of dairy products are being produced in Armenia, totally. Oval Plastics, MoksPlast companies are among the leaders of producers of containers for dairy products. Local producers of packs for dairy products possess necessary technologies and equipment, but the inputs (i.e. plastic granules) are being imported almost completely. Thus, dependence from foreign supplies is again high.

Plastic packaging for cheeses is also being totally imported. Local producers of similar products are not able to ensure necessary features of such packaging, e.g. keeping the cheese sufficiently humid, extracting gases, ensuring hermetic closure, etc. In reality, only the most advanced countries afford having local production of packaging for cheese, such as GB, Germany, Russia, Israel, etc.

Organization of the production of all necessary inputs in Armenia that are currently being imported from abroad is hypothetically possible, but it all options are connected with large and long-term investments and sometimes even assume systemic reforms.

Enterprises of milk processing sector lack well-qualified narrow specialists in the fields of milk technologies and microbiology, substantially. Any of processors would be glad to offer well-paid employment to a qualified expert, but those are really few in the country and are sourcing from production sphere rather than academia. Thus, the major problem in terms of human resources is referred to technologists.

In the meantime, some processors also mentioned about the lack of good accountants and bookkeepers specialized in milk processing sector. This production has its specific aspects that are not properly addressed in the legislative and regulatory framework. In this situation additional requirements are raised for accounting and bookkeeping practices.

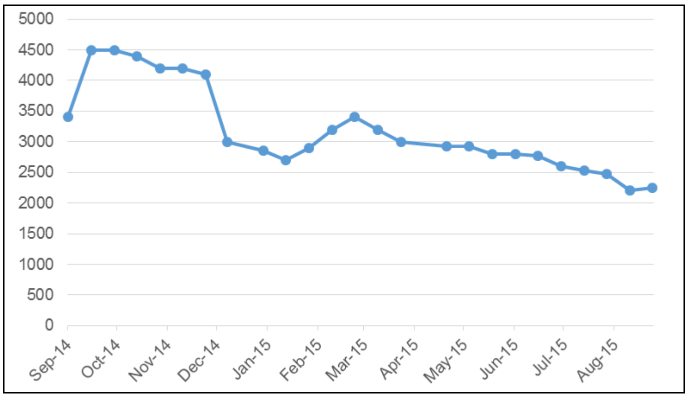
Dry milk production is Armenia is conducted by 6 enterprises including Ashtarak-Kat, Dustr-Marianna, Tamara, Ani-Dairy, Mil-Kat, and Diet. Total production capacity of these enterprises comprises 1,400 kg/hour or 3,000 ton/year.

Table 18 - Dry milk flows in Armenia[27]

Dry milk statistics	Unit	2011	2012	2013	2014
Dry milk production volume	ton	177.3	596.9	631.4	971.0
Dry milk imports volume	ton	1,828.0	1,479.6	2,664.1	3,859.1
Dry milk exports volume	ton	33.7	153.6	441.7	706.0
Dry milk use at local market	ton	1,971.6	1,922.9	1,784.1	2,700.5
Dry milk local use, transformed to milk	thousand ton	16.4	16.0	14.9	22.5
Dry milk share in dairy production	%	5.2%	5.0%	4.1%	5.8%

[27]Source: The RA MoA

Picture 2 - Dry milk international prices, USD/ton[28]



Dry milk (or milk powder) is an exchange commodity and prices are formed during the trade on international platforms. Drastic changes were registered in international prices during the last 12 months. According to US Dairy Export Council (USDEC), in the western Europe market, the whole milk powder (WMP) price comprised about 4,500 USD per metric ton as of late September 2014. In exactly one year, September 2015 the prices dropped drastically to the level of $2,250 per metric ton. Similarly, dry milk customs prices for 2013 and 2014 imports comprised respectively $4.16 and $3.93 per 1 kg. Respective export prices comprised $4.56 and $4.25 per metric ton. The most recent prices (of late spring 2015) varied in the range of $1.7-2.0 per 1 kg for dry milk imported from Ukraine. This price does not include transportation costs and VAT that will increase the price to $2.3-$2.5 per 1 kg. Providing the coefficient of recovering the milk from dry milk as 8-12 liters per 1 kg of dry milk, it can be concluded that imported dry milk may cause serious competition for local primary production of milk. However, it is certain that local producers of cheese do not use dry milk for technological reasons, and local dairy producers use dry milk just for ensuring the density of their products and fill-in the gap in specific periods.

Imports of dry milk to Armenia are being conducted by about 10 organizations. Import destinations are Lithuania, Germany, Ukraine, Belorussia, and Netherlands.

2.3.2 Technology

Production of dairy and cheese was traditionally developed in Armenia. Spatial concentrations of production were actually the same as they are now (except of Yerevan), but sizes of producers were bigger. All the milk processing enterprises then were equipped by old soviet period made equipment and machinery, used production technologies defined in and approved by Soviet GOSTs, produced the assortment approved by central authorities, etc. By the way, modern Russian technologies, as well as standards are considered to be among the best.

Now the situation has changed. Advanced milk processor succeeded to attract sufficient funds for renovating the production facilities and technologies. In the last decade, many producers introduced new technologies, such as for production of yogurts, melted cheese, Pastafilata cheeses, semi-hard and hard cheeses, dry milk, kefir, etc. Almost all producers prolonged their assortment, introduced various sizes of the same product, and various fat content. However, not all the processors are ideally fitting to and meeting current international food safety standards. However, milk processors' current facilities and equipment are fully sufficient for meeting local demand. Processors are working under the terms and conditions specified by the RA Law on food safety and the RA Government decree N1925-N adopted on December 21st, 2006 on Approval of Technical Regulations on Milk, Dairy and Requirements for their Production. State Service for Food Safety (SSFS) of the RA MoA regularly suspends production of certain products at certain companies following the requirements of the abovementioned regulation. However, solution of identified food safety issues does not tale long usually.

[28] Source: US Dairy Export Council

Production cycle of dairy products is very short if fresh milk is used for production – it lasts from 3 to 12 hours maximum. If a processor uses milk recovered from dry milk, some processes last longer. However, they last maximum 24 hours. The situation is different in case of cheese. Technological cycle of the main types of cheeses produced for local market (Lori and Chanakh) take at least 40 days before delivering them to the market. Pastafilata cheeses (main varieties produced locally) are being produced within 24 hours, too.

2.3.3Knowledge use

The most important knowledge that operators of milk value chain must have and apply is the comprehensive knowledge of milk processing technologies and practices. The assortment of dairy and cheese products is so wide, and technologies are so diverse that ultimate success of the operation of business heavily depends on and is conditioned by the knowledge, skills, and experience of laboratorians, technologists, and dairy masters / master cheesemakers. It was already mentioned that private operators do not much appreciate the qualification of specialists prepared at local academia. The only remaining option is on-job training of future specialists, leaving them without a solid scientific and academic knowledge.

Knowledge of milk processing technologies is not yet enough for successful operation in a competitive market of Armenia, and, moreover, for trying to export. Availability of highly qualified market assessment and strategic development team is of crucial importance. Currently, only very few processors do offer really unique products that are targeting narrow market niches and have almost no competition. All others compete severely for every retail outlet, and preparedness to market challenges becomes very important. In terms of having sufficiently working market team, the absolute leader is Ashtarak-Kat.

There is no objective basis for addressing the issue of how knowledgeable operators of milk processing sector are. Everybody names himself (almost all managers of processing enterprises are men) as the best and only expert in Armenia; all others are irrelevant. However, it is suggested to skip this issue.

Business-maker experts of milk processing enterprises in Armenia (e.g. technologists, micro-biologists/laboratorians, dairy masters and master cheesemakers) can be divided into 3 major groups in terms of places for receiving respective knowledge:

- Armenian academic institutions,
- Russian academic institutions,
- On-job trainings at local processing enterprises.

Currently, these 3 options actually remain the only sources for obtaining knowledge or upgrading, but none of them serves well. Local academia is largely rejected by private operators due to systemic shortcomings. Russian academia is largely inaccessible and unaffordable. On job trainings do not ensure comprehensive and sustainable knowledge. From time to time, different international development organizations launch short and mid-term development initiatives that somehow address also the needs of Armenian milk VC processing segment operators, but rather on marketing issues. Thus, lack in technological and other knowledge is among the most important constraints hindering milk VC development in Armenia.

2.3.4 Costs and margins

Milk procurement expenses are the major direct cost both for dairy and cheese producers. Expenses made for procurement of ferments/yeast are also among the list of direct and variable costs common both for dairy and cheese. In case of other costs, strict separation may be provided between expenses for production of cheese and dairy.

Other major direct/variable costs of dairy products include fat/butter, plastic bottles and packs, labels. Each dairy producer at the beginning of its operations may afford specializing on a certain product, but in line with developing the production assortment must grow, new varieties should be introduced in order to become more interesting for the market, meeting demand of various segments of consumers, etc. In addition, the production of various dairy products requires actually the same inputs in terms of technology and equipment, communal expenses (gas, electricity, water, etc.), qualified and non-qualified workforce, transportation, etc. In other words, it is almost impossible and useless to separate/attribute such expenses between various specific types of dairy products.

Other major direct/variable costs of cheese products include salt, plastic packs, labels. Production of various cheeses requires actually the same inputs in terms of technology and equipment,communal expenses (gas, electricity, water, etc.), qualified and non-qualified workforce, transportation, etc. Again, it is almost impossible and useless to separate/attribute such expenses between various specific types of dairy products.

Farmers usually complain about the low price of milk, making it important to understand whether raw milk has to be cheap in order to ensure proper profitability for milk processors. Before starting the analysis of the issue it is important to recall that dairy and cheese products are included in the food consumption basket in Armenia. In other words, this means that Armenian market will demand these products in any case and fluctuations of the market volume will not be too big.

Growth in milk prices heavily affects the costs of dairy and cheese products. In the recent period of 5 years, milk processors several times faced drastic growth of milk prices and at least twice they successfully mitigated the negative results of that growth by increase of prices. Besides, dairy producers effectively apply the replacement of major (expensive) inputs by other (cheaper) inputs, such as imported dry milk vs. fresh milk, animal fat vs. other amino acids (plants fat), etc. The situation would not be so easy if the market was less concentrated, but it is already for quite a long time the lion's share of dairy market in Armenia is captured by just 2 enterprises.

Profit margins (gross and net) are notably different for dairy and cheese producers, as well as among different producers of similar products. Reasons of such a variety are many, including prices of milk procurement, remoteness of collection centers from processing facilities, volumes of production, assortment of products, size and condition of facilities and equipment, intensity of cooperation with retail networks, efficiency of management, share of shadowed operations (100%-1000%), extent of attraction of external financial resources, and many other factors. Interestingly, geographical location does not cause serious differences in profitability of milk processing enterprises. Processors located in capital Yerevan (i.e. in the center of market) lose in transportation of raw milk from remote regions. Regional processors suffer from narrow market and severe competition from the side of farming households.

While analyzing the profitability of milk processing activities, one important circumstance should be paid attention. Production of cycle of dairy products and Pastafilata cheeses lasts hours, which lasts up to 2 months in case of most of local cheeses. The circulation of working capital in dairy enterprises is much faster than in case of cheese. Instead, cheese production does not face such losses as dairy sector due to much longer perishability period of cheese.

The most profitable products processed from milk are sour-cream, high-value cheeses, tan. Ordinary local cheeses, matsoun, curd are not so profitable products, but are must products for ensuring the profitability. In addition, the smaller is the unit of end-product, the sales price is higher and the more profitable is the product. According to estimations of milk processing sector, the profitability of higher profit dairy products varies in the range of 20%-30%. In case of higher value cheeses, the profitability goes high up to 50%. In case of lower income dairy products and ordinary cheeses the profitability comprises 10%-20%.

Milk processing enterprises face financial challenges in terms of needs in both working and investment capital. During the high season of milk procurement, processors have to buy a lot of milk for ensuring the regularity of milk supply, regularity of delivering products to the retail network, meeting ongoing operational expenses, storing necessary volumes of stock (in the form of dry milk (in case of 6 large enterprises), curd, fat). On the other side, retail network requires and usually succeeds in getting from processors in-kind credit (delayed payments) for about a month and those credits are quite big size. In such situation, processors have no other choice than attract external funding (usually loans from financial institutions) ranging from tens to hundreds of thousands dollars for covering the gap in working capital.

Most of Armenian milk processors started their operations on the technical and technological basis and facilities inherited from soviet period. In the course of operations, many of them succeeded to update and upgrade their technical and technological base, facilities and equipment, either gradually (using own earnings and comparatively small and revolving loans) or one-time (making large-scale investments attracted from foreign partners or loans from financial institutions). However, not all enterprises succeeded to more or less comprehensively renovate their production.

Moreover, this process of updating and upgrading the production bases never ends. Milk processing enterprises always need investment capital, and usually do not face big problems in attracting small to medium funds from financial institutions. In case of larger investments (from several hundreds of thousands to millions of US dollars) the process is more complicated, but not impossible. Some big players in Armenian financial market (Ameria Bank, HSBC Bank of Armenia, Ardshininvestbank Bank) adopted quite an aggressive policy of providing large loans especially to known companies. The situation notably worsened after the crisis in financial market of Armenia in December 2014, after which financial institutions transformed their loan investments into firm currency assets (wherever possible) and ceased lending volumes. Nevertheless, if borrower enterprises of milk processing sector did not substantially overdue their liabilities so far, they do not face any problem of using resources of local financial institutions though at quite expensive conditions.

There is no MFI that specializes in financing of the processing segment operators of milk VC. However, the CARD AgroCredit UCO may be separated from others. This UCO is a part of CARD Foundation family, which, among other activities, also specializes in provision of milk production and processing equipment. Understandably, potential borrowers that target procurement of milk processing equipment are addresse as primary clients.

2.3.5 Innovation

In the frame of the current analysis, innovation[29] is defined as the implementation of a new or significantly improved product (good or service) introduced to the market, or new process and/or marketing/organizational method in business practices, workplace organization or external relations

[29] Source: OECD Oslo Manual

introduced within an enterprise. Innovation is an important vehicle that contributes to growth and competitiveness. Innovations are segregated to be as **technological, marketing, and organizational**. In the recent observable period, the milk processing sector of Armenia has been able to introduce only technological innovations that consist of process and product innovations. A *process innovation* is the implementation of a new or significantly improved production or delivery method. A *product innovation* is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. Hardly any marketing or organizational innovations were applied at Armenian milk processing organizations.

It was already presented that only few organizations have been able to completely renovate their production facilities, technologies and equipment comprising the nucleus of process innovations. Instead, almost all processing enterprises invested in partial improvements and renovations. Totally new technologies were introduced by enterprises that launched dry milk production in Armenia which did not exist before. Other innovations rather related to introduction modern, more efficient production, filling, and packaging technologies and equipment.

Product innovations in the milk processing sector started from early 2000s, when 2 development initiatives (USDA MAP and USAID ASME projects) were widely implemented in Armenia. With the support of these projects, local producers launched production of dry milk, melted cheese, sweet curd, kefir, Pastafilata cheeses, semi-hard and hard cheeses, etc. All these products were innovative for Armenian with reservations since they were largely imported for quite a long time already.

Currently, milk processing enterprises continue small-scale research works for identifying and testing “new” products, but those efforts are of rather scattered and limited nature. Among such examples are experiments with low-fat products (though they are not new anymore) that became fashionable in the market in the recent period. However, only a small part of Armenian consumers tend to change their test, they are rather conservative and innovating in such environment is challenging.

2.3.6 Major constraints and proposed solutions

Inter alia, the list of major constraints for development of milk processing capacities and technologies in Armenia contains, but is not limited to the following:

- Gap in terms of availability and affordability of raw milk;
- Gap in availability and affordability of financial resources;
- Gap in availability and affordability of technologies and equipment;
- Gap in availability of necessary knowledge and skills.

In the recent period of 4 years the volumes of primary milk production grew slowly but steadily. In parallel, similar growth was registered also in volumes of end-products’ production. The growth is most visible for production volumes of dry milk (5.5 times) and sour-cream (1.65 times). Milk processing enterprises use primarily produced raw milk as the main input of their production. Extent of using (imported) dry milk (which is considered as an indicator of local market gap for raw milk) is very limited in dairy sector, and almost does not exist in cheese production. Overwhelming majority of imported dry milk goes for ice-cream production. So, it would be hard to justify that as of 2015 the market of primarily produced raw milk faces any challenges in terms of production volumes.

The situation is more complicated in terms of prices of milk. Processing enterprises do currently work under certain administrative, social, and economic pressure. On the one hand, high procurement price of raw milk minimizes or even dilutes their profit margin. Processors have two options: a) use cheap imported dry milk (if available) (not an option for cheese producers), or announce a decrease of procurement prices (creates dissatisfaction of farmers and rough administrative pressing from the side of the government), or increase sales prices (creates dissatisfaction of government). The best solution would be the identification of new markets, launch of new productions of high-value products, and respective increase of procurements. More demand would source economy of scale and everybody would appear in win-win situation. Unfortunately, this is not a nowadays' reality. If the current low/marginal summer prices of raw milk balance on the current and continue also in 2016, it may cause widespread slaughtering of livestock due to inefficiency of animal husbandry activities. This, in a long run, will result in huge gap in raw milk production volumes and drastic jump of prices. Just a few milk processing enterprises will be able to compete in such an aggressive environment.

It was introduced that main operators of milk processing sector do not change challenges in terms of availability of short-term finances (for funding working capital needs); but they do face serious challenges in terms of affordability of funds that they attract for filling-in the gap of working capital. This issue became of a really serious importance since financial market fluctuations in December 2014. Financial institutions largely ceased provision of cheap loans in Armenian drams. Loans are mainly offered in firm currency, for shorter period, and became more expensive (for at least 2-6% per annum).

The situation is better in terms of availability and affordability of investment loans; several financial institutions do offer purposeful loans and leasing products. Milk processing sector is among prioritized sectors for funding.

Technological gaps at milk processing enterprises are not of crucial nature. All processors need ongoing renovation and update of their equipment and technologies. There are no major problems for availability of necessary technologies. Instead, their affordability is a real challenge for the overwhelming majority of Armenian enterprises.

Gap in knowledge and skills of especially technological personnel was announced to be among the most challenging factors hindering the development of milk processing sector of Armenia. Private processors heavily criticized academic sphere mentioning that less than 1% of graduates have a potential for becoming good specialists. Majority of technologists are being trained on job, which is not the best option for taking the responsibility for smooth production and development of an enterprise of milking processing sector.

It is hardly possible to overvalue the importance of introduction of the high-value cheeses production in Armenia. First of all, it will be another hint for primary raw milk production, though new quality related challenges will be advanced for local animal husbandry farms. In the meantime, very few enterprises dare to experiment with high value cheeses. Among others we can mention Dustr-Marianna (producing Gouda, Mozzarella) Dili (producing Mozzarella cheese), MastaraChedo (producing roquefort, chechil and tel, suluguni), Eco-Kat (producing Gouda), CheezLer (producing Gouda), a number of other producers producing chechil, suluguni, and other Pastafilata family cheeses, etc. However, production of high-value cheeses is challenged in Armenia due to lack of high-quality milk, unavailability of technologies, lack of knowledge on production of such cheeses, difficulties of marketing such products (especially at foreign markets), etc.

It was already mentioned that best milk is being produced in few areas of Armenia, mainly in northern part of the country – from east to west. According to experts' estimation, the volume of commercial milk from these territories totals to some 50,000 tons annually, and every liter of that milk is already being demanded by many processors and procured at comparatively high prices. Some part of that milk is already being procured exactly by the mentioned processors and processed to high-value cheeses, but current volumes are far not sufficient for even substituting imports, not speaking about large exports.

Prices of primary milk do influence the capacities of producing high-value cheeses, but rather indirectly. When prices are on low/cheap/affordable level cheese producers may afford offering higher price for better quality milk necessary for the production of high-value cheeses. This is important, since high-value cheeses may be produced only with input of the best milk. The alternative to this is the multiple separation of procured milk for chosing the best, which is more time and money consuming process. Other production costs do not influence/hinder (at least notably) the production of high-value cheeses in Armenia.

Two types of major constraints are available with producers of high-value cheeses in Armenia: lack of financial resources and traditionally low marketing capacity available with professional cheesemakers. Large-scale promotion of Armenian cheeses at local market is not usual in Armenia. Cheese is considered to be a product of everyday consumption, and producers used to selling based on orders received from the retail network. Promotional measures were left on the minimum level, claiming their marginal usefulness. In addition to lack of experience in the local market, very few (almost none of) cheesemakers have an experience of promoting cheese at foreign markets. Moreover, even at local market, the promotion is quite expensive exercise, not talking about larger markets, such as Russia. None of local cheese producers currently possesses sufficient financial resources to finance large-scale (comprehensive) marketing and promotional campaigns in abroad.

The second finding is interesting, too. Experts of the sector, as well as a number of producers state that most of Armenian cheese production enterprises are based on skills and experience of a single person ruling the business. Usually, this person is technology expert, rather than market specialist. Qualitative assessment was made, that usually technology experts are not the best promoters and sellers due to their very mentality.

Three major measures were identified for overcoming the constraints of development: a) ensuring high-quality milk production via application of good agricultural practices, better hygienic conditions, etc., and b) installation of new knowledge at the very enterprises producing (planning to produce) high value cheeses; and c) upgrading and updating 80-90% of all facilities and technological bases of almost all producers. However, this will still be a partial and scattered solution.

Establishment of a separate institution/project responsible for sectoral development is mentioned to be more general and comprehensive solution to the problem of boosting high-value cheeses production in Armenia. In particular the idea builds on establishment of an entity that would be given a formal right for centralized control of cheese quality (at least to some extent), centralized procurements of reliable high-value products, centralized exports to foreign markets, where initially concentrated promotional campaign for Armenian high-value cheeses was conducted. This idea is not new; several years ago the mentioned postulates were put in the basis of “Armenian Cheese” project, which was actually failed due to wrong implementation and management.

2.4 Dimension 3: End-Markets and Trade

2.4.1 End-product characteristics

Specific end-products produced by milk processing sector of Armenia are dairy and cheeses of the following main types:

Table 19 – Main types of end-products processed from milk in Armenia

Products	Packaging	Size	Perishability, +4 +6^{0}C
Pasteurized milk	Plastic, paper	0.5 – 1.0 kg	36 hours
Matsun	Plastic, glass	0.25 – 2.0 kg	48 hours
Sour-cream	+Plastic	0.1 – 0.5 kg	72 hours
Curd	Plastic, foil	0.1 – 0.2 kg	24-36 hours
Soft cheeses (Lori)	Cellophanes	Bulk, 4 – 5 kg heads	12 months
Soft cheeses (Chanakh)	None	Bulk, 4 – 5 kg heads	8 months
Pastafilata cheese	Cellophanes	0.1 – 0.5 kg	15-90 days
Semi hard cheese	Cellophanes	Bulk, 2 - 3 kg heads	6-12 months
Hard cheeses	Cellophanes	Bulk, 2 – 5 kg heads	6-12 months
Other products (tan (doogh), tan with cucumber and green, kefir, yogurt, dense matsun, sweet curd, curd and sour-cream mix, Narine, melted cheese, sheep and goat cheese, colored and smoked cheese, buffalo milk matsun, crème, fat, dry milk, etc.			

Dairy and cheese products are of great variety of few hundred types; products differ by their fat, salt, sweet, spice content, liquidity, packaging, size, milk type used, etc. Every market has its specificities. For example, Armenians very much love and largely consume matsun, which cannot be met for example in ordinary Russian shops. Similarly, ordinary curd produced in Armenia is not always met in European market. Instead hundreds of products offered in other markets are absent in Armenia.

The list of new products for Armenian market is to be quite short. Actually, the best indication for introducing new products is imports. Big imports of yogurts, kefir, and even dry milk hinted local producers invest in production technologies of these products in early and mid 2000s. Similarly, huge quantities of imports of Georgian suluguni, chedder used for preparation of food stuff (khachapuri, pizzas, etc.), as well as good sales of Gouda and other semi-hard and hard cheeses hint local processors to establish local production of these products.

In the meantime, introduction of new products to Armenian consumers is not only challenging, but also quite risky. Armenian consumers are rather conservative, and are not being easily convinced. That is why, also taking into account weak R&D bases available at milk processing sector, it would be much easier and safer to concentrate on products already familiar to local consumers. The potential for growth in this direction is already quite big for short and mid-term horizon.

Information on retail prices of dairy and cheese products was collected at supermarkets (Yerevan-City, SAS, Nor-Zovq), ordinary shops, and small “next-door” kiosks of Yerevan (10 trade outlets in total). Summarized results are presented below.

Table 20 - Variation of main dairy and cheese prices in retail market

Product	Size	Min. price, AMD	Max. price, AMD
Milk	0.5 liter	250	310
Milk	1 liter	420	670
Matsun	0.25 kg	240	260
Matsun	0.45 kg	330	360
Matsun	0.5 kg	270	350
Matsun	1 kg	310	570
Matsun	2 kg	1,170	1,170
Sour-cream	0.1 kg	130	150
Sour-cream	0.2 kg	230	390
Sour-cream	0.25 kg	330	350
Sour-cream	0.45 kg	460	600
Sour-cream	0.5 kg	680	700
Curd	0.1 kg	240	270
Curd	0.15 kg	460	470
Curd	0.2 kg	450	520
Cheese “Lori”	1 kg	1800	2800
Cheese “Chanakh”	1 kg	1600	2600
Cheese “Suluguni”	1 kg	2650	3800
Cheese Mozarella	1 kg	3600	6500

Great variety of different dairy and cheese products are presented in the retail network. Leading brands of dairy are introduced almost everywhere. Choice of cheeses is rather modest in smaller shops. Supermarkets offer great variety; almost all known brands are presented.

Employees of retail outlets explained that presented prices do not stay stable. From time to time certain discounts are applied for the production of this or that brand, prices may grow due to increase of milk prices, etc. However, usually changes are not drastic.

Variation of prices for the same products in different trade outlets is not big and limits in the range of 20-30 AMD, providing no special packaging (such as clay tare) applied by a certain brand is conducted. Usually, prices are higher at supermarkets.

It was already mentioned that despite the fact that 2 major processors captured about 60% of local dairy market, several tens of other producers do operate in the market, too. They all severely compete for any market niche. Regional organizations try to penetrate to Yerevan market mainly engaged by leaders, those leaders do their best for ensuring regional representativeness, etc.

In this severe competition milk processors apply any possible way to increase their competitiveness, ensure procurement of more and better milk, decrease costs, increase sales prices, offer wider assortment in terms of product types, fat content, packaging, size, design and labeling, etc. For example, Ashtarak-Kat introduced a new line of “Kovik” products with low fat content, Dustr-Marianna introduced matsun in 2kg plastic bucket, Igit offers a range of Pastafilata cheese varieties of different taste and smoking condition, Van Dairy introduced curd cheeses (sweet, salty, spicy, etc.), Mastarachedo introduced Roquefort cheese and suluguni with mushrooms, etc. Almost all local processors carefully watch/follow the market and from time to time introduce new products.

2.4.2 Consumer demand

Theoretically, market size of directly consumed processed milk products should be calculated by the following formula: **Local Production + Imports - Exports - Industrial Consumption**. Closer look to the formula identifies a number of shortcomings for each component of the formula. Let us address them consistently.

Total volume of *locally produced* dairy and cheese products is presented in **Table 14**, but that volume does not include dairy and cheese produced within farming households for subsistence purposes, i.e. volume consumed exactly within those households. Also, various producers of dairy and cheese products indicated the volume of returned products not exceeding the 5% approximately (much less in case of cheese) since of total supply, since almost all dairy producers cooperate with retail networks based on preliminary orders. However, the majority of returned products are being re-processed.

Besides, direct consumption volume contains also the consumption of *imported* dairy *and cheese* (such as of Parmalat, Lactel, Prezident, Sterilgarda, Wimm Bill Dann, Dannon, Savushkin, Bärenmarke, Karat, and many other brands (especially the long list of cheese brands)). Total official volume of imports is presented in **Table 21**. In the meantime, some imported products should be excluded from total volume (e.g. dry milk is mainly not assumed for direct consumption).

Exports of processed milk contain the figure of dry milk exports, which would be wiser to exclude from total volume, since being counted in use of raw milk, it is not affecting the total consumption volume of dairy products. The same reservation in regard of dry milk relates to imports, too. Volumes of imported dry milk ultimately appear in quantities of dairy and ice-cream production and should be excluded from consumption volumes for avoiding double counting.

Thus, there are too many varying parameters that make this way of estimating the size of dairy and cheese market very difficult, if not impossible. On the other hand, official sources present the formal figure of per capita milk consumption. This figure comprised 230-235 kg/year (including all dairy, cheese and other products consumption transformed to milk) for the recent period of 2011-2014 and is based on volumes of commercial raw milk production divided to total number of permanent population of about 3 million.

According to various subjective estimations, official statistics exaggerates both figures of milk production and permanent population. As a better example, it is suggested to base the calculations on the following estimated figures: a) milk production volume - 550,000 tons approximately, b) permanent population 2.8 million people approximately. Average per capita annual consumption of milk in form of different products averages to 200 kg. It is very important to realize that this figure comprises the average of "remote" figures. Farming households over consume milk substantially, while poorer households in urban areas may not afford themselves dairy and cheese for many weeks.

Currently, the market of dairy products is balanced. Some 1,000-1,500 tons of dairy products are being imported annually comprising about 10% of dairy market. The obvious leader in imported dairy products is yogurt, sweet curds, melted cheese and products alike. It would be wrong to suggest investing efforts towards full substitution of these imported products, since their major role in the market is ensuring wider assortment and offering better choice to consumers. Dairy market does not face exceeding supply or deficit of dairy products, since the product circulation in the market is very fast; suppliers deliver products based on preliminary orders. Both suppliers and retail network are well aware of required quantities. Finally, processing companies can immediately increase their production volumes for 10-20%, and significantly more in a short period of a couple of months, if needed. Within the period of those few months imports may slightly grow or prices may climb-up, but for quite a short period, only.

Situation is slightly different in the cheese market. Currently, the main types of imported cheeses are semi-hard and hard types, as well as those used for production of pizza and other products. Volumes of cheese imports and exports do balance each other with a difference of less than 200-300 tons (exports prevail). Moreover, several local producers of cheese launched production of cheese types that are being imported. This does not mean elimination of cheese imports in a short or medium horizon, but does mean substantial cut-off of imported volumes; trends of recent 2-3 years attest this statement.

Dairy and cheese products are being consumed in Armenia through 2 channels: a) direct consumption by population (over 90%), and b) consumption by population intermediated by public food entities and other institutions (cafes, restaurants, schools, kindergartens, etc.).

Whatever is the current demand in dairy and cheese products, it is fully met. The tendency of recent years was growing according to formal statistics, but we already identified that experts of the sector do not much rely on official data. Volume of the market demand can grow for the following main reasons:

- Demographic growth of population;
- Replacement of other products by dairy and cheese;
- Replacement of imported products by local production.

Providing the current socio-economic and political situation in Armenia, no substantial demographic growth can be expected. Moreover, vice-versa is much more possible. Consumption of dairy and cheese (especially in animal husbandry farming households) is very close to the maximum level, if not exceeding it. The only real potential for growth is observed in the field of substituting imports and boosting exports of cheese of preferably higher value. The observable quantity that can be targeted immediately is about 1,500 tons annually.

2.4.3 End-buyer characteristics

Within the context of the current analysis, the end-buyers of the end-products of milk VC in Armenia are supposed to be those entities engaged in final process of delivering the end-products to ultimate consumers. In simpler words, those are outlets of retail trade – mainly supermarkets and shops. There are no intermediaries in Armenia that carry out functions of middlemen or wholesalers, as well as exporters of dairy or cheese products. Supplies of all types are being conducted directly by producers.

Aside from being sure on food safety issues, retail networks do not much care about other features of dairy and cheese products. Surely, this does not relate to the leaders of milk VC (Ashtarak-Kat, Dustr-Marianna, Chanakh, Ani, etc.) (though there is no obvious leader in among cheese producers). Retail outlets are ready to cooperate with any producer that is ready to offer good/competitive price, affordable and better quality (though there is no system for assessment of that quality), regularity of supplies, and delayed payments. The last condition is especially sensible in case of big networks of supermarkets. Not all producers are able to credit the retail networks for such amounts; sometimes the amount of delayed (non-decreasing) amount reaches to a couple of tens of thousands dollars.

2.4.4 Marketing and trade capacities

2.4.4.1 Wholesalers and importers

No regular wholesalers of dairy products do operate in Armenian market. All deliveries of dairy products are being conducted by the producers. For cheeses, some wholesale function is being conducted by centralized wholesale trade points in Yerevan, such as Surmalu market. These points usually do not operate formally, sales volumes are not registered anywhere. Actually, the whole operation is shadowed. Thus, the volume of cheese wholesale is untraceable.

Armenia imports almost all types of dairy and cheese products. Specialized trading organizations do supply the Armenian retail networks for quite many years. These importers capture certain market segment, successfully compete with local producers, established firm relations at retail networks, possess sufficient financial and other resources for sustaining in the market. However, absolute volumes of processed milk products in the recent period did not grow. Substantial growth was registered only for dry milk and butter quantities. For other products, scattered growth was conditioned mainly by short-term market conjuncture or by increase of prices.

Table 21 – Dairy and cheese foreign trade in Armenia

Products	2011				2012			
	Export		Import		Export		Import	
	Ton	$,000	Ton	$,000	Ton	$,000	Ton	$,000
Milk and cream			377	565	-	-	387	529
Condensed milk, dry milk	34	141	3,130	9,422	154	415	2,680	7,136
Cream, matsun, sour cream, tan	0.1	6	888	1,684	8	15	946	1,684
Milk whey	-	-	331	494	-	-	458	682
Butter and milk fat	0	0	4,540	14,444	0.1	0.3	4,907	21,404
Cheese and curd	440	1,855	1,019	5,594	904	2,335	1,056	5,434

Products	2013				2014			
	Export		Import		Export		Import	
	Ton	$,000	Ton	$,000	Ton	$,000	Ton	$,000
Milk and cream	-	-	431	564	-	-	596	933
Condensed milk, dry milk	442	2,016	2,664	8,579	706	3,002	3,859	12,066
Cream, matsun, sour cream, tan	17	31	1,179	2,610	0	0.5	1,448	3,314
Milk whey	-	-	595	928	-	-	383	559
Butter and milk fat	66	374	4,749	20,105	120	546	5,262	22,763
Cheese and curd	1,541	4,610	1,244	6,759	1,542	4,890	1,188	6,314

Regular importers of dairy and cheese products to Armenia are not many. Actually, the number of main operators will vary around ten companies. Some of them do specialize on certain products, others operate as representations or distributors of famous foreign/international brands. There are also importers that are not specialized in dairy or cheese trade, but import any type of products (when and wherever they can feel the possibility of making profit).

Table 22 - Major importers of dairy and cheese to Armenia

Brand	Country	Products
"Yerku Eryak" Food Importing Company LLC		
Lactima	Polland	Processed cheese
Hanne/Arla	Germany	Havarti, Gouda, Edam, Fontina cheeses
Hochwald	Germany	Dairy, Mozzarella and other cheeses
ZOTT GMBH & CO.KG	Germany	Yogurt and dairy
"Lactalis Arma" Cheese and Dairy Products Importation Company		
President	France	Cheese (Brie, Brinza, Camembert, Mascarpone, Grana Padano, Maasdam, Mozzarella, Parmigiano-Reggiano, Roquefort) and dairy
Galbani	Italy	Cheese (Brie, Brinza, Camembert, Mascarpone, Grana Padano, Maasdam, Mozzarella, Parmigiano-Reggiano, Roquefort) and dairy
Dolche	Ukraine	Yogurt and dairy
Fanny	Ukraine	Yogurt and dairy
Uniform (Texworld) LLC		
???	Russia	Yogurts
Andako LLC		
Parmalat	Italy	Dairy
Italcheese	Italy	Cheeses
Zanetti SPA	Italy	Cheeses
Derjava CJSC		
Dannon, Aktivia	Europe/International	Yogurts
Catherine Group LLC		
Humana	Europe/International	Yogurts, baby food
Brand leader JV LLC		
Campina, Alpenland	Russia	Yogurts

Usually, importers conduct only logistics and distribution functions. They organize the transportation of products from overseas, take the responsibility of custom clearance, in-country transportation and cold storing, promotion of products, delivery to retail networks. Importers do not change the products they import, anyhow. Importers do not apply any re-packaging, re-branding, mixing or other activity to imported products.

Cost of imported products contain the shipment prices of foreign producers, transportation and insurance, 20% VAT on top of value totaled at the moment of custom clearance (or on top of so called assessment value provided by customs officers), and 10% of import tax. Beyond the amount received after these calculations, the importers face costs of in-country transportation, cold storing, marketing, promotion, and distribution, and delivery to the retail networks. Most often, importers supply the retail network via their own means, though some small share of wholesale trade through major shadowed operators also takes place. This usually works for delivering products to regions retailers.

Prices of all imported products are substantially higher the prices of local products. Substantially means up to twice for yogurts, up to 5 times in case of milk, sour cream, curd, and up to 10 times in case of unique products such as hard-cheeses. Actually, it cannot be stated that imported products are in competition with locally produced analogues. Imported products are in very unfavorite condition in terms of price, but possess certain share among comparatively richer segment of population.

Importers apply 20%-100% commercial margin on top of costs for their products, depending from the type of products, sales location, targeted segment of buyers/consumers, etc. In some cases, very specific products are offered containing even bigger commercial margin, but they are usually of smaller quantities and one-time supplies of unique products. In turn, retail traders apply their standard 15-20% retail margin on top of value offered by importers for sales to ultimate consumers.

Importers usually undertake the responsibility for promoting products they import in the markets of their operations. Sometimes, such promotional activities are funded by producers in the form of promotional budgets allocated to local dealers and distributors for conducting agreed or TBD measures on behalf of producers. More often, local distributors initiate those activities themselves, at the expense of their profits.

However, promotional and marketing activities are not of very wide and large scale, and are applied mainly for boosting sales at the moment of entry of a product into the market. Once the operator penetrates the market, establishes firm relations with retail network, they just should take care for ensuring stable sales volume required by retail traders. Usually, importers ensure those volumes by several-days promotional campaigns (usually on TV, FM radio or WEB) conducted once or twice a year in the best case.

It was already mentioned that importers of dairy and cheese products operating in Armenian market are not many. In the meantime, existence of just few suppliers of imported products into the retail trade network does not mean domination. Any newcomer is welcomed to supply dairy and cheese products (since these products are out of interests of major oligarchic circles of Armenia), but should meet the requirements of retail market, i.e. sales of certain volumes in assigned period, comparable prices with analogue products, delayed payments, etc. Very often, these requirements are unbeatable even for quite strong organizations.

2.4.4.2 Retailers

Overwhelming majority of dairy and cheese produced in processing enterprises of milk VC is being sold via retail trade outlets. Actually, the exact volume of retail can be calculated by deducting volumes of exports (mainly cheese), returns of outdated products (up to 5% majority of which is being re-processed), volume of products delivered directly to educational and social institutions via public tenders (tiny share in total). Thus, it can be roughly concluded that over 95% of total production is being sold via retail network. This is on top of significant volume of dairy and cheese sold by farmers to consumers directly.

Commercial margin of retail trade outlets varies in the range of 10-20% on top suppliers' price. The bigger is the shop/supermarket and the larger of its chain, the higher is the commercial margin. Moreover, some large networks require the suppliers to provide special price discounts of 2-3% for the products they supply. The largest network of retail trade in Armenia is Yerevan-City, followed by Krpak, Nor-Zovq, and others.

Sales of dairy and cheese products do not comprise substantial share of retail trade outlets. In case of other products retailers may apply totally different commercial margins. For example, the surplus in Coca-Cola is really low and supply conditions are much worse than in case of dairy or cheese. Instead, other products may be offered at prices twice higher from the procurement prices. Retail traders could not see a reason for revealing their net profit margins explaining that dairy and cheese products play really small role in its composition.

Retail traders conduct marketing and promotional activities quite intensively, regularly, and via using of all possible channels. In the meantime, whatever they do relates to their brand, not to specific products they sell. Special events organized and implemented in supermarkets (such as degustation, special day of a brand, etc) are just supported by traders, but at the suppliers' expenses. Supermarkets provide just logistic support and almost always require respective compensations for extra efforts.

Dairy and cheese products are being sold in all food shops and supermarkets, even at open air markets. The number of retail trade outlets selling food (including dairy and cheese) in Armenia exceeds 10,000. Understandably, big supermarkets of Yerevan and smaller supermarkets at regional towns (less than 200 in total) are the main target of all suppliers. However, the number of smaller shops is much more and all of them are selling milk VC products. In any case, no domination of any player is observed in the market.

2.4.4.3 Exporters

Armenian producers' exports of dairy and cheese products are presented in **Table 21**. Analysis of the exports' structure reveals that almost no exports of dairy products have been made during the recent period of 2011-2014. Partially, this can be explained by perishability of dairy products, though substantial imports of the same/analogue products from European countries and Russia prove the opposite. Absence of dairy exports can be explained rather by weak marketing capacity of local producers and inconsistency of the production with food safety requirements on international level.

Cheese exports gradually grew in the same recent period. However, experts of the sector estimate the potential of cheese exports from Armenia can reach to 4,000 tons. Substantial part (almost half) of current exports appearing under the name cheese is semi-ready cheese exported to Russia mainly for being re-processed to melted cheese by Russian enterprises. There are no exporters specializing in provision of intermediary exporting services. Usually, producers export their products directly to their foreign (say Russian) counterparts. Main exporters of cheese from Armenia are Dustr Melania, Amasia Cheese Factory, Igit, etc.

Major destination of cheese exports is the Russia covering almost 99% of exports. Some experimental (very small) shipments were made also to other countries (e.g. USA), but that was just a reckon.

Volume of cheese imports to Armenia varied in the range of around 1,000-1,200 tons. Providing that this figure contains also some curd products, melted cheese and similar products, and taking into consideration that some growth in the market is still possible (though not substantial), it can be concluded that Armenian national market of high-value cheeses does not exceed annual volume of 1,000 tons. It should be assumed also, that some quantity of imported high value cheeses will not be possible to replace due to very sophisticated technology, high expenses, absence of equipment and other inputs, and many other reasons. Finally, some quantity of imported high-value chesses simply must exist in the market for meeting the demand that will never decrease to total zero.

In the long-run, Russia remains the major potential market for exports of Armenian cheese. Import potential of Russian market comprises 150,000 tons of cheese, which means that Armenian exports to that market may grow several times. This opportunity is supported by the fact that quality that high-value Armenian cheeses may suggest can be ensured in Russian market only by local producers (not talking about foreigners) that use high-quality milk from Altay region and places alike that are quite limited though.

In the meantime, it should be understood that such a growth cannot happen overnight. The growth must base on increase in production of input supply base, i.e. the volume of the primary production of raw milk must increase, first. Otherwise, (theoretical) preferable prices of Russian market for Armenian cheeses may cause a serious cut-off in the supply of cheese in local market causing a drastic jump of cheese prices in Armenia. However, it is too early talking about such development: in the current circumstances most of Armenian cheese producers face survival rather than development challenge. And the first problem to be sold urgently is the improvement of milk quality.

2.4.5 Standards

General standards of dairy and cheese production in Armenia (that are mandatory for all producers) are defined by the RA Law on Food Safety, a number of subsidiary regulatory framework (including Government Decree N1925-N adopted on December 21st, 2006 on Approval of Technical Regulations on Milk, Dairy and Requirements for their Production). These official documents define general definitions related to milk processing, technical conditions (specifying the allowed content/limits of dangerous materials, bacteriological features, nutritive value for each product),requirements for labeling and packaging, requirements for special technological processes, processed milk products' identification process (physical and chemical features), compliance verification procedures, ways of unification of products' measurement, list of standards (GOSTs), etc.

In the meantime, by joining the Custom Union Armenia took the responsibility of applying and following the regulatory requirements and framework of the CU. The CU Technical Regulation On Safety of Food Products (CU TR 021/2011) and product compliance assessment (confirmation) should have become mandatory for application in Armenia since the beginning of 2016. At that moment, any enterprise producing food in Armenia should have installed Hazard Analysis and Critical Control Points (HACCP) system. But, in summer 2015 the RA Government confirmed the schedule of introducing HACCP. The schedule is set for different group of products, thus meat and fish products, including diary, have to be adjusted to HACCP standards till January 1, 2020.

HACCP[30] is a systematic preventive approach to food safety from biological, chemical, and physical hazards in production processes that can cause the finished product to be unsafe, and designs measurements to reduce these risks to a safe level. In this manner, HACCP is referred as the prevention of hazards rather than finished product inspection. The HACCP system can be used at all stages of a food chain, from food production and preparation processes including packaging, distribution, etc. HACCP is the most known quality standard applied internationally for food production.

HACCP principles and standards are the following:

[30] Source -https://en.wikipedia.org/wiki/Hazard_analysis_and_critical_control_points

1. Conduct a hazard analysis. Plans determine the food safety hazards and identify the preventive measures the plan can apply to control these hazards;
2. Identify critical control points (point, step, or procedure in a food manufacturing process at which control can be applied and, as a result, a food safety hazard can be prevented);
3. Establish critical limits for each critical control point, i.e. maximum or minimum values to which a physical, biological, or chemical hazard must be controlled;
4. Establish critical control point monitoring requirements. Monitoring activities are necessary to ensure that the process is under control at each critical control point;
5. Establish corrective actions to be taken when monitoring indicates a deviation from an established critical limit;
6. Establish procedures for ensuring the HACCP system is working as intended. Validation ensures that the plants do what they were designed to do. Verification ensures the HACCP plan is adequate, that is, working as intended;
7. Establish record keeping procedures. The HACCP regulation requires that all plants maintain certain documents, including its hazard analysis and written HACCP plan, and records documenting the monitoring of critical control points, critical limits, verification activities, and the handling of processing deviations.

Requirements of the abovementioned Technical Regulation are mandatory for all dairy and cheese producers in Armenia. Moreover, those requirements are applied also for the imported products. The issue of local producers' readiness or willingness to follow the standards and requirements of the Technical Regulation is out of discussion by default.

The RA State Service for Food Safety (SSFS) is the agency monitoring, checking, steering, and controlling food safety issues in Armenia on behalf of the Government. This agency conducts regular inspections of also dairy and cheese products. From time to time the Agnecy bans the production of a certain product of a certain enterprise based on findings of specific inspections. Usually, the SSFS bans the production and sales of certain products providing the producer chance to resolve the problems within a certain period of time. Omce the problems are resolved, the production and sales of products are allowed again. All decisions of the SSFS are being formally presented on the website of the agency and widely re-posted by media.

Aside from food safety mandatory requirements, some producers also apply voluntary standards that are usually more tough and more difficult to meet than formal requirements. For example, some producers of dairy and cheese products installed internationally accepted quality and food safety standards (e.g. ISO, HACCP).

The number of certification (not only for HACCP) organizations in Armenia is not too many. The leaders of the sector are National Institute of standards, CARD Foundation, GlobalGroup, EcoGlobe, TuV Rheinland, Businessin Ynadraj Quality Center, Hay Consult, etc. In the meantime, big number of food enterprises that should install HACCP, in couple with lack of professional experience and capacity of local certifying organizations make it challenging the whole certification process of food producing (including dairy and cheese) in Armenia.

2.4.6 Major constraints and proposed solutions

Constraints for elaboration of end-markets and trade are few and not of "impossible to overcome" nature. Most importantly, there are no constraints of subjective, caused by administrative or oligarchic nature. The market is widely open, but for entering it the suppliers must meet certain requirements. Thus, those requirements are:

1. Availability of sufficient funds for cooperation with retail networks. It was mentioned that especially large retail networks advance tough conditions for cooperation consisting of minimum quality requirements, delayed payments, discounts, minimum sales, etc. All these, ultimately is being transformed to costs that are being reimbursed but in a long-run. In other words, only enterprises with strong financial capacity may afford cooperating with large retail networks.
2. Absence/lack of food safety certification and non-compliance of the production with international standards. Despite the fact that quality certification culture exists in Armenia for more than a decade already, local capacities are not very strong. Not all certification issued by local organizations is acceptable for foreign markets, not all enterprises were ready/willing to face related costs of certification. Some of large and advanced dairy and cheese producing enterprises already succeeded in installation and application of HACCP, ISO and/or other food safety or quality assurance standards. However, not all of them sustained those standards. In addition, so far introduction of food safety systems was not affordable for tens of producers also from the milk VC; and the current situation is not better, at all.
3. Absence/lack of marketing skills and capacity for promoting the products at international markets. Only few adavanced producers (Ashtarak-Kat, Dustr-Marianna, Dustr-Melanya, Eco Kat, and few others) do afford funding the operation of internal marketing service, design and implementation of marketing strategy, development of new products, promotion of sales, etc. Overwhelming majority of producers have no sufficient capacity for communicating in English.

The following measures are suggested for the purpose of overcoming the above presented problems of elaboration of end-markets and trade:

- Initiate dialogue with financial institutions on improving the access to loans for filling-in the gap of working capital at milk VC enterprises. Currently, enterprises solved the problem of insufficient funds, but attracted financing is very expensive quite often, which makes their use almost unaffordable. However, addressing this issue is very challenging, since local financial institutions see no necessity and commercial for drastic change in conditions of providing loans.
- The best way of improving the situation in the market of certification services is the enhancement of demand. Mandatory requirement of installation and application of HACCP system means potential demand for certification services, which, unfortunately, is not always sustained by financial ability. Introduction of co-financing instruments may be very helpful and supportive for food producing enterprises.

2.5 Dimension 4: Governance of Value Chains

2.5.1 Actor domination

In the current analaysis, it was already several times mentioned that 2 leading dairy producers (Ashtarak-Kat and Dustr Marianna) captured almost 60% of Armenian market of dairy products processed at industrial enterprises supplying about equal shares of the market. According all widely accepted estimations, such situation should be considered as domination of those 2 enterprises in the market. The same was announced by the RA State Service on Food Safety (SSFS) and those enterprises faced some penalties due to their position in the market. On the other hand, use of the term "dominance" assumes not just supreme share in the market, but also use of it in some way, such as dictating certain processes or conditions (e.g. milk procurement prices), or hindering the entry of others into best retail networks, etc. It can be surely stated that dominance of mentioned 2 dairy producers influences on other operators of milk VC and processes conducted by them in no way.

Leading enterprises of the production segment of milk VC are good at almost all processes they implement, including organization of milk procurement, production technologies, equipment and ensuring food safety, product delivery and establishment of cooperation with the retail network, marketing and promotion. But even in that situation, leading enterprises do not play coordinating role in milk VC. The same relates to application of and following the standards – no influence from the side of lead producers.

Production of no dairy product is monopolized in Armenia. There are some dairy products (e.g. (drinkable) yogurt, kefir, dry milk, glased (sweet) curd, etc.) that are processed by few enterprises, but this does not mean that others are in any way hindered/banned from production of the same products. It is just a matter of choice: some producers prefer wide assortment, others invest efforts in specialization on specific products.

Finally, no dairy producer(s) in Armenia may hinder the entry of any new brand into the market in general, or presentation of products at specific retail outlet in particular. Once the enterprise meets the requirements of retail network, it is allowed to be sold at shelves of the most fashionable supermarkets in Armenia.

Thus, it can be concluded that formal dominance in the dairy market does not yet mean real influence on other operators of milk VC. The situation is even more "decentralized" in case of cheese producers. In cheese market there is no leadership or dominance. The only difference appearance in ability to produce higher value cheeses and in exporting capacities. However, no monopolization, no influence from the side of certain producer(s) on others, no power to hinder the entry of new operators into cheese market exists in Armenia.

2.5.2 Cluster concentration

Concentration of dairy and cheese enterprises by regions is presented in **Table 16**. 35 out of total 70 working milk processors of Armenia are concentrated in 3 locations: capital Yerevan, Aragatsotn and Shirak regions. However, it would be very wrong to identify the existence of registered enterprises in specific regions with cluster concentration. There may be tens of operational milk processing workshops in one region that do not collect and process milk in a quantity processed by a single or 2 enterprises in other area. The best illustration of that statement are Ashtarak-Kat and Dustr Marianna enterprises, that engage 60% of total industrial dairy market.

The logic of cluster concentrations lays in different roots: dairy enterprises are located closer to consumption markets. Biggest dairy producers are located in Yerevan, Abovyan, Gyumri, Vanadzor towns or neighboring/adjacent villages. Cheese producers are closer to milk supply centers, such as Aragatsotn, Shirak, Lori, and Gegharkunik regions. Such concentrations are logical and developed historically, but the situation started changing gradually. For the sake of surviving in severe competition, milk processing enterprises have to evolve uninterruptedly. Among others, introduction of wider products is one of ways of the mentioned enhancement of milk processors. Dairy producers (e.g. Ashtarak-Kat, Dustr Marianna) see business opportunities in cheese production (better use of production capacities, making additional benefits from already existing retail trade networks, use of consumers familiarity with the brand, etc.). Similarly, some initially cheese producers see no limitations for introducing also dairy, as a measure of market expansion. However, the second option is appearing rarer.

Thus, it can be concluded that even with mentioned evolving realities, the cluster may be defined to be in between the existing and declining conditions of development extent.

2.5.3 Type of governance

From the viewpoint of raw milk production and processing the milk VC is driven both by suppliers and buyers. From the beginning of milking season in April-May until the September-October, the VC is characterized to be buyer driven. Production and supply of milk exceeds the demand and procurers may dictate certain conditions – prices, delayed payments, quality requirements, etc. Situation changes drastically at the end of milking season, when the quantity of supply declines significantly. Some dairy producers prefer to fill-in the gap by imported or locally produced dry milk, which is unaffordable for cheese producers. The primary market market very fastly becomes supplier driven. This cycle works for already many years and there are no serious pre-conditions for major changes.

Situation is different in case of end-products. At large, the market of dairy and cheese products is driven again by suppliers/producers. Usually they decide prices, demarcate their segments, select the assortment. In the same time, all those suppliers do operate in avery competitive environment, and even small mistakes usually cost them substantial losses both in monetary terms, and in market share.

Prices of dairy and cheese products are largely decided by suppliers/producers based on COGS plus profit margin formula. Transparently operating enterprises (BTW, the bigger is the processors, the more difficult to hide in a shadow) usually work in the range of 10-20% net profit margin (averaging rather closer to lower threshold). Closer look to smaller producers reveals totally different situation. Especially at cheese production enterprises the actual volumes of production and formal figures vary for 5-10 times. Net profits for such enterprises grow to 30% and much higher for specific high-value products (sour-cream, pastafilata cheeses, etc.).

In turn, ultimate consumers usually do not influence the dairy and cheese prices in Armenia. They are free to chose among a great variety of end-products of identical features (size, fat content, quality, brand, etc.) but their prices usually vary in the range of 10-30 AMD (in case of smaller packs) and 30-50 AMD (in case of larger packs), which is not so crucial even for low income population. Really poor consumers simply do not consume industrial dairy and cheese.

Dairy and especially cheese markets of Armenia can be defined as highly competitive. This is even taking into account the “dominance” of 2 dairy giants.

There is obvious mutual dependence between the operators of various segments of milk VC in Armenia. That inter-dependence of farming households producing primary milk and milk processors was thoroughly analyzed from all aspects. In the long horizon none of those segments can survive without the other. Without proper input supply base the dairy producers will find themselves in full dependence from international market of dry milk, and cheese producers may be simply demolished. In turn, farmers will not be able to save their animal husbandry without commercial demand expressed by processors. High commercialization level of milk attests the important role of milk in income generation of rural households.

2.5.4 <u>Major constraints and proposed solutions</u>

Summarizing the analysis of the VC governance dimension it can be concluded that there is not much to improve in this regard for milk VC in Armenia. The substantial part of the market (60% of dairy market and around 30% of total milk processing market) is captured by 2 large enterprises, but that supremacy does not turn into “domination” in the market in the negative sense of the term. Major operators of the market cannot and do not dictate any conditions, do not influence the process, etc. They are working in the same severe competition environment and the only difference is that they should sustain larger volumes of operations. Consequently, no recommendations are needed in regard of the VC governance in the segment of processing.

The situation is slightly different in case of raw milk production and supply. As in case of end-products’ market no negative impacts of domination in the market are observed. However, the overall governance can be improved via consolidation of farmers’ efforts and resources. The idea of cooperation around the idea of collaborative milk production, cold storing and delivering proved itself to be the best solution in Armenia, so far. Slight improvements of animals husbandry conditions, application of automated milking, and other advanced measures will serve as additional contributors to enhancement of raw milk production segment of milk VC.

2.6 Dimension 5: Sustainable Production and Energy Use

<u>2.6.1 Use of materials</u>

The issue of main inputs used in milk processing was thoroughly addressed in analysis of previous dimensions: technologies, end-products features, etc. Adopted technical regulations for dairy and cheese production in Armenia specify all the inputs and materials allowed for being used in production. No materials of toxic, polluting or any other way harmful to people and environment materials are allowed.

The same regulations specify the allowed limits of possible dangerous materials in end-products. Extent of meeting the abovementined regulatory requirements on food safety is being regularly monitored, checked and controlled by the State Service for Food Safety (SSFS) of the RA MoA. From time to time the SSFS conducts wide-scale investigations among milk processors and almost always a number of violations (usually exceeding content of poisonous materials, or certain infectious bacteria, etc) are identified. Similarly, those investigations trace to identify violation of technologies, use of wrong materials (e.g. cocoa oil), etc. The usual procedure in such cases is the following: the SSFS suspends/bans the production of specified products of certain producers, makes them to call back the product from market, penalizes the producer and gives time assigned by legislation to resolve the problem. All these, as well as resolution of the problem is being formally announced on the website of the SSFS.

However, in the context of the current dimension’s analysis it can be concluded that no regular use of materials and inputs harmful to nature, environment, and population’s health exists in the market.

2.6.2 Energy use

All milk processors use electricity for production of dairy and cheese products. The most energy-intensive processes are cooling of milk in refregirators/freezers and milk warming/pasteurization. Some producers’ facilities are not supplied with gas and heating of the production buildings is also conducted by electricity despite its very high cost. Cold-storing of ready end-products before delivering to the retail network is another electricity consuming aspect of milk processing business.

The electricity supply in Armenia is centralized and all consumers procure the electricity from the Electric Networks of Armenia CJSC. All enterprises of processing segment of milk VC procure electricity from that organization. Bigger (and newly constructed) processing facilities are equipped with their own electricity transformation stations. Intensity of the use of electricity directly depends on the production capacities of processors and volume of processed milk. Intensity of the electricity use is much higher in case of dairy than in cheese production, though both productions use the most energy in the process of pasteurization. However, the highest expense of electricity appears in case of dry milk production.

Use of electricity is not among the key expenses of milk processors in Armenia. Almost none of operators apply specific energy saving technologies (even if they exist). Some savings are surely made in large enterprises by using modern lighting equipment, switching on the processing equipment and heating in the factory exactly before the start of production process, replacing the old and energy-consuming equipment with new analogues saving substantial energy, etc. However, those are rather occasional cases. Some enterprises also mention alternative technologies to be applied in the future if the buseness goes well. In some factories more realistic technologies of using diesel or gas combustion energy is applied, but just as a complementary measure for emergency situations.

In the modern world, it is obligatory for the design of milk processing facilities to ensure efficient measures against energy and heat losses. Blockge and separation of different sections of processing facilities is the most effective way for increasing the efficiency of the energy use. In addition, energy savings are achieved by decreasing the expenses on heating and ventilation costs via application of:

- Centralized heating and ventilation systems (save of 10% heating);
- Enhancement of heating planning and accountability (save of 2% heating);
- Ensuring maximum load of power transformers and minimals losses in the networks;
- Enhancement of electricity planning and accountability;

Unfortunately, the most of requirements remain completely theoretical instructions for the overwhelming majority of Armenian milk processors.

2.6.3 Use of water

Milk processing industry remains among the largest users of water. The water appears in all technological stages of milk processing; it contacts with inputs, semi-ready and end-products, is applied for cooling products, washing the production equipment, etc. The average quantity of the use of water per processing of 1,000 kg milk varies in the range of 1-2 tones of water depending on the types of end-products, condition of equipment, etc[31].

Usually, the use of technical water in milk processing enterprises is not welcomed. It is allowed for being used for external wash of machinery and territory, and other secondary purposes. Use of technical water may comprise 15% of total water consumption. The other 85% should be drinking water. In advanced foreign enterprises, a system of water circulation (multiple use and cleaning of the same water) is applied

[31] Source: Dairy producers - Chanakh, Van, Ara-Areg, etc.

which allows to decrease the consumption of water significantly. However, this issue is not actual for the overwhelming majority (if not for all) local processors.

Armenian producers obtain/procure water either from water supply companies in Yerevan and regions, including Yerevan Djur (Veolia), Armenian Water and Sewerage Company, Nor-Akunq, Lori and Shirak Water and Sewerage Companies, etc. Tariffs of drinking water are being approved by the RA Public Services Regulatory Commission and vary in range of 170-200 AMD per cubic meter.

All processing enterprises are equipped with sewerage systems for removal of wastewaters. Usually, the system consists of respective network, sediment pools/basins, cleaning and filtration facilities, and final removal pipeline/sewerage system. In the meantime, almost all sewerage systems (especially out of Yerevan and partially except of very newly constructed processing facilities) were inherited from soviet period and the quality of their operation (if at all) is strongly questioned. However, absolutely all processors fairly make all the payments for wastewater removal based on agreements they have with water supplying and sewerage removal organizations.

Wastewaters comprise 80-90% of initial volume used for production and auxiliary servicing purposes. Wastewaters contain large volume of organic materials (protein, fat, milk sugar, etc.) due to losses in and residuals of milk processing operations. In addition, the wastewaters also contain unorganic formations (washing stuff (caustic soda, acids and other chemicals), metal residuals, etc.). However, processing enterprises insist that they use really small (allowed) quantity of dangerous materials.

2.6.4 Effects on bio-diversity

In the operation of milk VC, risk of negative impact on biodiversity exists only in raw/primary milk production segment of milk VC. This issue has been already addressed and analyzed in the beginning of the current document. Use of remote pastures in Armenia has been marginal since the independence and the situation started changing just recently, mainly with the wide-scale support of the WB funded projects. Threats for bio-diversity start in early spring when animal husbandry farms take their animals out for grazing aiming at cutting-of the use of procured feeding. Legitimately, they do not take animals to remote pastures, and animals graze next-door, demolishing not yet grown-up grass with routs and trampling the soil. This process usually continues in the whole pasture period; pastures adjacent to villages are overloaded, while remote areas are not utilized. All these cause land and landscape degradation risks that cause serious bio-diversity risks.

Direct bio-diversity risks in the process of dairy and cheese production are actually marginal (if exist at all). Negative impact of operation of these enterprises is appeared rather in forms of use of energy and water, residuals, and emissions.

2.6.5 <u>Emissions</u>

The following major sources of emissions at milk processing enterprises were identified during the current analysis:

1. Emissions happening due to ventilation of production facilities and removal of vapor (steam) evaporated mainly in the milk warming and pasteurization process. Anyhow, this emission is not poisonous and does not harm the bio-sphere.

2. Emissions happening in course of cheese production - smoking and waxing. However, volume of smoked and waxed cheese in Armenia is quite small, and the damage to the bio-sphere is marginal (if at all).

2.6.6 Waste management

Waste generated at milk processing enterprises comes from residuals of spoiled packaging (plastic and glass packs for dairy, cellophane for cheese, etc.), packs of inputs (bags, carton boxes, etc.). Removal of this waste is organized in two ways: 1) either enterprises contract local waste removal company (that usually provides waste boxes), or 2) removes the waste by its means. In both cases, the volume of removed waste, as well as related costs are too small for being addressed heavily.

2.6.7 Major constraints and proposed solutions

Though milk processing activity is quite energy and water intensive, more or less direct impact on nature and environment it makes only via wastewaters mainly due to bad operation of wastewater cleaning facilities in many locations. However, this is a much larger issue and cannot be comprehensively addressed only in the context of enhancement of milk processing enterprises. In the meantime, it is already mandatory for them to comply with the HACCP requirements in observable future, and those requirements surely address also clean production and enhanced waste(water)-removal issues. Milk processing enterprises will have to invest substantial funds and introduce better operating systems as a pre-condition of their operations.

2.7 Dimension 6: Value Chain Finance

2.7.1 Financial attractiveness

Both primary milk production and its processing segments of milk VC have always been attractive for making investments. The number of animal husbandry farms that invested (regardless the amount) in primary milk production reaches 170,000, though overwhelming majority of them breed just few animals. The number of large farms (such as hundreds of heads livestock) does not exceed 200-300 cattle. In the meantime, this information is relative, it changes too fast due to farms' vulnerability from outside factors, such as milk and meat procurement prices, sales opportunities, forage and feeding availability and prices, etc. However, it can be surely insisted that over 90% of all farms (of any type) made investments attracted from outside - mainly from financial institutions, but also from other investors (though in much rarer cases).

Here is one specific issue related to almost all animal husbandry farming households. According to local legislation, primary producers of agricultural products (including milk) are practically exempted from paying any taxes till getting VAT threshold (which is avoided by all means by local producers). Thus, farmers do not keep any records or make separation of income (from various sources) and costs (as business and household expenses). This means, that investments attracted from outside (say from financial institutions (FIs)) may be named agricultural loans, but be used for totally different purposes. Similarly, consumer loans extended to farmers against the gold pledge may be used by farmers for the procurement of forage and grass for animals. Following this logic, it can be surely stated that overhelming majority of animal husbandry farms attracted investments for investing in primary milk production. Major form of investment is a micro loan offered by a number of FIs (banks and credit organizations).

Attraction of external resources is a quite common practice also among operators of processing segment of milk VC. Moreover, if farming households usually attract loans for filling-in the working capital needs (in rather small amounts), processors demand more differentiated services. Processing enterprises need regular short-term funding for milk procurement (though reaching quite big amounts of several hundred thousands US dollars), and capital investment loans for renovation of production facilities and upgrade of technologies, equipment, transportation means. It would be a challenging task to find a single processing enterprise having no borrowed liabilities to local FIs. This means that FIs assess the financial attractiveness of milk processing enterprises as acceptable for making loan investments. Approximate calculations show that net profitability margin of these enterprises varies around (annual average of) 20%, which is sufficient for allocating funds with them.

2.7.2 Financial risks

Before passing to analysis of financial risks that participants of financial market face while lending to milk VC operators, it should be mentioned that Armenian FIs do operate under the everyday strict (even tough) regulation, steering, and control of the Central Bank of Armenia (CBA). It is already more than a decade that stability of Armenian FIs is out of any observable and justified doubt. This stability has been achieved not only by the introduction of financial sector reforms and hardening the financial sector regulations, but also adoption of internal control mechanisms, improvement of lending capacities, etc. by the FIs. All those reforms followed the shocks at Armenian financial market in the beginning of 2000s and closure of several banks. Remaining FIs reassessed their capacities, and adopted drastically improved strategies for further operations and development. Consevative strategy of operating in the zone of minimum risks became the major policy of many FIs in the market. This included also assessment of financial risks in the process of lending, including to operators of milk VC.

FIs provide lending to operators of milk production and processing segments of milk VC and collect back their investments and respective interest for many years already. Moreover, some financial institutions do specialize in working on those segments. They succeed in attracting cheap resources for providing purposeful lending, design differentiated portfolio financial products envisaged for agricultural and processing sector enterprises, etc.

Intensive lending to milk VC operators does not mean that FI see no risks in their (borrowers') operation. There are many risks following all the operators of milk VC, but FIs succeeded in developing capacities for measuring and assessing those risks. The biggest number of borrowers of FIs are in the segment of primary milk production, but the average amount of borrowings is unmeasurably lower than in case of processors. That is why; the following analysis of financial risks was conducted for these 2 groups, separately.

The primary producers of milk (i.e. animal husbandry farms) face the following major risks:

- Climatic risks - forage and feeding for the animals may be insufficient due to natural cataclisms (e.g. draught), which will cause increase in prices and cut-off farmers' income;
- Animal diseases - animal health management practices are far from being effective and efficient in Armenia (the last large burn of infectious disease of cattle happened in Syunik region in Spring 2015);
- Drop-down of milk prices in the market - may happen due to decision of processors to procure milk at cheaper prices or to replace locally produced raw milk with imported cheap dry milk. The last example was registered in early 2015;
- Non-purposeful use of loans - e.g. envisaged for procurement of animal feeding but used for everyday needs may cause cut-off farmers' income.

Milk processing enterprises face the following main risks:

- Drastic growth of the main input's (i.e. raw milk) price, which may cause the necessity of increasing prices for end-products, thus losing market competitiveness;
- Inability of procuring milk due to insufficient quantity in raw milk market or inability to offer acceptable milk procurement terms and conditions to farmers;
- Old and obsolete facilities, equipment, and technologie screating, inter alia, also food safety risks;
- Cease of end-products market (e.g. due to decrease of populations purchasing parity, or impossibility of exports);
- Lack of funds for meeting the regulatory requirements in food safety issues (i.e. installation of HACCP system and standards).

Not the complete list of negative scenarios of milk VC operators activities ultimately influence on their ability and capacity of production and sales, i.e. the income/profit generated, which is the major source of the repayment of loans and accrued interest. FIs developed certain capacities and accumulated knowledge on measuring and assessing those risks. FIs introduced loan applications' scoring systems, gathered large team of qualified and experienced loan officers, entice good borrowers of other FIs by offering better conditions, etc. However, all FIs apply more tangible measures for risk mitigation. The following measures are applied by FIs for risks' mitigation most often:

- Requirements of guarantees - pledge/collateral of real estate (land and buildings), movable assets, houseware; guarantee letters from other FIs, family members, friends and relatives; group responsibility, etc.;
- High interest rates (applied particularly in micro-lending) that allow to stay more risky with few clients, i.e. high yield of interest covers potential losses from bad borrowers;
- Inclusion of bad borrowers' names in the blacklist of Armenian Credit Register.

Despite the general positive situation related to possible risks management, there some hidden factors that may cause unpredictable situations in the market. Snapshot to such factors is presented below:

- Huge number of farmers (tens of thousands) totally used to taking and repaying loans for every need of their households (including also business purposes). If the availability of external financing is suspected even once, they will find themselves in a very risky situation.
- As a continuation of the previous comment - sometimes farmers are not able to repay the previous loan (and interest) and have to apply to other FI for taking another loans and repaying the old one. The worst aspect of this is the capitalization of the interest; in other words it transforms into a small model of financial pyramid.
- "Other" FIs are usually well aware of the previous statement, but they still risk to lend the same farmers thus feeding the formation of already mentioned "pyramid". The major argument is rather phsychological - FIs are sure that farmers will always be able to attract finances from "other" FIs if they faile to repay themselves. This assumprion is true until the amount of a borrowing remains in the frames of micro or small (up to 1-2 million AMD). Beyond that amount the case turns to become very risky.
- Many FIs in Armenian financial market adopted quite aggressive expansion strategy. Among others we can mention Ameria Bank (extending larger loans), ACBA - Credit Agricole Bank (extending large, medium, small, and micro loans), FINCA UCO (extending small and micro loans). Though the average rates of interest grew in Armenia since December 2014, many FIs have sufficient funds envisaged for

being allocated and generating interest. That is why; some FIs do their best to attract as many clients as possible, even at some expense of safe lending procedures.

Moreover, some FIs apply even some unfair measures in competition for good clients. Just one example - FIs do not inform their best clients about the dates of repayments, thus causing a situation when they must to inform about overdue debts of those good clients to the CBA Credity Register. When the client applies to other FI (say they want to change their FI), new institution takes the credit history of the potential client and sees breaking the repayment schedules for old loans and ranks the client as non-reliable, though the overdues were for few days only and for small amounts. This is just one example how the FIs keep the clients with them by suspicious methods.

2.7.3 <u>Norms and practices</u>

It is impossible to estimate the exact number of farmers using attracted financial resources for the following reasons: 1) FIs usually do not uncover such information, 2) even if they do, it is not accurate and contains a lot of double counting and other misleading pieces, 3) nobody knows the extent of using loans purposefully (e.g. for agriculture) by farmers; 4) number of borrowers changes every day (some repay and get out of the list, others receive loans). However, it can be surely stated that over 90% of farming households (including animal husbandry farms) sooner or later took loans (at least micro or small, agricultural or consumer, from a bank or UCO, etc.) to finance their ongoing (personal affairs not related to business but repaid from business proceeds, animal feeding, etc.) or capital (procurement of land, mechanization, animals, etc.) needs.

Similarly, almost all milk processors are serving loans received from FIs for filling-in the gaps in current and/or capital needs. Enterprises with rich credit history never close their credit lines, i.e. once receiving a loan they register it in a form of credit line that allows them to receive and repay loans within the assigned amount without additional checking and assessment, providing no cases of delayed repayments or non-payments happened. Processors usually take loans for 2 purposes: 1) procurement of milk in large quantities and 2) procurement of new facilities, equipment, and technologies. FIs usually finance the current needs via short-term loans or credit-lines (of up to 12 months), and capital needs - via mid or long-term loans of 3-5 years.

2.7.4 <u>Availability of financing</u>

There are no specific types of financing for exactly milk VC operators. Instead, in financial market of Armenia there are financial products assigned for primary agriculture (farmers), mainly in the form of micro loans. Similarly, there are small and medium enterprises (SME) lending programs, food processing sector enterprises lending products, or a certain region(s) targeting programs. Some FIs offer leasing services for procurement of any equipment and machinery. Moreover, regularly, various development initiatives provide also grant financing for food sector enterprises. Best examples can be grant initiatives successfully completed by the USDA MAP, USAID ASME, WB funded RESCAD and CARMAC Projects, IFAD funded projects in food processing sector, etc.

Aside from all the abovementioned sources of external financing, milk VC operators may attract funds also from formal sources as consumer loans under the pledge of assets of high liquidity (car, gold, etc.), or even from informal sources. Such financing costs rather expensive – 3-5% monthly, sometimes even more. However, especially processing enetrprises usually avoid using such funding, and actually do not need.

Finally, external funding resources do exist also within the VC, though the process may happen without actual circulation of finances. For example, milk producing farming households usually provide at least 15-days delayed payment option to their procurers. Some processors delay payments even for several months. Similarly, milk processing enterprises usually provide in-kind loans to retail networks (sometimes reaching to tens of thousands dollars) that are being paid within a period of a couple of months.

Lending to farming households and food processing enterprises is among the most popular activities of Armenian FIs. At least 15 financial institutions provide loans to individuals and legal entities working in these 2 sectors of economy. Ranges of terms and conditions provided to farmers are the following:

- 50,000 AMD – 60,000,000 AMD and $80-$150,000;
- 8% - 12% annual interest rate;
- 3 - 84 months repayment period;
- Collateral: real estate, gold, guarantees, movable assets;
- Purposeful and consumer loans.

Ranges of terms and conditions provided to milk processing enterprises are the following:

- $10,000 - $350,000 or even much above based on individual negotiations;
- 11% - 18% annual interest rate;
- Up to 84 months repayment period;
- Collateral: real estate, gold, guarantees, movable assets.

Detailed description of financial products of 15 FIs are presented in the attached document, that can be accessed via the link in Annexes. However, any financial institution will be ready to discuss provision of non-featured lending service to their good clients. Moreover, financial products and services do regularly change in the market.

2.7.5 Major constraints and proposed solutions

While addressing different milk processing enterprises it was identified that almost all of them sooner or later use external financial resources, attracting them mainly formally - from banks and UCOs. Absolutely all of them complain from the cost of attracted financing, blaming the interest rates to be high, repayment period too short, collateral requirements too tough, etc. However, all of them use loans and repay them quite successfully for already many years. This means that, in other equal conditions, the features of financial products are dictated by the market itself, without a notable influence from the side of any operator.

However, one aspect for the improvement of the financial market situation can be mentioned. Currently, FIs offer affordable interest rates only for firm-currency loans (around 12% annually). This interest would be excellent for many producers, especially if loans ere taken for fulfillment of working capital needs. However, negative experience attests that almost every year in recent period the Armenian Dram devaluates and local enterprises face additional serious expenses since their proceeds are almost totally in local currency. Only few cheese producers have exports to Russia, but they are mostly paid in Russian Roubles, which devaluates even stronger. Mitigation of currency devaluation risks is not realistic, but options for provision of local currency loans at affordable interest rate (let it be subsidized by the State) would be helpful very much. By the way, to some point Armenian producers of cheese were planning to apply to the Government with a similar request and project.

2.8 Dimension 7: Business Environment and Socio-Political Context

2.8.1 Business environment

Armenian legislation specifies the following major types (legal statuses) of organizations allowed to run a business in the country: Open Joint Stock Company (OJSC), Closed Joint Stock Company (CJSC), Full Liability Company (FLC), Additional Liability Company (ALC), Limited Liability Company (LLC), and Production Cooperatives (PC). Overwhelming majority (above 95%) of private legal entities in Armenia do operate with the legal status of LLC. This is the easiest form of a legal business entity (Sole Entrepreneurs (SEs) do not have a status of legal entity) to register and run in the country. However, only half of milk VC operators (mostly dairy producers) are LLCs; Majority of cheese producers are SEs (though most of them do not currently operate at all); milk procurement and collection points usually have the status of consumer or production cooperatives (though most of most of them do not operate, either). Few joint stock companies obtained their legal status during the process of privatization; though the greater majority of their stocks belong to a limited group of individuals.

Providing real volume of operations, limited number of participants/owners, and other features of milk processing enterprises, the best option for establishment a legal entity is assumed to be the LLC. Establishment of LLc in Armenia is regulated by a several legal acts. One of the main advantages of this option is that you can open LLC without any significant assets invested as the capital. For example, you can invest a computer (the minimum size of the authorized capital to open LLC. Yet the Law does not determine the minimal investment size, but in some cases this is obligatory). A number of documents is required for the establishment of the LLC that are openly presented in the official website of the State Register of the Legal Entities of the RA Ministry of Justice. The registration of the commercial entities in the first time is free of charge; for further amendments the fee comprises 10,000 AMD (slightly more than $20). Theoretically, the organization can be established in 2 working days (the least).

Additional costs related to the establishment of a legal commercial entity in Armenia are expenses on preparation of a seal ($25 approximately), opening a bank account ($2-$10 depending on the bank and embedded services), installation of internet banking tools, etc. Or, a business person may chose to outsource the whole process to a specialized legal advisory entity for about $100-$150.

Armenia also has been continuously reforming its business incorporation regulations in recent years. Armenia established a one-stop shop in 2010, allowing electronic registration and merging procedures for reserving a business name, registering a business and issuing a tax identification number. In 2013 Armenia eliminated company registration fees.

One of the best indicators of the business environment in a country is the Ease of Doing Business index. The index ranks World economies from 1 to 183. For each economy the index is calculated as the ranking on the simple average of its percentile rankings on each of the 10 topics covered in Doing Business 2010, i.e. exclusive of the electricity pilot data. The ranking on each topic is the simple average of the percentile rankings on its component indicators[32]. Dynamics of the compound index in recent years for Armenia was the following: 2012 - 55, 2013 - 32, 2014 - 37.

[32] http://www.doingbusiness.org/~/media/FPDKM/Doing%20Business/Documents/Reforms/DB10Easeofdoingbusinessrankmethod.pdf

Armenia's position engaged by the Ease of Doing Business index is quite high. In the meantime, it does not mean that Armenia is very attractive for foreign direct investments, or the competitiveness of Armenian products is high at international markets. There are a number of factors seriously affecting (by the negative mean of the term) the business environment. Among others, we can mention unfair treatment of business enterprises by State authorities (including and lead by the State Revenue Committee of the RA MoF), monopolization of very important sectors of economy, availability of too many investigation and controlling entities, high level of corruption, etc.

2.8.2 Product and trade regulations

As in case of any other goods or services, exports of milk processing sector products is highly prioritized in strategic development policy of Armenia. In the meantime, export of dairy and cheese products is substantially hindered with a number of specific and general constraints. Among others the following major constraints can be mentioned:

1. Short perishability period of the most of dairy products. As it was mentioned in the current document, the perishability period of the most of dairy products is limited with a week or around. This makes the export of dairy products possible to the only bordering countries, i.e. actually to Georgia, only. Exports to more remote countries is possible only via air transport which will make the product unaffordably expensive. In the meantime, short period of perishability, preferences of consuming their local products, and many other factors substantially limited and restricted sales potential at Georgian market (though some attempts were made by Armenian enterprises).
2. Substantial part of local production does not meet the international food safety and quality standards (though some enterprises passed HACCP and ISO certification). Local producers succeeded to convince foreign buyers in affordable quality and safety of only cheese, and not for many producers. That is indirectly attested lSO by small export volume of cheese.
3. Armenian soft cheeses (Lori and Chanakh) are widely unknown in foreign markets. They are demanded mainly by Diaspora Armenians, but not in really big volumes.
4. Quality of locally produced semi-hard and hard (higher value) cheeses is rather questioned. Problems with this issue start from the very beginning of animal husbandry and primary milk production issues. Even the best quality milk is received in suspicious hygienic conditions, hand milking is widely practiced, animal housing is poor, problems of milk storing and proper transportation are not fully solved, etc.In such conditions it is not possible to ensure stable quality of high-value cheeses, which is an important pre-condition for exports.
5. Small volume of high-value cheese production is the next constraint on the way of exports. The easiest market to enter for Armenian cheese producers is the Russia. But for fulfilling the demand of just one retail network, the total production of high-value cheeses in Armenian will not be sufficient.
6. Severe competition in foreign markets also stops many Armenian cheese producers. Great variety of supplied cheese requires really competitive features for Armenian cheeses, including food safety, quality, olygoleptic features, price competitiveness, financial strength of producers that can afford substantially delayed payments, etc. Unfortunately, very few Armenian cheese producers meet those requirements, currently.

There are no specific national trade regulations for milk VC enterprises in Armenia. Production of dairy and cheese in Armenia does not require specific licensing or certification, yet. However, Armenian producers will have to introduce and apply HACCP standards very soon, conditioned by the liabilities undertaken by the membership in Customs Union. Currently, the only regulatory requirements refer to standards of dairy and cheese production that were already addressed above. Finally, the major challenge and constraint faced by Armenian cheese producers for entering foreign markets remains food safety requirements.

2.8.3 Public and private service provision

Regardless the location of milk VC enterprises (mainly of processing segment) all of them are more or less properly supplied with all public and private services, such as supply of utilities (electricity, water and sewerage, gas, waste removal), telecommunication, roads and other infrastructure, etc. Condition of some infrastructure may be not so good, but still remains usable. Services of FIs (including also insurance companies) are available in all towns of Armenia and are widely accessible for any enterprise. Main consultancy and knowledge suppliers are available in capital Yerevan.

However, the only support Armenian milk processors need regularly and much is the promotion of their production. In turn, low sales are conditioned not only by narrow markets, but also low capacities of local producers.

2.8.4 Social and cultural context

No social/cultural norms and institutions have more or less notable influence on business culture of milk VC in Armenia or its operators. Milk VC operation does not specifically affect any social or cultural group of people. Existing business links and relations among operators of various segments are not unique or exclusive.

In Armenia, milk processing enterprises usually employ a lot of women in all segments of production. In average, women comprise 50-70% of all production personnel (except of end-product suppliers and drivers that are not counted in production personnel). Some positions, such as employees of laboratories, are almost totally engaged by women. Younger employees are welcomed at any enterprise, but usually they should face the necessity of passing through a quite long period of trainings and probation, before being offered a promising position.

3 Conclusions and Recommendations

The analysis of milk value chain operation is being ended by the summarization of all findings, conclusions and recommendations made as a result of the study. Understandably, ENPARD project will not be able and does not have such mandate to address all the contraints identified. Moreover, complete solution of those constraints is possible in a long-run, only. Immediate outputs of selected activities cannot be assumed as solution of any problem. However, the list of identified constraints and respective recommendations will give more or less comprehensive understanding on the current situation in milk VC in Armenia, will suggest certain and specific activities that can serve to be at least the start of wide-scale improvements, or continuation of already in-process measures.

3.1 Conclusions on Value Chain Mapping

Milk VC operation in Armenia has its specific aspects. First of all, it should be bolded that the sector of milk processing is dynamic, development is ongoing and the situation is changing all the time. Whatever concluded on the certain period of time, is a subject for substantial changes. However, some summarization is possible:

1. Milk flows start from ordinary farmers and reach to ultimate consumers passing the stages of collection (cold storing), processing, distribution, exports, and retail. The value of primary milk, which serves as the major input changes (i.e. grows) gradually in the course of proceeding through the VC.
2. Every segment of milk VC in Armenia has its specific features and development constraints. All those constraints are in logical cause-and-effect relationship, but should be addressed as subjects of separate changes (if not reforms). No single development initiative has such a capacity and resource to address several challenges together.
3. There are 2 major opportunities for adding value in milk VC: a) import substitution, and b) export promotion. Both scenarios have pros and cons, but the sector seems to face tougher challenges currently, such as milk quality, inappropriate technologies, irregular market, etc. It would be good to address all those factors first, before proceeding with competing with foreign brands at local and international markets.

int on Development Constraints and Recommendations for Overcoming

Conclusions on constraints of effective and efficient operation of milk VC operators from the viewpoint of various dimensions are presented below.

Table 23 – Summarization of conclusions and recommendations for Dimension 1

	Conclusions on development constraints		Recommendations
1.	**Gap in sizes and structure of animal husbandry farms**: small-scale production of milk, high fixed costs, inattractive activity due to low profitability, small quantity of milk, which not interesting for any collector/buyer.	→	Promote enlargement of animal husbandry farms via implementation of subsidies for animal trade (for further breeding) and provision of affordable / subsidized and accessible loans for procurement of animals. Intensification of consolidation of small and scattered farms, support the cooperation.
2.	**Gap in animals' quality/productivity features**: pedigree features of Armenian cows dropped significantly, seriously affecting productivity. Main reason well-known - low application of pedigree activities, particularly artificial insemination.	→	Promotion of artificial insemination via motivation schemes and banning regulations. Promotion of localized and countrywide projects in the field of pedigree activities' application. Support to establishment of modern genetic stations.
3.	**Gap in farmers' access to and affordability of animal feed, other inputs**: main feeding is grass and hey, quantities of alfalfa, juicy forage, grains, complex food are small for influencing productivity. Reasons are low accessibility and affordability of proper feeding. Statement is true also for - instruments, quality medicals, pedigree semen, etc.	→	Promotion of animal feeding production in Armenia. Replication of existing positive experience. Provision of agricultural machinery and mechanization to newly established cooperatives, subsidizing the expenses of production of technical crops and animal feeding, introduction of crop rotation, etc.
4.	**Gap in farmers' access to remote pastures**: vital harm to environment and biodiversity, bad condition of roads to remote pastures, lack/absence of animals' watering and housing facilities, movable milking machines and cold storing facilities in pastures, etc.	→	Gradual continuation of the uptake of remote pastures. Elaboration and real application of modern pasture and herd management plans. Use of already damaged and endangered pastures stopped for several years.
5.	**Gap in farmers' access to and affordability of veterinary and other services**: need for reforms. Though services offered by private institutions are expensive in comparison to those provided by ordinary veterinarians, many farmers prefer them for much better quality and ultimate results.	→	Implementation of independent/external professional evaluation of the work of the State veterinarians and assessment of farmers' needs of veterinary services in terms of types, regularity, quality, and prices. Wide support to the development of the provision of veterinary services by private institutions.
6.	**Gap in farmers' knowledge and application of proper animal husbandry practices**: lack of knowledge on proper husbandry, farmers are willing to participate any training and knowledge transfer activities only if they are free, like entertainment.	→	Launching and/or re-vitalizing the provision of knowledge transfer and training on modern animal husbandry practices via the agricultural extension services.
7.	**Gap in automatization of animal husbandry processes**: farmers using manpower, application of automation is on very low level, increased costs and low efficiency of milk production activities, food safety problems, etc.	→	Promotion of modern/innovative automated solutions for animal husbandry, including animal housing (ventilation, manure-removal, feeding and watering, automated milking (also in pasture), use of electronic shepherds, etc.).

Table 24 – Summarization of conclusions and recommendations for Dimension 2

	Conclusions on development constraints		Recommendations
1.	**Gap in terms of availability and affordability of raw milk**: volumes of primary milk production grew slowly but steadily, extent of using (imported) dry milk (which is considered as an indicator of local market gap for raw milk) is very limited, but exists. Milk processors cannot afford high prices for milk.	→	Intensification of milk production, steady improvement of quality by primary producers of milk. Identification of new markets by milk-processors, launch of new productions of high-value products, and respective increase of procurements of milk. More demand would source economy of scale and everybody would appear in win-win situation.
2.	**Gap in availability and affordability of financial resources**: serious challenges in terms of affordability of funds. Ceased of cheap lending in AMD.	→	Strict monitoring of agricultural funding processes at least for the funds allocated by and/or with the support of the government.
3.	**Gap in availability and affordability of technologies and equipment**: processors need ongoing renovation and update. Mainly available, but largely unaffordable.	→	Further promotion of available financial products, intermediation between FIs and milk processors, State intervention in terms of subsidizing the costs for technological investments.
4.	**Gap in availability of necessary knowledge and skills**: big challenge hindering the development of milk processing. Heavy criticism towards academia.	→	Systemic reforms, support to vocational education, establishment of training centers and capacities
5.	**Constraints for high-value cheese production**: lack of high-quality milk, unavailability of technologies, lack of knowledge on production of high-value cheeses, difficulties of marketing such products, etc.	→	Selected combination of activities suggested above.

Table 25 – Summarization of conclusions and recommendations for Dimension 3

	Conclusions on development constraints		Recommendations
1.	**Lack of sufficient funds for cooperation with retail networks:** tough conditions for cooperation consisting of minimum quality requirements, delayed payments, discounts, minimum sales, etc.	→	Initiate dialogue with financial institutions on improving the access to loans for filling-in the gap of working capital for milk processors. Already mentioned State interventions might be useful, too.
2.	**Absence/lack of food safety certification and non-compliance of the production with international standards**: local capacities for food safety certification are weak, certification issued by local organizations is acceptable for foreign markets, not all enterprises were ready/willing to face related costs of certification.	→	The best way of improving the situation in the market of certification services is the enhancement of demand. Mandatory requirement of installation and application of HACCP system means potential demand for certification services, which, unfortunately, is not always sustained by financial ability. Introduction of co-financing instruments may be very helpful and supportive for food producing enterprises.
3.	**Absence/lack of marketing skills and capacity for promoting the products at international markets**.	→	No suggestion, totally internal issue.

Table 26 – Summarization of conclusions and recommendations for Dimension 4

	Conclusions on development constraints		Recommendations
1.	60% of dairy market and around 30% of total milk processing market is captured by 2-3 large enterprises, but that supremacy does not turn into "domination". Major operators of the market cannot and do not dictate any conditions, do not influence the process, etc.	→	All processors are working in the same severe competition environment and the only difference is that they should sustain larger volumes of operations. Consequently, no recommendations are needed in regard of milk VC governance.
2.	Different situation in raw milk production and supply. Again, no negative impacts of domination in the market are observed. However, **room for the overall improvement of governance**.	→	Governance can be improved via consolidation of farmers' efforts and resources. The cooperation around collaborative milk production, cold storing and delivering was the best, so far. Slight improvements of animals husbandry conditions, application of automated milking, and other advanced measures will serve as additional contributors.

Table 27 – Summarization of conclusions and recommendations for Dimension 5

	Conclusions on development constraints		Recommendations
1.	Milk processing activity is quite energy and water intensive, more or less direct impact on nature and environment it makes only via wastewaters mainly due to bad operation of wastewater cleaning facilities in many locations. However, this is a much larger issue and cannot be comprehensively addressed only in the context of enhancement of milk processing enterprises.	→	In the meantime, it is already mandatory for them to comply with the HACCP requirements in observable future, and those requirements surely address also clean production and enhanced waste(water)-removal issues. Supporting milk processing enterprises in installation of food and quality standards is the best option.

Table 28 – Summarization of conclusions and recommendations for Dimension 6

	Conclusions on development constraints		Recommendations
1.	The primary producers of milk (i.e. animal husbandry farms) face the following major risks: ▪ Climatic risks - forage and feeding for the animals may be insufficient due to natural cataclisms; ▪ Animal diseases - animal health management practices are far from being effective and efficient; ▪ Drop-down of milk prices in the market; ▪ Non-purposeful use of loans.	→	Risks of primary milk producers may be mitigated by the following measures: ▪ Establishment of diversified self-operated forage production basis, replication of existing practices; ▪ Establishment of private FVSCs; enhancement the capacities of existing structures via trainings; ▪ Development of the State milk strategy controlling the milk balance and State interventions.
2.	Milk processing enterprises face the following main risks: ▪ Drastic growth of the main input's (i.e. raw milk) price; ▪ Inability of procuring milk due to insufficient quantity in raw milk market; ▪ Old and obsolete facilities, equipment, and technologies creating also food safety risks; ▪ Cease of end-products market; ▪ Lack of funds for meeting the regulatory requirements in food safety issues.	→	Risks of milk processors may be mitigated by the following measures: ▪ Intensification of primary milk production; ▪ Subsidies to enhancement of processing enterprises through respective financial services; ▪ Subsidies for sharing costs of mandatory installation of food safety standards.

Table 29 – Summarization of conclusions and recommendations for Dimension 7

	Conclusions on development constraints		Recommendations
1.	No major contraints in business environment	➔	Development of the State milk strategy controlling the milk balance and State interventions. This document should include also well justified suggestions for the regulatory framework improvements, including tax excemptions and holidays, VAT related issues, etc.

Annex 4: Value Chain Analysis: Fruits and Berries

List of Abbreviations

NSS	National Statistical Service
MASC	Marz Agricultural Support Center
EU	European Union
RoA	Republic of Armenia
UN	United Nations Organization
WUC	Water-using company
SSFS	State Service for Food Safety
SCPEC	State Commission for Protection of Economic Competition
SMEs	Small and medium-sized enterprises

Introduction

The Fruits and Berries Value Chain Analysis Survey (hereinafter referred to as Survey) was conducted under the EU-funded ENPARD[33] and commissioned by UNIDO[34] and UNDP[35] involved in the implementation of the Project.

1.1Project Profile

The ENPARD supports the Republic of Armenia (RoA) Government in ensuring efficient and sustainable agriculture that contributes to better living conditions in rural areas of the country. The ENPARD technical assistance component (hereinafter referred to as Project) focuses on producer groups and value chain development. The Project is implemented by UNIDO and UNDP with EU funding of EUR 2.4 million and co-financing by the Austrian Government of EUR 1 million. Particularly, the ENPARD Project aims to strengthen the producer groups and engage them in new value addition activities, enhance the value chains that provide improved access to affordable, better quality food, promote Armenia's rural development, improve access to both domestic and international markets and facilitate introduction of ecologically clean agricultural production and processing practices. The direct beneficiaries of the Project are agricultural producers, members of producing groups, their employees and families, small and medium-sized enterprises (SMEs) involved in the agricultural production value chains, and agricultural production consumers at large. Women, youth and other vulnerable groups are in the spotlight of the Project.

1.2 Survey Profile

1.2.1 Survey Objective

The ENPARD technical assistance Project targets 3 outputs, and the actions to ensure Output 3 cover, among others, this Survey.

- Output 3: Strengthened value chains that provide improved access to affordable, better quality food. The Project (ENPARD) will identify and develop key intervention points at any level within the selected value chains that will benefit not only stakeholders of those value chains but also Armenian consumers locally and nationally.

1.2.1.1 Survey Task and Scope of Work

This Survey aims to carry out a comprehensive analysis of the selected value chains to ensure Output 3 of the ENPARD technical assistance Project. The selected 4 value chains covered 4 product groups. The Project covers the value chain of one of such 4 product groups, namely that of **fruits and berries**. The Fruits and Berries Value Chain Analysis targeted the fruits below:**apple, pear, apricot, peach and plum**, and the berries below: **raspberry, strawberry, blackberry and currant**. The fruits and berries value chain analysis will make it possible for those responsible for the Project to map out actions and interventions to resolve the value chain issues at hand and open new opportunities of improved productivity and efficiency for the farmers groups engaged in the value chain.

1.2.1.2 *Theoretical Guidance*

[33] European Neighborhood Program for Agriculture and Rural Development
[34] United Nations Industrial Development Organization
[35] United Nations Development Program

The Diagnostics for Industrial Value Chain Development: An Integrated Tool[36] prepared by UNIDO's Agribusiness Development Branch experts (with contributions by Frank Hartwich, Jean Devlin, and Patrick Kormawa) in 2011 served as the basis and guidance for the Fruits and Berries Value Chain Analysis.

1.2.2 Survey Methodology

1.2.2.1 *Information Sources*

The fruits and berries value chain is very large due to the big number of value chain actors and their functions. To carry out the value chain analysis, the Consultant interviewed and collected information from the actors at every level of the value chain. The groups of the value chain actors are listed below:

1. fruit and berry producers;
2. agricultural raw materials and input suppliers;
3. fruit and berry trading actors: intermediaries, wholesale and retail sellers, markets, supermarkets, shops, fruit and berry stands;
4. processors;
5. exporters;
6. cold storage facilities;
7. transportation: individuals and organizations.

To collect statistical data on the surveyed product groups (at national and marz (regional) levels), verify and update the information available and gather specialized information (on technologies, innovations, etc.), the Consultant interviewed and sent inquiries to experts and representatives of competent institutional entities and organizations, including:

1. National Statistical Service (NSS);
2. RoA Ministry of Agriculture;
3. Association of Dried Food Producers;
4. Greenhouse Association;
5. Green Lane NGO.

As a secondary base, the Consultant used the information sources below:

1. various studies and analyzes on the surveyed product group;
2. vast volume of relevant information available on the Web, including statistical and analytical reports information, interviews of the actors in the value chain of fruits and berries, etc.

1.2.2.2 *Information Collection Methods*

The Consultant used various methods to collect the required information from the sources above:

1. The Consultant collected information from the actors engaged directly in the value chain through **face-to-face interviews**. Technically, the Consultant collected information **at the location of the**

[36] http://www.unido.org/fileadmin/user_media/MDGs/IVC_Diagnostic_Tool.pdf

source; this means that he visited all the marzes (regions) and a number of communities in each of them. The collection of information especially in the marzes heavily relied on the snowball method, with surveyed interviewees pointing to other sources of information (e.g. an surveyed producer or exporter provides information on other producers or exporters).

2. The institutional entities in possession of statistical and analytical data provided the information requested by the Consultant in responses to his **written inquiries** orthrough **face-to-face interviews**.
3. All the information available online was studied and processed through **office surveys**.

1.2.2.3 *Information Collection Tools*

To collect information, the 2 information tools below were developed: a) several standardized questionnaires for face-to-face interviews with various actors in the value chain; b) databases with all the collected information classified by thematic sections.

1.2.2.4 *Information Processing and Analyses*

The information processing and analysis were quite time-consuming due to the large volume of the information with occurring inconsistency therein and some contradictory data. The official statistics provides key information on the surveyed product group, such as fruits and berries production quantities, orchard areas and crop capacity rates in the form of grouped data. For instance, details on apples and pears are found in form of non-separated data in the product group of pome fruits; those on apricots, peaches and plums are found in the form of non-separated data in the product group of drupes (stone fruits); and those on strawberry, raspberry, blackberry and currant are found in the form of non-separated data. To obtain separate information on different types of fruits and berries, the Consultant analyzed the views and assessments of numerous experts. Yet, as for some general information, it proved impossible to either separate it, or obtain relevant individual data.

The contradiction among the data posed another challenge to information processing. The information sometimes even differs from one official statistical source to another. In such cases, the Consultant sought clarification with both the information sources and relevant specialists and experts. The most reliable data were considered those verified with 2 or more sources.

Despite all the challenges above, the Consultant processed and conducted a rather careful and in-depth analysis in terms of this Survey.

1.3 Survey Results

Based on the UNIDO guiding tool for value chain analysis, the Consultant ensured the outcomes below:

- value chain map that provides a graphical idea of the value chain structure, actors and their functions;
- statistical data on fruits and berries production quantities, orchard areas, crop capacity rates and production geography of production; prime cost and farmers' profitability estimates, information on agricultural raw materials and input supply of information; challenges and obstacles for primary production;

- outlines of post-harvest warehousing/storage practices, technologies, capacities of cold storage facilities; transportation logistics and costs associated with the processes above;
- information on fruits and berries processing volumes and processing technologies; outlines of value addition at processing stage, varieties of the products processed, etc.;
- outlines of end-markets or sales markets; market volume; functions of wholesalers and retailers, and obstacles for sales of products;
- outlines of business environment and access to finance, etc.

At the summarizing stage, the introduction into all the thematic sections heavily focuses on the description of the challenges and obstacles faced by the value chain actors at its various links.

2 Value Chain Analysis

2.1 Value Chain Mapping

2.1.1Products

1. **Surveyed products.** The Fruits and Berries Value Chain Analysis targets the fruits below: **apples, pears, apricots, peaches and plums**, and the berries below: **raspberry, strawberry, blackberry and currant.** It is noteworthy that the value chains of the fruits and berries above are generally very similar, since their share the same business environment and processes, i.e. producers, main production centers, raw materials and input suppliers, as well as all the warehousing/storage, transportation and processing infrastructures and export logistics.

2. **End-products.** Thevalue chain of the surveyed products shows an interesting and complex structure. Hence, the fruits and berries value chain might be as follows: a) short: starting from production and ending in selling the fresh products to consumers; and b) long: starting from production, passing through processing where the fresh fruits and berries are transformed and continue their way through the value chain as canned food (fruit preserves, jams, compotes), purees, juices and dried food. This Survey focuses on the long (extended) value chain of fruits and berries; this means that at fruits and berries reach the end of the value chain in the form of both fresh and processed products.

2.1.2 Value Chain Actors and Their Functions

3. **Core functions of the value chain.** The fruits and berries value chain covers a set of functional links. Each of such links is unique and inherent and might have various challenges, which in the long run either adversely affect the entire production and sales of fruits and berries or create difficulties throughout this process.
   Table 30lists the core functions of the fruits and berries value chain identified within the Survey. Such value chain functions are inherent in all the fruits or berries targeted under the Survey. As for exceptions, they are minor: for instance, the apricot value chain might cover no import, and the raspberry, blackberry and currant value chains still cover no export.

Table 30 - Core functions of fruits and berries value chain

Value Chain Functions	Value Chain Functions Profile
Input supply: agricultural raw materials, inputs and services	This function ranges among the very essential value chain links covering the flow of key inputs involved in prime cost formation. Such inputs comprise as follows: fruits and berries seedling, fertilizers, agrochemicals (pesticides), irrigation water, agricultural tools and equipment, farm machinery or equipment or services provided thereby. The buyers of the products and services above are the actors engaged in fruit and berry production, i.e. farmers and organizations. The agricultural raw materials and inputs are mostly imported. The importers have their own stores and/or distribution networks to sell their inputs all over Armenia.
Production	Fruits and berries production results from combined use of agricultural assets (orchards), raw materials, inputs and services and the knowledge and labor of producers or their hired labor. Production is a process lasting for several months with its efficiency influencing the earnings and well-being of the actors fulfilling this function.
Harvesting	Harvesting is the logical conclusion of the production process, when the produced fruits and

Value Chain Functions	Value Chain Functions Profile
	berries are collected, packed and transported directly to the market or storage facilities.
Warehousing	After harvesting, not all the fruits and berries are put on sale immediately. The products intended to be sold later or used for domestic consumption is transported to special warehouses, storage facilities, cellars, storage bunkers, certain buildings, cold storage facilities from where they are later delivered to the market in parts.
Storage	The fruits and berries are stored to be sold at higher prices in winter or spring. The main difference between warehousing and storage functions is that storage entails special conditions: temperature and humidity. Fruits and berries are stored in natural or artificial cold storage facilities, i.e. cold storage facilities, cellars and storage bunkers.
Transportation	This function ensures the flow of fruit and berries through all the links in the value chain, including transportation from farmers' orchards to the storage facilities or warehouses, local or international markets, or from storage facilities or warehouses to the market, etc.
Processing	Processing transforms fruits and berries into preserves, juices, semi-ready products (purees). In fact, processing creates favorable conditions for long-term preservation of fruits and berries.
Export	Export entails transportation of fruits and berries from their production, warehousing/ storage facilities on the domestic market to markets foreign markets
Import	Import entails transportation of fruits and berries from foreign production, warehousing/ storage facilities to Armenian retail or wholesale markets.
Wholesale	Wholesalers purchase from producers large volumes of their production and sell them independently by retail or transport it to marzes (regions) and sell to the local traders and merchants and retail outlets (i.e. fulfill a distributor's function).
Retail sale	In retail sale, upon passing through all the links of the value chain, the fruits and berries, either fresh or processed, reach their end-consumers.

4. **Value chain actors and their number.** The functions in**Table 30** above are fulfilled by various actors. Some of them are engaged in a particular link of the value chain and assume a specific function, e.g. transportation actors, namely individuals and organizations using their own vehicles to transport the products. Some other actors assume several functions in the value chain, e.g. producing farmers who apart from the production also transport (transportation function), process and sell their production by retail.
Overwhelmingly, there are no data on the number of the fruits and berries value chain actors. The matter is that the vast majority of fruits and berries producers are individual farms. They are not accountable to any state/administrative agency and pay no taxes. After Independence, the first Armenian Agricultural Census was conducted in October 2014. Presently, the Census results are still processed and will be ready no sooner than by the end of 2016.

As for the value chain link actors subject to state registration, i.e. legal entities or private entrepreneurs, the task to identify their number seemed quite feasible at first. However, in practice it appeared somehow different. For instance, along with a certain number of registered legal entities engaged in agricultural raw materials and input sales (among them holders of relevant license for pesticides), there is an uncertain number of small shops in the marzes which are essentially engaged in resale of agricultural raw materials and inputs of importers. Hence, estimating the data on the number of fruits and berries value chain actors appears to be quite a complex issue that is either insoluble or only partially soluble.

Table 31 - Fruit and berries value chain actors

Value chain actors	Value chain actors profile
Agricultural raw materials and input suppliers and service providers	Actors engaged in agricultural raw materials and input sales and service provision. Armenia overwhelmingly imports agricultural raw materials and inputs: fertilizers and pesticides. The agricultural raw materials and input suppliers (importers and retailers) might be divided in the 2 groups below: ▸ large traders, all of whom are legal entities and mostly located in Yerevan and nearby communities. They own stores and marz (regional) distribution networks. The number of such companies totals 30; and ▸ small traders mostly concentrated in marzes and engaged in reselling the products of large retailers. Some of them are retailers mostly registered as private entrepreneurs, and some others are individuals with unregistered business activities selling a limited range of agricultural raw materials and inputs in their places of residence often from their own houses. It is quite difficult to estimate the number of small traders; most probably, this number ranges between 100 and 200. Seedling suppliers play a key role as compared with the other agricultural raw materials and input suppliers. In Armenia, the seedling demand is met by about 1,000 actors, namely farms engaged in its production and about a dozen of importers.
Producers	To be considered actors engaged in fruits and berries production, relevant producers should own or lease orchards (perennial nurseries) on privatized plots. In this sense, rural inhabitants harvesting fruits in their homestead land only may not be considered fruit farmers. Over 99% of the fruits and berries producers are individuals without any state registration. It appears very difficult to estimate their number as there are tens of thousands of farmers. The fact that over 90% of the farmers in the Ararat Valley (Ararat and Armavir marzes) and foothills and low-lying areas in Aragatsotn and Kotayk marzes are engaged in fruit growing, suggests that number of producing farms there makes about 90 thousand. As for the other marzes, they have both a relatively smaller numbers of farms and limited scale of fruit growing. Based on very approximate estimates of the number of farms in the main fruit growing centers in the other marzes (Tumanyan region in Lori marz; Arpa river valley in Vayots Dzor marz; Goris, Kapan and Meghri regions in Syunik Marz; Berd and Noyemberyan in Tavush Marz), the number of farmers producing all sorts of fruits and berries might total about 125 thousand (half of the number of all the farms in Armenia). As for a separate statistics on producers of individual sorts of fruits and berries, there are no data available.
Intermediaries	Intermediaries play a key role in the fruits and berries value chain since they ensure the flow of most fruits and berries through the value chain links. The intermediaries are divided into the 2 groups below: ▸ Group 1. Intermediaries buying fruits and berries from the producers' storage facilities or warehouses, transfer them to the markets and either sell them to retailers, or act as retailers themselves by selling the fruits and berries in the yards or streets. ▸ Group 2. Intermediaries with permanent certain area or stall in fruit and vegetable wholesale markets (e.g., 'GUM' (Main Department Store), Malatia, Masis, etc.), who buy large volumes of production brought by farmers to the market and either sell it to retailers in Yerevan and marzes, or act as retailers themselves. There are no sufficient data to estimate at least the approximate number of intermediaries. Firstly, they are all individuals without any state registration of their activities. Secondly, the number of the intermediaries is unstable and varies all the time. Some of them resell fruits and berries all year round as it is their permanent occupation. And some others trade fruits and berries only during some months of the year. By the estimates of the Consultant, the number of intermediaries in the value chain of fruits and berries totals a few hundred or thousand people.

Value chain actors	Value chain actors profile
Processors	Based on their status and the varieties of products resulting from fruit processing, the fruits and berries processors are divided into the diverse groups below: ▸ Group 1. processing companies producing fruit preserves. There are 43 such companies producing fruit preserves, jams, compotes, marinades, juices and semi-ready products (purees), etc.; ▸ Group 2. processing companies producing dried food. There are 20 such companies with a processing capacity of over 5 tons of fruits; ▸ Group 3. processors: mostly individual farms producing dried food in small sizes (with processing capacities of no more than 1 ton of fruits). The number of such processors might make up to 5,500.
Retailers	Upon passing through all the links of the value chain, fruits and berries, either fresh or processed, reach retailers. This group comprises various agricultural markets, supermarkets, shops and fruit and vegetable stands, hotels and restaurants. Throughout Armenia, this group might comprise about 15 thousand actors.
Exporters	Traditionally, exporters perform the functions of both intermediaries and transporters. They buy fruits and berries directly in producers' orchards and then transport them abroad and sell them either to retailers (as e.g. Spayka Company does) or wholesalers (as almost all the other exporters do). It is also hard to identify the number of exporters since it changes year by year. Hence, as compared to the number of fruits and vegetables exporters making about 30 in 2010, this number almost doubled in 2015. Hoping to take advantage of the fruit and vegetable shortage in the Russian Federation, many individuals purchased and exported fruits this year. Moreover, this was the first export experience for 1/3 of such individuals.
Importers	Importers exporters perform the functions of both intermediaries and transporters, too. They buy fruits and berries from foreign producer, and then import them into Armenia and sell to retailers.

2.1.3 Fruit and Berries Sales Structure

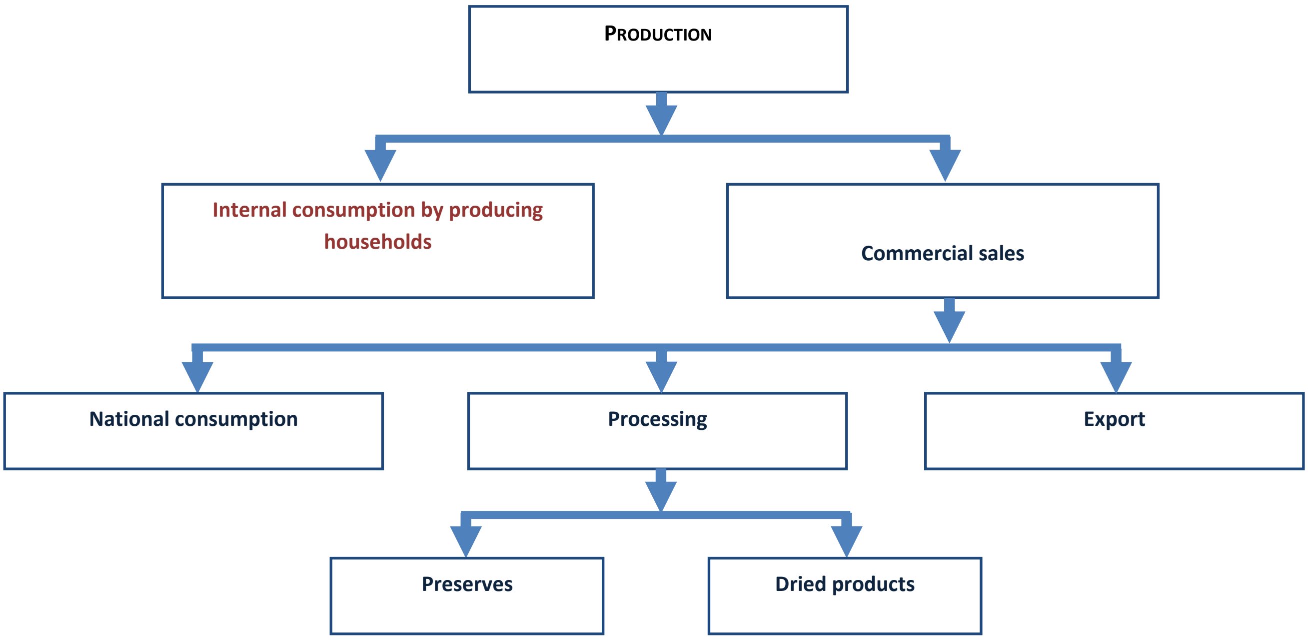
5. The fruits and berries sales structure provides a general initial understanding of the product flows through various links of the value chain and the intensity of such flows. The development of the fruits and berries sales structure carries some objective problems. As the fruits and berries production volumes vary from year to year, the question is the *which year statistics it is most reasonable to consider* for such a structure, since no year, considered separately, might be representative of the general situation for the reasons below:
   - Not a single year statistics may be considered favorable on average for all the fruits since throughout a specific year, some fruits might yield record-breaking large volumes of crops, while some others might yield a record-breaking small volumes. The year of 2014 might serve as a particularly vivid example: Armenia saw an unprecedented large production volume of apples and the small apricot production volume, in fact the scarcest within the past 15 years.
   - Fruits with small production volumes are priced higher on the market. Consequently, processors sharply reduce the purchase of such fruits. As for apricots or peaches, the purchase volumes of these fruits for processing purposes might vary 2 or 3 times over years.

Hence, to develop the fruits and berries sales structure, the Consultant used the average data for the past 4-5 years. The fruits and berries sales structure covers only the products targeted under the Survey. The data below show the production volumes of such products in an average favorable year:

- apple: 130,000 tons
- pear: 28,000 tons
- apricot: 100,000 tons
- peach: 60,000 tons
- plum: 15,000 tons
- berries: 10,000 tons

- **Total: 343,000 tons**

If within the year considered, the surveyed products yield the volumes of crops above, their sales structure would look like as follows:

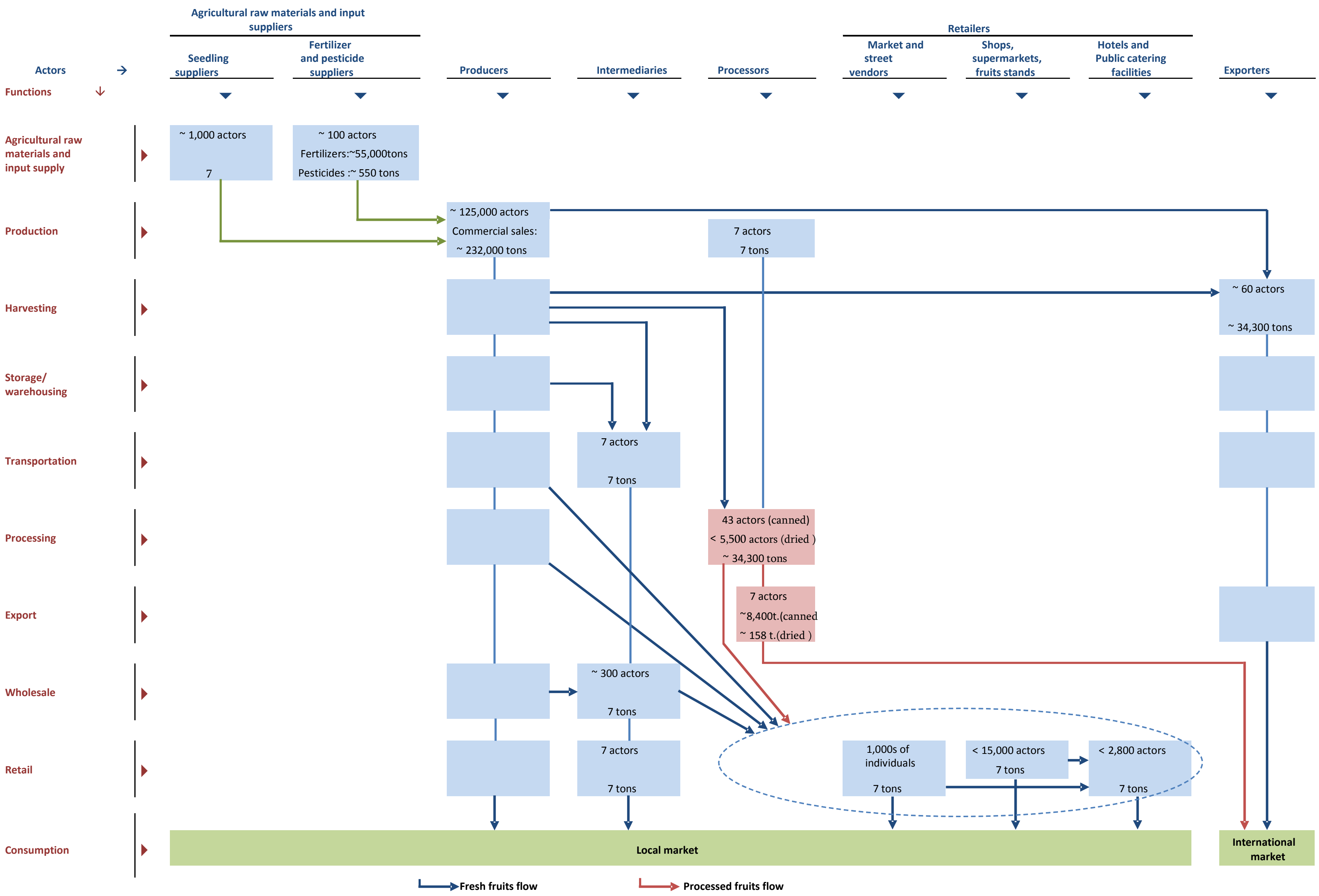


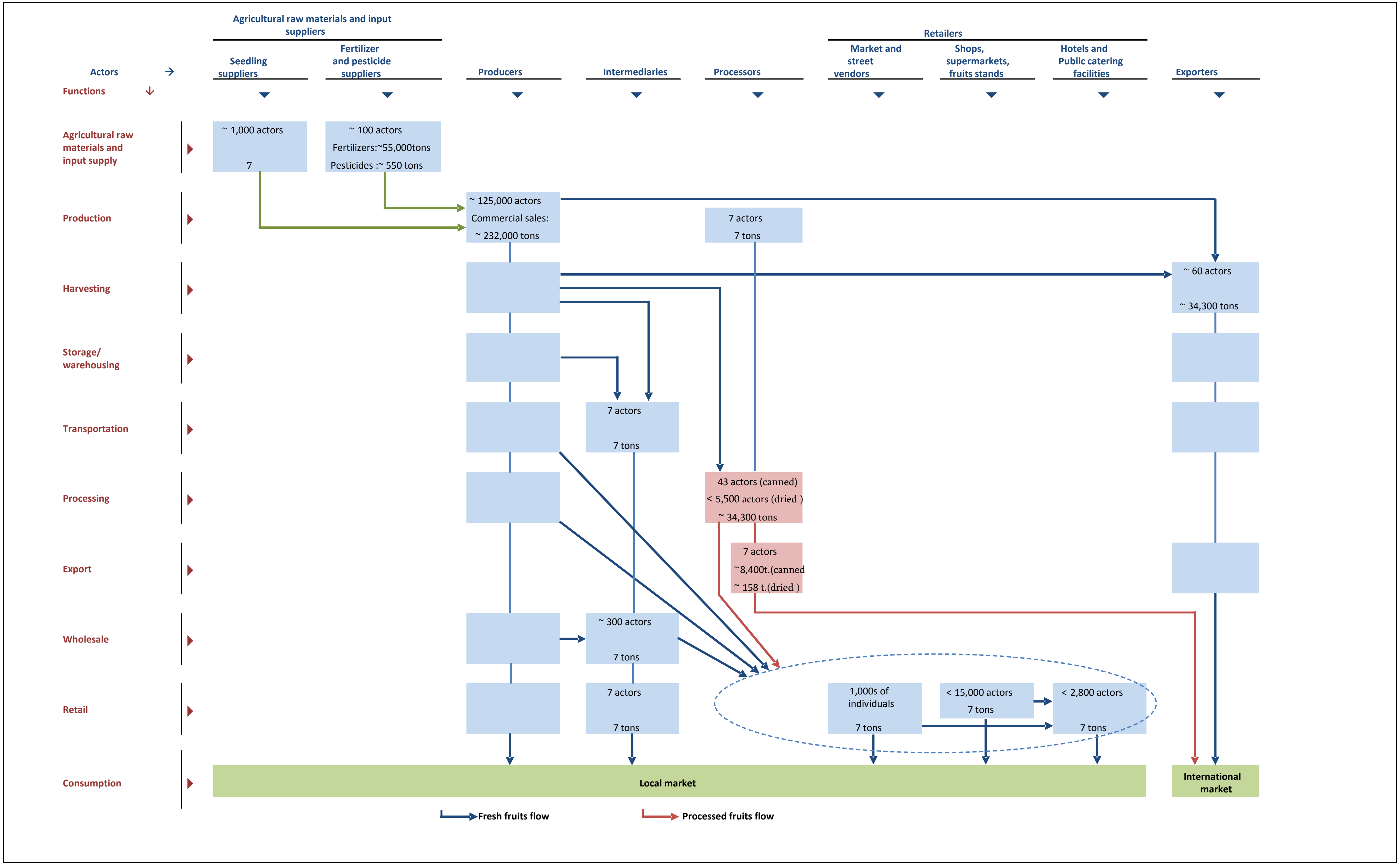
2.1.4 <u>Related Services</u>

6. The fruits and berries value chain operation requires a variety of services and their proper provision. It is such services that make it possible to ensure the flow of products from the stage of production to their end-consumers. Below are listed the actors who are not directly involved in the value chain, but whose services are vital to ensure its operation:
    1) **Transportation service providers** ensure transportation of fruits and berries from their warehouse or storage facilities to the market. Meanwhile, transporters do not act as either product buyers, or sellers, but rather as transportation service providers. The fruits and berries transporters are overwhelmingly individuals, whose activities are non-formal in nature; they are not registered as business units. They use truck vehicles (e.g. Yeraz, Gazel, Ford) with an average carrying capacity (up to 5 tons) and buses adapted for transportation.
    2) **Cold storage facilities** ensure long-term preservation of fruits. Cold storage is of essential significance for the fruits with long-term (several months) of preservation capacity (e.g. apples, pears). Refrigerators make it possible to prolong the fruits sales period throughout the months with lack of fresh fruits (winter and spring months). As a result, the farmers may diversify their cash flows and sell their own products at higher prices.

3) **Agricultural consulting.** Giventhe lack of sufficient knowledge among the farmers, the agricultural consulting system represented by the Marz Agricultural Support Centers (MASCs) constitutes considerable support to their activities. Such state-financed Centers function in every marz (region) and employ skilled and qualified consultants.
4) **Institutional units.** As for fruit and vegetable producing farmers' advocacy organizations, they are either none of them, or if any, they are still too weak and immature. Such organizations mostly cover farmers' unions and associations. In the fruits and berries sector, there are several associations of dried food producers and greenhouse associations with a very limited number of farmers and therefore not representative of the entire sector.

2.1.5 Value chain maping





Agricultural raw materials and input suppliers
Retailers
Actors
Functions
Seedling suppliers
Fertilizer and pesticide suppliers
Producers
Intermediaries
Processors
Market and street vendors
Shops, supermarkets, fruits stands
Hotels and Public catering facilities
Exporters
Agricultural raw materials and input supply
Production
Harvesting
Storage/ warehousing
Transportation
Processing
Export
Wholesale
Retail
Consumption
~ 1,000 actors
7
~ 100 actors
Fertilizers:~55,000tons
Pesticides :~ 550 tons
~ 125,000 actors
Commercial sales:
~ 232,000 tons
7 actors
7 tons
~ 60 actors
~ 34,300 tons
7 actors
7 tons
43 actors (canned)
< 5,500 actors (dried)
~ 34,300 tons
7 actors
~8,400t.(canned
~ 158 t.(dried)
~ 300 actors
7 tons
7 actors
7 tons
1,000s of individuals
7 tons
< 15,000 actors
7 tons
< 2,800 actors
7 tons
Local market
International market
Fresh fruits flow
Processed fruits flow

2.2 Primary production and Agricultural Raw Materials and Inputs

2.2.1 Production of Fruit and Berries

7. **Producers**. Individual farms make up over 99% of the total number of the actors in the production of fruits and berries. Individual farms emerged after the land privatization in 1991 and 1992 as most of approximately 900 collective farm assets (as for plots: 66%) were transferred to the rural population and resulted in formation of some 320 thousand farms. While every village had a few agronomists with relevant educational background or specialization, the new farmers overwhelmingly had big gaps of knowledge and experience in fruit-growing.

There are no accurate data on how many farms received perennial nurseries during privatization. As for such farms existing today, it is also very difficult to estimate their number. There are some tens of thousands of farmers. The fact that over 90% of the farmers in the Ararat Valley (Ararat and Armavir marzes) and foothills and low-lying areas in Aragatsotn and Kotayk marzes are engaged in fruit growing, suggests that number of producing farms there makes about 90 thousand. As for the other marzes, they have both a relatively smaller numbers of farms and limited scale of fruit growing. Based on very approximate estimates of the number of farms in the main fruit-growing centers in the other marzes (Tumanyan region in Lori marz; Arpa river valley in Vayots Dzor marz; Goris, Kapan and Meghri regions in Syunik Marz; Berd and Noyemberyan regions in Tavush Marz), the number of farmers producing all sorts of fruits and berries might total about 125 thousand (half of the number of all the farms in Armenia). As for a separate statistics on producers of individual sorts of fruits and berries, there are no data available.

Fruits and berries are also produced by actors mostly engaged in their processing. By doing so, some business units seek to produce their own and therefore cheaper raw materials. For instance, Tamara Fruit and Yerevan Brewery range among the fruit preserves and natural juice businesses which own orchards to produce the fruit and berries for processing. Mostly, such businesses produce dried food.

8. **Producers' cultivation area size.** The privatized plots in the lowlands (Ararat Valley, regions in Meghri and Noyemberyan) used to be too small as compared to those in the foothills since the rate of the rural population in the relatively smaller lowland areas by far exceeded that of the foothills. And it was just in the lowlands that most of the perennial nurseries (orchards and vineyards) located. Consequently, the orchard areas per farms are also small (on average, 0.3-0.5 ha).

Some years later, as Armenia entered the stage of economic development (early in the 2000s), the fruit producing farms embarked on some processes to ensure farm expansion and improved specialization. Some farms unable to find new ways for making their business activities more effective, sold all or some of their lands. And some others with successful production and sales practices started to expand their business cultivating larger areas. To this end, they either purchased new plots or leased those owned by the state or the community. Following land consolidation, today the major fruit producers cultivate much larger lands as compared to those obtained by the privatization. Particularly, today large individual producing farms in Armenia own and cultivate:

- 20-30 ha of apple orchards;
- 50-100 ha of apricot orchards;
- 10-20 ha of peach orchard;
- 3-5 ha of plum orchards; and
- 5-10 ha of berry orchards.

As for pears, there are almost no large orchard areas. Despite the large number of pear producing farmers, the cultivated plots are small and divided among different owners.

In Armenia, there are some larger cultivated plots with orchards of mostly apricots, peaches, plums and apples. In the early 2000s, some foreign investors and local magnates made capital investments in large orchards. Hence, in the marzes of Ararat and Armavir have some orchards of up to 300 and 400 ha owned by some private individuals.

9. **Fruits and berriesproduction quantities.** The surveyed fruits (apples, pears, apricots, peaches and plums) and berries (strawberry, raspberry, blackberry and currant) make up over 90% of the overall volume of fruits and berries produced in Armenia. Hence, in an average favorable year in terms of climate conditions, e.g. in 2013,[37] the fruits and berries production quantities in Armenia totaled 338,084 tons[38], with the surveyed fruits and berries making 306,600 tons, i.e. 91% of the total.

Table 32 - Fruits and berries production quantities in 2011-2015, in tons

	2011	2012	2013	2014	2015[1)]
Total crop of fruits and berries [2)], with:	**236,009**	**331,736**	**338,084**	**291,113**	**370,000**
Apple	77,000	110,000	112,000	133,000	128,000
Pear	23,000	23,000	25,000	26,000	28,000
Apricot	49,000	76,000	89,000	4,000	105,000
Peach	44,000	63,000	55,000	74,000	46,000
Plum	12,400	19,000	16,000	21,000	19,000
Berries	6,300	8,000	9,600	6,000	13,000

[1)] The rates for 2015 rely on the projections of the competent agricultural agencies and experts.
[2)] The source for the data on total fruits and berries crop rates is the publication on Social and Economic Situation in the Republic of Armenia in 2011-2014 by the National Statistical Service (hereinafter referred to as NSS), and the separate crop rates for specific fruits and berries are based on the estimates of the competent agricultural agencies and experts.

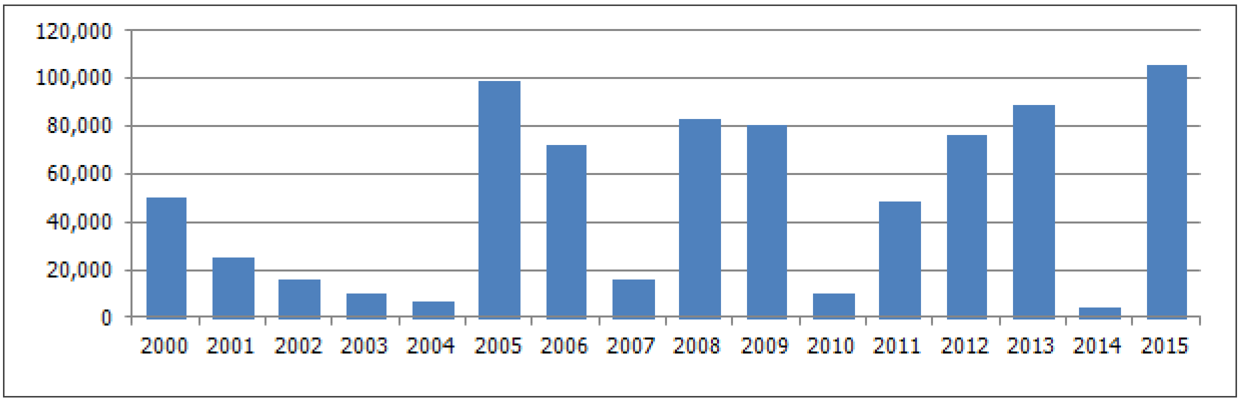
10. **Variations in fruits and berries production quantities.** The variations in fruits and berries production quantities is caused by the 2 key factors below: a) expanded orchard areas, and b) rapid climatic and weather fluctuations. The orchard area expansion produces only a single-sided, namely cumulative effect on the fruits and berries production quantities. In the past 10 years, the orchard areas have expanded steadily by totaling 40 thousand ha in 2015 from the 35 thousand ha of 2015. This resulted in improved fruits and berries production basis ensuring further capacity of producing about 50 thousand tons of fruits and berries annually. As for the climate and weather conditions, they prove to be a stronger factor which every year “affects” adversely the fruits and berries production. The

[37] Here we did not consider the year of 2015 since there are no accurate fruits and berries crops results available yet, and as for the year of 2014, it cannot be considered a favorable one due to the unprecedented low rates of apricot crops affected by the frosts of March 30 and 31, 2014.
[38] This rate does not cover the production quantity of grapes. Source: Social and Economic Situation in the Republic of Armenia in January-December, 2013, NSS, 2014.

unfavorable climate conditions mostly cause frosts (March-April), hail (April-May) and drought (July-August). Such unfavorable conditions stem from Armenia's vertical zoning; due to this, agriculture ranges among the the most risky sectors of the economy.

The impact of the climatic fluctuations on the fruits production quantity is shown best by the example of apricots which are most affected by climate and weather conditions as compared with the other fruits covered under the Survey.

Figure 1 - Apricot production quantities in 2000-2015, in tons



In the past 15 years, apricot orchards have been affected by weather conditions (mostly frosts in early spring, above normal rainfalls in spring and extremely damp weather) 4 times, at least once per 3 years, and this seems to set a pattern. Apple, peach, plum and berries orchards also face similar challenges, but to a smaller extent.

11. **Fruits and berries production quantities breakdown by marzes.** The fruits and berries production quantities breakdown by marzes shall rely on the rates of the average favorable year for all the fruit types considered. Identifying such a year appears quite difficult since no year might be considered on average favorable for each of the fruits and berries surveyed. Thus, a year might yield apricot crops above the average rates and peach crops below the average rates, or apple crops below the average and that of peach - stable, etc. Therefore, to ensure the most objective fruits and berries production quantities breakdown by marzes, the Consultant found it reasonable to use the orchard area figures as a cornerstone for such breakdown. Such figures are relatively stable and change very slowly. In fact, the only change is the difference in the number of newly grown and destroyed orchards during a specific year.

Table 33 - Fruits and berries orchard areas in 2011-2015, ha

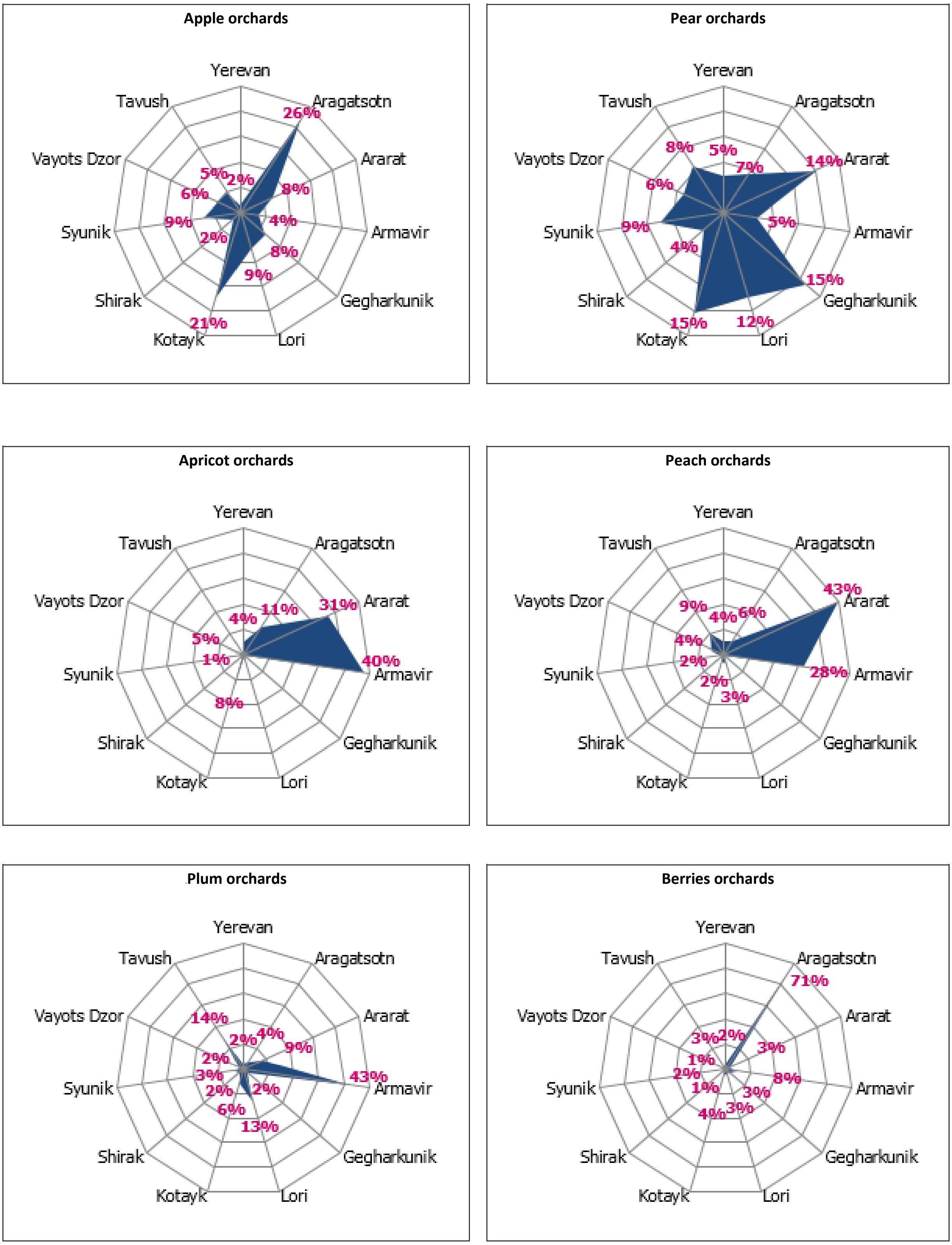
	2011	2012	2013	2014	2015[1)]
Fruits and berries orchard areas [2)], with:	**37,149**	**39,285**	**40,229**	**40,129**	**≈ 40,129**
apple orchards	9,680	11,000	11,100	11,200	11,200
pear orchards	2,900	3,000	2,900	2,800	2,800
apricot orchards	9,850	10,000	10,400	10,350	10,350
peach orchards	5,280	5,200	5,200	5,150	5,150
plum orchards	2,050	2,120	2,370	2,400	2,400
berries orchards	1,670	1,780	2,000	1,795	1,795

1) The rates for 2015 rely on the projections of the competent agricultural agencies and experts.
2) The source for the data on the fruits and berries orchards is the NSS publication on Area under Agricultural Crops and Gross Harvest for 2011-2014, and the orchards areas of specific fruits and berries are based on the estimates of the competent agricultural agencies and experts.

The figures above show the general area of the fruits and berries orchards, including the newly-planted orchard areas which have yielded no crops yet. According to the figures of 2014, the fruit-age orchards cover the area below: 1) apple orchards: 10,000 ha (89% of the total apple orchards area); 2) pear orchards: 2,650 ha (95%); 3) apricot orchards: 9,050 ha (87%); 4) peach orchards: 4,600 ha (89%); 5) plum orchards: 2,150 ha (89%); and 6) berries orchards: 1,770 ha (99%).

The fruits and berries orchards area breakdown by marzes heavily depends on their climate conditions and the varieties of fruits and berries. The orchards of fruits with wide varieties and long-term crop seasonality growing in various zones (apples, pears) spread over wide and extensive areas. As for orchards of the other fruits, they are highly concentrated in certain marzes or even in certain regions of particular marzes.

Figure 2 - Fruits and berries orchard areas, by marzes



Apples grow in all the marzes of Armenia, in the areas of 800-2,000m above the sea. They have an advantage over drupes/stone fruits (apricots, peaches, plums), since their production is significantly diversified both for their geography, varietal composition and seasonality. Apple crop is collected throughout 4 months (July-October) and sold in 10 months (July-April). Therefore, in an average favorable year, apples are the most widely consumed fruits in Armenia.

The **pear** production is quite stable since its orchard areas are almost unchanged. Moreover, it is the most geographically diversified one due to the location of the orchards. Like apples, pears also grow in areas of 800-2,000m above the sea, have a wide varietal composition and a long-term crop seasonality. However, unlike the other fruits, pears have no major producers, the orchard areas are scattered and a considerable bulk of such orchards are located on homestead lands.

The drupes, namely **apricots**, **peaches** and **plums** are grown in areas of 800-1,500m above the sea, mostly concentrated in Ararat and Armavir marzes (Ararat valley) and the foothills of Aragatsotn marz. The apricot, peach and plum orchards areas tend to expand. These fruits are particularly in great demand among exporters and processors, which contribute to increasing number of new orchards.

As for berries, namely **strawberry, raspberry, blackberry** and **current**, their industrial cultivation ahs been promoted in recent years. Aragatsotn is the leading marz in berries production, and the marzes of Kotayk and Tavush have recorded rapid development of such production recently.

12. **Fruits and berries crop yields.** Thefruits and berries crop yields are of utmost importance for the production cost estimation. Their significance lies in the fact that regardless of the crop yield, the cultivation costs for a conditional area of 1 ha must/should be met. Therefore, the richer the harvest and the higher the crop yields, the lower the production costs. The opposite also holds true: the lower the crop yields, the higher production costs.

In Armenia, the fruits and berries crop yields vary year by year. **Here, the key regulatory role rests with the climate conditions.** Hence, frosts, hails and droughts may significantly affect the crop yields. Due to the pronounced vertical zoning of the country, the crop yields in various marzes also striking differences. The Table below covers the fruits and berries crop yield figures of 2012-2014.

Table 34 - Fruits and berries crop yield figures, tons/ha

	Apples			Pears			Apricots		
	2012	2013	2014	2012	2013	2014	2012	2013	2014
Aragatsotn	22.2	20.0	27.6	5.8	8.8	3.3	7.4	10.7	0.2
Ararat	19.7	18.8	23.2	11.4	10.5	14.2	11.5	13.9	0.1
Armavir	14.4	14.3	18.7	13.1	12.2	20.2	11.3	10.1	0.8
Gegharkunik	17.1	17.7	18.1	24.5	24.9	25.4	1.6	1.6	1.4
Lori	3.1	2.8	0.8	2.5	2.4	1.1	1.0	0.9	0.3
Kotayk	5.3	5.8	5.0	3.7	4.0	4.0	3.2	3.2	0.3
Shirak	14.3	20.2	20.2	9.0	15.2	16.0	-	-	-
Syunik	5.4	6.2	6.6	3.3	3.2	4.8	1.4	2.2	0.1
Vayots Dzor	3.4	4.3	0.4	1.1	1.8	3.2	2.4	3.2	1.2
Tavush	3.7	4.6	2.0	5.1	5.0	3.4	4.2	1.9	0.5

Yerevan	4.2	6.9	4.6	2.0	8.1	5.4	7.3	3.3	0.8
Armenia	**11.5**	**11.5**	**13.3**	**8.4**	**8.9**	**9.7**	**9.2**	**10.0**	**0.5**

	Peach			**Plum**			**Berries**		
	2012	**2013**	**2014**	**2012**	**2013**	**2014**	**2012**	**2013**	**2014**
Aragatsotn	9.3	9.9	6.9	5.0	5.1	3.4	3.9	2.9	3.1
Ararat	14.2	12.5	19.5	10.2	10.8	9.1	6.7	7.4	7.3
Armavir	21.4	15.1	21.4	18.9	13.1	18.3	12.3	10.4	5.9
Gegharkunik	-	-	-	1.2	1.2	1.2	7.8	8.1	8.3
Lori	1.9	2.7	2.4	4.0	2.5	3.1	1.6	2.9	1.2
Kotayk	0.3	4.6	2.7	3.7	3.9	3.2	2.8	3.5	1.8
Shirak	-	-	-	17.5	11.8	16.9	4.8	3.3	1.8
Syunik	1.1	0.4	0.5	8.3	7.5	7.5	3.2	13.2	6.7
Vayots Dzor	7.0	4.8	7.3	1.6	2.2	2.6	0.4	0.4	0.3
Tavush	17.8	18.5	12.6	9.7	3.6	2.5	1.8	2.9	3.9
Yerevan	2.3	0.3	3.5	1.4	6.8	5.8	0.9	2.8	2.8
Armenia	**14.3**	**12.1**	**16.2**	**10.6**	**7.9**	**10.1**	**4.5**	**4.8**	**3.5**

When compared against the available data on the orchard areas of various fruits and berries, the crop yield figures above make it possible to identify the leading marzes in fruits and berries production with the highest crop yields.

Table 35 - 3 leading marzes in fruits and berries orchard areas and crop yields

Fruits and berries	**Orchard areas** *3 leading marzes*			**Crop yields** [1)] *3 leading marzes*		
	No 1	**No 2**	**No 3**	**No 1**	**No 2**	**No 3**
Apples	Aragatsotn	Kotayk	Lori	Aragatsotn	Ararat	Shirak
Pears	Gegharkunik	Kotayk	Ararat	Gegharkunik	Armavir	Shirak
Apricots	Armavir	Ararat	Aragatsotn	Ararat	Armavir	Aragatsotn
Peaches	Ararat	Armavir	Tavush	Armavir	Tavush	Ararat
Plums	Armavir	Tavush	Lori	Armavir	Shirak	Ararat

Berries	Aragatsotn	Armavir	Kotayk	Armavir	Gegharkunik	Syunik

[1)] – Estimated based on the average crop yields of 2012-2014.

Nevertheless, the crop yield figures above carry no real information on the potential productive capacities of the farmers engaged in intensive agriculture and with specialized skills in cultivation of a particular fruit. By estimates of experts and farmers, proper agricultural practices in a favorable year might result in the crop yields below on an area of 1 ha: a) apples: up to 60 tons; b) pears: 30-40 tons; c) apricots: up to 25 tons, d) peaches: up to 40 tons, e) plums: 15-20 tons; and f) berries: 10-12 tons.

13. **Production cost.** Thefruits and berries prime costs make up the key starting-point indicator of their value chains. Before any estimation of such prime costs, the factors underlying such estimates should be taken into account. A key factor is the **large number of farmers and the various fruits and berries cultivation approaches and technologies they use**. While the large number of producers is not problematic, the fact that they use their own fruits and berries cultivation approaches, differing from one farmer to another, might exert different impacts on the prime costs. The differences in the farmers' activities, approaches and technologies are based on the factors below:

1) **Orchard areas**
Fruits and berries cultivation on small plots (up to 5,000 sq. m.) makes it possible for the farm members to take a number of agro-technical measures (e.g. preparatory measures for irrigation season, i.e. inter-trunk and inter-row area cultivation, pruning, protection/treatment (grafting)) themselves and spend no money on hired labor. As for farmers with larger plots, they have to involve hired labor and machinery for the cultivation of their orchards. However, here, the opposite effect also holds true. The fixed costs of farmers with small plots (e.g. transportation costs for driving to the plot and back home) prove to make up a larger share in the fruits and berries prime cost. Hence, such farmers have difficulty producing scale effect.

2) **Location and distance of orchards from farmer's house**
The location of orchards is a determining factor for farmer's transportation costs. Obviously, the farmers whose orchards are located far from their houses (impossible or inconvenient to reach on foot) have to add a transportation item in their production costs.

3) **Availability of agricultural machinery, equipment and tools**
By applying their own agricultural machinery for cultivating their orchards, the farmers improve the efficiency of their work and reduce their rental costs.

4) **Purchasing power of farmers, availability of working capacity**
To ensure the full-range agro-technical measures for orchard cultivation, farmers need a sufficient reserve of working capital. Once they have it, farmers can ensure adequate cultivation of their orchards and expect good outcomes. If they have no such capital, farmers usually choose one of the 2 ways below: a) they either involve loan resources and another cost item, namely loan interests, adds to the product cost; b) or farmers fail to complete the full-range agro-technical measures (e.g. insufficient fertilizing of the soil, incomplete tree protection and treatment, etc.) and consequently, produce poor-quality and low crop yield rates.

5) **Level of farmers' knowledge**
After the land privatization in the early 1990s, rural inhabitants without relevant education and knowledge became owners of orchards, i.e. farmers. Today, fruit-growing farmers overwhelmingly acquired the necessary knowledge from their own experience, as well as training projects carried out by the RoA Government with technical support of international

organizations and the launched agricultural consulting system.[39] Yet, as of today, many farmers still have insufficient knowledge and even the agricultural knowledge they have differ from one farmer to another. This affects their activities by somehow impacting either their production cost or efficiency.

The list of factors influencing the prime costs of the fruits and berries is not exhaustive. Hence, the production cost might be also affected by the weather conditions in a specific year. Particularly, dry years might call for large-scale irrigation, and rainy and damp years might call for extra measures for tree care and protection, etc. Given the variety of the factors affecting the fruits and berries prime costs, **estimates of such costs must rely on a specific scenario comprising assumptions and some limitations**.

To estimate the prime costs of the surveyed fruits, the scenario below was applied.

Table 36 - Fruits prime costs estimate scenario

1. Orchard status	▸ Orchard with 5- or 10-year-old trees
2. Orchard area size	▸ 1 ha
3. Number of fruit trees in the orchard. - apple orchard: - pear orchard - apricot orchard - peach orchard - plum orchard	 ▸ 625 trees (planting scheme: 4x4 m) ▸ 280 trees (planting scheme: 6x6 m (highly conventional)) ▸ 100 trees (planting scheme: 10x10 m) ▸ 625 trees (planting scheme: 4x4 m) ▸ 600 trees (planting scheme: 4x4 m)
4. Orchard location	▸ Within on-foot access zone
5. Hiring labor for agro-technical measures	▸ Hired labor
6. Using necessary machinery and equipment for agro-technical measures	▸ Paid services (renting machinery, with machine operator's services)
7. Weather conditions	▸ Average favorable year
8. Orchard amortization period	▸ 20 years
9. Orchard amortization base (orchard setup and up to 5-year cultivation and maintenance costs): - apple orchard: - pear orchard: - apricot orchard: - peach orchard: - plum orchard:	 ▸ around 4.0 million AMD ▸ around 3.0 million AMD ▸ around 2.4 million AMD ▸ around 3.4 million AMD ▸ around 3.8 million AMD

The fruits prime costs estimation is provided **in line with the sequence of agro-technical measures**, starting with orchard maintenance works in early spring up to harvest time. The **prime cost estimation is mostly typical of the Ararat Valley** both in terms of agro-technical measures and costs. The table below shows the costs serving as a basis for fruits prime costs estimation as calculated through the initial database in**Table 8**.

[39]By this Marz Agricultural Support Centers (hereinafter referred to as MASCs) are meant.

Table 37 - Approaches to orchard cultivation costs estimation

Agro-technical measures, variable and fixed cultivation costs	Cost calculation approaches
1. Tree inter-trunk area cultivation (hoeing and tilling the soil around the trees)	This entails hired labor costs calculated either by the number of the trees, or spent men-days. By the tree number calculation approach, the hired labor are paid around 400 AMD for tailing the soil around trees with relatively thicker trunks (apricot trees). As for trees of smaller size, they are paid 200 or 300 AMD. And the spent men-days calculation approach envisages day wages: man/day: 5,000 AMD.
2. Tree inter-row area cultivation: preparatory works for irrigation network	To calculate such costs, the 2 approaches below might be used: number of either grooves, or spent men-days. 1 groove curved to connect the tree rows irrigation network costs around 1,000 AMD. As for the day wages, they are the same as above: man/day: 5,000 AMD.
3. Lime	Tree trunk liming/whitening substance, with average cost per tree: 30 AMD
4. Tree trunk and core branches liming/whitening	This entails hired labor costs calculated by spent men-days. The day wages are the same as above: man/day: 5,000 AMD.
5. Pruning and shaping	This entails hired labor costs calculated either by the number of the trees, or spent men-days. By the tree number calculation approach, the hired labor are paid 200-400 AMD per tree based on the tree size. As for the spent men-days calculation approach, it envisages day wages: man/day: 5,000 AMD.
6. Fertilizing	Traditionally, nitrogen fertilizers are most popular. 1 kg of state-subsidized fertilizer costs around 120 AMD. As for non-subsidized fertilizer, 1 kg costs 160 AMD. In recent years, phosphate and potash fertilizers have become more popular, with 1 kg costing 140 AMD.
7. Fertilizing: organic (manure)	Manure is mostly used in the regions with developed cattle-breeding along with farming. In such regions, 1 ton of manure costs 5,000 AMD.
8. Fertilizing labor cost	This entails hired labor costs calculated by spent men-days. The day wages are the same as above: man/day: 5,000 AMD.
9. Fighting pests and diseases	There is no universal approach to estimating the costs of pests and diseases fighting measures. The toxic treatment (grafting) action plans and frequencies differ from one tree species to another. Based on the interviews with experts and farmers, the Consultant made the rough estimations below of the annual costs of pests and diseases fighting measures per hectare: apple and pear trees: around 350,000 AMD, apricot trees: around 170,000 AMD, peach and plum trees: around 170,000-250,000 AMD.
10. Renting machinery equipment for tree grafting	Tree grafting is performed through specific equipment; 1,000 liter of grafting costs 15,000 AMD
11. Irrigation	There is no universal approach to orchard irrigation cost estimation either. The irrigation schemes differ from one tree species to another and predetermine the scale or irrigation. Also, the irrigation water cost might differ from one farmer to another, based on the irrigation network condition, water loss and species. Based on the interviews with experts and farmers, the Consultant estimated roughly that the annual irrigation water cost per hectare ranges between 80,000 and 120,000 AMD.
12. Wages of irrigation workers	This entails hired labor costs calculated by spent men-days. The day wages

Agro-technical measures, variable and fixed cultivation costs	Cost calculation approaches
	are the same as above: man/day: 5,000 AMD.
13. Land tax	The average annual land tax totals 10,000 AMD per hectare.
14. Harvesting	This entails hired labor costs calculated by spent men-days. The day wages are the same as above: man/day: 5,000 AMD.
15. Annual amortization of orchard	The costs associated with orchard set-up and cultivation till it yields crop are capital costs and therefore make part of the production cost. Based on the orchards amortization period of 20 years, the production cost is raised annually by 1/20th of the costs of orchard set-up and cultivation throughout the first 5 years.
16. Other costs	Conventionally 100,000 AMD per year.

The data in **Table 9** and **Table 10** resulted in the fruits prime cost estimates below.

Table 38 - Fruits prime cost estimates, AMD/ha

	Apple	Pear	Apricot	Peach	Plum
Tree inter-trunk area cultivation (hoeing and tilling the soil around the trees)	187,500	75,000	40,000	125,000	120,000
Tree inter-row area cultivation: preparatory works for irrigation network	40,000	15,000	10,000	40,000	40,000
Lime	18,750	8,400	3,000	18,000	18,000
Tree trunk and core branches liming/whitening	10,000	10,000	10,000	20,000	20,000
Pruning and shaping	250,000	100,000	40,000	125,000	120,000
Fertilizing with nitrogen, phosphate and potash fertilizers	135,000	140,000	135,000	135,000	135,000
Fertilizing labor cost	15,000	15,000	15,000	15,000	15,000
Fighting pests and diseases	350,000	165,000	170,000	250,000	250,000
Renting machinery equipment for tree grafting	150,000	120,000	75,000	108,000	108,000
Irrigation	120,000	120,000	120,000	100,000	100,000
Wages of irrigation workers	50,000	40,000	50,000	40,000	40,000
Land tax	10,000	10,000	10,000	10,000	10,000
Harvesting	250,000	250,000	165,000	200,000	120,000
Annual amortization of orchard	200,000	150,000	120,000	170,000	190,000
Other costs	100,000	100,000	100,000	100,000	100,000

Total	1,886,250	1,318,400	1,063,000	1,456,000	1,386,000

Crop yield kg/ha	**25,000**	**15,000**	**12,000**	**20,000**	**10,000**
Prime cost: AMD/kg	**75.5**	**87.9**	**88.6**	**71.8**	**138.6**

No doubt, the fruits prime cost calculations above are conventional. Hence, they may serve as an approximate estimate, rather than a sole and final solution. As mentioned above, the prime cost estimate relies on the fruit production scenarios mostly typical of the Ararat Valley. Also, the estimate rests on "actual" cultivation practices in use rather than "theoretical" ones. In this sense, the estimate cannot universally cover all the cultivation practices throughout Armenia. The marzes differ in their climate conditions, soil quality (soil fertility level) and use of agricultural inputs and raw materials. Hence, the marzes of Ararat and Armavir marzes with smaller scope of cattle-breeding show relatively limited (or no) use of manure for fertilizing, as compared with similar rates of Aragatsotn, Kotayk, Vayots Dzor and Syunik marzes. Almost half (if not most) of the farmers still use only nitrogen fertilizers, and some other farmers already use both nitrogen, phosphate and potash fertilizers. As for irrigation water costs, they heavily depend on the gravity flow or pump propulsion system since gravity flow water supply is cheaper as compared to the pumped water supply.

The factors above ultimately influence both the fruit crop yield, and fruit production costs, which make up the 2 key indicators of prime cost formation.

Climate conditions and soil quality do not serve as decisive factors for **berries prime costs** unlike fruits since berries grow at all heights starting from low-lying up to mountainous areas. The cultivation costs of berries largely depend on their species: thus, strawberry is a plant, and raspberries, blackberries and currant are shrubs. Based on this, the prime cost formation differs from one berry species to another.

Strawberry prime cost formation is the most diversified one due to the variety of cultivation technologies. The cultivation of strawberry on open and closed grounds, weeds uprooting through weeding or agro-fiber and the pesticides level result in quite a high prime cost of strawberry ranging between 130 and 470 AMD/kg. The striking difference among the prime costs of the same product was revealed through calculations jointly with several strawberry farmers. Such calculations showed that they shared almost the same annual and fixed cultivation costs. The difference lied in cultivation technologies and crop yield rates. The Consultant made the estimate below jointly with Vahagn Hakobyan from Oshakan village (Aragatsotn marz) engaged in strawberry cultivation. The technology-related feature shown by this farmer is that he uses drip irrigation and agro-fiber to fight weeds. According to V. Hakobyan, the strawberry cultivation capital costs per hectare total 5,825,000 AMD, with amortization period of 4-years for 3,425,000 AMD, and 10 years for 2,400,000 AMD (drip irrigation system). Accordingly, the annual amortization costs for a 4-year capital cost cycle were estimated to make 1,100,000 AMD.

Table 39 - Prime cost estimate of strawberry cultivated in open ground

Costs	Unit of measure	Quantity	Price, AMD	Cost, AMD
Irrigation	cubic meter	7,000	11	**77,000**
Wages of irrigation workers	men-days	70	5,000	**350,000**
Bio-humus solution spreading	L	480	350	**168,000**
Bio-humus solution spreading labor cost	men-days	30	5,000	**150,000**
Harvesting	men-days	620	5,000	**3,100,000**
Containers	batch	1	300,000	**300,000**
Land tax	ha/year	1	10,000	**10,000**
Annual amortization	year	1	1,100,000	**1,100,00**
Other costs	conventional	1	100,000	**100,000**
Total				**4,256,100**

Crop yield, kg/ha	**40,000**
Prime cost, AMD/kg	**131.3**

According to the farmer, the prime cost of 131 AMD/kg might be obtained/ensured with crop yield of 40 tons per hectare (and he claimed to have yielded such crops with this technology). Most of the farmers we met (in Aragatsotn and Kotayk marzes) had cultivation costs similar or equivalent to those of the farmer above but their crop yields ranged between 13 and 20 tons/ha. Thus, the prime cost of the strawberry comprises the same 470 AMD/kg when it is cultivated in open ground and yielding a crop of 13 tons/ha, or that of the strawberry cultivated in closed ground (greenhouse) and yielding a crop of 20 tons/ha. We consider the strawberry prime cost below 470 AMD/kg more convincing with more realistic crop yield rates.

The feature above holds true for **raspberry** as well. Depending on the applied cultivation techniques (wire-and-pillar (trellis), or simply bunching) and pesticide use rate, the crop yield rates of different farmers may show striking differences. The reason above determine the prime cost of raspberry ranging between 262 and 360 AMD/kg.

The prime cost estimate below was carried out jointly with Hrachik Grigoryan from Artashavan village (Aragatsotn marz). The technology-related feature shown by this farmer is that he set up his orchard by the trellis method that covers considerably more expensive technology as compared to the simple weeding of raspberry bushes. According to the farmer, the raspberry cultivation capital costs per hectare total 10.8 million AMD, with amortization period of 20 years; therefore the annual amortization costs total 540 thousand AMD. According tothe farmer, this raspberry cultivation method provides 10 tons/ha crop yield, with raspberry prime cost totaling 227 AMD/kg (see the estimate below).

Table 40 - Raspberry Prime cost estimate [1)]

Costs	Unit of measure	Quantity	Price, AMD	Cost, AMD
Slight pruning and shaping (spring)	men-days	3	5,000	**15,000**
Weeding by equipment	times/ha	2	50,000	**100,000**
Hand weeding	men-days	20	5,000	**100,000**
Tying up stems	men-days	4	5,000	**20,000**
Irrigation	Ha	1	70,000	**70,000**
Wages of irrigation workers	men-days	40	5,000	**200,000**
Pesticides (fighting pests and diseases)	l	5	7,000	**35,000**
Bush grafting labor costs	men-days	10	5,000	**50,000**
Slight pruning and shaping (summer)	men-days	12	5,000	**60,000**
Fertilizing with manure (autumn)	kg	6,000	6	**35,000**
Fertilizing labor costs	men-days	8	5,000	**40,000**
Harvesting	men-days	250	4,000	**1,000,000**
Containers	batch	1	300,000	**300,000**
Land tax	ha	1	10,000	**10,000**
Annual amortization		1	540,000	**538,333**
Other costs	conventional	1	50,000	**50,000**
Total				**2,623,333**

Crop yield, kg/ha	**10,000**
Prime cost, AMD/kg	**262.3**

[1)] - Blackberry and currant prime cost estimates are quite similar.

Unlike the trellis raspberry cultivation techniques, the so-called bunching technique significantly reduces the capital and ongoing costs. However, the raspberry crop yield rates are too low in this case. Most of the raspberry farmers apply this techniques. According to the average estimates, if the crop yields by this techniques make 5 tons/ha, the raspberry prime cost totals 360 AMD/kg.

14. **Quality of fruits and berries.**Regardless of the extent to which farmers comply with all the agro-technical requirements, all the fruits and berries yielded cannot be completely identical. Thus, some

of the harvested fruits and berries might be large and some others might be small, some might be ripe and some others unripe, etc. The data collected through interviews of farmers and experts make it possible to divide the fruits and berries crop into 3 groups by its quality:

1) **high-**quality products making **40-50%** of the crop;
2) **medium-**quality products making **20-30%** of the crop; and
3) **low-**quality products making around **30%** of the crop.

These rates are of vital importance and directly influence the profitability of farmers' activities. The matter is that fruits and berries of different quality are sold at different prices. Moreover, farmers sell high-quality products several times above their prime costs, and low-quality products below their prime costs. Therefore, farmers' profitability should be estimated by the **weighted average cost price** depending on the proportions of high, medium and low quality products.

15. **Farmers' profitability.** By comparing the fruits and berries prime costs above and their sales prices in 2014-2015, we estimated the profitability of farmers' production activities. As for apples and pears, we considered the sales prices of 2014, and as for the other fruits - those of 2015. To estimate the profitability, we first estimated the **fruits and berries average sales price** weighted by product quality proportions as shown in the previous section.

Table 41 - Farmers' profitability estimate

		Apple	Pear	Apricot	Peach	Plum	Berries	
							Strawberry	Raspberry
Primary value in average favorable year, AMD/kg (see Table 38)		76	88	89	72	139	470	360
Product sales prices (AMD/kg), including	High-quality product price	300-500	400-600	400-550	400-600	500-700	800-1,000	1,500-1,700
	Medium-quality product price	150-250	200-400	200-300	150-300	250-350	600-800	1,300-1,500
	Low-quality product price	30-80	80-150	50-150	80-120	80-120	300-500	900-1,200
Weighted average product sales price, AMD/kg		245	335	318	375	311	700	1,385
Farmers' profitability, AMD per kg		169	247	229	303	172	230	1,025
Profitability / prime cost		2.22	2.81	2.57	4.21	1.24	0.49	2.85

As noted above, harvesting is the last stage covered in the fruits and berries prime costs estimation. Such approach rests on the fact that while farmers start selling their products from their own orchards, this does not mean that they carry no other costs to be incorporated in the product prime cost. For instance, farmers take (transport) a considerable bulk of their production to wholesale markets by carrying relevant transportation costs. Some farmers store long-term storage fruits, namely apples and pears, in refrigerators to sell them later at a higher price. In this case, they carry electricity or leasing costs, which also make part of their products' primary value. There might be a variety of scenarios and it proves impossible to provide separate estimates for each of them. It should be borne in mind that additional cost items automatically results in higher sales prices of fruits and berries.

16. **Storage life of fruits and berries.** The fruit and berries farmers mostly aim to sell their products at higher prices rather than increase the volume of their production. Therefore, post-harvest processing, sorting, packaging and prolonging the sales period are of essential importance. All these measures make it possible for the farmers to significantly improve the product competitiveness and generate higher income.

The fruits and berries covered under the Survey differ dramatically in their storage life. Thus, pome fruits, namely apples and pears, have the longest storage life, with some of their sorts stored for up to 8 months after harvesting, depending on storage conditions, mostly temperature. Apples and pears can have longer storage life if stored in refrigerators under stable temperature conditions as required. Many farmers with no such conditions, store their products in their cellars taking an advantage of the low temperatures in autumn or winter months. In such conditions, the storage life of apples and pears decreases to 4 or 5 months.

Stone fruits, namely apricots, peaches and plums, are difficult to be stored for long even in refrigerators. Therefore, this fruits' production and sales mostly occur within the same season.

As for berries, they range between the pome and stone fruits by their storage life. While they cannot be stored for long without special storage conditions, by deep freezing their storage life might be extended to many months.

Table 42 - Fruits harvesting (production) season and storage life

Fruits and berries	Production and storage /sale	Year 1												Year 2					
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	I	II	III	IV	V	VI
Apple	Harvesting						♦	♦	♦	♦	♦	♦							
	Storage / Sale						✷	✷	✷	✷	✷	✷	✷	✷	✷	✷	✷	✷	
Pear	Harvesting								♦	♦	♦	♦							
	Storage / Sale								✷	✷	✷	✷	✷	✷	✷	✷			
Apricot	Harvesting						♦	♦	♦										
	Storage / Sale						✷	✷	✷										
Peach	Harvesting							♦	♦	♦	♦								
	Storage / Sale							✷	✷	✷	✷	✷							
Plum	Harvesting						♦	♦	♦	♦									
	Storage / Sale						✷	✷	✷	✷									
Berries	Harvesting					♦	♦	♦	♦	♦	♦								
	Storage / Sale					✷	✷	✷	✷	✷	✷								

17. **Production quantity, quality and price stability.** Armenia has never seen production quantity, quality and price stability of fruits and berries and cannot see any as long as the current orchard cultivation technological solutions are in use. As mentioned above, the strong impact of the climate conditions on the fruit-growing sector in Armenia constitutes the prime challenge. The introduction of the frost-resistant species has just been launched and is at the testing stage. To this end, imported seedlings are cultivated in small orchards. Meanwhile, orchards overwhelmingly comprise traditional and popular fruits.

The hail protection level is low. While 90% of the country's territory is considered prone to hail, the hail-protection makes only 10%, and hail-protection networks are still on the wish-list.

The fruits and berries production quantities are **inversely proportional** to their sales prices: **the greater production quantities, the lower the prices, and vice versa.**

The fruits and berries sale prices set by farmers vary a lot due to product quality. Products with most diverse quality range have broader price range.

Table 43 - Fruit and berry prices in 2014-2015, AMD/kg

Fruits and berries		2014	2015
Apple	High quality	300-500	
	Medium quality	150-200	
	Low quality	40-60	
Pear	High quality	400-600	
	Medium quality	200-400	
	Low quality	80-150	
Apricot	High quality	1,500-3,000	400-600
	Medium quality	1,000-1,500	200-300
	Low quality		50-150
Peach	High quality		500-700
	Medium quality		250-350
	Low quality		80-120
Plum	High quality		400-600
	Medium quality		150-300

	Low quality		80-120
Strawberry	High quality		700-1,000
	Medium quality		600-800
	Low quality	350-370	300-500
Raspberry	High quality		1,500-1,700
	Medium quality		1,300-1,500
	Low quality		900-1,200
Blackberry	High quality	500-800	500-800
	Medium quality	300-500	300-500
	Low quality		
Currant	High quality		600-1,000
	Medium quality		450-550
	Low quality		300-450

It is noteworthy that the prices of berries vary based on whether they are cultivated (produced) or wild. Wild berries are of poor quality as compared to those cultivated in orchards and usually cost about twice cheaper.

The prices differ significantly from season to season. The prices in**Table 43** are mostly typical of the harvest (supply) peak season.

Meanwhile, the first and last harvest prices in a season with very low supply might be differ significantly. For instance, in 2015, apricots were first harvested in Surenavan community in Ararat marz, where in the first 2 or 3 harvest days, high-quality apricot was sold at a price up to 1,200 AMD/kg, which fell to 400 AMD/kg in 10 or 15 days. This holds true for strawberry. While the release price from large manufacturers (e.g. Biga LLC) on the market supply peak season (summer months) is 700 AMD/kg, while the sales price of the strawberry grown in greenhouse in autumn or winter may jump to 2,500 AMD/kg.

18. **Production quantity growth potential.** The potential for fruits and berries growth is based on 2 key factors: a) availability of lands, and b) availability of sales markets. While there is no shortage of lands for setting up fruit and berry orchards, it is still difficult to estimate the area of lands suitable for growing certain fruits and berries. But one thing is clear; every year over 100 thousand hectares of arable lands, a part of which theoretically might be used for perennial nurseries, remain uncultivated for various reasons. According to the RoA Government decree,[40] 448 thousand ha of the Armenian agricultural lands are arable. And in 2014, the crop sown areas totaled 333 thousand ha;[41] this means that the arable land use level makes 74%. At the same time, it is noteworthy that only 27% (120

[40] RoA Government Decree № 1184-N dated 17.10.2013 on 2013 Report (Land Balance) on Availability and Distribution of Republic of Armenia Land.
[41] Source: “Agricultural Crops Sown Areas and Gross Harvest in 2014”, NSS, 2015.

thousand ha) of the arable lands are irrigated; this a serious obstacle to setting-up orchards. For comparison, note that the irrigation of the perennial nurseries makes 98%.

However, even if it were not for irrigation, farmers would still face challenges of selling their production, rather than that of production as such. In this regard, there are favorable conditions for fruits and berries since the sales and particularly export opportunities for these products expand year by year. And it is for such opportunities that farmers slowly but consistently expand their orchards. Hence, if in 2005, the fruits and berries orchard area covered 35 thousand ha, in 2015 it totaled 40 thousand ha. Grapes orchards show a similar picture, with their area expanding from 15 thousand ha in 2005 to 17 thousand ha in 2015. Even by the most lowest estimates, with these tendencies in place, after 10 years Armenia will annually produce additional 50 tons of fruits and berries, exceeding the current production rates by 13%. The surveyed fruit and berries will make over 90% of such production.

19. **Standards.** RoA Government relevant Decree (№ 1913-N dated December 21, 2006[42]) stipulates the safety, packaging, labeling, transportation and storage requirements for fresh fruits and vegetables, known as technical regulations for fresh fruits and vegetables. The technical regulation requirements above cover 89 standards in compliance with the AST and GOST standards. Each of them covers a certain food safety, packaging, labeling, transportation and storage issue of a certain fruit species. The list of standards is available on the website of the National Institute of Standards.[43]

It is noteworthy that the fruits and berries value chain links, with individual farms (farmers) as key actors, almost do not apply any of the existing standards. As a result, when classifying their products e.g. by their quality, it is either the farmers themselves or the consumers who rate such products under 1st, 2nd or 3rd classes by visual observation. Due to this neglected state of affairs, the product considered 1st-class by one farmer might be considered of 2nd class for other farmers or consumers. This gives rise to a series of misunderstandings over the product quality.

Yet, the question below is still actual: *Do farmers need to apply the standards?* The answer seems to be no, since the challenges farmers have faced with selling their products so far have never risen from the lack or non-application of standards. The farmers are not motivated to apply standards due to the quantities, persons and places the farmers and their consumers sell the fruits and berries (among resellers mostly in outdoor markets in Armenia and Russia).

The failure to establish such standards and ensure their application might be obstructive if the fruits and berries markets are retargeted to European countries, which however appears not quite real, given the present quantities of fruit and berry production.

20. **Organic fruit growing.** The development of organic agriculture dates back to 2002. Ever since, the organic fruit growing has seen a slow but steady progress. In 2003, Ecoglobe LLC, the leading Armenian organic agriculture and food production certificationcompany, introduced organic agriculture and food processing certification services. Since 2011, SGS Organic German company has also entered this market. As of 2012, the organic production areas served by Ecoglobe totaled 1,695 ha, with 300 ha of certified areas, 450 ha of areas at the transitional stage and about 800 ha of wild collection areas. And SGS Organic certified an area of around 145 ha. As of October 2015, Ecoglobe

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[42] Source: http://www.sarm.am/docs/kanon%20ptux.pdf
[43] Source: http://www.sarm.am/js/editor_innova/assets/vegitables.pdf

certified and recognized as organic orchards of 11 actors engaged in vegetable production release, and the orchards of another 7 actors are currently at the transitional phase. The first organic horticulture project was launched in Dimitrov village of Ararat marz (Avetik Nersisyan, Ecofarm demonstration farm). Today, the fruit and berry production business entities and individuals below have achieved considerable success in this field: 'Tsirani Aygi' LLC (v. Argina, Armavir Marz); 'Tsiranut' CJSC (v. Aragats, Aragatsotn Marz); individual farmer Tigran Ghazaryan (3 ha of raspberry production, v. Alapars, Kotayk Marz); processing companies: Yerevan Beer CJSC (around 100 ha) with its Areva organic juices; 'Tamara Fruit' CJSC (v. Karbi, Aragatsotn Marz) with its organic berries and processed products; 'Sis Natural' LLC with its 'Yan' organic juices; EuroTerm LLC with its organic orchards (v. Vanand, Armavir Marz) and processed products (Yerevan). As of 2012, exports of organic products totalled almost 151 tons, with 'Areva' organic juices making up around 40 tons (Singapore, Malaysia); 'Tamara Fruit' products - around 60 tons; 'Yan' organic juices - about 20 tons, as well as fresh fruits, dried herb and honey (about 2 tons).

2.2.2 <u>Input Supply (Agricultural Raw Materials, Inputs and Services)</u>

21. **Common varieties of fruits and berries.** Pome fruits, namely **apples and pears** have the widest variety. It is this diversification that ensures the long-term production (harvesting) of apples. In Armenia, European varieties of apple are especially common, with orchards located mostly in foothills and partly in mountainous areas. Unlike the local varieties, the European ones yield much higher crops. The most common apple varieties are Golden Delicious, Star Krimson, Aydared, Renet Simirenko and Kekhuri. As for pears, the most common varieties include: Malacha, Forest Beauty and Dzmernuk late-ripening varieties.

As for the stone fruits, their varieties are narrower. Thus, **apricots** have 2 prevailing varieties. Thus, Yerevan apricot variety with popular name "Shalakh" yields 80-85% of the crops (80-85 thousand tons in an average favorable year). This variety a apricots are exported and quite well-known in Russia. And the Saten variety, in a great demand among processors, dried food producers on the domestic market and consumers at large for preservation purposes, yields about 15% of the crops (15 thousand tons in an average favorable year). About 5% of the apricot crops comprises other varieties (mostly Khosrov, Ghevond, etc.).

Traditionally, all the **peach** varieties cultivated in Armenia are fuzzy-skinned. They include: Zafra, Lemon, Narinj (orange), Tchughur and Uspekh. In recent years, the nectarine varieties (fuzzless) have become quite common. Peach has quite a long harvesting terms due to its varieties. Early-ripening varieties are harvested from mid-July to August, the medium-ripening ones – from mid-August til late September and the late-ripening ones - in October.

Plum also has local and imported varieties. Local common varieties include as follows: Black, LargeGreengage, Yellow Plum, Vazir, Kanachken and Albukhar. Imported plum varieties include as follows: Anna Spath, Peachy, Green Greengage, Vengerka Italian, Vengerka Ordinary, and Victoria.

The Armenian market offers June-bearing and ever-bearing **strawberry**; local (traditional) and imported (European) varieties. In recent years, the varieties below have been imported in Armenia: Albion, Portola, Flamenco, Ostara, Suite and Mieze Schindler. Cultivated in the Armenian greenhouses and in open ground, these varieties have already yielded transportable abundant crops with long-term storage and products with marketable appearance and good taste. Other most common strawberry varieties include as follows: Ada, Druzhba, Gora, Red and Rich.

As for the other berries, it proves quite difficult to identify the most common varieties. The RoA Agriculture Minister's Order on Approving the List of Plant Varieties[44] includes the **raspberry** varieties below: Novokitaevskaya, Novost Kuzmina, Sputnitsa and Skromnitsa; as well as **blackcurrant** varieties**:** Belaruskaya sladkaya, Zagadka, Pilot Alexander Mamkin, Otlichnitsa; and **redcurrant** varieties**:** Nenaglyadnaya and Rondom.

22. **Fruit and berry planting stock suppliers.** Most of the demand for the planting stock (seedling, sapling, seeds) of all the fruits and berries cultivated in Armenia is met by local production. Also, Armenia imports some planting stock. The local planting-stock production is mostly concentrated in the communities that had state nursery farms back in the Soviet times. Such concentration is accounted for by the fact that it such communities have labor force specialized in this kind of production. Of course, this does not suggest that other communities have no nursery areas.

Generally, farmers and relevant specialized companies are engaged in production of plating stock. According to our estimates, the number of such farmers throughout Armenia might total 1,000. Unlike fruit production overwhelmingly concentrated in the Ararat Valley (Ararat, Armavir and Aragatsotn marzes), the planting-stock production is geographically diversified. Almost every marz has communities specialized in plating stock production, some of which are well-known major suppliers, including:

1) Karbi and Ohanavan communities, Aragatsotn marz;
2) Narek (about 90% of rural households are engaged in planting-stock production) and Kaghtsrashen communities, Ararat marz;
3) Lenughi community, Armavir marz;
4) Tsovinar (about 30 farmers annually produce at least 50 thousand seedling), Mets Masrik, Artsvanist (with a nursery area of 1 ha, one of the largest in Armenia) communities, Gegharkunik marz;
5) Shnogh and Tchochkan communities, Lori marz;
6) Nor Geghi, Alapars and Dzoraghbyur communities, Kotayk marz;
7) Meghri community, Syunik marz;
8) Yeghegnadzor, Getap, Rind and Areni communities, Vayots Dzor marz; and
9) Ayrum and Ayghedzor communities, Tavush marz.

Planting-stock producing farmers mostly operate on homestead, privatized and rented plots of 1,000-5,000 sq. m.

23. **High-quality planting stock availability.**Mostly, farmers face no difficulties with planting stock availability. On the contrary, it is the planting-stock producing actors that mostly complain of some difficulties with the sale of their production. There are very small registered short supply rates of any seedlings on the market. Such short supply might occur in cases when, for instance, some farmers, make up their mind to set up a large cherry orchard and purchase most of the seedling available on the market. Marzes are engaged in intense trade of planting stock. The marzes of Ararat, Armavir,

[44] See RoA Agriculture Minister's Order № 28-N dated February 8, 2006 on Approving the List of Registered Plant Varieties for the Purposes of their Use and Further Breeding in the Republic of Armenia.

Vayots Dzor, Gegharkunik and Kotayk are considered self-sufficient in terms of planting stock production. Whenever facing insufficient supply, farmers purchase planting stock from other marzes.

24. **Fertilizers and pesticides markets.** Armenia mostly imports fertilizers and pesticides. The market volume covers as follows: a) fertilizers, including 90% of nitrogen, 5% of phosphate, 3% of potash and 2% of other fertilizers: 50-55 thousand tons (20-22 million USD) annually; and b) pesticides: about 500-550 tons annually.

25. **Fertilizer and pesticide suppliers.** The fertilizer and pesticide markets are known for a high level of monopolization; this results in the lack of transparency and scarce data on such markets. According to official data, in 2012, 3 (Catherine Group, Agrimat Co and 'Masis Berriutyun') of less than a dozen fertilizer market entities (importers) ensured 76% of the market supply. The companies above are linked to well-known oligarchic circles and are spotted from time to time to abuse their dominant position on the market. In Armenia, fertilizer production and sales are not licensed activities. Most fertilizers are imported from Russian Federation, Iran and Georgia.

As for pesticide production and sales, such activities are licensed in Armenia. The RoA Ministry of Agriculture issued about 80 licenses to large and small entities engaged in such activities. Nevertheless, this sector lacks adequate control, since along with the licensed entities, there are lots of unlicensed entities (resellers) selling pesticides. Such resellers are concentrated mostly in the marzes of the country. The pesticide market is even more monopolized, as compared to that of fertilizers. Natali Agro Company provides almost 90% of the market supply. Pesticides are imported from various countries, e.g. Germany, Switzerland, China, Iran, etc.

26. **Availability of fertilizers and pesticides.** In Armenia, the fertilizers and pesticides import volume is determined by farmers' solvent demand. In this sense, farmers face no availability problems. Instead, there are problems concerning the prices and quality of such products. The dominant actors on fertilizers and pesticides market constantly seek to abuse or take advantage of their position and **raise prices** on any pretext. The state actively intervenes in the prices through the leverages of the State Commission for the Protection of Economic Competition of the Republic of Armenia (SCPEC) and the role and status of the RoA Ministry of Agriculture as the major fertilizer purchaser. In fact, the RoA Ministry of Agriculture orders about 50% of imported fertilizers and subsidizes most of its costs. Particularly, 1 sack (50 kg) ofsubsidized fertilizers costs 6,000 AMD, and that of unsubsidized ones costs 8,000 AMD.

There is a wide variety of pesticide types and prices. Relatively high-quality European pesticides are several times expensive as compares with the Chinese ones. Most farmers with insufficient funds of for saving purposes mostly use cheap pesticides, and consequently get poor results and express discontent. According to the experts, relatively expensive and more effective pesticides are mostly purchased in Yerevan and nearby marzes, and the relatively cheaper ones are purchases by farmers from remote marzes.

As for fertilizer and pesticide **quality,** the problems at hand stem from the farmers' low level of knowledge and inadequate control of market. Also, some of the imported products above contain expired pesticides among them, and some fertilizer packages with signs of substance 34% upon relevant analysis appear to actually contain twice as less, etc.

27. **Use of organic fertilizers.** Farmers largely use manure for fertilizing. Most intensively manure is used in the areas with developed cattle-breeding, along with fruit growing (marzes of Aragatsotn, Kotayk, Vayots Dzor and Syunik). While, the Ararat Valley has lower rates of manure application (due to its availability), such practices still exist there. Farmers there mostly use bird droppings for fertilizing. Farmers purchase 1 truck (45 tons) of manure for 25-50 thousand AMD.

28. **Equipment and machinery use by farmers.** To cultivate their fruit and berry orchards, farmers need a tractor with its various functional toolkit, particularly plows, sprayers, etc. Most individual farmers own neither tractors, nor tractor sprayers. Instead, most of them use petrol or mechanical manual sprayers (almost every farmer owns such devices with low efficiency and used to cultivate small plots). In almost every village, there are machine operators with their own tractors, sprayers and plows who provide paid services to farmers. However, the number of such machine operators is not sufficient to ensure timely services and avoid delays in spraying. The tractor spraying services cost 15,000 AMD/ha and inter-row area ploughing costs 25-40 thousand AMD/ha. The prices above cover both the machine operator's wages (income), and fuel costs.

The vast majority of farmers pay for the machinery services immediately and in cash for the machine operators to buy fuel and necessary spare parts. Very seldom can farmers pay in kind; mostly, wheat or potato farmers do so.

29. **Agricultural raw materials and input quality requirements.**The primary requirements for fruits and berries planting stock concern the purity of specific fruit or berry varieties and the quality grade of the planting material. Hence, 1st class seedlings should have a well-formed root system, a straight trunk of a certain thickness, and a few well-formed core branches. The costs of 1st class fruit seedlings range between 1,000 and 1,500 AMD. Seedlings of lower classes with highly probable purity of fruit variety cost between 800 and 1,000 AMD. The market also offers low-quality seedlings with very questionable purity of fruit variety with costs ranging between 400 and 500 AMD.

As for berries, the raspberry and blackberry planting stock is more available as compared to that of strawberry. Strawberry planting stocks (rooted) are offered by the farmers engaged in its cultivation for 30-50 AMD/pcs. As for ever-breeding European varieties of strawberry, their prices climb up to 250 AMD/pcs. The average price for raspberry rooted planting stock makes 100 AMD. The seedlings of blackberry American varieties (thornless blackberries) cost up to 400 AMD. All the requirements for tree planting stocks above (purity if berry variety, quality grade of planting stock) hold true for those of berries as well.

2.2.3 Business Relations between Value Chain Actors

30. **Nature of business relations.** The actors in the fruits and berries value chain develop both formal and informal relations. Mostly, informal relations prevail. As for formal ones, they mostly arise between grape producers and their customers. The actors of the surveyed fruits and berries value chain overwhelmingly shape non-formal business relations, with: a) verbal arrangements; b) cash payments; and c) disputes settled through negotiations beyond the legal framework.

31. **Factors influencing business relations.** The **legal status of fruit and berry producers (farmers)** is the factor determining the nature (either formal or non-formal) of their business relations. As already mentioned, a considerable bulk of the fruit and berry value chains actors carry out unregistered, pay

no taxes and submit no reports on their business activities. Actually, it makes almost no sense for farmers to own a bank account, because since they find it inconvenient (villages have no bank offices and almost no ATMs) and have no skills and experience of bank account management. Given this, agricultural product purchases have no option but to pay farmers in cash, which renders documenting the sale and purchase transaction unnecessary.

Along with rights, formal (contractual) relations envisage certain responsibilities. Both farmers and customers (exporters, intermediaries) **are reluctant to assume any responsibilities**. At first sight, it seems that to ensure their sales and supplies, the producers and buyers, respectively should wish to sign contracts with each other. However, both sides refuse to take such formal measures since producers are not sure whether they will be able to comply with their contractual obligations under the unpredictable climate conditions, and the buyers are concerned that their advance payments will remain with the farmers and generate payables. There are some precedents for such practices, especially with apricot trade.

The intermediaries reselling the producers' fruits and berries take advantage of the latter's being not interested in documenting their transactions. By not documenting their purchase transactions, the intermediary retailers with due state registration and cash registers, can further sell such undocumented products and hide their sales turnover (to pay lower taxes).

The state of affairs above holds true for the relations between producers and processors. They do not develop any formal relations, since producers do not need them as such. As for processors, non-formal business relations help them to maneuver in their bookkeeping by recording the number of purchased products at their own discretion rather than the real ones.

2.2.4 Storage and Warehousing of Primary Products

32. **Storage and warehousing types.** After harvesting fruits and berries, the farmers transport the crops not sold on the spot (in the orchard) to warehouse facilities for short-term or long-term storage. Products with short-term storage life (stone fruits, berries) can be temporary stored in various premises, including cellars in farmers' houses, garages, or any building not exposed from direct sunlight or cool to some extent. Within at most 2 or 3 days, fruits and berries are delivered to market from such storage facilities. As for fruits with longer storage life, e.g. apples and pears, the basic storage infrastructure covers cold storage facilities.

33. **Number and capacity of cold storage facilities.** There are no accurate data on the number and capacity of cold storage facilities. The information available mostly relies on survey findings and expert opinions. By various estimates, in the 1980-1990s, the overall capacity of crop production cold storage or refrigeration facilities in Armenia totaled 30,000 tons. The vast majority of such capacities is ensured by 5 largest cold storage facilities located in Karbi (Aragatsotn marz), Armavir (Armavir marz), Nor Geghi (Kotayk marz) and Yerevan. This number of such facilities was obviously insufficient to meet the needs of farming households. Therefore, starting from the mid-1990s, farmers started establishing small private cold storages. According to a survey dating back to 2012,[45] there are about 1,700 small cold storage facilities in Armenia, with a gross capacity of at least 75-80 thousand tons. The long-term cold storage of most (93%) fruits is ensured by refrigerators. Only 7% of the apple crops is stored in cellars, storage bunkers and other storage facilities.

[45]Capacities of cold storages operating in Armenia, FREDA 2012.

Presently, the enhancement of cold storage facilities is under way. In recent years, major investments in this sector have been made by Spayka LLC (cold storage complex with a capacity of 1,000 tons) and Armenia International Airports CJSC which launched a cold storage with a 500-ton capacity at Zvartnots Airport. By rough estimates, the gross cold-storage capacity in Armenia may range between 110 and 115 thousand tons.

34. **Storage conditions efficiency.** Farmers assess the efficiency of storage conditions by 2 criteria: a) How long can they store fruits and berries? and b) To what extent can they minimize the losses? During fruits storage, some losses may occur in forma of wastes. They depend on control of the necessary stable temperature and humidity in the storage facilities. In this sense, the most effective storage facilities are refrigerators. Large refrigerators with modern equipment ensure high level of temperature and humidity control. The crop losses of the products stored in such faculties do not exceed 5%. As for small and especially homemade refrigerators (making the overwhelming majority of the 1,700 small cold storage facilities above) carry some problems in this regard. They are mostly equipped with air conditioners unable to fully ensure the necessary temperature and humidity. In such refrigerators, the crop losses may total up to 10% of the total. And the situation with the fruits stored in cellars and storage bunkers is even worse. Such storages are cold mostly due to natural weather conditions and can by no means have stable temperature or humidity. In such storage facilities, the crops losses may total up 20-30% of the total; such losses sometimes exceed the cold storage costs.

35. **Supply and demand for cold storage capacities.** As mentioned above, the gross cold storage capacity (supply) in Armenia may range between 110 and 115 thousand tons. To identify the demand for such capacities and compare it against the supply, we cannot consider only the fruits targeted under the Survey.

While cold storage facilities may store a variety of products: fruits, potato and other vegetables, the biggest demand for long-term cold storage of products is generated by apples, pears, grapes and persimmon to be **stored at the same time**. Since the production (2,000-2,500 tons) and import volumes of persimmon are not too large, we hereby focus on apples, pears and grapes. At the same time, we ignore the technical varieties of grapes (making 70% of total grapes crops) and consider only the table and universal varieties (in the aggregate making 30% of the total grapes crops).

Table 44 - Production quantities of fruits generating demand for cold storage

Products	Production quantity in average favorable year, tons	Crops harvested in September-October, with portions to be stored in refrigerators	
		%	tons
Apples	130,000	66%	85,800
Pears	30,000	50%	15,000
Grapes of table and universal varieties	80,000	65%	52,000
Total			**152,800**

There are no reliable estimates and well-grounded opinions on the portion of the production quantity above stored by farmers in refrigerators. Yet, some analyses might be used to make rough estimates. About 30% of the 152,800 tons of apples, pears and grapes harvested in September and October are purchased as low-quality products by processors. Some part of these fruits are consumed within producing entities (e.g. for processing vodka), and the rest is disposed of. As for the remaining 107,000 tons of the crops, the farmers have to store them to sell them within the following 6 or 8 months. This figure can be considered as the maximum rate for the cold storage capacity demand. Also, considering that farmers (mostly smaller producers) store some portion of the apples and pears crops in their own cellars and storage, it becomes obvious that at the moment, there are sufficient cold storage capacities to is meet the farmers' demands.

36. **Cold storage service prices.** While the large cold storage facilities can provide higher-quality and cheaper services as compared to the small homemade refrigerators, our discussions with a few farmers and cold storage facility managers suggest that the cold storage prices are balanced to some extent with **30 AMD annually per 1 kg of stored product**. This price covers both includes both the maintenance and operating costs of the cold storage facilities and the income of service providers.

2.2.5 Primary Product Transportation/Delivery Vehicles

37. **Fruits and berries transportation/logistics.** The fruits and berries transportation/logistics has a variety of solutions depending on whether such transportations are domestic or foreign. As for **domestic transportation** (transportation/delivery of fruits and berries within Armenia), there are no specialized institutions and organizations. Such services are provided by entities and individuals with their own trucks who only fulfill the function of transportation. Domestic transportations are carried out by farmers, retail or wholesale resellers of their production and in some cases by processors. The limited transportation volumes among individual farmers and resellers constitute the major obstacle to capacity building of the domestic transportation system. Actually, the volume of farmers' products to be transported is so small that they can be even transported by a passenger vehicle. As for **foreign transportation** (fruit and berry exports from Armenia), the situation is quite different. Given that exporting only large volumes of products may be economically efficient, the need for large trucks made some individuals and organizations invest in this sector.

38. **Domestic transportation vehicles and prices.** Farmers and resellers (who purchase products from farmers either in their orchards or storage facilities) of their production use similar transportation vehicles below for domestic transportations:

1) personal vehicles, including passenger cars and truck vehicles, e.g. Yeraz, Gazel, Ford, with average carrying capacity (up 3-5 tons); and
2) hired vehicles, mostly trucks with a carrying capacity (or loading capacity) of 3-5 tons, e.g. Yeraz, Gazel, Ford Gazelle, Ford and buses.

Farmers use their **private** vehicles only to transport their own production to its end-consumers or to the market. As for trucks with average capacity, farmers mostly use them to transport their production, but can sometimes transport that of other farmers for a relevant fee. The resellers of fruits and berries use for transportation only their own passenger vehicles or trucks (depending on the scope of their activities).

Farmers who have no vehicle or cannot drive their personal vehicles for transportation,**hire** othervehicles for such purposes. Hence, such farmers use the services of the other private persons who own trucks with average capacity and deliver transportation services. **In almost every rural community with a significant volume of fruits and berries delivered to the market, there is at least one individual who transports the production of other farmers by his vehicle.**

The table below shows the prices for transportation of farmers' production by different vehicles under the following scenarios:

- transportation/delivery road route length: about 30 km;
- the transportation vehicle is equipped with a gas-pressure system;
- place of product sales: retail and wholesale markets.

Table 45 - Fruits and berries transportation/delivery prices by types of vehicles

Status of transportation vehicle	Type of transportation vehicle	Costs	Maximum weight load	Transportation costs per 1 kg
Private	Passenger	fuel (gas): 1,500 AMD market area rental fee: 1,000-1,500 AMD	500 kg	5-6 AMD/kg
	Trunk with average capacity	fuel (gas): 3,500 AMD market area rental fee: 2,000-2,500 AMD	4,000 kg	1.4-1.5 AMD/kg
Hired	Passenger	-	-	-
	Trunk with average capacity	1 box (= 10-15 kg): 200-250 AMD; or 10 kg: 200 AMD	4,000 kg	17-20 AMD/kg

Obviously, farmers find it much more profitable to farmers to transport/deliver their own production by their private vehicles. Also, it is quite obvious that using average capacity trucks to provide transportation services to farmers is quite profitable, since drivers of fully loaded vehicles earn 68-80 thousand AMD, and there costs hardly exceed 16.5 thousand AMD (fuel: 3,500-4,000 AMD; market area rental fee:: 2,000-2,500 AMD; depreciation, food and other costs: 5,000-10,000 AMD).

39. **Foreign transportation vehicles and prices.** Fruits and vegetables can be exported from Armenia in the 2 ways below: a) by land transportations, and b) air transportations. Land transportations are provided exclusively by trucks. Along with the export volume of the Armenian fruits, the technical requirements (temperature conditions and transportation speed) for fresh fruit transportation can be met only through transportation by trucks. For instance, rail transportation appears inconvenient. Fruits are transported in trucks with a 20-ton-capacity cold storage trailer (fruit effective load (net) weight: an average of 18 tons). Land transportation is provided by a large entity and dozens small entities. **Spayka LLC** is the **largest international transportation company.** Its fleet of vehicles comprises 100 cold-storage trucks. These cold-storage semi-trailers are equipped with the most modern technologies with thermal protection systems and cold storage installation. These vehicles are designed for transportation of highly perishable frozen food. Several companies and a few dozens private persons provide transportation services with only 1 or several trucks. Fruit and berry transportation to Moscow (main export destination, around 3,000 km) by trucks with 20-ton-capacity cold-storage trailers costs 8-10 thousand USD. It follows that costs of 1 kg of fruits or berries transportation at a distance of about 3,000 km costs 210-270 AMD.

The air transportations are very limited. Exporters export by air only small batches of fruits mostly within tthe first days of harvest, when the first crops can be sold on the export market at a price 10 times higher than that during the harvest peak days.

As of September 2015, 96% of the exported fresh fruit and vegetables were transported by trucks, and 4% by air.

2.2.6 Communications

40. **Forms, objectives and frequency of communication between buyers and suppliers.** To ensure business relations, the actors in the ‘agricultural raw materials and input suppliers - farmers - buyers' chain communicate with each other to some extent. Communication forms, objectives and intensity differ from one link to another:

- **Farmers’ communications with agricultural raw materials and input suppliers**This value chain link shows passive communication depending on the intensity and frequency of agricultural raw materials and inputs (fertilizers, pesticides, tools) procurement by farmers. These relations are strictly commercial, shaped exclusively in the buyer-seller format.
- **Farmers’ communications with intermediaries, retailers and wholesalers** Farmers directly communicate with the buyers who directly contact them to purchase their products. Such contacts are especially frequent if intermediaries are relatively big purchasers. They might contact the farmers early in the season (spring) to learn about the potential crops volume and quality. At this stage, they usually do not negotiate the price yet, but some buyers might give farmers some advance payment to ensure supply of the necessary products. At harvest time, farmers and intermediaries contact regularly through meetings or by phone.
- **Farmers’ communications withexporters**The most profitable buyers for farmers are exporters. They purchase large volumes of production at high prices. Farmers either communicate directly with the exporters or their brokers who are come from the same communities as farmers or other neighboring communities. Actually, every major exporter has brokers in the major fruit producing villages to keep in touch with dozens farmers there. Starting from the beginning of the season (spring) and til the end of harvesting, such brokers help the exporters with the issues below: a) collect live data on the expected quantity and quality of the crops; b) make preliminary crops purchase arrangements with farmers, sometimes by making some advance payments (with amounts submitted by exporters); and c) on harvest days coordinate and control collection, weighting, truck-loading and delivery of the necessary quantity of the products. The exporters’ brokers are paid for all these functions by certain amount per 1 kg of fruits. As for farmers’ contacts with smaller exporters, the outline of their communication with intermediaries above holds true for such communication as well.

41. **Level of trust between buyers and suppliers.** There is a certain mutual dependency between farmers and their buyers. To ensure their production sales, farmers seek to maintain stable relations with the buyers. As for buyers, they are concerned over supply stability and therefore seek to build honest and transparent relations with the farmers. As a result, both of them highly appreciate their relations and seek to build them on the principle of mutual trust.

2.2.7 Major Constraints for Fruit and Berry Production and Proposed Solutions

42. There are macro- and micro-level constraints for the production of fruits and berries. Furthermore, the macro-level constraints are global in nature and have the largest scope of impact. Such macro-level challenges for the fruit and berry production in Armenia are listed below:

43. **High-level adverse affect of climate conditions**that appears in the forms of regular frosts, hail, and draughts. While unfavorable climate conditions affect fruit and berry production every year, their impact may differ year by year. As a result of such impact, the producing entities bear losses. Particularly, they: a) lose either the entire, or some part of their production, or b) yield low-quality products (with poor marketable appearance). In both cases, producers suffer reduced income and improvement opportunities. This challenge might be solved by introducing agricultural insurance system, which is not in place yet and its lack can be considered as another challenge to the fruit growing sector.

44. **Lack of agricultural insurance system.** With no agricultural insurance systems in place, the Armenian farming households have to face the climate-related risks on their own. While the state attempts to take steps to compensate (loan interest subsidies, free seeds, irrigation or land tax debt forgiveness) for the losses of the farmers caused by natural disasters, the Armenian economy is not strong enough to ensure full compensation of farmers' losses. The agricultural insurance system development requires that the 3 parties, namely the state, insurance companies and farmers reach a consensus on sharing the agricultural risks. This entails additional financial commitments for the parties, especially for the state and farmers, which seams a difficult task in the current social and economic situation of the country.

45. **Product sales challenges.** Producers have always faced and still do face the challenge of product sales. The matter is that according to the findings of 2015, the balance of grapes (only table varieties), fruits and berries (=production+import-export) in Armenia will range between 415 and 420 tons. Supposing that the Armenian population makes 2.5 million, the per capita fruit consumption will make 0.46 kg/day which, however, seems quite unreal (even without taking into account the poverty level of 35%). The figures above show that the fruit market in Armenia might be considered quite abundant and self-sufficient. However, unlike the population (consumers) rate and standard of living, the production quantities increase year by year. In average favorable years farmers always face issues with the sale of their products. The only solution to the situation lies in promotion of processing industry and export.

46. **Low diversification level of sales markets** The Armenian processing units and exporters are mostly oriented to the Russian market. Such heavy dependence automatically limits the Armenian processors' and exporters' opportunities especially given the another shock and recession of the Russian economy (continuing for over 2 years). This issue might be resolved only by diversification of the sales markets. Armenian farmers cannot enter solvent markets (Europe or stable countries in the Middle East) due to a number of obstacles, particularly small supply quantities and undermined stability, and lack of uniform quality standards.

47. Below are the reasons underlying the micro-level challenges for fruit growing in Armenia:

48. **Small scale of producing farms.** With their small farming areas, the fruit and berry producers are unable to ensure large-scale stable supply. Within around 125 thousand of producing farms, there are

not at least 1,000 farms with orchard areas of or over 50 ha. Agricultural activities on small farms prove inefficient due to the increased share of fixed costs. This challenge faced by small farms can be only solved by land consolidation through setting up farmers' associations (agricultural cooperatives, associations).

49. **Lack of knowledge.** It should be borne in mind that fruit-growing farmers overwhelmingly have been engaged in such activities for a maximum of 25 years and in fact, they had become farmers all by chance. Therefore, their activities are based on their own experience mostly gained by ***trial and error***, rather than education and knowledge. Actually, small farming households do not perceive fruit-growing as their permanent or perspective occupation of and therefore take not steps to getting vocational agricultural education

2.3 Processing

2.3.1 Processing Capacities

50. **Fruits and berries processing sector.** In Armenian, the fruits and berries processing sector can be divided into 2 parts: a), and b) industrial processing.

51. **Private home processing of fruits and berries by the population.** These practices is based on traditions and cultural features dating dozens or even hundreds of years back. People process fruits and berries and transform them into fruit preserves to ensure food supply and a source of fresh fruits for the winter months. In terms of market supply, the home-made fruit preserves are quite insignificant since they are almost entirely intended for household consumption only. Yet, such home processing practices come to constitute a major factor for market demand for fruit preserves since the households producing fruit preserves partially or entirely stay out of list of fruit preserves consumers. It proves very difficult to estimate the percentage of households producing fruit preserves for their own consumption. The information below might suggest some ideas.

> Excerpt from Social Survey on Food Safety Public Awareness Report
> Authored by AM Partners, 2015
> Link: www.arspiu.com/uploads/media/5.1._Report__draft__Social_survey_on_food_safety_public_awareness__arm.pdf
>
> *…As for canned food, most of the respondents claimed that their households did not consume any imported canned food. This is mostly accounted for by the fact that most of the households not buying any canned food produce such food themselves in their own houses. Such practices are quite popular, though with a little bit limited scope in Yerevan and quite widespread in marzes and particularly in villages. To get a general picture of its scope, the Consultant compared the number of respondents not buying canned food in Yerevan, marz cities (towns) and villages. Thus, it follows that the number of such respondents in Yerevan totals 42%, in marz cities (towns) 66% and in villages 82%.*

According to the estimates based on the data above, 62% of the households (about 473 thousand households) in Armenia do not buy canned food. Yet, this does not mean that all of such households produce fruit preserves at home. At any rate, the number of households engaged in fruit preserves home-production can be roughly estimated to total around 300 thousand, given the rate of the population in the country’s regions specialized in fruits and berries production and the potential scope of preserves home-production practices in cities/towns.

52. **Industrial processing of fruits and berries. Number of processors and production capacities.** Canned food production has traditionally ranged and still ranges among the most developed branches of the Armenian food industry. This is determined by the availability of the necessary raw materials. The fruit and berry industrial processing branch can in its turn be divided into 2 sectors: a) preserves production, and b) dried food production.

Presently, there are 43 units engaged in the fruit and vegetable processing sector to provide products for **fruit preserves production**. 8 of such units were established before Armenia's declaration of independence (in 1991) and possess large production capacities. As for the others units, they were established after independence, and have relatively smaller production capacities. The gross production capacities of the preserved fruit and vegetable processing units ensure annual processing of around 250 thousand tons of fruits and vegetables.

As for **dried foods**, including dried fruit producing entities, their number is quite unstable. While the number of the entities permanently and regularly engaged in such processing activities makes several hundreds, in some years with too large volumes of fruit crops and issues related to their sales (especially as in case with black plums) many individuals engage in fruit drying. In such cases, the number of dried fruit producers might total several thousands, overwhelmingly with individual farming households with processing capacities of up to 1 ton of fruits (production of dried fruit ranged between several dozens and several hundreds kilograms) annually. 100 processing units have industrial capacities of processing up to 5 tons annually and 20 units – over 5 tons. The gross production capacities of dried fruit producers make around 15 thousand tons of fruit and vegetable processing annually.

53. **Location of fruit and berry processing units.** The fruit and berry processing units are located close to the main concentrations of their raw material (fruits and berries) production. Given that the 75-80% of the fruit and berry production quantities in Armenia is covered by the Ararat Valley (area of Yerevan, marzes of Armavir and Ararat, and low-lying zones and foothills in the marzes ofAragatsotn and Kotayk), it is quite natural that most of the processing units are located in there.

Map 1 - Location of fruit and berry processing units

In other marzes, the processing units are also located in the fruit and berry cultivation areas, e.g. low-lying areas in the marzes below: Tavush marz (area of Noyemberian or Berd), Vayots Dzor marz (Arpa River valley) and Syunik marz (Kapan and Meghri areas (Aras River valley)).

The dried food producers are also located in the same areas as the fruit and berry processing units. Hence, producers are mostly concentrated in the region of Armavir in Armavir marz and region of Meghri in Syunik marz.

54. **Fruits and berries processing quantities.** The 43 fruit and vegetable processing units above produce preserves. Also, another several dozen small units supply fruits, berries and vegetables for dried food production

By its quantities, apricot is on the top of the fruits supplied for processing. In an average favorable year with apricot crop totaling 9-10 tons/ha, the share of apricot in the fruits supplied for processing makes 30-50%. In this terms, the other leading fruits are apples and peaches. Overall, apricots, apples and peaches make 70-80% of the fruits supplied for processing.

Table 46 - Supply of fruits and berries for processing in 2012-2014, tons

	2012			2013			2014		
	For preserves	For dried fruits	**Total**	For preserves	For dried fruits	**Total**	For preserves	For dried fruits	**Total**
Fruit and berry supply, with	**21,640**	**3,980**	**25,620**	**20,057**	**8,735**	**28,792**	**6,735**	**7,141**	**13,876**
Apples	4,467	300	**4,767**	3,663	1,525	**5,188**	1,576	1,508	**3,084**
Pears	N/A	N/A	**N/A**	N/A	N/A	**N/A**	N/A	N/A	**N/A**
Apricots	6,654	2,200	**8,854**	9,914	3,125	**13,039**	193	517	**710**
Peaches	5,563	600	**6,163**	726	1,195	**1,921**	1,597	1,320	**2,917**
Plums	N/A	N/A	**N/A**	N/A	N/A	**N/A**	N/A	N/A	**N/A**
Cherry, sweet cherry and plums	655	800	**1,455**	890	1,190	**2,080**	765	2,012	**2,777**
Berries	722	30	**752**	1,114	600	**1,714**	482	663	**1,145**
Other fruits and berries [1)]	3,579	50	**3,629**	3,750	1,100	**4,850**	2,122	1,121	**3,243**

Sources: RoA Ministry of Agriculture media publications; information provided by processors.
[1)] Including pears, quince, figs, pomegranates, rosehip, etc.

The variations of fruit processing volume heavily depend on the shares of apricots and peaches therein. For instance, in 2014 as most of the apricot crops (90 percent) perished due to the spring frosts, the volume of the fruits and berries supplied for processing was twice low as compared to that of 2013, due to the sharpdecline in apricot supplies. In the years with poor crops, apricot prices are quite high, and processing unit prefer not to buy any.

55. **Utilization of processing units' production capacities.** The vast majority of the 43 fruit and vegetable processing units purchase the fruits and vegetables to be processed. Thus, in 2015, fruits were purchased by 42, and vegetables - by 29 of the 43 units above. The analyzes of the data within the past 3 or 4 years show that the fruits and vegetables purchased by the processing units annually range between 55 and 60 thousand tons, except for the year of 2014 due to the unprecedented decline in the crops and consequently, in the purchase of apricot.

Table 47 - Volumes of fruits and vegetables processed by processing units in 2012-2014

	Unit of measure	2012	2013	2014
Fruits (fruits and berries)	tons	25,620	28,792	13,876
Vegetables	tons	33,646	27,970	34,077
Total	**tons**	**59,266**	**56,762**	**47,953**

Source: Release of key products in in-kind terms by industrial organizations in January-December 2012-2014, NSS, 2013-2015.

Given the annual gross production capacities of the fruit and vegetable processing units equaling almost 250 thousand tons, the **utilization level of the production capacities of such units may be estimated to make 22-24%**. Particularly low production capacity utilization rates are shown by large processing units established back in the Soviet times. Thus, the former Hoktemberyan preserving plant (now known as Levon LLC) utilizes only 2% of its production capacities, and Borodino preserving plant uses only 5% of its capacities (with annual production capacities of around 40 thousand tons of fruit and vegetable processing, in 2012-2014 (in a 3-year period) the plant purchased and processed only a 6 thousand tons of fruits and vegetables).

56. **Reasons for underutilized capacities of processing units.** The reasons underlying the underutilization of production capacities differ from one processing unit to another. For instance, the processing units set up back in the Soviet period (before 1991) have quite large production capacities. At those times, there were around 900 public/collective farms essentially acting as major producers and suppliers of raw materials (fruits and vegetables). Such large volumes of centralized supplies called for processing units with large production capacities to purchase and process the products. The processing units were established in the areas with major raw material production concentrations, i.e. on the territory of the present marzes of Ararat, Armavir and Aragatsotn and Meghri region in Syunik Marz, namely the preserving plants of Artashat, Ararat, Armavir (Hoktemberyan), Ashtarak and Meghri). The plants above were also public enterprises. Hence, the essence of the system in use was as follows: the state produced fruits and vegetables, then purchased them from itself, processed and later sold the processed products. After independence, this centralized system of production, processing and supply collapsed. As a result, every chain actor, i.e. producers (320 thousand small farming households that replaced the 900 collective farms above) and processing units had to address their problems on their own. **The biggest challenge faced by large processing units was the loss of large sales markets and collapse of the former sales system (centralized public purchases).** As a result, major processors became unable to purchase and process as large quantities of fruits and vegetables (i.e. utilize their production capacities) as they did before.

The underutilization of production capacities posed new challenges for large processing units. Thus, **the fixed costs (depreciation, property tax) increasingly made up a larger share in their production cost**. Those of the large processing units that: a) re-equipped their production capacities with smaller but the up-to-date and new equipment (e.g. preserving plants of Artashat and Ashtarak); b) diversified their production by extending its scope adapted themselves to the current market relations and found ways of their further improvement. As for other units, they found themselves in a difficult situation.

Mostly in the early 2000-s, a few dozens processing units of relatively smaller production capacities came to replace the former ones. Equipped with modern devices, the new processing units prove more effective in terms of cost management.

2.3.2 Quantities of Processed Production

57. **Types and quantities of processed products.** The products resulting from processed fruits and berries can be divided into 3 main groups: **a) fruit preserves, b) fruits,** and **c) natural fruit juices**. The fruit preserves include as follows: sweet preserves, marmalades, comfitures and jams. The natural fruit juices include natural juices for end-consumers and semi-ready products, namely fruit juice concentrates. The table below shows the quantities of such products.

Table 48 - Products processed from fruits and berries by processing units and their quantities in 2012-2014

	Unit of Measure	2012	2013	2014
Vegetable and fruit preserves, including only:	tons	8,356	8,886	10,850
Fruit preserves	*tons*	*2,666*	*3,357*	*2,584*
Dried fruits	tons	37	43	12
Natural juices, including only:	thousand liters	16,742	19,544	21,106
Fruit juices	*Thousand liters*	*16,144*	*18,924*	*20,645*

Source: Release of key products in in-kind terms by industrial organizations in January-December 2012-2014, NSS, 2013-2015.

Dried fruits production quantities are too small. By the estimates of experts and businessmen, the annual volume of dried foods (fruits and vegetables) production in Armenia makes **about 1,000-1,500 tons**. Particularly, Armenian dried food producers use the fruits and vegetables below: apricots, plums, peaches, cherries, figs, pineapples, apples and pears, as well as tomatoes, string beans and aubergines. Also, various herbs and spice plants are dried. The dried fruit and vegetable production is largely concentrated in the Ararat Valley (marzes of Ararat and Armavir). These marzes have prevalent production of dried apricots, peaches, plums and cherries. As for dried figs and persimmon, their production is concentrated in Syunik marz (Meghri region), Tavush marz (Berd region) and Lori marz (Alaverdi region). And Aragatsotn marz (Ashtarak region) has a relatively large production of dried apples, apricots and cherries.

58. **Leading processing units and their specialization.** Today, the market of preserved fruits and berries and natural juices has identified its leaders. Depending on how the processing units solved their marketing challenges, each of them specialized in a particular area of dried food production. The list below covers the large companies processing annually over 500 tons of fruits and berries.

Table 49 - Large companies processing fruits and berries to produce fruit preserves and juices and their key details, 2013

Processing units	Year of establishment	Fruits and vegetables purchase volumes in 2013, tons		Trademarks	Outline
		Fruits	Vegetables		
EuroTerm	1998	~ 5,000	~ 465	Noyan	Leading producer of fruit juices and juice concentrates (about 30% of the market), fruit preserves and jam production leader
Artashat Preserving Plant	1961	~ 3,000	~ 10,300	Artfood, Amare, Vitamix	Leading producer of tomato paste, jam production leader
Proshyan Brandy Factory	1980	~ 3,000	~ 500	Royal	Main production: brandy and wine; also produces fruit liqueurs and jams
Ararat Food Plant	2011	~ 2,300	~ 2,900	Ararat, Armenium	A fruit juice market leader
MAP	1942	~ 800	~ 4,000	MAP	Leading tomato paste producer
SIS Natural	2000	~ 725	-	Yan, Sis, Jusis	Fruit juice market leader
Tamara Fruit	2000*	~ 700	~ 250	Tamara	Leading producer of frozen fruits and vegetables (around 95% in the market), fruit preserves and jam production leader
Ararat ABRIKON	2000s	~ 620	-	Abrikon	Leading producer of apricot vodka
Yerevan Beer	1952	~ 600	~ 35	Kilikia, Areva	Leading producer and exporter of organic fruit juices

* - Tamara Fruit was established in the basis of the former Ashtarak preserving plant

In 2013, the 9 processing units above collectively released 60% of the fruit preserves and juices. As for the rest 40% of such products, they were released by other 30 processing units functioning at that moment. Taken separately, each of the processing units above produces a wide range of fruit preserves and juices and at the same time excel in a particular direction of such production. Hence, Artashat Preserving Plant, EuroTerm and Tamara Fruit are leading fruit preserve and jam producers, and EuroTerm, Artashat Preserving Plant, SIS Natural and Ararat Food Plant are leading juice producers.

As for **dried fruits market processing units,** the quantities of their processed fruits and berries are much more limited.

Table 50 - Large companies processing fruits and berries to produce dried fruits and their key details, 2013

Processing units	Year of establishment	Fruit processing volumes, tons	Dried fruit production quantities, tons	Outline
Tsiatsan-Ani (v. Sardarapat, Armavir marz)	-	~ 150-200	~ 30-40	
Sateni Consumer Cooperative (v. Yervandashat, Armavir marz)	2011	~ 100	~ 20	The Cooperative unites 36 dried fruit producers from Yervandashat and Bagaran villages.
Nor Aygi (v. Sardarapat, Armavir marz)	-	~ 100	~ 20	
Vayk Group CJSC (c. Vayk, Vayots Dzor marz)	2000	~ 100	~ 20	Produces 7 types of dried fruits and exports 80% of its production. Vayk Group CJSC owns a solar drier of 94 sq. m. as well as orchard area of 140 ha with apricot orchards (45 ha), grapes orchards (24 ha), plum orchards (5 ha), cherry orchards (5 ha), apple, almond and walnut orchards.
Armen Manukyan private entrepreneur (v. Surenavan Ararat marz)	2007	~ 60	~ 12	The private entrepreneur took considerable branding efforts promoting the trademarks below: Armenian Dried Fruits, Fruit Food and Choko Chir trademarks; produces 40 types of dried fruits from 7 or 8 fruit species.
Suren-Ani (c. Aparan, Aragatsotn marz)	1997	~ 25	~ 5	Along with dried fruits production, Suren-Ani is also engaged in shelved electric dryers
Areni Wine Factory (v. Areni, Vayots Dzor marz)	1994*	~ 10	~ 2	Products are sold from Factory's wine tasting hall

* Dried fruits production was launched in 2012.

The data above suggest that even the largest dried fruit company is more likely to be characterized as a small processing unit. Such companies, along with dozens of other similar processing units (registered legal entities, private entrepreneurs, individual farmers), produce only 1,000 ton of dried fruits.

2.3.3 Processing Technologies

59. **Fruit and berry processed product information and technological schemes.** With the wide variety of fruits and berries available, the Armenian processing companies produce a wide range of products: compotes, fruit preserves, jams, marmalades, natural juices, dried fruits and candied fruits. The table below provides description of such products.

Table 51 - Fruit and berries processing products information

Processed products	Product description	Technological scheme
Compotes	2-component preserves: fresh, quick-frozen or sterilized fruits and berries (or their mixtures) in sugar syrup	Procurement, acceptance, sorting out, measuring, washing, preparing the raw materials, syrup making, pouring into jars, sealing, sterilization
Fruit preserves	Fruits/berries cooked in sugar syrup. Despite cooking, the fruits/berries are not mashed, but whole or sliced. The syrup is sticky but not jelly-like. In fruit preserves, the proportion of fruits/berries and syrup is 1:1.	Procurement, acceptance, sorting out, measuring, washing, preparing the raw materials, syrup making, putting fruits or berries in the syrup and cooking it, pouring into jars, sealing , sterilization and cooling
Jams	A jelly-like substance comprising whole or sliced fruits and berries cooked in sugar. Once the product is ready, the syrup is inseparable from the fruit/berry mass.	Procurement, acceptance, sorting out, measuring, washing, syrup making, preparing the raw materials, cooking jam, determining the invert sugar composition, pouring into jars, sealing, sterilization
Marmalade	Fruit or berry puree cooked with sugar, with or without adding food pectin and food acids	Procurement, acceptance, sorting out, washing, steaming, stone (seeds) removal, mashing, cooking, cooling, pouring into jars, sealing, sterilization
Natural juices	Multi-fruit juices, produced by mixture of one or more mixed fruits and berries (with or without pulp), without any sugar or sugar syrup, acids, coloring, flavor and preserving agents	**See below**
Dried fruits	Fruits dried naturally or by industrial methods, with residual moisture of about 20%	Procurement, acceptance, preparing the raw materials, steaming, sulfiding, drying, putting in containers
Candied fruits	Fruits cooked in sugar syrup, then dried and covered with powdered sugar and glazed with sugar syrup	Procurement, acceptance, preparing the raw materials, syrup making, cooking the fruits/berries, taking out the fruits/berries from the syrup, cover them with powdered sugar or glazing with syrup, drying and putting in containers

60. **Fruit and berry processing technologies.** The fruits and berries processing units apply various technologies depending on the specialization and main bulk of products released by a particular processing unit. Thus, **fruit preserves and juice producing units** introduce modern technologies and apply advanced techniques of production automation and production lines. As for dried food

production units, they are equipped with much weaker, sometimes even primitive technical devices and apply simple technologies of 2 or 3 types.

The technological schemes in**Table 51** were used to develop and launch a huge number of production technologies and equipment; such variety renders it impossible to provide a common idea of fruit and berry processing technologies. Yet, the analysis and comparison of the equipment structure and production cycles of various processing companies suggests that when releasing similar products, various producing units take similar technological actions in similar sequence, with the only difference lying in equipment automation and capacity level.

Within the past 15-20 years, the processing companies have invested heavily in their technologies. Nowadays, the whole production process is automated, starting from raw material acceptance to containerizing the end-products and packaging. The passage below describes the fruit juice concentrate production technological cycle used with slight differences by the leading companies engaged in such production.

Apple juice concentrate production model

The general cycle begins from the place where the place of fruit procurement where they are accepted, weighed and undergo laboratory quality test. After accepting the fruits, they are transported to short-term storage bunkers where they are stored for up to 24 hours. There, fruits are washed by water machines and sorted by the sorting conveyor. Upon sorting, decayed and perished fruits are removed from the general volume of the fruits procured. The sorted pass from the sorting conveyor to elevators lifting the fruits to the grinding machines. There, the fruits are crushed, mashed and grinded and then pass to the pressing machines. During the pressing, the raw materials undergo preliminary filtration separating fluid and denser masses. After pressing, relatively fluid masses are collected by special containers for short-term storage where they undergo thermal processing by a relevant unit. The automated unit heats the liquid up to 60^0 C and then freezes it back to normal temperature.

[Companies equipped with more modern technologies (e.g. EuroTerm) use the cold extraction method in fruit processing that unlike the traditional steaming method used by many processing units, makes it possible to separate the pulp from the fruit stone without steaming and thermal processing, which preserves (by 70-80%) the fruit vitamins].

The mass formed after the thermal processing is collected in special collection containers and undergoes fermentation. The dense fruit concentrate formed after fermentation is pushed through pumps into special tanks. Then it is pushed to the ultrafiltration line and undergoes membrane filtration. The ultrafiltration provides basic juice, which upon cooking in special cooking devices develops into juice concentrate of +/- 70 brix. The concentrate is poured into 200-liter aseptic bags, where it can be stored for up to 2 years without quality changes.

The end-consumption fruit juices are containerized through automatic pouring devices into glass or plastic jars or bottles. The main achievement in the past 15 years was that the major fruit juice producers (EuroTerm, Artashat Preserving Plant, Sis Natural, Ararat Food Plant and Yerevan Beer) introduced the Swedish Tetra Pak company's aseptic packaging production lines. This significantly increased the competitiveness of the Armenian juices and today, local juices prevail on the Armenian market. In 2014, the Armenian natural fruit juice market comprised 21 thousand tons, with local juice totaling 18 thousand tons.[46]

The **dried food producing units and individuals** use 2 main fruit and berry drying technologies: a) mechanical or solar dryers, and b) technical, i.e. electric or gas dryers. The traditional and most common method is solar drying. There are around 250 dryers in Armenia. At the same time, hundreds of individual farmers dry fruits in the sun without using any special solar dryers. As for the technical dryers, their use dates back to the past 5 or 6 years, as mostly electric dryers were imported to Armenia under various development programs (implemented by Shen NGO, Center for Agribusiness and Rural Development (CARD), World Vision, Oxfam). It is still too early to judge about their

[46] Production: 21 thousand tons, export and import: 3 thousand tons.

efficiency since producers are not quite willing to use them mostly for concerns over their quality (the electric dryers were mainly imported from China).

61. **Production outputs of fruit and berry processing.** The fruit and berry processing results in a huge variety of end-products, with hundreds of products. The differences of such products rest on the factors below.

- Raw material (fruit and berry) type
- Traditional or organic products
- Sugar content
- Production automation level
- Container type and size (capacity)
- Product type (compotes, fruit preserves, juices)

While the list above covers the key factors influencing the production range, it is not exhaustive. Thus, a key factor for compotes is whether the fruits in the container are whole or sliced, peeled or unpeeled. As for natural fruit, a key factor is whether juices contain fruit with fruit pulp or not. The quality of raw materials (fruits and berries) constitutes another essential factor in terms of raw material in-process losses. The aforementioned suggests that the fruit and berry processing also results in a great variety of production outputs and the relevant estimates for a particular product should be based on its individual scenario.

The estimate below covers are fruit compotes, fruit preserves and natural juices as fruit and berry processingproducts with the largest production quantities and significant differences.

Table 52 - Production outputs of fruit and berry processing

Raw material consumption standard for 1 ton of end products					
Product 1 - Compotes		**Product 2 – Fruit preserves**		**Product 3 - Natural juice**	
Raw material/ product type	**Raw material consumption, kg**	**Raw material/ product type**	**Raw material consumption, kg**	**Raw material/ product type**	**Raw material consumption, kg**
Apple (by halves, peeled)	986	Apple	450	Apple (without pulp)	1,583
Pear (whole, unpeeled)	835	Pear		Pear (without pulp)	1,954
Apricot (whole)	657	Apricot	400	Apricot (with pulp)	658
Peach (by halves, peeled)	957	Peach	450	Peach (with pulp)	809
Plum (whole)	723	Plum	400	Plum (with pulp)	760
-	-	Strawberry	400	Strawberry (without pulp)	1,160
Raspberry	722	-	-	Raspberry (without pulp)	1,429
-	-	-	-	Blackberry (without pulp)	1,250
Black currant	722	Black currant	400	Black currant (without pulp)	953

As for **dried fruits**, they also have some peculiarities in terms of production outputs. As already mentioned in the processed product descriptions, dried fruits are *fruits dried naturally or by industrial methods, with residual moisture of about 20%*. At first sight, it might seem that 5 units of raw material losses can produce only 1 unit of dried food. Yet, it is not the case. Dried fruit production entails raw material weight loss due to removing stones/seeds and peeling. When prepared for drying, different types of fruits show different weight loss rates, which is quite natural. As for the dried end-products processed from the surveyed fruits, they weigh 6-10 times as less as the initial mass of their raw materials.

Table 53 - Fruit drying production outputs

Raw material consumption standard for 1 ton of dried fruits	
Product type	**Raw material consumption, kg**
Dried apple	10,000
Dried pear	9,091
Dried apricot	6,061
Dried peach	8,333
Dried plum	6,667

Reverse calculation: end-production (dried fruits) output from 1 ton of raw materials	
Raw material	**End product output, kg**
Apple	100
Pear	110
Apricot	165
Peach	120
Plum	150

62. **Raw materials availability.** The fruits and berry processors use the raw materials below: a) fresh fruits and berries, and b) fruit concentrates. The issue of raw materials availability should be considered from the 2 perspectives below: a) availability of fruits and berries cultivated in Armenia, and b) availability of fruits and berries not cultivated in Armenia.

The processors buy the **fruits and berries cultivated inArmenia** (fruits targeted under the Survey: apples, pears, apricots, peaches, plums and berries) both in their fresh form and in semi-processed form (concentrates). Fresh fruits are in a greater demand as raw materials since they can be used to produce all the varieties of processed fruit products: compotes, fruit preserves, jams, juices, etc. The semi-processed raw materials (concentrates) can be used for processing a limited number of products, mostly juices. Given the production quantities of local fruits and berries, it seems that processors should have no difficulties with their procurement. Yet, things are not that simple. The analysis of the fruit and vegetable juices import statistics shows that in 2014, Armenia imported 349 tons (352 thousand USD) of apple juice (concentrate) and 482 tons of tomato (503 thousand USD) juice (concentrate). This means that even with the big production potential, the local processors might have to import raw material produced from the fruit types cultivated in Armenia.

Unlike the producers of fruit preserves and natural juices (also concentrates) facing no big difficulties with raw material procurement in an average favorable year, the dried fruit producers face difficulties with raw materials from time to time. The matter is that dried fruits may be processed only from some of the types (varieties) of fruits. For instance, only Saten apricot variety or Forest Beauty pear variety are in great among the dried fruit producers. Despite the rather large apricot production volumes (100 thousand tons in an average favorable year), Saten variety makes only 15% (15 thousand tons) of it. Accordingly, the orchard areas of this apricot variety are limited and scattered.

Despite the quite small current demand among the dried fruit producers, the limited supply still causes certain problems in this sector.

As for the semi-processed raw materials (concentrates) raw materials, several large processing units produce them mostly for their own needs or for export. Yet, this does not mean that such processors do not sell concentrates to other local processors. Based on the volume of orders, small processors (up to 200 tons annually) can purchase concentrates mostly from EuroTerm, leading Armenian concentrate producer.

The Armenian fruit preserve and natural juice producing units offer a rich variety of subtropical fruit juices. Particularly, among juices produced from **fruits not cultivated in Armenia,** the local processors offer banana, pineapple, orange or mixed juices. To process them, they have to import tropical fruit concentrates. The table below shows the import rates of tropical fruit concentrates in 2014.

Table 54 - Tropical fruit concentrates import rates in 2014

Fruit concentrate raw materials	Import	
	Rates, tons	Cost, USD
Orange	~ 310	358 thousand
Grapefruit	~ 25	26 thousand
Pineapple	~ 72	76 thousand
Multi-fruit concentrates	~ 1,726	2,365 thousand

Source: Foreign Trade of the Republic of Armenia for 2012-2014 (According to the Commodity Nomenclature of External Economic Activity at 8-digit level), NSS, 2013-2015.

63. **Raw material quality issues.**The range of raw material quality requirements is quite diverse, depending on the products to be processed. Thus, there are strict requirements imposed on the raw materials for compotes, fruit preserves or dried fruits production, since in this case their initial marketable appearance is quite essential. Processors of these products seek to buy not the most expensive, but at least medium-quality fruits. As for production of jams, comfitures, juice or juice concentrates, processors mostly buy the cheap and low-quality fruits; here, it is also essential that such raw material fruits are not dirty, rotten or wormy, etc.

2.3.4 Knowledge

64. The processing units primarily rely on the knowledge of their technologists (production engineer), most of whom also worked in such units back in the Soviet era and are quite skilled in this sector. Such specialists also have young colleagues who gain their own experience and come to replace the older generation.

All the major processors regularly participate in various international exhibitions, forums and conferences, which helps them to be aware of all the trends in the agricultural processing industry development.

The major processors establish some contacts and business relations with companies producing and selling processing equipment, production lines and technologies. The purpose of such communication is the possibility to purchase the necessary equipment or technologies (or both) at any time. Mostly, such equipment or technologies are purchased from the European processors who re-equip their units and sell their old equipment and technologies to the companies in developing countries (e.g. Armenia).

2.3.5 Revenues and Costs

65. **Direct and indirect costs.** The processing unit production cost covers clear-cut direct and indirect costs. The direct costs include raw materials (fresh fruits, concentrates, sugar), water, electricity and production staff wages costs. Such costs are variable since they depend on the quantities of the released production. As for the fixed costs, they include the management staff wages, property tax, wore and tear and other costs not determined by the released production and its quantities.

66. **Product prime cost.** The retail trade in Armenia has a remarkable feature: all kinds are compotes are sold at same price. This also holds true for the jams, juices and other fruit preserves. How can this be possible given that processors buy the main raw components of all such fruit preserves at different prices? Moreover, juices from both local fruits and citruses (not cultivated in Armenia) are sold at same price. These practices rely on the **weighted average cost estimation** approach applied on the Armenia market. Such approach makes it possible to balance to some extent the prime costs of juices produced from different fruits and ensure equal competitiveness environment for each of them. In Armenia, the prime costs of citrus fruit juices are higher as compared to those of local fruit juices. Nevertheless, if this factor influences the citrus juice prices, the citrus fruit juices will no longer be competitive in Armenia, whereas such citrus juices are the most top-selling ones both in Armenia and worldwide. Considering this, the Armenian processors produce citrus juices and sell them at price of the juices produced from local fruits. Despite their lower profits, such processors can use a maximum of the market opportunities.

67. **Factors influencing processed product prime cost formation.** Thefruit and berry processing results in a **broad variety** of products**,** withdozens of product types. First, there are many product groups: compotes, fruits preserves, jams, marmalades, juices, dried fruits, candied fruits, etc. Second, the range of raw materials, namely processed fruits and berries is very broad. Third, the same product groups and raw components may have serious differences based on e.g. whether the fruits in the compotes are whole or sliced, peeled or unpeeled, etc.

The key factors shaping the product prime cost are the **raw material prices** that may vary within years or months of the year.

The prime costs of the same product may vary from one producing unit to another depending on their production capacity utilization rate (influencing the share of fixed costs in the product prime cost) and the technologies applied.

From this perspective, the prime cost estimates of processed products obviously exceed their varieties. Since it is impossible to cover all such calculations in the Survey, to get an idea of processed product prime costs, it is more reasonable to consider the products in**Table 52** and **Table 53**.

68. **Processed product prime costs calculations.** The calculations below may serve as an approximate estimate only. Since the product prime cost calculations constitute a trade secret of processing units, it is impossible to collect complete information about the costs of any such unit and make accurate calculations. Unlike the information on the costs of raw materials (fruits, concentrates, sugar, etc.) for

particular products, which is available to some extent, the data on the fixed costs, especially fixed costs and taxes vary greatly, are limited and mostly unavailable.

Table 55 - Conventional calculations of fruit and berry processed product prime costs

Product: Compotes
The costs are estimated as per 1 ton of end-product

Product varieties	Raw materials			Sugar			Other costs	Total prime cost AMD/ton	Total sales cost, AMD/ton	Profitability
	Quantity, kg	Price, AMD	Cost, AMD	Quantity, kg	Price, AMD	Cost, AMD				
Apple (by halves, peeled)	986	60	**59,160**	109	370	**40,330**	100,000	**199,490**	450,000	**56%**
Pear (whole, unpeeled)	835	150	**125,250**	100	370	**37,000**	50,000	**212,250**	**450,000**	**53%**
Apricot (whole)	657	150	**98,550**	151	370	**55,870**	50,000	**204,420**	**450,000**	**55%**
Peach (by halves, peeled)	957	120	**114,840**	111	370	**41,070**	100,000	**255,910**	**450,000**	**43%**
Plum (whole)	723	120	**86,760**	100	370	**37,000**	50,000	**173,760**	**450,000**	**61%**
Strawberry	-	-	-	-	-	-	-	-	-	-
Raspberry	722	1,000	**722,000**	188	370	**69,560**	50,000	**841,560**	**450,000**	**-87%**
Blackberry	-	-	-	-	-	-	-	-	-	-
Black currant	722	400	**288,800**	213	370	**78,810**	50,000	**417,610**	**450,000**	**7%**

Product: Preserved fruits
The costs are estimated as per 1 ton of end product

Product varieties	Raw materials			Sugar			Other costs	Total prime cost AMD/ton	Total sales cost, AMD/ton	Profitability
	Quantity, kg	Price, AMD	Cost, AMD	Quantity, kg	Price, AMD	Cost, AMD				

Apple	450	55	**24,750**	535	370	**197,950**	100,000	**322,700**	1,200,000	**73%**
Pear	-	-	**-**	-	-	**-**	-	**-**	**-**	**-**
Apricot	400	100	**40,000**	583	370	**215,710**	100,000	**355,710**	**1,200,000**	**70%**
Peach	450	100	**45,000**	535	370	**197,950**	100,000	**342,950**	**1,200,000**	**71%**
Plum	400	100	**40,000**	535	370	**197,950**	100,000	**337,950**	**1,200,000**	**72%**
Strawberry	400	400	**160,000**	583	370	**215,710**	100,000	**475,710**	**1,200,000**	**60%**
Raspberry	-	-	**-**	-	-	**-**	-	**-**	**-**	**-**
Blackberry	-	-	**-**	-	-	**-**	-	**-**	**-**	**-**
Black currant	400	400	**160,000**	213	370	**78,810**	100,000	**338,810**	**1,200,000**	**72%**

Product: natural juice (with sugar)
The costs are estimated as per 1 ton of end-product

Product varieties	Raw materials			Sugar			Other costs	Total prime cost AMD/ton	Total sales cost, AMD/ton	Profitability
	Quantity, kg	Price, AMD	**Cost, AMD**	Quantity, kg	Price, AMD	**Cost, AMD**				
Apple (without pulp)	1,583	55	**87,065**	51	370	**18,870**	100,000	**205,935**	450,000	**54%**
Pear (without pulp)	1,954	115	**224,710**	51	370	**18,870**	100,000	**343,580**	**450,000**	**24%**
Apricot (with pulp)	658	100	**65,800**	91	370	**33,670**	75,000	**174,470**	**450,000**	**61%**
Peach (with pulp)	809	100	**80,900**	91	370	**33,670**	75,000	**189,570**	**450,000**	**58%**
Plum (with pulp)	760	100	**76,000**	93	370	**34,410**	75,000	**185,410**	**450,000**	**59%**
Strawberry (without pulp)	1,160	400	**464,000**	81	370	**29,970**	100,000	**593,970**	**450,000**	**-32%**
Raspberry (without pulp)	1,429	900	**1,286,100**	71	370	**26,270**	100,000	**1,412,370**	**450,000**	**-214%**
Blackberry (without pulp)	1,250	900	**1,125,000**	76	370	**28,120**	100,000	**1,253,120**	**450,000**	**-178%**
Black current (without pulp)	953	400	**381,200**	122	370	**45,140**	100,000	**526,340**	**450,000**	**-17%**

Product: dried fruit

The costs are estimated as per 1 ton of end-product

Product varieties	Raw materials			Other costs	Total prime cost AMD/ton	Total sales cost, AMD/ton	Profitability
	Quantity, kg	Price, AMD	Cost, AMD	AMD/ton			
Dried apple	10,000	250	**2,500,000**	150,000	**2,650,000**	3,000,000	**12%**
Dried pear	9,091	300	**2,727,273**	150,000	**2,877,273**	4,000,000	**28%**
Dried apricot	6,061	250	**1,515,152**	150,000	**1,665,152**	2,500,000	**33%**
Dried peach	8,333	400	**3,333,333**	150,000	**3,483,333**	4,000,000	**13%**
Dried plum	6,667	200	**1,333,333**	150,000	**1,483,333**	2,500,000	**41%**

The calculations in**Table 55** show end products which are however, non-containerized and unpacked. The matter lies in a great variety of containers for end products. Containers vary in their material type (paper (Tetra Pack), glass, polyethylene) and size (capacity). Their costs are expressed in the prime costs in different sizes. For instance, to containerize 1 ton of preserved fruits, farmers need 2,500 glass jars with a capacity of 400 gram or 3,030 glass jars with a capacity of 330 gram. As for natural juices, they are mostly containerized in 1-liter Tetra Pack paper boxes (1,000 pieces) (Noyan, Ararat and Amare juices), or 1 or 0,25-liter glass jars (Yan juices), etc. Therefore, the profitability rates in the last column of the table above are actually lower due to the containerizing and packaging costs.

A number of rates in**Table 55** are conventional. Thus, the *Other costs* rates are rather conventional as along with the raw materials (fruits, sugar), they also cover other production costs (except for containers). According to the information collected among several processors, other costs, except for the raw materials, make 25-30% of the production. Yet, this appears to be a very rough estimate and differ from one product to another and from one production unit to another (see the reasons above). The product sales prices are conventional as well. While processors set the same prices for their products, various enterprises might set different release prices for such products depending on the final containerization, marketing policies (low and high price scales designed for consumers with different purchasing power) and other factors. Accordingly, the profitability of such products may differ. The working capital value is another factor that may influence the profitability of fruits and berries processing production. If the working capital value is based on bank loans, their interests also add to the production cost. Such interest rates do not increase the product sales price, but rather reduce its profitability.

Other noteworthy figures in**Table 55** cover the low profitability rates or potential unprofitability of several products. Such products include berry compotes, fruit and juices. Objectively, these products have either low profitability, or they yield no profits at all, since their raw materials are too expensive, unlike that of fruits. Nevertheless, to ensure a wide variety of their production, some processors still produce berry compotes and juices trying to reduce the high prime cost by using natural flavoring agents. Such techniques make it possible to reduce raw material costs and achieve the taste and flavor compounds through artificial agents.

2.3.6 Major Constraints for Fruit and Berry Processing and Proposed Solutions

69. The challenges faced by the Armenian fruit and berry processing units are quite diverse. Discussions with the managers of such units suggest that the most urgent concerning challenges are posed by the trade sector rather than production as such. Almost all the surveyed managers believe that they have no technological problems with release of their production. Moreover, they are sure that their production is of the highest quality. The **working capital deficiency** can be identified as the major challenge faced by processors. Such deficiency affects various links of the product release and sales process and causes the issues below:

70. **Raw materials procurement difficulties caused by insufficient funds.** Most of the financial difficulties faced by the entities engaged in primary agriculture and related sectors (e.g. agricultural product processing sector) are caused by the seasonal features of production and sales. The harvesting (supply) season of the fruits and berries purchased by processing units is very short; e.g. for apricot it lasts 1-1.5 months (June-July), for peach - 1.5-2 months (August-September) and for apple - 2-3 months (August-October), etc. In such short terms processors have to purchase the necessary raw materials which they process and sell within several next months, sometimes within 1-1.5 years. Therefore, in the raw materials (fruits and berries) harvesting season, processors always face severe lack of working capital. To overcome such difficulties, the vast majority of the processors take bank

loans. Today, there is hardly any processing unit with no loans from several banks. Processors pay the farmers for most of the raw materials they procure at the moment of the purchase sincethe latter also face severe shortage of working capital.

71. **Sales-related difficulties caused by insufficient funds.** Presently, most of the Armenian processors tend to export their production. In export markets, production is sold within retail chains with a strict set of rules: large batches, stall rent, installment payments. In export markets, processors also need some working capital to secure their product cycle before they receive any funds for their products supplied. In the current situation, one of the best solutions is to store raw materials, e.g. through production of juice concentrates. However, only a limited number of companies have such opportunities.

The initial step on the way to resolution of export-related issues is setting up an export insurance company specialized in risk assessment. Here, an important role can be played by the state which will provide a considerable support to exporting companies and organizations.

72. **High rates of funds procured from external sources.** Today, local banks are the main sources of funds for the processors, and international financial institutions (e.g. European Bank for Reconstruction and Development (EBRD) providing funds directly to the private sector) - for largest processing units. The rates of the funds procured from local banks are too high, especially for the industrial enterprises with shifted costs and sales seasonality. As for the funding by international institutions, one of the main challenges is caused by the approach they use to rate the capitalization of Armenian processing units; local businesses are rated lower as compared to European ones and receive funding at a low percent rate of their liquidating value. Obviously, this approach proves insufficient for the development of the Armenian processing units.

2.4 Trade and Markets

2.4.1.Fruit and berry trade

2.4.1.1*Wholesalers*

73. **Wholesalers.** There are 2 groups of fruit and berry wholesalers: direct producers (farmers) and traders reselling their products. The latter can also be called intermediaries since their activities mostly aim to direct the flow of fruits and berries from their producers to processors or retail sales chain. As for the producers wholesaling their own production, they transport their products to wholesale agricultural markets (Hovtashat, Malatia, 'GUM') and sell its entire volumes to 1 or several resellers without dealing with any end-consumers.

74. **Types of intermediaries.** Intermediaries are the actors in the fruits and berries value chains who are engaged in the trade, i.e. buying and selling of fresh and processed fruits and berries in the chains below: "producers-consumers", "producers-processors" and "producers-consumers". Intermediaries may be classified in the 2 groups below: a) mobile intermediaries, and b) wholesale intermediaries. **Mobile intermediaries** drive their own vehicle to visit producers, procure fruits and berries immediately from producers' orchards or storage facilities, transport them to sale markets and sell them either to processors or retailers (supermarkets, shops, fruits stands); or retail them on their own. **Wholesale intermediaries** are the intermediaries with almost unchanged locations in wholesale agricultural markets (Malatia, 'GUM', Hovtashat (on the border of Ararat and Armavir marzes)) who purchase large volumes of the products delivered by producers to wholesale markets and sell them to

the other vendors shopping in the market, including to mobile intermediaries and persons engaged in trading activities in various markets and streets of Yerevan and cities/towns in marzes, as well as representatives of shops, supermarkets and fruit stands, etc.

75. **Number of intermediaries and their trading volumes.** In terms of their legal status, the vast majority of intermediaries are **individuals with unregistered and unrecorded business activities**. Therefore, no one can accurate estimate how many people are engaged in fruit and berry resale and what the volume of trade they ensure. It is especially difficult to estimate the number of mobile intermediaries since it is unstable due to the specifics of their activities below:

- For some part (majority) of the mobile intermediaries, fruit and vegetable trade is a **permanent occupation**. They are not specialized in the trade of any particular product, but rather buy and sell the fruits and berries available at various seasons of the year;
- Another part (minority) of the mobile intermediaries are engaged in trade on a **non-regular** basis, mostly in the harvest seasons of various crops when they can purchase large quantities of fruits or berries at relatively low prices, transport them to distant marzes and sell them to end-consumers or retail chains there;
- **Producers** themselves act as mobile intermediaries. This is mostly the case with the berry producers who can supply their products directly to retail chains, especially supermarkets. Producers harvest strawberry, raspberry, blackberry and blackcurrant crops twice a year. To ensure the continuity of the supplies and relations with the supermarkets within the period between the 2 harvests, most berry producers start purchasing their product type from other regions and supply them to their customers.

As for the wholesale intermediaries, there are also engaged in unregistered and unrecorded business activities. They only pay their space (stall) rental fees to the trade coordinators in the wholesale agricultural markets, where they mostly concentrated. There are no other transactions, activities or documents that might provide some further information on their sales turnover. There are only very approximate data e.g. that there are several dozens (approximately 50-60) agricultural product resellers in Malatia market, a little smaller number of resellers in 'GUM' market, and about twice or thrice as many resellers in Hovtashat market. Apparently, the total number of wholesale intermediaries can make 300, taking into account the resellers in other agricultural markets (Komitas, Nor Nork) in Yerevan as well.

2.4.1.2 Retailers

76. **Types of retailers.** Upon retail, the fruits and berries reach their end-consumers. The 5 groups of retailers below can be identified: a) fruit and berry producers, b) intermediaries, c) market and street traders, d) supermarkets, shops and fruits stands, e) hotels and public catering facilities.

77. **Retails by fruit and berry producers.** Some of the producers use their opportunities to retail their products. To this end, they: a) transport their production to agricultural markets (e.g. Malatia market, 'GUM' market) and retail it there, usually in the areas near the market (as all the market stalls are already occupied by other resellers), b) transport their production to cities/towns and villages and sell it through street trade in the streets and yards, or c) sell their in the agricultural fairs held by the RoA Ministry of Agriculture and Yerevan Municipality.

Agricultural Fairs

Agricultural Fairs were first launched in Yerevan in 2011. They are held on the weekends of every summer, autumn and winter month and are attended by farming households from various marzes (regions) of Armenia, offering to consumers exclusively their own products, fresh fruit and vegetables. Farmers may sell their products at the fair only if they hold relevant references issued by the MASCs and certifying that the products in question are their own products. To exclude participation of any intermediaries at the Fair, the organizers provide on-the-spot control. The RoA Ministry of Agriculture provides the Fair participants with free stalls, counters, scales and carts. As for Yerevan Municipality, it provides the area and its cleaning in the end of each fair day.

Fairs are held in 2 areas, namely Kasyan Street in Yerevan (about 100 stalls) and Mashtots Avenue (about 120 stalls). The quantity of agricultural products sold during each fairs make 50-60 tons/day.

78. **Retails by intermediaries.** Intermediaries also act as retailers. After purchasing fruits and berries from producers for further resale, the intermediaries sell them both wholesale and retail. For instance, mobile intermediaries transport the fruits and berries to sales markets and sell them to the traders there (market and street vendors, stall-owners). As the intermediaries resell the products in the streets, very often the end-consumers also act as buyers. The wholesale intermediaries operating in the markets also retail their products to end-consumers, if they have such a chance. Such resale practices are especially popular in Malatia and 'GUM' markets.

79. **Retails by markets and street traders.** This group of retailers exclusively comprises individuals with unregistered and unrecorded business activities. Thus, there is no information available on the quantities of the fruits and berries retailed by them. They either trade in the market occupying certain areas and stalls and pay relevant rent, or trade in unauthorized places in the street. The traders in this group procure the fruits and berries for further resale in the 2 ways below: a) they either go to wholesale agricultural markets (e.g. Hovtashat, Malatia) and purchase the necessary products directly form producers or wholesale intermediaries, or b) purchase such products from mobile intermediaries in the places of their business activities.

80. **Retail by supermarkets, shops and stalls.** Unlike the 3 retail groups above, the number of the retail outlets and their sales records are quite clear.

Table 56 - Number of retail outlets as of June 30, 2015

Marzes	Shops	Consumer markets	Agricultural markets	Stalls	Other retail outlets	Total
Yerevan	7,659	32	7	797	191	**8,686**
Aragatsotn	219	2	2	243	56	**522**
Ararat	1,121	3	1	78	94	**1,297**
Armavir	185	3	2	129	90	**409**
Gegharkunik	320	2	2	89	92	**505**
Lori	264	3	2	598	78	**945**
Kotayk	819	4	2	170	68	**1,063**
Shirak	771	5	2	379	65	**1,222**
Syunik	211	7	0	135	46	**399**
Vayots Dzor	242	0	1	19	25	**287**
Tavush	736	1	1	272	41	**1,051**
Armenia	**12,547**	**62**	**22**	**2,909**	**846**	**16,386**

Source: Social and Economic Situation in the Republic of Armenia in January-June 2015, NSS, 2015

There is no data on the volumes of fruit and berry sales in retail outlets, and it appears very difficult to estimate such volumes. First, fruits and berries are sold only in stores (including supermarkets), agricultural markets and fruit stands. Second, not all stores and stalls (some of them sell quite different products, e.g. consumer products sales outlets) sell agricultural products. And third, no individual records are kept of the varieties and volumes of products sold in retail outlets.

The fruits and berries appear in retail outlets from different sources and in different ways. Such facilities receive direct supplies of fruit and berries by their producers and intermediaries. Shops and supermarkets receive products like fruit preserves and natural juices directly from their processors. Large stores and supermarkets have already formed their own supply chain, and as a rule, suppliers deliver their products to such stores and supermarkets. As for small shops and stalls trading fruits and berries, the products are supplied in one of the 2 ways below: a) either a representative of such shops or stalls purchase the products above from direct producers on wholesale agricultural markets (e.g. Hovtashat, Malatia), or b) they purchase such products from mobile intermediaries in the places of their business activities.

81. **Retails by hotels and public catering facilities.** The retails in hotels and public catering facilities (mostly restaurants) make up another direction of sales of the fresh fruits and berries and their processed products. By the end of 2013, Armenia counted **229 hotels** and hotel harbors with 75, in Yerevan. The numbers above cover hotels, hotel harbors, resorts and boarding houses. The table below provides the distribution of the number of hotels by marzes.

Table 57 - Number of hotels and public catering faciltieis

Marzes	Hotel industry facilities
Yerevan	75
Aragatsotn	3
Ararat	-
Armavir	-
Gegharkunik	17
Lori	11

Marzes	Hotel industry facilities
Kotayk	33
Shirak	11
Syunik	31
Vayots Dzor	15
Tavush	33
Armenia	**229**

Source: Marzes and Yerevan city of the Republic of Armenia in figures, 2014, NSS, 2014

The Armenian hotel industry develops rapidly. As compared to 2013, in 2014 the number of hotels rose by 39, with 14 hotels in Yerevan, and by the end of 2014 the number of hotels and hotel harbors totaled 268, with 89 in Yerevan.

In Armenia, there are about 2,500 **public catering facilities**, with half of them in Yerevan. These include restaurants (about 2,000), outdoor cafes and canteens (about 125), bars (about 50), etc.

The hotels and catering facilities mostly purchase fresh fruits and berries and their processed products from other retail outlets, e.g. markets, shops and supermarkets. Sometimes, such products, mostly processed products, might be delivered to hotels and catering facilities directly by processors.

2.4.1.3 *Exporters*

82. **Fruit and berry exporters.** While the fruit and berry **exporters** with a long experience and reputation are considered to make total 30, in 2014-2015, the number of exporters almost doubled. Given the rich crops in 2015, and seeking to use their opportunities opened up by Armenia's joining the Eurasian Economic Union and take advantage of the effects of the international sanctions against the Russian Federation (that caused product shortage), in 2015 many entrepreneurs purchased fruit and vegetable and exported them.

Spayka Company is the leading exporters. Its market share in fresh fruit and vegetable exports makes 65%. Spayka exports the broadest range of products, with main product groups as follows: stone fruits (apricots, peaches, nectars, cherries), grapes, apples, pears, mushrooms, greens, root vegetables (cabbage, potato, onion, carrot) and vegetables (peppers, tomatoes, cucumbers, radishes). Spayka exports 99% to Russia and other former Soviet Union states and 1% - to European states.

The other exporters are relatively small. Before 2012-2013, each of the exporters (except for Spayka) used to export 500-600 tons of fruit. In 2014-2015, the market has seen even larger exporters. As of September, 2015, a few major exporters recorded the rates below: SV Group exported 4,610 tons of fruits and vegetables (apricot: 4,000 tons, and cherry and potato making the rest); Mavas Group: 700

tons (apricot: 69 tons, and tomato, cherry and potato making the rest); Mos Fruit: 515 tons (apricot: 210 tons, peach: 180 tons, and grapes making the rest); Kaga Group: 427 tons (apricot: 60 tons, and tomatoes and grapes making the rest); Gago-77: 350 tons (plums: 100 tons, and grapes making the rest). These rates will continue to grow till the end of 2015, with the intensive of grapes export ahead.

Berries are exported by Biga Company, a leader of berry production in Armenia (located in Akunk village, Kotayk Marz).

2.4.2 Trade Volume

2.4.2.1 *Sales of fresh fruit and berries*

83. **Fresh fruits and berries commercialization rates.** In Armenia, some part of almost every agricultural production is consumed within the producing households and does not enter the value chain. Most bulk of the production sold by such households determines the commercialization rate (= sold production quantity/ total production quantity).

The commercialization rates differs from one agricultural product variety to another and largely depend on the quantity of production. Since the home consumption of the producing households is a relatively constant value, the higher farmers' production quantities, the higher their rate of commercialization. This becomes particularly obvious with the different commercialization rates for the marzes available. Accordingly, the largest fruit and berry producers are located in Ararat, Armavir and Aragatsotn marzes. These 3 marzes also recorded the highest rates of commercialization, respectively, 72%, 87% and 77% (seeTable 58). The lowest commercialization rates were recorded in Tavush, Gegharkunik and Vayots Dzor marzes: 7%, 9% and 12%, respectively.

Table 58 - Sale (use) of fruit and berries by farming households in 2014, % of production volumes

	Total	Including:				
		Sold	Delivered within exchange of goods	Delivered in kind for services	Consumed within the households	Balance in the household
Aragatsotn	100%	77.3%	3.2%	-	16.2%	3.3%
Ararart	100%	71.6%	8.1%	1.2%	17.9%	1.2%
Armavir	100%	86.6%	4.1%	1.3%	7.9%	0.1%
Gegharkunik	100%	8.5%	-	-	69.6%	21.9%
Lori	100%	15.5%	1.0%	0.2%	79.5%	3.8%
Kotayk	100%	41.6%	3.2%	0.2%	41.4%	13.6%
Shirak	100%	16.4%	11.5%	-	37.0%	35.1%
Syunik	100%	27.6%	10.9%	1.3%	51.3%	8.9%
Vayots Dzor	100%	11.9%	21.4%	-	36.1%	30.6%
Tavush	100%	7.4%	3.3%	0.3%	75.5%	13.5%
Armenia	**100%**	**51.8%**	**6.6%**	**0.6%**	**32.3%**	**8.7%**

Source: Realization (Use) of Agricultural Product by Peasant Farms for 2014 (in Armenian), NSS, 2015

The reasons for the low commercialization rates are not restricted to the small sizes of farming households and small production volumes. Due to the difficulties with sales and long-term storage of fruits and berries, farmers have to process their products. In this regard, the leading marzes are Gegharkunik and Tavush. The fruits and berries consumed within the producing households (70% and 76%, respectively) were mostly consumed as processed products: Gegharkunik: 94% and Tavush: 66%. Farmers produce preserved fruits, compotes and fruit vodkas, etc. for their own consumption.

84. **Fresh fruits and berries sales volumes.** As compared, the fruit and berry production volumes and commercialization rates within the past few years, suggest that the total quantity of the fruits and berries used by producing farms (farming household consumption of fresh and processed fruits and berries) makes 90-95 thousand tons annually, and this rate does not vary too much from year to year.

Use by producer's of their own products within their farming households:
Below are the rates of production and farming household use (consumption) volumes of the fruits and berries targeted under the Survey:

2014:	- Fruit and berry production quantity:	291,113 tons
	- Share of household use (consumption) by producers:	32.3%
	- Quantity of household use (consumption) by producers:	**94,029 tons**
2013:	- Fruit and berry production quantity:	338,084 tons
	- Share of household use (consumption) by producers:	27.0%
	- Quantity of household use (consumption) by producers:	**91,283 tons**

The share of the products delivered to the market by producers exceed that of the products for their household use (consumption). In 2014, the quantity of the fruit and berries produced and sold by farmers totaled 197 thousand ton, and in 2013 - 247 thousand tons. It is this quantity of products that constitutes the market supply volume and passes through the value chain. **If the production quantities of all the types of the surveyed fruits and berries make about 343 thousand tons in an average favorable year** (as shown in Paragraph 5), it follows that the **quantity of the fruits** (apples, pears, apricots, peaches and plums) **and berries** (strawberry, raspberry, blackberry and currant) delivered by the producers to the market **will range between 248 and 253 thousand tons**.

2.4.2.2 *Export of Fresh Fruits and Berries*

85. **Varieties of exported fruits and berries.** Apricot has the largest export volumes and potential as compared to the other fruits exported from Armenia. The other fruits with relatively stable and significant export quantities cover as follows: grapes, peaches, cherry and plums. Apples and pears are also exported, but their export quantities are not too high and vary dramatically year by year.

86. **Fruit and berry export quantities.** To collect information on export quantities, the Consultant used various sources, including: NSS, information available on the Internet with sourced by the RoA Ministry of Agriculture, State Service for Food Security (SSFS), customs agencies, etc. It is noteworthy that the figures published by the NSS have some insignificant differences as compared to those

provided by other sources. From here on, the export data are provided incompliance with the RoA Ministry of Agriculture and SAFS sources since only such sources cover breakdown of export data by countries.

Table 59 - Fruit and berry export quantities, 2012-2015, tons

Fruits and berries	2012	2013	2014	2015 (as ofSep. 15)
Fruits (apples, pears, apricots, peaches, plums)	14,742	25,706	7,487	27,122
Berries (strawberry and raspberry)	0	37	44	11
Total	**14,742**	**25,743**	**7,531**	**27,133**

The lower fruit export quantities in 2014 were caused by the unprecedented decline of apricot crops. Apricot production volumes have the biggest influence on the fruit export since apricot makes 80-90% of total exports.

Table 60 - Fruit and berry export quantities by fruit types, 2012-2015, tons

Fruits and berries	2012	2013	2014	2015 (as of Sep. 15)
Apple	45	635	29	505
Pear	2	7	1,993	1,415
Apricot	12,629	23,259	1,791	21,275
Peach	1,597	978	2,968	2,345
Plum	469	827	706	1,583
Strawberry and raspberry	0	37	44	11
Total	**14,742**	**25,743**	**7,531**	**27,133**

The Armenian fruit export volumes have grown since 2011-2012, as Spayka Company started its exports. Spayka owns a large fleet of trucks, up-to-date fruit reception, sorting and storage production lines and equipment and applies new product containerizing solutions and most importantly, its realizes its exports to supermarkets (rather than open-air markets). Over the half of the export quantities inTable 59 are ensured by Spayka.

87. **Countries where fruits and berries are exported.** The list of countries where Armenian fruits and berries are exported is not too extensive; in fact, it contains a dozen of countries. Among such countries, **Russian Federation** might be considered the **priority export destination,** and **Georgia** as a

key destination. Based on the data in[Table 60] suggesting that in 2012-2015 (as of September 15), the fruit and berry export quantities totaled 75,149 tons, it can be concluded that 87% of such export volume entered Russian Federation, and 11% - Georgia.

Table 61 - Countries where fruits and berries are exported by the gross export outcomes of 2012-2015, tons

Courtiers where fruits and berries are exported	Apple	Pear	Apricot	Peach	Plum	Strawberry and raspberry	Total
Russian Federation	1,003	3,413	50,728	6,883	3,332	54	**65,413**
Georgia	212	3	6,656	980	201	2	**8,054**
Ukraine			1,159	19	20		**1,198**
Belarus			306		3		**309**
Kazakhstan			95		7		**102**
UAE			9	6	22	36	**73**
Total	**1,215**	**3,416**	**58,953**	**7,888**	**3,585**	**92**	**75,149**

As for the other countries where Armenian fruits and berries are exported, they cannot be considered stable markets. Ukraine used to range as the 3rd largest market before the start of the domestic crisis there in 2014. Instead, there are some new prospects with Belarus and Kazakhstan, but the export quantities to these countries are still too small. Another promising export market is UAE where the Armenian strawberry and raspberry are exported. While the Armenian fruits are exported to some other countries as well, the export quantities are too limited. In the past few years, small quantities (several hundred kg) of fruits were exported to Netherlands, Switzerland, Germany, Latvia, Norway, Austria and Kuwait. Yet, the prospects for expanding on these markets are still too unclear.

2.4.2.3 *Export of Processed Products*

88. **Exported processed product varieties.** Fruits and berries are processed by farming households (including producers of fruits and berries) and processing units. Only the production of the processing units is exported. Such plants export all their processed products: fruit preserves, jams, compotes, fruit juices and fruit concentrates. Within the exported products, apricot, peach, apple and tomato processing products prevail.

89. **Processed product export quantities.** The Armenian processed product export quantities increase year by year. This holds true for both fruit preserves, and juices, and dried fruits. This is promoted by the increased recognition of Armenian products in foreign markets, which is achieved due to the quality and taste and flavor compounds.

Table 62 - Exports of fruit and berry processed products in 2012-2014

Processed products	2012		2013		2014	
	Quantity, ton	Cost, USD	Quantity, ton	Cost, USD	Quantity, ton	Cost, USD
Fruit preserves	2.5	4,985	5.1	14,072	20.6	70,963
Jams, fruits puree	703.0	1,220,178	980.2	1,564,536	1,000.3	1,400,235
Other preserves	2,846.5	6,551,913	4,387.0	8,318,398	4,886.7	10,090,836
Fruit juices	1,845.5	2,277,818	1,931.1	2,455,243	2,502.5	3,205,436
Total	-	**10,054,894**	-	**12,352,249**	-	**14,767,470**

Source: Foreign Trade of the Republic of Armenia for 2012-2014 (According to the Commodity Nomenclature of External Economic Activity at 8-digit level), NSS, 2013-2015

The processed products with overwhelming export quantities are fruit juices and semi-ready products for their production, i.e. fruit concentrates (making up the major part of products on line 3 and complete part of products on line 4,Table 62). The group of fruit and vegetable juices contains one type of vegetable juice, namely tomato juice, with export quantity of 473.6 tons in 2014. And the rest are all fruit juices. While Armenia grows no subtropical fruits, it exports fruit juices as well. Particular, in 2014, Armenia exported 310 tons of orange juice, 25 tons of grapefruit juice, and 72 tons of pineapple juice. Such juices are produced from the imported fruit concentrates.

As for dried fruits export quantities, their rates are much lower but show a tendency for growth. In 2014, dried fruits exports totaled 158 tons worth 697,000 USD.

Table 63 - Dried fruit export in 2012-2014

Dried fruits	2012		2013		2014	
	Quantity, ton	Cost, USD	Quantity, ton	Cost, USD	Quantity, ton	Cost, USD
Dried apricot	12.1	39,803	8.1	27,464	5.0	39,086
Dried plum	4.9	24,635	24.0	64,343	38.6	153,750
Dried apple	1.0	10,042	1.3	3,424	0.4	2,682
Dried peach	5.2	17,676	18.6	55,518	58.8	326,029
Dried pear	0.5	6,612	5.9	14,673	3.5	27,804
Other dried fruits	24.0	38,548	50.7	83,749	49.5	136,087
Mixed dried fruits	0.2	313	2.6	12,564	2.1	11,162
Total	**47.9**	**137,629**	**111.2**	**261,735**	**157.9**	**696,600**

Source: Foreign Trade of the Republic of Armenia for 2012-2014 (According to the Commodity Nomenclature of External Economic Activity at 8-digit level), NSS, 2013-2015

Peach and plum are the main exported dried fruits. As for dried apricots, it is not become popular with the foreign markets yet due to the dominant positions of the Turkish dried apricot. Here, the major problem lies in too small production quantities.

90. **Countries where processed products are exported.** Unlike fresh fruits and berries, the export geography of the Armenian processes fruit and vegetable products is much wider. As of the data of 2014, the processed products were exported to 27 countries around the world. Here again, the primarily sales market of the Armenian products is **Russian Federation**, where in 2014, 78% of the processed products were sold. However, unlike fresh fruits and berries, the processed products are also sold on the markets of developed countries; this attests to the advanced competitive capacities of such products. The list below covers the 10 countries constituting the major export destinations:

1) Russian Federation: 78%
2) USA: 5.0%
3) Georgia: 3.6%
4) Ukraine: 2.9%
5) Kazakhstan: 2.6%
6) Belarus: 2.2%
7) France: 1.5%
8) Turkmestan: 1.0%
9) Germany: 0.4%
10) Sweden: 0.4%

2.4.2.4 *Import of fresh fruit and berries*

91. **Imported fruit varieties.** Armenia's foreign trade balance is negative: fruit imports exceed exports. According to the gross results of 2012-2014, the Armenian fruit exports totaled 48 thousand tons, while the imports in the same period totaled about 89 thousand tons. However, these figures can hardly provide the real picture of the state of affairs. Actually, **Armenia mostly imports the fruits not cultivated in thee country**, i.e. the imported fruits come to complete the varieties of the consumed fruits. Only 6% of the 89 thousand tons of fruits imported in Armenia in 2012-2014 covered fruits that grow in Armenia as well. The fruits below make the largest numbers in the fruit imports quantities: banana (39%), orange (24%), mandarin (15%), lemon (4%) and grapefruit (3%). There is nothing strange about the import of such fruits; like the other countries located in the same zone and even further north (European countries, Russia), Armenian imports tropical and citrus fruits. The import of such fruits will continue regardless of the quantities of fruit production in Armenia and trends of changes thereof.

The analysis of the imported fruit varieties shows that out of the fruits cultivated in the country as well, Armenia imports those with limited volume of domestic production, particularly, persimmon, quince and pomegranate. These imported fruits come to meet the demand not met by the local products. Some others fruits are imported into Armenia due to seasonal shortage. For instance, while the harvest of melons and watermelons in Armenia starts in August, as early as in May the Armenian markets offer watermelons mostly imported from Iran.

92. **Fruit and berry import quantities.** The data on import quantities below is also base on the sources of the RoA Ministry of Agriculture and SSFS since only such sources provide import data breakdown of countries.

Table 64 - Fruit and berry import quantities in 2012-2014, ton

Fruits and berries	2012	2013	2014
Total import, with`	**27,066**	**29,999**	**31,888**
Apple	80	84	380
Pear	142	48	95
Apricot	-	0.04	1.0
Peach	4	76	96
Plum	0.5	0.3	1.4
Strawberry	0.7	1.3	3.6

Below are listed the 3 preconditions for importing the fruits targeted under the Survey:

1) Before ripening of the local fruits and the start of the harvest season, some businesspersons take advantage of the consumers' expectations and import into Armenia fruits cultivated in the country, such as grapes (mostly in July-August), apricot (in May), peach (June-July), plums (June). Such fruits are imported from countries where they ripe about 1 month earlier, particularly from Uzbekistan and Iran. This precondition will always persist, and this year Armenia will see "pre-harvest" import again. But one thing is clear. Such volumes of fruits are imported to Armenia at high prices and with the intent to sell it within 1 month; therefore, such import volumes will be very small.
2) Fruits cultivated in Armenia as well are imported due to market deficit. In years when a particular products yield poor crops due to some reasons, their import volumes are larger. Particularly, this was the case with the relatively large quantities of apple imports in 2014. However, it is noteworthy that some fruit types, such as grapes and apricots that are quite sensitive to long-distance transportations, are imported in small quantities even in years with poor crops.
3) Some fruits are imported to Armenia the improve marketable appearance of fruit stalls. These fruits mostly include peach, apple, pear. Such imports are initiated by the major Armenian commercial networks, e.g. SAS, Yerevan-City. However, this condition is not a sufficient for large-scale imports. The Armenian consumers with their preferences also have a say, and they mostly choose local fruits.

93. **Countries wherefrom fruits are imported.** Armenia imports a relatively significant quantities of apple, pear and peach. Apple and pear are imported in small quantities, mostly to ensure variety of the product in the second half of the year. These fruits are mostly imported from France, Italy, Chile, Turkey and United States. Peaches, mostly nectarines are imported overwhelmingly from Georgia.

Table 65 - Countries wherefrom fruits and berries are imported to Armenia, by gross import data, 2013-2014, tons

Foreign countries	Apple	Pear	Apricot	Peach	Plum	Strawberry and raspberry	Total
France	102	1					**103**
Italy	100						**100**
Chile	73	13		1	0.2		**87**
Turkey	72	54	1		1.2	3	**131**
USA	63	13					**76**
Georgia	16	2		174			**192**
Republic of South Africa	16	24					**40**
China	7	19					**26**
New Zealand	7						**7**
Greece	1	6					**7**
Belgium		4					**4**
Other	5	9			0.4	1	**15**
Total	**462**	**145**	**1**	**175**	**2**	**4**	**787**

2.4.2.5 ***Processed product import***

94. **Imported processed product variety.** The imported fruit and vegetable processed product varieties are the same as exported. Armenia imports fruit preserves, jams, juices, concentrates and dried fruits. These products are processed from raw materials that either are no cultivated or developed in Armenia. Particularly, a large share of the imported processed products make canned olives, green pea, corns, *walnuts*, *subtropical fruits concentrates*.

95. **Processed product import quantities.** While **the import quantities of canned fruits and natural juices** have fluctuated year by year, in the long term, they are generally stable. The import is relatively stable due to the fact that the preserves and juices from the fruits not cultivated in Armenia have always prevailed among the imported processed products.

Table 66 - Imports of fruit and berry processed products in 2012-2014

Processed products	2012		2013		2014	
	Quantity, ton	Cost, USD	Quantity, ton	Cost, USD	Quantity, ton	Cost, USD
Fruit preserves	28.1	87,263	75.8	217,479	56.8	169,151
Jams, fruit puree	229.7	335,775	312.3	473,364	251.7	388,172
Other preserves	382.0	823,894	1,464.8	3,655,389	846.1	2,335,077
Fruit juices	5,660.1	6,057,145	4,393.4	5,640,164	2,943.6	4,835,020
Total	-	**7,304,077**	-	**9,986,396**	-	**7,727,420**

Source: Foreign Trade of the Republic of Armenia for 2012-2014 (According to the Commodity Nomenclature of External Economic Activity at 8-digit level), NSS, 2013-2015

According to the data in Table 66, the import of fruit and vegetable juices has continuously reduced in the past 3 years. This can be accounted for by the 2 reasons below: a) increasing number of Armenian processing companies equipped with modern technology and ensuring quite completive products in terms of marketable appearance, quality and cost, b) Armenian processing companies have started packaging the products of imported juice producers by relevant license agreements. Thus, in 2012, the world-famous Pepsi Group Company, represented in Armenia by Jermuk Group, imported equipment to package the leading imported Sandora juice (Ukraine) in Armenia. Such activities are also implemented by EuroTerm and Ararat Food company which package several Russian products branded ‘Haykakan Hamer’ and ‘Moya Semya’, respectively. The Russian ‘Dobry’ juices are also partly packaged in Armenia.

The processes above have resulted in shift of domination in the natural juice market from importers to local producers.

The **dried fruit import quantities** almost equal the export quantities. Imports ensure 10-15% of the Armenian dried fruit market. The largest bulk of such import products comprises apricot and prune dried fruits produced from fruits that are cultivated in Armenia.

Table 67 - Dried fruit import in 2012-2014

Dried fruit	2012		2013		2014	
	Quantity, ton	Cost, USD	Quantity, ton	Cost, USD	Quantity, ton	Cost, USD
Dried apricot	104.5	268,351	37.2	103,828	62.3	321,717
Dried prune	73.9	210,892	42.6	110,391	35.1	118,427
Dried apple	0.0	248	0.0	150	0.0	287
Dried peach	0.0	83	0.0	0	13.1	85,615
Dried pear	0.0	0	0.0	0	0.0	0
Dried papaya	2.6	9,770	3.3	12,930	2.8	10,698
Other dried fruits	21.7	55,622	21.9	50,714	26.7	102,040
Mixed dried fruits	0.0	442	0.1	1,056	0.2	1,292
Total	**202.7**	**545,408**	**105.1**	**279,069**	**140.2**	**640,076**

Source: Foreign Trade of the Republic of Armenia for 2012-2014 (According to the Commodity Nomenclature of External Economic Activity at 8-digit level), NSS, 2013-2015

The key advantage of the imported dried apricot and prune are their relatively low and stable prices that can be afforded by the exporting producers (Turkey, Iran) due to the large quantities of production.

96. **Countries wherefrom processed products are imported.** According to the data of 2014, Armenia imported processed fruit and vegetable production from 46 countries. The list below covers the 10 countries constituting the largest sources of import.

1) Russian Federation: 14.9% mostly natural juices
2) Spain 14.0% mostly olive processed products
3) China 9.8%
4) Hungary 9.7% mostly green pea processed products
5) India 7.6% mostly processed vegetables
6) Iran 5.8% mostly tomato paste concentrates
7) Ukraine 5.6% mostly natural juices
8) Israel 5.0%
9) Netherlands 3.8%
10) Romania 3.0%

2.4.3 Markets

97. **Volumes of fresh fruits and berries and their processed product markets and their market.** The balance of fresh fruits and berries and their processed product market is shaped by the difference between the 2 input parts (production and imports) and an output (export) parts.

Some difficulties with estimating the surveyed product market size are related to the fruit preserves dried fruits. Particularly, the difficulties with the fruit preserves are caused by the lack of any comparable data on both production quantities of their varieties, and export and import volumes, which obstructs the estimation of the market size of this large product group. As for dried fruits, no accurate production data are available as well they are mostly produced by individual farming households or small processing units with overwhelmingly shadow businesses. The table below shows the volume of fresh fruits and berries and their processed production markets as of 2012-2014.

Table 68 - Volume of fresh fruits and berries and their processed production market size, 2012-2014, tons

2012

Products	Production	Export	Import	Market size
(1)	(2)	(3)	(4)	(5) = (2) - (3) + (4)
Fresh fruits and berries*	331,736	14,742	227	**317,221**
Canned fruits, with: *sweet fruit preserves, jam, fruit puree*	2,666 -	- 705	- 258	**?** **?**
Fruit juices	16,144	1,845	5,660	**19,959**
Dried fruits	~ 1,000	48	203	**1,155**

2013

Products	Production	Export	Import	Market size
(1)	(2)	(3)	(4)	(5) = (2) - (3) + (4)
Fresh fruits and berries *	338,084	25,743	210	**312,551**
Canned fruits, with: *sweet fruit preserves, jam, fruit puree*	3,357 -	- 985	- 388	**?** **?**
Fruit juices	18,924	1,931	4,393	**21,386**
Dried fruits	~ 1,000	111	105	**994**

2014

Products	Production	Export	Import	Market size
(1)	(2)	(3)	(4)	(5) = (2) - (3) + (4)
Fresh fruits and berries *	291,113	7,531	577	**284,159**
Canned fruits, with: *sweet fruit preserves, jam, fruit puree*	2,584 -	- 1,021	- 309	**?** **?**
Fruit juices	20,645	2,502	2,944	**21,087**
Dried fruits	~ 1,000	158	140	**982**

* - only the fruits and berries targeted under the Survey

The data above suggest as follows:

- The fresh fruit and berry markets heavily depend on **production quantities** since the **export** and especially **import** volumes of the fruits surveyed are quite small, as compared to their production volumes;
- Armenian products are dominating on the canned fruit market, particularly among sweet fruit preserves, jams and compotes;
- due to the current developments in the natural fruit juice market, the Armenian market gradually shifts towards domestic production resulting in larger volumes of local production and reduced imports;
- in terms of dried fruits, the market is also primarily formed by local production; yet, the foreign trade turnover is unstable and fluctuating, often even negative, due to products (dried apricot and prune) that might be undoubtedly replaced by local production.

The sharp fluctuations in the fresh fruit and berry production quantities, as was the case in 2014, as compared to 2013, constitute a considerable stress for all the actors in the trade value chain: producers, processors, traders, perhaps except for the end consumers. Consumers can always replace one fruit type with another in their consumption structure. For instance, as the apricot production in 2014 was very low and the prices were too high, consumers started using other fruits: cherry, peach and apples. Thus, sharp fluctuations in separate fruits are not a big problem for consumers.

98. **Consumers** Both fresh fruits and berries, and their processed products are overwhelmingly consumed by the country's population who acts as end-consumer. At the same time, the products above are also consumed by various businesses in the food industrial sector. Particularly, fresh and processed products are consumed (used) for production purposes by the entities below:

- *Confectionary plants* (with leading plant Grand Candy) use dried fruits, particularly dried apricot, peach, plum and fig. Grand Candy was the first to import to Armenia dried apricot for industrial purposes (raw material);
- *Bakery plants* producing cakes, cookies, fruit jelly, etc.

99. **Customers' preferences.** It is widely held among the Armenian population that locally produced foods are better and preferable than imported ones. This position is supported by the opinion that the Armenian food is fresh and delicious. Regardless of the underlying causes, such opinion of the

consumers is a significant competitive advantage for the local food industry and its processed products.

It is noteworthy that in terms of fresh fruits and berries, consumers' preferences are definitely in favor of the Armenian production. This especially holds true for the surveyed fruits and berries. The consumers also largely prefer the products processed from locally raw materials (e.g. apricot, cherry, sweet cherry, peach, pear and fig preserves, apricot or peach jams). The consumption rates of such products are not too high due to the widespread tradition among the households of preparing home-made jams and marmalades.

As for natural juices, the state of affairs is quite different. The Armenian market reveals is a fierce competition between the local and imported juices in the market, and the former gradually strengthen their positions and enhance their market share. The Consultant dynamically tracked the developments in the natural juice market in terms of being recognized and preference for any specific trademarks or tastes and flavor compounds among the consumers. Hence, according to survey back in 2009, in brand name most engraved in consumers' memory was the Russian J7, followed by Ukrainian Sandora and Armenian Noyan. In the few years after, developments occurred that might first seem minor but are actually quite essential. According to the information provided by SAS supermarkets, in 2015, Sandora and Noyan were the top sold natural juices. It should be borne in mind, however, that Sandoran is already packaged in Armenia and there is some intention to gradually shift to local raw materials. The most top-selling flavors of Sandora are those of banana, apple, orange, pineapple and multifrut. As for Noyan, the to- selling flavors are those of rosehip, orange, cherry, apricot and apple. The list of other leading natural juice brands covers as follows: Maaza mango juice (produced by Zovk Plant (Armenia) produced by imported raw materials, Santal orange juice (produced by Parmalat, Italy), Ararat juices (produced by Ararat Food Factory, Armenia), Yan juices (produced by SIS Natural, Armenia).

100. **Growth potential for fruit and berry processed products quantities.** Data inTable 68 suggest that the fruit and berry processed product markets are generally well-balanced and have a tendency of slow growth. Yet, the market slow growth relies on the developments of the past 10-15 years. As for short-term historical figures and expectations, the Armenian fresh fruit and berries and their processed product markets revealed both new opportunities and challenges. If we supposedly ignore the unpredictable interventions of the climate conditions with the fruit and berry production process, it might be concluded that its further development depends heavily on export opportunities. Currently, the primary export destination of both fresh and processed fruits and berries is Russian Federation which represents a market of both opportunities and challenges. For about 2 years, Russia has faced international sanctions, which is among other expressed by restrictions of trade among countries. A number of leading European producers of fruit and vegetables, namely Poland, Spain, France and Greece are deprived of the opportunity to export their products (not only fruits, but also many types of ready food products) to Russia. This results in product shortage on the Russian market. No doubt, this situation opens up a **great export opportunity for the Armenian fresh and processed fruits and vegetables**. However, the complicated economic and political relations between Russia and its trade and political partners have resulted in a series of economic difficulties in Russia. Thus, its economy is heavily depends on its raw materials (gas, oil) exports, which are priced much cheaper under the current trade war. One of its negative effects results in declined purchasing power of the population, which, in its turn, affects the fresh fruits and processed products consumption volumes. Consequently, the major Russian commercial chains have either reduced their orders or restricted the payment mode. As a result, the working capital circulation of the organizations suppling products to such commercial chains is significantly delayed. Such organizations cover among others, Armenian

export processing companies. **This constitutes the global challenge posed by the Russian market**. This year (2015), a number of fruit processing units have significantly reduce their purchase volumes of fruits and berries fearing that they would no longer be able to sell their products in Russia.

Armenia's economic difficulties posed another challenge to the growth of the fruit and berry processed production quantities. Not only there is no growth in the local market, but it rather slowly declines due to the decreasing number of the population and its declined purchasing power. Here too, most of the problems stem from Russia's economic difficulties since the Armenian economy heavily depends on remittances from Russia. In the past 2 years, the annual flow of the remittances from Russia that used to total 1 billion USD has decreased by about 20%, which is a serious problem for a country with small economy like Armenia.

The situation above casts uncertainty on Armenia's further economic development and makes it quite impossible to make any substantiated projections on the growth potential of the fruit and berry processed production quantities.

2.4.4 Prices

101. **Factors affecting price formation at wholesale and retail sales levels** As mentioned above (see Para. 13 (p, 109) and Para. 67(p. 144)), the prices of both fresh fruits/berries, and their processed products vary greatly due to the prime values of such products and an number of other factors influencing price formation. The factors affecting the prices of end-products are not limited to their production stage (with farmers and processors). The products further pass through the wholesale and retail links of the value chain, where along with the wholesalers' and retailers' profits, such products are affected by some other factors raising their prices. The table below shows the factors affecting product prices at wholesale or retail stages.

Table 69 - Factors affecting product prices at wholesale or retail stages

Factors affecting wholesale prices	Factors affecting retail prices
▸ **Purchase price at which products are procured from suppliers.** This price already covers all the factors affecting the prime price formation of the product at the stage of production. ▸ **Wholesale purchaser's transportation costs.** Thesecosts vary greatly, depending on the destination. If the wholesale purchaser is an intermediary and the fruits and berries are transported from Artashat to Yerevan, the price increases by up to 20 AMD (per kg). And if the purchaser is an exporter and transports the fruits and berries from Artashat to Moscow, the price increases by 270 AMD (per kg). ▸ **Other costs** related to the activities of wholesale purchasers, including vehicle operating and maintenance costs, various fees, e.g. parking (e.g. in the market), storage, cold storage facilities and other infrastructure.	▸ **Purchase price at which products are procured from suppliers**If the product is supplied to the retailer directly by the producer, this price already covers all the factors affecting theprime price formation of the product at the stage of production. As for cases when the product is supplied by intermediaries, the price is also influenced by the factors covering the costs of intermediaries. ▸ **Retail purchaser's transportation costs.** This applies only if the product is supplied bythe retailer at his own expense, rather than by the producer. ▸ **Retail outlet marketing policies.** Some retailersincursignificant marketing costs (e.g. intensive TV and radio ads), as well as high-quality service costs, etc. In such outlets,the product prices are higher (e.g. SAS supermarkets) as compared to their competitors. ▸ **Other costs** related to the activities of retail purchasers, including fixed assets use and maintenance costs, wages and other infrastructure.

102. **Wholesale and retail prices.** The fresh and processed fruits and berries show some differences in the formation of their wholesale and retail prices. Thus, the wholesale prices of **fresh fruit and berries** are formed as a result of the intermediaries' activities. Here the main role rests with mobile intermediaries and wholesalers in agricultural markets. The latter make quite a small number and may even unite to dictate their prices to suppliers (producers).

As for retailers, they may play various roles in the retail price formation. Thus, small traders (market or street traders, marz-based individuals or fruit stands trading agricultural products), they mostly buy product from intermediaries, i.e. at higher prices as compared to direct purchase from producers. Nevertheless, since small traders have no additional costs (e.g. wages, fixed assets maintenance or operating costs), they can afford purchasing products from intermediaries. Unlike them, major retailers (e.g. supermarkets) seek to purchase products directly from their producers (so-called *first-hand)* or at least at producers' prices to ensure that upon applying their extra price (profits and costs) the product prices still remain competitive.

The situation above almost similarly applies to **processed products,** with the only difference that here most products flow from producers (processors) directly to retail outlets, without intermediaries. This flow is ensured by processors through their own delivery services. Along with this, there are 2 wholesale food markets in Yerevan (Petak and Surmalu) engaged in wholesale trade of ready food products, including fruit preserves and juices. The keepers of food shops and stalls in marzes mostly purchase their trade stocks at the markets above.

Upon summarizing the data collected from fresh and processed fruit and berry wholesaler and retailers, it can be roughly estimated that fresh fruit and vegetables wholesale prices are 1.2-1.5 times and retail prices - 1.5-6 times as higher as producers' prices. The fresh fruit and berry prices are most dramatically transformed in the longest cycle of the value chain starting from producer's orchard and ending in retail chain of the export market. In this cycle, the fruit and berry producers' wholesale prices and export market retail prices might differ by up to 5-6 times. For instance, in 2015, exporters purchased high-quality apricot by 400-550 AMD/kg and then wholesaled it in Russian Federation for 100-200 rubles (equivalent to 870-1,740 AMD) and retailed for 150-250 rubles (1,300-2,175 AMD).

As for the processing production, the processing units control the situation. This is quite natural since given the strong market competition, processors let the intermediaries determine the prices at their own discretion. As mentioned above, the fruit and berry processors are guided by the **weighted average cost price** calculations making it possible for them to set similar sales prices for the products.

Retail outlets sell processed products at higher prices as compared to producers' (wholesale) prices. The retail prices of natural juices are about 1.25-2 times as high and those of fruit preserves - 1.6-3 times as high. The table below shows the producers' (wholesale) and retail prices for the 2 products above making a large share in the processing industry.

Table 70 - Wholesale and retail prices of fruit preserves *

Product	Producer's sales (wholesale) price	Retail price			
		Tamara (Armenia)	Noyan (Armenia)	Artfood (Armenia)	Yan (Armenia)
Fruit preserves	1,200 AMD/kg	Peach  1,250 AMD/400 g	Cherry  1,430 AMD/450 g	Peach  690 AMD/340 g	
		Walnut  1,250 AMD/400 g	Walnut  1,410 AMD/450 g		Walnut  990 AMD/275 g
		Blackberry  1,250 AMD/400 g	Blackberry  1,430 AMD/450 g	Blackberry  690 AMD/340 g	Raspberry  990 AMD/275 g
		Cornel  1,250 AMD/400 g.	Strawberry  1,430 AMD/450 g	White cherry  690 AMD/340 g	Fig  990 AMD/275 g

* - Retail prices are provided as of October 19, 2015 at SAS supermarket, which has the highest prices as compared to other retail chains. The products above can be found in other retail outlets at 15% lower prices.

Table 71 - Wholesale and retail prices of natural juices*

Product	Producer's sale (wholesale) price, AMD/l	Retail price, AMD/l			
		Sandora (Ukraine)	Noyan (Armenia)	Amare (Armenia)	Yan (Armenia)
Natural juice	450	Banana  720	Pineapple  690	Pineapple  570	Multifruit  880
		Vegetable  720	Rosehip  690	Tomato  570	Rosehip  880
		Orange  720	Orange  690	Orange  570	Orange  880
		Apple  720	Apple  690	Strawberry  570	Cherry  880
		Cherry  720	Apricot  690	Apricot  570	Apricot  880

* - Retail prices are provided as of October 19, 2015 at SAS supermarket, which has the highest prices in retail chain

Pomegranate juice (beverage) is an exception from the taste-based price standard principle, with its price exceeding by some 50% those of juices of other tastes. By the way, the same approach is used by importers.

103. **Marketing actions to promote retail sales.** Retail sales promotion should cover only the fruit and berry processing industry. As for the fresh fruits and berries, no measures are taken as such to promote their sales. This can be accounted for by the 2 reasons below: a) in terms of the surveyed fruits and berries, the local market is comprised by over 99% of local production; therefore, there is no need to promote its sales for improved competing capability against imported fruits. Moreover, consumers fully prefer the local products; b) individual farming households producing most of the fresh fruits and berries have neither the knowledge nor required resources to take any marketing activities.

As for the sales promotion of processed products, both producers, and importers use all effective means ofinfluencing consumers' choice. Such sales promotion activities overwhelmingly cover TV advertisements and various actions (tasting, discounts) in retail stores, particularly supermarket. Along with the proactive promotional activities and advertising campaigns, local producers use some psychological techniques to influence the consumers' choice. A number of leading Armenian enterprises use national notions in their brands and trademarks, e.g.: "Noyan", "Sis", "Ararat", etc. The Ararat Food Plant which has entered the market quite recently, decorates the boxes of its products ("Ararat", "Armenium") with the paintings of Martiros Saryan and Minas Avetisyan. While it is difficult to assess to the extent to which such actions contribute to promotion of Armenian products, the fact that the increased recognition and sales growth of the processed products increase in parallel with each other attests to the efficiency of the marketing activities.

2.4.5Standards

104. **Processed product standards[47].** In Armenia, there are a number of fruit and berry processing standards. In particular, the RoA Government Decree No. 744-N dated June 26, 2009 set the tecnichal regulatons for juices and juice products.[48] The technical regulation requirements above cover 121 standards in complaince with the AST and GOST standards. The list of standards is available on the website of the National Institute of Standards.[49] There are also technical requirements for compotes and jams (AST standards), technical requirements for fruit preserves (GOST standards), etc.

105. **Product security.** Amongother key tasks, the processing units have to ensure the food product security throughout the entire cylcle of accepting the raw materials up to the sale of end-products. e to the final finished product sales throughout the cycle. Processors mostly import the raw materials from foreign countries; it is extremely important to make sure that such materials comply with the required standards and norms, since materials of unknown origin and sometimes even expired ones are often used in processing undermining food security. In this terms, it is essential that relevant state control mechanisms and international standards (sanitary, phyto-sanitary, etc.) are introduced and stipulated by law to regulate every subsector of food production. Furthermore, each subsector should be regulated by relevant legislative clauses focusing on relevant objectives, challenges and necessary measures to solve them.

Most of the fruit preserves and juice producing entities, on their own initiative, introduced the ISO 9001-2008 (Quality Management), ISO 9001-2015 (Quality management of enterprise risks and

[47] For fruit and berry standards see sections above (see Para. **19**, p. **32**).
[48] Source: http://www.sarm.am/docs/Tex%20kanon%20hjuter.pdf
[49] Source: http://www.sarm.am/js/editor_innova/assets/TK_hyuter.pdf

potential safety) and ISO 14001 (Environmental Management) standards. As for dried food producers, they still have to embark on this process, since they have taken no actions yet to introduce the international quality standards above.

2.4.6 Major Constraints and Proposed Solutions

106. **Challenges to fresh fruit and berry markets and trade.** The primary challenge for the fresh fruit and berry trade and market is related to ensuring **regular supplies**. Such requirements are imposed by retail outlets, particularly supermarkets, both on local and export markets. They are interested in timely replenishment of their storages with fresh products. Yet, this problem is difficult to solve in Armenia, since fruits and berries are overwhelmingly cultivated in open ground and yield crops only once a year. Regular supplies are partly ensured only for the crops with long-term storage life (apples or pears) or a long harvest period (berries). As for the stone fruits (apricots, peaches, plums, cherries), which are in great demand, this issue still remains unresolved.

The retail chain actors are aware of this issue and while shaping their business relations with suppliers seek to make arrangements on long-term supplies of a groups of products rather than one-time supply of a single product. In this terms, intermediaries gain a major advantage over primary producers (farmers), since there are universal traders, mobile, specialized in trading, are more skilled at retail trade demand (on the level of rapid data) and perform products distributor's function. This situation aroused discontent among farmers holding that intermediaries obstruct them from delivering their own production directly to end-consumers or ink of the value chain, i.e. the retail chain. This however, does not mean that farmers provide not direct supplies to are retail outlets.

107. **Challenges to processed products trade and market.** The challenge of regular supplies faced by the fresh fruits and berries trade and markets can be considered solved for processed products. The processing settled the issue of their production distribution through delivery services which reduced to the minimum the need for any intermediaries (a small portion of the production is sold by wholesale food markets (Surmalu, Petak)). Instead, the processing product trade and markets face the challenge of **trade financing**. Processors pay for their fixed costs (e.g. procurement of raw material) at the very moment of the transaction and receive payments for the products supplied to retail outlets by installment. This challenge is especially urgent for export transactions, when it comes to large supplies. According to the Chairman of Armenian Union of Union of Canned Food and Juice Producers,[50] the situation can be settled only with the intervention of the State through state guarantees or loan interest subsidies. Another way to solve the problem is to launch the export state insurance system. While this system has been widely discussed for over 2 years, no practical steps have been taken yet.

Today, most processing units are burdened by debt obligations. The current interest rates and other credit market conditions do not comply with the specifics and requirements of the processing units. Processors always meet their re-equipment and working capital needs by loans, usually medium-term (3-5 years) and sometimes long-term, and their rates range between 10 and 18 percent. Given this situation, any disruption to trade financing carries serious financial risks for businesses. 'Alishan' LLC might serve as an illustrate example to perceive the gravity of the problem. Back in 2011, the company above used to be the 3rd leader in the market of fruit preserves (with a 13% market share) and currently it is put up for sale due to its loan obligations (the plant has been already closed up).

[50] Yervand Tarverdyan, Head of Ararat Food Plant

2.5 VALUE CHAIN MANAGEMENT

2.5.1 Dominant Actors

108. **General characteristics.** The study of the composition, functions and relations among the fruits and berries value chain actors suggests that the market of fresh and processed fruits and berries is characterized as **highly competitive**, without any monopolists or dominating entities which might be called dominant players. While various links of the value chain have their own leading actors in terms of their sales volumes, such leaders do not have dominant positions to affect the market independently. Perhaps, the only exception can be tracked in the segment of agricultural raw materials and input supplies.

109. **Actors of the agricultural raw materials and inputs supply segment.** The agricultural raw materials and inputs supply segment has an extremely high level of market concentration. This does not apply to the sectors of planting stock, farming tools and equipment supplies, but rather those of fertilizers and pesticides supplies. Thus, ¾ share of the fertilizers supplies is provided by 3 companies. To avoid any abuse of their dominant positions by any such companies, the State (represented by SCPEC) provides a close control. The State's active involvement lies in the fact that it is the largest purchaser (import client) of fertilizers.

As for pesticides, this market is almost monopolized the market, with 90% market share belonging to 1 company (Natali Agro). It appears quite difficult to estimate the extent to which a market dominant actor observes competition rules as there is no information on any proceedings against the Company initiated by the SCPEC.

110. **Production segment actors.** This production segment of the surveyed fruit and berry value chain covers about 125 thousand actors. Overwhelmingly (over 99%), they are individual farming households with small areas ofcultivated lands. In this connection, it may be noted that the fruit and berry production segment is extremely competitive without any dominant actors. The largest producer with some 4-5% of share in production is Biga LLC (Armenian-Dutch joint venture), a leading berry (strawberry, raspberry, blackberry) production company. There are no other producers of any other product with larger share of production quantities.

111. **Storage/warehousing segment actors.** Storage/warehousing is an essential post-harvest process. Regardless of the varieties of the fruits and berries, every producer engages in their storage. As for storage of products in special conditions, only 2 types of actors provide it through: a) 1,700 small (often homemade) refrigerators (with a gross capacity of 75-80 tons) owned by individual (mostly farmers), and b) about 10 special cold storage infrastructures (with a gross capacity of about 35 tons of total capacity) for agricultural products. The small cold storages initially aimed to meet the personal needs of the farmers who owned them and then offered services to other farmers. In this sense, they influence neither the market supply, nor prices. As for the large cold storages, due to their large sizes (an average of 5-6 thousand tons), they also have high maintenance and operation costs. Hence, they are interested in creating most affordable conditions for farmers to ensure a maximum use of the capacities of their refrigerators. While each of the large cold storages is the only such facilities in their location, they still cannot use their monopole position and raise their service prices. Otherwise, farmers will end up to using their own cellars and storage bunkers as refrigerators in the natural cold weather conditions of winter months.

112. **Transportation segment actors.** There are no actors specialized in domestic (within Armenia) transportation of fruits and berries. Domestictransportations are carried out by farmers, the retail/wholesale resellers fo their products and in some cases processors, any actor with a convenient vehicle for such purposes. It can be noted that there is no established market of fruit and berry domestic transportation services. As for the foreign transportations, such services are provided by 2 or 3 large and several smaller organizations and dozens of individuals who own a truck or a truck fleet and offer services to any person in need of transportation services. The major player in this market is Spayka LLC, with its fleet of 100 cold-storage trucks, which is an absolute market leader with its infrastructures and transportation volumes. Yet, Spayka has strong competitors in transportation among local and foreign (Georgian, Turkish, Iranian) individuals and companies. Despite its obviously high level of technical equipment, Spayka does not act as a value chain dominant actor.

113. **Processing segment actors.** The fruit and berry processing segment is divided into 2 parts. a) fruit preserves and juices, and b) dried food. The **segment of fruit preserves and juices** covers 43 producing units and over 30 importing companies. While there are leading companies in various segments of the market, it is quite difficult to say which of them might be called dominant. The matter is that most of such processing units and companies carry out multi-sectoral activities and very identical in terms of the product varieties. Hence, most companies produce fruit preserves and juices and furthermore, almost from the same raw materials. At the same time, some companies also import similar products in similar seasons. The entities below are leading in relevant segments of the market:

- local production of fruit preserves: EuroTerm, Artashes;
- export of fruit preserves: EuroTerm, Artashes, Ararat Food Plant;
- import of fruit preserves: Proshyan Brandy Factory, Tamara Fruit;
- frozen fruits, berries and vegetables: Tamara Fruit;
- natural juice production: EuroTerm (brand: Noyan), Jermuk Group (brand: Sandora), Artashat Preserving Plant (brands: Amare, Vitamix), SIS Natural (brand: Yan);
- natural juice import: Coca-Cola HBC Armenia (brands: Dobriy and Rich), Jermuk Group (brands J7 and 7UP).

The most recently updated information on fruit preserves and natural juices, with separate data on relevant businesses dates back to 2011. According to the research by the State Commission for Protection of Economic Competition, the fruit preserves market had an average concentration level, with the shares of the leading 3 companies making 46.5%. In the market of natural juices, the situation was quite similar, with the shares of the leading 3 companies making 51.3%. In the past 3 or 4 years, the market concentration level further decreased, mostly due to the success of the Armenian processing companies.

The dried food market actors are small and weak as the market as such is small, too. None of these 100 or 120 entities or workshops can be called a dominant actor, especially considering that, apart from them, another several thousands of farmers are engaged in such activities.

114. **Export segment actors.** The fruit and berry export segment has an absolute leader, Spayka Company. With its exports activities dating back to 2011, Spayka introduced drastic changes to the Armenian fruit export. Hence, if in 2006-2010, the Armenian fruit export quantities ranged between 26 and 27 thousand tons (in a 5-year period, without grapes), in the next 5 years (2011-2015), this rate exceeded 85 thousand tons. As for the concerns that Spayka might have a dominant position on the market (and this actually happened since Spayka Company's fruit and vegetable export share totals about 65%) and might abuse its position to cause unfair competition, were quite irrelevant. After

Spayka entered the market, the number of fruit and vegetable exporters rose from 30 to almost 60. Furthermore, several other large exporters passive before 2011 emerged. In Armenia, export developed along with the increased fruit and berry production quantities. Such increase made it possible for every exporter to purchase as much quantity of products as they needed.

115. **Wholesale segment actors.** The fruits and berry wholesale segment has 2 types of actors (mobile intermediaries and market wholesale resellers) assuming the role of trade intermediaries between producers and processors, retail outlets and the end-consumers. This group mostly comprises individuals with unregistered and unrecorded activities. They apply primitive and routine business rules. It is unreasonable to consider any of the wholesale segment actors in dominant players in.

116. **Retail segment actors.** The fruit and berry retail segment comprises thousands of actors very different from one another both by their legal status and activity (sales turnover) volumes. Hence, this group covers both individual market and street traders (operating without official registration and record), and large supermarket chains (SAS, Yerevan City, Krpak). Each of such retailers or retail outlets has their own target customers. Small (individual) traders mostly retail in easy accessible areas for customers, e.g. streets, yards and sometimes violate the food safety regulations. They might even sell some products to their acquaintances by installment payments. While supermarkets offer high quality service and higher level of compliance with the food safety regulations, the buyers must pay for the goods they buy on the spot, at the moment of the transaction. Given such peculiarities of trading, all the retail actors find their customers. But the fact is that every new store or supermarket makes the activity of any vendor in the area virtually impossible. In this sense, supermarkets can be considered as actors with more competitive advantages.

117. **Market entry barriers.** Any link in the fruit and berry value chain is entirely open for business activities. Such openness rests on the factors below:
- .primary agricultural production release is tax-exempt;
- except for fertilizers and pesticides, the other markets have no dominant players;
- markets rely on competitive relations.

The characteristic feature of the fruit and berry value chain is that it is equally easy both to enter its markets (e.g. fruit and berry production, processing, trade), and to the as easily and rapidly to find oneself beyond it. This is caused by the uncontrollable factors influencing the activities of the actors in key links of the value chain (production, processing and export), such as the large-scale adverse impact of climate conditions on primary production and low diversification level of export markets.

118. **Opportunities for improved value chain management.** The normal functioning of the fruit and berry value chain are affected by 2 global challenges, namely: instability of production quantities and low diversification level of the markets. It is quite difficult to solve them since it calls for large investments that the producers of fruits and berries are either unwilling or unable to make. The instability of production quantities is mostly caused by frequent adverse impacts of the climate conditions. Countries with developed agriculture, e.g. Netherlands, Israel, use innovative agricultural technologies covering the use of orchard hail-protections networks and greenhouse fruit production. In Armenia, farmers are overwhelmingly too weak and ignorant to introduce such technologies. Another global challenge is the heavy dependence of the fruit and berry processors and exporters of processed products on the market of Russian Federation. In terms of long-term product sales, the Russian market has never shown stability, and its any rise and fall cause similar effect on the Armenian fruit and berry production.

Among the actors fulfilling producers' functions in the fruit and berry value chain (farmers, processors), it is only the processing units that are willing to invest into development. As for diversification of the sales market, the processors' needs imply introduction of food safety and quality management systems and constant and consistent presentation ofthe Armenian products on international markets. As of today, much efforts have been invested in this sector, and the results are quite tangible. Yet, such efforts should be continued. Every year, 1 or 2 new processing companies enter the market. The State and its development program donor international organizations should provide technical assistance at least to the new entities, if not to the companies with some recorded progress, before they become strong enough to have a stable position on the market.

2.5.2 Cluster Concentration

119. **Geographical concentration of clusters.** The fruit and berry value chain actors and the infrastructures servicing such value chain form an entire cluster. The current geographical concentration in separate segments of the Cluster rests on 2 reasons. a) closer location to the centers of fruit and berry production, and/or b) closer location to the sales market. These are the only 2 reasons underlying the **high concentration within the clusters**. The table below provides the geographical concentration rates of the key fruit and berry cluster segments.

Table 72 - Geographical concentration rates of key cluster segments

Cluster segments	Marzes										
	Yerevan	Aragatsotn	Ararat	Armavir	Gegharkunik	Lori	Kotayk	Shirak	Syunik	Vayots Dzor	Tavush
Fruit and berry production		24%	25%	24%							
Cold storage capacities		~15%	~29%	~25%			~15%				
Fruit and berry procurement for processing	45%	22%	20%								
Wholesale	~35%		~35%	~20%							
Retail	>50%										

The data show that fruit and berry clusters are geographically concentrated in the Ararat Valley, which in terms if the country's administrative division, makes part of Armavir and Ararat marzes and low-lying (foothills) zone of Aragatsotn marz (Ashtarak region). Yerevan is also located in this area and as the main sales market of fresh and processed agricultural products, heavily conditioned the cluster's location. To make it clear, it should be noted that while Yerevan, the marzes of Ararat and Armavir and Ashtarak region of Aragatsotn marz occupy 14% of Armenia's territory, it is there that about 75% of the fruits and berries are produced, about 70% of cold storage capacities are located and about 95% of fruits and berries procured for processing are provided, over 90% of fruit and berry wholesale and over 60-65% of retail.

It is no coincidence that all the major suppliers of pesticides and fertilizers are located in Yerevan and nearby communities. Almost all the exporters of the fresh fruits and berries reside or are located in Yerevan and marzes of Ararat, Armavir and Aragatsotn.

120. **Cluster concentration's impact on the value chain.** A high level of cluster concentration on a small or limited area attests to diversification issues inside the cluster. The underlying reason for all the problems at stake is the **high level of production (vineyards) concentration.** And this constitutes a problem due to the large-scale impact of unfavorable climate conditions as the most risky factor influencing the fruit and berry production quantities. The sharp fluctuations in production quantities greatly affect especially the utilization of cold-storage and producing units' capacities and stability of exporters' activities.

121. **Level of cluster establishment.** The fruit and berry cluster is fully established. The activities of the actors in every link of the value chain makes it possible to ensure a smooth flow of fruits and berries from production to consumption in form of either fresh, or processed products.

2.5.3 Form of Value Chain Management

122. **Is it supplier's or buyer's (consumer's) value chain?** As already mentioned on several occasions, local production dominates the fresh fruit and berry market generally, and the market of the surveyed fruit and berry market specifically. Even in recent few years with the Armenian fruit and berry production quantities declining sharply for some reasons (e.g. frosting, most recently recorded in 2014), such products still do not yield their position to any imported fruits and berries. Thus, in the year with low apricot production quantities, the buyers (consumers) showed the approach below: **they put up with the fact that they would not consume any apricots during the year and consume other fruits, e.g. peach, plum and apple, to meet their fruit demand.** From this perspective, it can be stated that suppliers are the driving force of the fruit and berry value chain: as long as there is supply - there is a demand, no supply - no demand. The local fruits' position on the Armenian market remain strong, since the decline in the supply of a certain fruit might be short-term, a maximum of a year.

123. **Product prices: regulation, control and dictation.** The prices of fresh fruits and berries and their processed products are generated by classical rules of market economy, based on supply and demand relationship. During the years with limited quantities of fruit and berry production, the prices at every level (producers' sales, intermediaries resale (wholesale), retail) are high, and vice versa. No actor or group of actors in any link of the value chain can predetermine or dictate product prices.

124. **Mutual dependence between value chain actors.** The actors in the fruit and berry value chain vary by their functions. Thus, some actors fulfill only one function in the value chain and their activities are highly specialized. Some other actors fulfill several functions in the value chain. Such actors are motivated by economic reasons, and as a result gain the additional value created on every level of the value chain. Obviously, the more functions such actors assume (i.e. complete the cycle themselves), the greater profits they will gain. In Armenia, some 2 or 3 dozens of actors fulfill almost every function in the value chain. These are several processing units and individual farmers specialized in primary production. The table below shows data on some of such actors.

Table 73 - Several actors in the fruit and berry value chain with largest number of functions

Value chain functions	Value chain actors				
	Tamara Fruit	Yerevan Brewery	Vayk Group	Spayka	2-3 dozens farmers
Production	●	●	●	1)	●
Storage/warehousing	●	●	●	●	●
Transportation	●	●	●	●	●
Processing	●	●	●	2)	●
Export	●	●	●	●	●
Wholesale	●	●			●
Retail					

1) Spayka set up greenhouses in Ararat marz where vegetables are grown, but the Company does not produce any type of the fruits and berries targeted under the Survey.
2) – Spayka makes investments in setting up its own processing plant.

While many of the value chain actors might perform several functions, all of them have their basic and associated functions. The main function is determined by the of the value chain actor's specialization, e.g. Tamara Fruit orYerevan Brewery are firstly processing units, and farmers are first and foremost producers. Perhaps, only Spayka can be attributed to perform 2 basic functions of transporter and exporter. Such actors must perform their basic functions but can stop performing the associated ones.

Considering only the basic functions of the value chain actors and ignoring the associated ones, it can be stated that there is a high level of interdependence between the actors in various links of the fruit and berry value chain. If undermined, any link will undermine theactivates of the vast majority of the value chain actors.

125. **Value chain actors controlling the market.** Except for the almost monopolistic status of a pesticide market actor, no other actors in the fruit and berry value chain control the market. The markets are absolutely competitive.

2.5.4 Major Constraints to Value Chain Management and Proposed Solutions

126. The fruit and berry value chain management does not face the numerous challenges posed to the segments of production or trade. Here, the situation is more attractive due to the fact that the value chain is managed by the **principle of self-management**, without any unfair side interference. This situation is also promoted by the lack of any dominant actors in different links of the value chain. The relations among the actors in different links of the value chain are based on partnership and those among the actors in the same linkare based on competition.

2.6 Sustainable Production

2.6.1 Use of Agricultural Inputs

127. **Types of inputs.** The actors in the production and processing links of the fruit and berry value chain, use various agricultural inputs. They are used in release of the production (fresh fruits and berries and their processed products) and ensure the effective operation of the value chain. The fresh fruit and berry production cycle mostly uses fertilizers and plant protection chemical substance, i.e. pesticides Armenia almost entirely imports such inputs. However, the supply system is uninterrupted and has never caused any disruption in the value chain activities.

128. **Use of inputs.** Armenia imports 50-55 thousand tons of fertilizers and 500-550 tons of pesticides annually. The markets of the both group of products is dictated by the demand dictates, i.e. the importers import as many products as they can sell. Yet, these figures cannot provide any answers to the question below: how and what quantities of fertilizers and pesticides do the producers use? Many farmers have insufficient farming knowledge, experience and skills. Many of them believe that the more pesticides they use, the better, whereas, the substances above have special regulations of use. Therefore, the prescribed doses should not be violated. Excessive use of pesticides may damage the plant and the soil, and too little use may not affected the harmful organisms.

The above also holds true for fertilizers. Definitely, fertilizers improve the soil qualities, by particularly resulting in notably less water evaporation from its surface which provides greater use of the water supply by the plants. Nevertheless, if used improperly, the fertilizers result in the opposite effect. If in the vegetation period of plants, the soil is fertilized only by nitrogen and receives no phosphate and potash fertilizers or receives them in other quantities than required, the plants yield a great vegetative mass but the crops is scarce and of low-quality. To prevent this negative impact of sole use of nitrogen and improve the quantity and quality of the crop, it is essential to use phosphate and potash fertilizers along with the nitrogen. According to the experts, phosphoric and potash fertilizers are used only by a small percentage of farmers. This is also shown by the low import rates of such fertilizers. Thus, nitrogen fertilizers make 90% of imported fertilizers, the phosphate ones make 5%, the potash ones - 3% and mixed fertilizers - 2%.

129. **Substances harmful to humans and environment.** Pesticides are dangerous for living organisms and therefore pose a threat to human health and the environment. In Armenian, the use of pesticides is essentially uncontrollable. This will sooner or later lead to (by some estimates, has already led) the chemical degradation of land, creating various threat to human health, including skin diseases, various types of cancer, poisoning, and cause destruction of the biosphere. Disrupted vital balance of the nature affects the quality of the production. It is the threats resulting from the irregular use of pesticides that have given rise to the idea of pesticide-free food production, which is the cornerstone of organic farming. In Armenia, the introduction of this sector is still in progress and still calls for serious efforts.

2.6.2 Energy Use

130. **Energy use in various segments of value chain.** The smooth functioning of various segments of the fruit and berry value chain is ensured by energy use therein. Below are the key areas of energy use: a) mechanical irrigation, with energy making about 50% of the irrigation water prime cost, b) ensured operation of cold storage facilities, and c) ensured operation of the production equipment and automated production lines of processing units.

131. **Energy sources.** The actors in the fruit and berry value chain use the energy sources below: electric energy (to ensure the work of the mechanisms), thermal energy (as a source of hot water and steam in the manufacturing process of processing units), solar energy (for production of products dried in solar driers).

132. **Energy efficiency and energy efficiency measures.** Most energy is used in the processing segment of the value chain. The fierce competition among the processors makes them continuously apply cost-effective management, including in terms of energy costs. When choosing the equipment, the processors of course pay major attention to their power use. Yet, this does not suggest that the power use is a decisive factor in this choice.

As for energy efficiency measures, the most tangible and large-scaled efforts are taken by the State which by the state budget and with the financial support of international organizations take serious steps to reform the irrigation system. Particularly, major investments are made in construction of small water storages not only intended to store water but also increase the volumes of gravity water supply at the expense of mechanical irrigation using huge amounts of energy to operate the pumps.

2.6.3 Water Use

133. **Role and need for water.** Water is of vital importance for the 2 main groups of the fruit and berry value chain, namely producers (farmers) and processors. It makes part of the primary production/technology costs of fruit and berry production and processing and no production and processing functions in the value chain can be fulfilled without water. Producers use water for irrigation of their gardens, and processors use it in a number of technological operations, including washing of the raw materials and using it as a component in the end-products. In this sense, the 2 major requirements to water are its availability (quantity) and quality.

134. **Use of irrigation water.** The basic components of the Armenian water industry are: drinking water and irrigation water supply systems. Thousands of farmers in the production link of the fruit and berry value chain use irrigation water. In thefiledof irrigation, there are 2 irrigation-water companies supplying irrigation water to 42 water-using companies (WUAs). They serve over 200 thousand farming households in 618 200 thousand communities to ensure irrigation of around 130 thousand ha. The major bulk of the irrigation water pipelines in Armenia was built back in Soviet times and has a high level of wear and tear, resulting in the loss of 40-45% of irrigation water. The high water losses are caused by the surface irrigation method and the ground grooved networks within the household. The land plots with drip irrigation or irrigation water transferred by pipelines makes a small portion of the arable lands.

The water available is not sufficient for the irrigation of all the arable lands and this is a serious obstacle to setting-up new orchards. The Ararat valley, the main center of fruit and berry production, also faces the irrigation water challenge. Here, the problem is partly caused by the indiscriminate use of ground waters by the local fish farms. The scarcity of water resources has resulted in lack of drinking and irrigation water in around 3 dozens of communities.

In Armenia, the rate of arable land purposeful utilization ranges between 70 and 75%. Out of the 233 thousand ha arable lands in Armenia, only around 154 thousand ha is irrigated mostly due to insufficient quantity of irrigation water and its inefficient use.

The water-using farming households are supplied with irrigation water by the WUCs. The prime cost of irrigation water is 20 AMD/cubic meter, with the fee to be paid by the farming households equaling 11 AMD and the rest to be subsidized by the State. The irrigation water fee collection rate makes 86%. Despite the general nature of the irrigation water fee, its prime costs differs from one marz to another, depending on the ways of water supply (manual or automatic). Therefore, in many cases, the WUCs and water-using farming households make irrigation arrangements based on the crops grown on land to be irrigated and/or water conveyance network type within the household (ground-furrow, open or closed pipelines, drip), rather than the net irrigation price. Particularly, when providing their irrigation fees, farmers from the Ararat valley mention the irrigating price per hectare (mostly totaling 20,000 AMD for an area of 1 ha) rather than that per cubic meter of water (therefore, the annual irrigation costs for orchards of 1 ha usually range between 80 and 100 thousand AMD, depending on the frequency of irrigation).

135. **Use of drinking water.** Drinking water is used by another key group of the fruit and berry value chain, namely the processing units. Unlike the irrigation water, the drinking water supply is in a better state. Unlike farmers, most of the processing units have their own drinking water reserves, which help them to plan the water spending and ensure its sustainable supply.

As for the qualitative properties of the drinking water in Armenia, this is another topic. Many representatives of the fruit and berry processing sector are unanimous in this issue stating that the drinking water in Armenia is clean, cool and fresh which significantly contributes to the production of high-quality natural juices.

The processing units use water for a number of technological purposes. Water is extensively used at the stages of procurement, washing and the sterilization of raw materials, at the stage of washing relevant equipment with special cleaning substance and finally as a material component in the ready products (juices, fruit preserves, and compotes) released.

The drinking waterespecially that used in the ready products, is cleaned with special filter devices before its use in production. All the processing units are equipped with such equipment.

As for the production wastewater, it is not always filtered before entering the sewerage system. This is done for investment- or cost-saving purposes.

2.6.4 Waste Management

136. Waste management is a challenge for the processing and retail trade segments of the fruit and berry value chain. The processing activities generate the wastes below: a) raw materials (fruits and berries) organic wastes due to rejection or production losses (e.g. as a result of fruit peeling or cutting), b) solid household wastes, c) industrial and domestic wastewaters. Except for the wastewater, the other wastes are not hazardous and are removed through the common household disposal system. The situation is not as simple with the wastewaters. They are released into the public wastewater network, the sewage. We have encountered no processing unit cleaning/filtering the industrial wastewater before discharging it into the sewage. The industrial wastewaters are hazardous, since the processing equipment is also washed with some chemical agents which when discharged in the sewage ultimately will enter some natural environment through mixing with the waters of a river. There is no strict control over the industrial wastewaters of the fruit and berry processing units, and the processing units avoid expensive investments and wastewater treatment costs.

Retail generates overwhelmingly non-hazardous wastes, mostly solid household wastes removed through the general garbage disposal system.

2.6.5 Major Constraints and Proposed Solutions

137. **Key challenges.** For the purposes of sustainable production, the challenges below can be mentioned:

- uncontrolled use of chemical substances;
- inefficient use of water resources;
- high electricity prices and great impact on formation of irrigation water prime cost
- waste management deficiencies.

138. **Implications.** The challenges above cause implications in several directions below:

- damage human health due to the unacceptable quantities of hazardous substances in fruits and berries;
- damage the land, the environment and jeopardize for long term prospects of productive agriculture in such area;
- jeopardize the ecosystem of water resources conservation and increase in a country like Armenia with limited water resources;
- high electricity costs result in higher maintenance and operation costs of the entire irrigation system, which would be too expensive for a country like Armenia, which imports all its energy carriers;
- inefficient wastewater management threatens human health the environment and primary agriculture, since the polluted waters end up in natural water basins with water used for irrigation purposes.

139. **Solutions.** To resolve the issues above, various actions are taken, including as follows:

- The Agricultural Consulting System, including the MASCs, agricultural newspapers and magazines should take consistent steps to improve farmers' awareness and knowledge. The farmers should have a clear understanding of the use of quantities and shares of agricultural raw materials and inputs, which will help them enhance the efficiency of their production and refrain from endangering consumers, as well as their own health.
- The State should continue to invest efforts to improve and enhance the infrastructures of water resources. This calls for a number of actions: a) build new basins to enhance the water resources and the share of gravity water supply, and b) improve and reconstruct the water supply networks to minimize water losses during water transfer.
- Farmers should use modern irrigation techniques, particularly switch to drip irrigation upgrade, which will significantly reduce water consumption and save funds. To this end, the State should jointly with financial organizations develop special/target credit products for farmers intended only for drip irrigation systems
- The State waste management oversight agencies should detect wastewater discharge sources and make sure that processors take relevant steps to introduce wastewater treatment systems.

2.7 Value Chain Finance

2.7.1 Financial Attractiveness

140. The financial attractiveness of the fruit and berry value chain are presented below:

- The products manufactured in the value chain, namely fresh fruits and ready food products are food industry products. Due to the rapid world population growth, food security has become a global issue. Therefore, presently and in the coming years, the branches and sectors of various economies will develop quickly contributing to the solution of the global food security challenge.
- The Armenian fruit and berry cluster units several markets, some of which are quite large for the Armenian economy. Particularly, the market of fertilizers and pesticides covers about 30 million USD, dollars, the market of the fresh fruits and berries surveyed - about 200 million USD (producers' prices), fruit preserves and natural juices market - about 30 million USD (processors' prices), dried fruit market - about 4 million USD (producers' prices), export volume of fresh fruits and berries - about 20 million USD, etc.

The cluster markets are stable or developing, despite the adverse impact of the global economic crisis unleashed back in of 2008. Presently, significant developments are underway in the fruit preserve and natural juice market, with slowly but steadily increasing share of the local products at the expense of imports.

In this context, the international organizations still show a great interest in the Armenian agriculture by constantly advancing agricultural development programs through the financial and technical assistance to Armenia.

The private investors have also actively contributed to the fruit and berry production and processing. Particularly, greenhouse cultivation of berries is quite popular, with Biga Armenian-Dutch leading company. In the past 2 or 3 years, it became possible to completely replace imports of strawberry with local production.

2.7.2 Financial Risks

141. **Financial risk carriers.** Almost all the actors in the fruit and berry value chain bear financial risks. The actors in the production and processing segments face especially great risks. The vast majority of the **farmers** engaged in the segment of primary production are small farms and find it difficult to meet their household needs only by fruit growing. Despite quite high profitability rates in an average favorable year, farmers still do not generate an absolute number (volume) of income (profit) to meet the household and production costs of their farming households. Also, the situation becomes more complicated with the high concentration of their cash flows, especially their revenues. Particularly, while farmers receive their annual revenues for stone fruits in 1-2 months and for pome fruits – mostly in 5-6 months, they have to meet the costs throughout the year. With an absolute number of small revenues, is appears very difficult to manage the costs so that they are evenly distributed among all months of the year. Thus, each year, by the launch of agricultural activities, farmers overwhelmingly have a severe shortage of working capital and have to take loan from financial institutions. By giving loans to farmers, the **financial institutions,** i.e. banks and credit organizations, in their turn, bear financial risks associated with the activities of the farmers.

The financial institutions also bear the financial risks jointly with **processing units,** which involve external funds for capital investments, filling the shortage of the working capital in the season of raw material procurement and meet the costs related to export transactions.

142. **Causes underlying financial risks.** The financial risks of the farmers and the financial institutions funding them arise from crop cultivation risks. The **impact of unfavorable climate and weather conditions** only and the **absence of agricultural insurance system** can overnight render a farmer insolvent with all its implications. In this case, unlike the financial institutions that have some leverages over farmers to repay their damages (mortgage, guarantees), farmers are absolutely alone in addressing such financial challenges.

The financial problems of processing units are caused by **distorted trade financing** (as discussed above). For instance, installment payments for the delivered products or delays in such payments result in higher loan costs for the producers since their continue paying the interests of the working funds that are still in the hands of the purchasers of their products.

Financial risks arise in every segment of the value chain. For instance, some exporters start paying advances to farmers in spring well before the harvest time so that they can easily purchase their products later (harvest time). However, the crops might be destroy by frosts and farmers might have spent the advance payments. This situation carries adverse implications for the both sides, since the exporters are temporarily (at least for a year) deprived of their working capital, and the farmers are burdened with debts that they may at best repay by the next year's crops. Another vivid example: land transportations carry financial risks for exporters. The only land road from Armenia to Russian Federation, key sales market of its fresh fruit and processed fruits and berries, lies through Upper Lars checkpoint at the Georgian-Russian border, located in an area of complicated terrain that often distorts the checkpoint operation even in summer. Even temporary delays in checkpoint operation results in higher costs of the transportable products, and as for fresh fruits, such delays may also create a risk of perishing.

143. **Specific risks.** Various segments in the fruit and berry value chain have some factors that pose certain risks to the customers. Such risk cover as follows:

- **Raw material and input supply risks** caused by markedly dominant players in the fertilizer and pesticide markets. Both of the markets above have a high level of centralization, which continuously carries the risk that one of the actors might abuse their competitive position, e.g. pursuing a policy of dumping prices to force the smaller competitors out of the market, or arbitrary rise of prices to make more profits. In the first case, the risks affect the market as it becomes uncompetitive, and in the second case, farmers face higher costs and prime cost of their production.
- **Production risks** already discussed above and caused by the enhanced (large-scale) impact of unfavorable climate conditions on crop cultivation in Armenia (scale) action, as well as low level of geographical diversification of the production and no agricultural insurance system in use.
- **Commercial risks** caused by the instability of the Armenia's national currency. The problem is most urgent for the exporters of fresh and processed fruits. For them, the least advantageous situation to avoid such risks is the national currency stability, while the most favorable one is weak currency. However, the situation was different in recent years, since Armenia is a country highly dependent on imports, and the state monetary policy aims to curb inflation.
- **Sales risks** caused by low diversification levels of fruit and berry and their processed product sales (exports) markets and the instability of the main (target) market (Russia).

2.7.3 Funding Practices

144. **Loan practices.** Loans are a common practice among farming households, especially those involved in crop production. Small farming households constantly face the challenge of capital shortage. Usually, there is a sharp rise in demand for loans among farmers in spring as after incurring large household costs in winter (New Year celebration and home heating) they face the production costs.
Financial institutions are an essential, and mostly the only source for the processing units to replenish their working capital.

145. **Share of loan borrowers among farmers.** Most of the farming households have loans. Moreover, most of them take loans regularly. This information has been verified by numerous surveys carried out in the past few years. The most recent relevant survey available dates back to June 2015.[51] The survey findings revealed the rate of loan- borrowers among the rural population:
    - 61% of the farming households in all the marzes of Armenia are loan borrowers;
    - Out of the total number of the farming households in the 2 marzes located in Ararat Valley (Ararat, Armavir), loan borrowers make 80% of the total;
    - Out of the total number of the farming households in 6 marzes under ENPARD Project, loan borrowers make 53% of the total.

    The data above show that farmers from the marzes with crops cultivation as their primary agricultural direction take loans more intensively.

146. **Share of loan-borrowers among processors.** The opinions of the surveyed representatives of processing units suggest that they all have a long credit history. Such processing units cover relatively large produces of fruit preserves and natural juices and dried fruits processors. While we have no available information on all the businesses functioning on the market, the representatives of a dozen of entities surveyed unanimously calimed having loans.

147. **Agricultural loan payment term.** The loan payment terms depend on the purpose of the loan. The individual farming households engaged in small-scale activities are offered the so-called *seasonal loans* to meet their seasonal agricultural expenses. Such loans are short-term mostly ranging from 6 to 9 months. As fro processing units, their credit needs are quite various and the both parties (banks and processing units) find it more beneficial to open credit lines. In this case, banks seek to motivate their clients by long-term relations and access to funds, and processing units are exempted from the standard bureaucratic procedures required to receive any next-in-turn loan tranche.

2.7.4 Availability of Financing

148. **Financial institutions.** In Armenia, there are 21 banks and 34 credit organizations. The vast majority of such institutions provide agriculture financing. Also, there are certain financial institutions specialized in agricultural loaning (banks: ACBA-Credit Agricole Bank, credit organizations: CARD AgroCredit).

149. **Financial products.** In Armenia, there are no special types of financing for the actors of the value chain of fruits and berries. Instead, the Armenian financial market has financial products (mostly in the form of micro loans) for primary agriculture (farmers) financing. Similarly, there are loan programs for small and medium-sized enterprises (SMEs), food processing units or certain target

[51] The survey was carried out by AM Partners Consulting Company (wetbsite: www.ampartners.am). While the survey did not cover agriculture, the rural respondents were asked a question about their loans. The statistics of the answers to this question is provided hereby.

region(s). Some financial institutions offer leasing services for equipment and machinery purchase. Moreover, there are various development initiatives and regular grants for food industry businesses. The best examples of such initiatives include as follows: United States Department of Agriculture Marketing Assistance Project (USDA-MAP), United States Agency for International Development Armenia SME Market Development Project (USAID ASME), World Bank-funded Rural Enterprise and Small-Scale Commercial Agriculture Development (RESCAD) Project and Community Agricultural Resource Management and Competitiveness (CARMAC) Project and International Fund for Agricultural Development (IFAD) successful food processing initiatives.

Apart from the external sources above, the fruit and berry production and processing units may also use official sources, e.g. consumer loans with pawned high liquid assets (vehicles, gold, etc.) and even non-official sources. Such financing rates are fairly high: 3-5% per month, sometimes even higher. However, processing units usually avoid it and actually do not need any such funding.

150. **Loan conditions.** Loaning of the farming households and processing units range among the most common types of activities of the financial institutions in Armenia. At least 40 financial institutions, 15 banks and about 25 credit organizations give loans to private and legal entities engaged in farming.

Farmers mostly may receive loans with the conditions below:

- 50,000-60,000,000 AMD or 80-150 thousand USD;
- annual bank interest rate: 8% -12%, and credit organization interest rate: 2 or 3 times higher;
- payment term: 3-84 months;
- guarantees: real estate, gold, guarantors, movable assets;
- purpose and consumer loans.

Processing units may receive loans with the conditions below:

- 10,000 and over USD depending on loan conditions and guarantee level;
- annual interest rate: 11%-18%;
- payment term: up to 84 months;
- guarantees: real estate, gold, guarantors, movable assets.

Recently, the RoA Government approved the RoA Strategy for Sustainable Development of Rural Areas and Agriculture for 2015-2025 stating that the demand for agricultural loans in Armenia remains unsupplied. In particular, every year farmers face a severe shortage of working capital, and the lending conditions of the existing banking system, namely the collateral, loan term, interest rates, etc., are unaffordable for most of the farming households.

Table 74 - Credit investments of commercial banks and credit organizations, including in agriculture as of end of the year, million AMD

	2010	2011	2012	2013
Credit investments	891,850	1,250,404	1,527,886	1,684,243
Volume of agricultural loans	52,365	73,440	91,890	103,222

In 2010-2012, the specific weight of agricultural loaning made 5.9-6.1% of the total credit investments by commercial banks; this rate is at least several times smaller as compared to the volume of the required investments in agriculture to ensure sufficiency of resources. In terms of sector loaning, the loaning process in compliance with the RA Government Order № 349-N dated March 31,2011 on Subsidizing Interests Rtes for Agricultural Loans is considered positive. Accordingly, agricultural loans were provided with affordable interest rates (14%) loans, with 4 percentage points subsidized by the State and 6 percentage points subsidized for the loans provided in the country's most vulnerable 225 communities. In the period of April, 2011 - September 30, 2014, around 71.5 thousand loans worth 63.2 billion AMD weregranted, with subsidy amount totaling 2.2 billion AMD.

151. **Other financing sources**. The value chain itself has external financing resources, although it might not entail any actual finance turnover. Hence, in the season of raw materials procurement by the processing units, they can make arrangements with the farmers to pay for them in installments. Some processors sometimes delays payments for several months. Similarly, processing units supply products to large retailing chain actors for payment in installments.

2.7.5 Major Constraints and Proposed Solutions

152. The major challenge for financing of the value chain is the lack of affordable loaning. The currently interest rates and other loan conditions of the loan market fail to meet the specifics and requirements of the producing farmers and processors of agricultural products. Therefore, it is a priority that increased loan accessibility programs are continued. The processing units constantly cover their re-equipment and working capital replenishment costs through loans that are usually mid-term (3-5 years) and sometimes long-term, and their rates range between 10 and 18%. To produce competitive products, almost all the processing units from time to time need re-equipment and due to having no free resources, they have to get them through loans. Re-equipment requires large investments, whereas the collateral of processing units is quite limited, and therefore, the entire property of such units is often pledged. In this case, the processing units can take no other loans to replenish their working capital in subsequent years due to the lack of collateral. The servicing costs of the re-equipment loans with limited payment terms considerably increase the prime value of the product and adversely affect its competitiveness of the product.

Another adverse impact on the competitiveness of processing units is caused by the relatively high and often unstable spontaneous prices of raw materials that the processing units ultimately pay considering that the farming households function in low-intensity conditions and are fragmented, which all lead to higher prime cost of agricultural raw materials. In this connection, the farming households are constantly discontent with the purchase prices. As for purchase price increase by processors, such opportunities are quite limited since ready products have a certain market price, and every change in such prices raises consumers’ opposition.

Given the peculiarities of the fruit and berry production and processing sectors in Armenia (high-risk of raw material production, difficulties related to sales, high costs of export transportations), the production might become profitable only if loan interest partial subsidizing mechanisms are applied, with partial collateral guarantees, as might be necessary. At the same time, it may be loss of time merely hoping that the global economic (and political) crisis will be over soon and Armenia and the countries (markets) it is interested in will be recover their economic and financial stability.

2.8 Business Environment and Socio-political Context

2.8.1 Business Environment

153. **Privileges for actors of primary agriculture.** Agriculture is the sector of economy with the most liberal legislative requirements for economic activities. Thus, all the actors in the primary agricultural production release are exempt from all taxes. Also, no state registration is required, which means farming households are not required to register their activities as any form organizational and legal activities. While such situation creates a very favorable and free environment for economic activities, it causes all the difficulties related to the estimation of agricultural rates.

154. **Legal and organizational solution.** Among the actors of the fruit and berry value chain, the requirement for state registration as a legal and organizational entity is posed on the processing units that operate under common tax regime. For business (commercial) activities, the Armenian legislation stipulates the legal and organizational forms below: joint stock companies (either open (OJSC) or closed (CJSC)), economic partnership and company, general partnership (GP), additional liability company, limited liability company (LLC) in cooperative. In Armenia 33 out of the 43 processing units engaged in fruit preserves and natural juice production operate as LLCs, and the rest 10 as joint-stock companies (5: open JSCs and 5 closed JSCs). The joint-stock companies were established back in the Soviet era (till 1991). During privatization, such enterprises were privatized by collective units through direct sale of their shares. As for the processing units set up after Independence, they are all LLCs. Given the strictly limited number of the participants (founders) of such companies, its is easier and more convenient for them to operate in such a legal and organizational form and also, they face much less bureaucracy (as compared with joint stock companies).

155. **Advantages of LLCs.** One of the biggest LLC advantages is that it may be established without any significant capital investments. Furthermore, there is no stipulated minimum capital size for LLCs any longer. The list of the documents required to set up an LLC is provided on the official website of the State Register of Legal Entities of the RA Ministry of Justice. The first registration of commercial entities is free and the subsequent amendments cost 10,000 AM (a little more than 20 USD). In theory, such companies can be established within 2 business days (minimum).

    The additional costs related to setting up legal entities are associated with preparation of a seal (about 25 USD), opening a bank account (2-10 USD depending on the bank and embedded services), online banking tools, etc. Or, entrepreneurs may choose to have this entire process completed by a specialized legal consulting organization (which will cost about 100-150 USD).

156. **Issues related to cooperatives.** A way to enhance agricultural assets is to improve agricultural cooperation by setting up farmer cooperatives. Unlike LLCs, currently there is no special law on cooperatives, and certain some of the relevant legal relations are regulatedby the RA Civil Code, which is obviously insufficient to promote the development of cooperatives.[52]

[52] For the study of the legal regulatory framework for cooperatives in Armenia see the link below: http://www.arspiu.com/fileadmin/user_upload/photogalleries/Coop_Study/Report_arm.pdf

Extract from the Republic of Armenia Strategy for Sustainable Development of Rural Areas and Agriculture for 2015-2025

"… The study of co-operation practices shows that the capacities of the private sector producers (especially small and medium) are used most efficiently if they voluntarily join and engage in joint industrial and economic activities. In this sense, various forms of cooperative societies are highly appreciated, since they make it possible for each of their members to use at a maximum their economic potential and generate much higher profits at various stages of re-production activities. Agricultural cooperatives stand out among the other forms thereof.

…According to the International Federation of Co-operatives Statement on Co-operative Identity, co-operative is an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise.

... Cooperatives are an incentive for improved economic opportunities for rural women facilitating their access to credits and enhancing their capacities of risk decision-making and assuming responsibility for economic issues.

... In Republic of Armenia, the legislative regulations of cooperatives are mostly stipulated in the documents below: RoA Civil Code and the RoA Law on Consumer Cooperatives.

… The legislative documents above in use fail to comply with the public international cooperative law regulations (particularly, International Cooperative Alliance, Statement on Co-operative Identity, the United Nations guidelines aimed at creating a supportive environment for the development of cooperatives, International Labor Organization Promotion of Cooperatives Recommendation N 193). In this connection, the Republic of Armenia legislation on cooperatives should be amended based on relevant international requirements for this sector.

… Considering the agricultural features of the Republic of Armenia, the types of co-operatives (by their activity type) below are most preferable:

a. supply of agricultural inputs;
b. agricultural machinery operation;
c. agricultural production;
d. accumulation and storing of manufactured products;
e. realization of manufactured products;
f. processing of agricultural products;
g. consulting services;
h. professional services (crops protection, agro-technical, veterinary, cattle-breeding and other services);
i. management of resources (pastures, irrigation chains, degraded lands, salt marshes, etc.);
j. application of mutual financing mechanism.

... To enhance the efficiency of their activities, cooperatives may unite with other cooperatives or legal entities to create federations, unions or associations. Members of such unions retain their economic independence and all the rights of a legal person.

... Presently, there are over 115 agricultural cooperatives in the country. Additionally, another 120 'Community Pasture User Association' consumer cooperatives were set up in 2 agricultural marzes of the country under the Community Agricultural Resource Management and Competitiveness 2 projects funded by the World Bank.

…inter alia, the new forms of agricultural households, particularly cooperatives are still under development which is a slow process. Obstacles to their development are listed below:

a. imperfection of the legal framework for co-operation sector;,
b. no trust and willingness to carry out joint investment activities;
c. low awareness level among the farming households on the principles and advantages of cooperatives;
d. low activity level the existing cooperatives and low socialization of their achievements;
d. scarce number of support programs promote agricultural co-operation;
f. slow progress of capacity building and improvement of the agricultural advisory system and its operation mechanisms to support the introduction of co-operation in agriculture.

Link: http://lori.mtaes.am/files/docs/16363.pdf

157. **Key reforms of the business environment.** In recent years, Armenia has seen a continuous improvement of the business setup regulations. In 2010, the single-window system was introduced to enable electronic registration and combined the procedures for registering the company name, business and issuing the tax payer's registration number. In 2013, the company registration fees were waived.

158. **Ease of doing business index.** One of the best indicator of the business environment in a country is its doing business index. This index ranks economies from 1 to 183. For each economy, the index is calculated as the ranking on the simple average of its percentile rankings on each of the 10 topics covered in Doing Business 2010. The ranking on each topic is the simple average of the percentile rankings on its component indicators. For Armenia, this complex index has shown the dynamic below: 2012 -55; 2013 – 32; and 2014 - 37.

The RA ranks quite high under the ease of doing business index. At the same time, this does not mean at all that Armenia is very attractive economy for direct/immediate foreign investors, or that the Armenian products enjoy high competitiveness in the international markets. There are a number of factors affecting the business environment. Among others, are the unfair treatment to business entities by state agencies (mostly by the State Revenue Committee, RA Ministry of Finance), monopolization of the essential sectors of economy, too large number of controlling agencies, high-level corruption, etc.

2.8.2 Public and Private Service Delivery

159. Regardless of their location, the fruit and berry processing units mostly enjoy all the public and private services: utilities (electricity, water and sewerage, gas, waste disposal), telecommunications, roads and other infrastructures. While some of the infrastructures are in a poor condition, they are still usable. The services of financial institutions (including insurance companies) are available to every entity in every city/town of Armenia and enterprise. The main providers of advice and knowledge are available in capital Yerevan.

2.8.3 Social and Cultural Context

160. There is a critical factor affecting the value chain of fruits and berries due to the country's social and cultural characteristics. This factor covers the tradition of homemade food preservation which has a very large scale of popularity. The cultural traditions of preparing preserved food date back to the Soviet past, when housewives had to preserve food due to the shortage of certain products or for winter reserves. Also, this tradition was caused by the difficult social and economic situation early in the 20^{th} century (World War 1 and World War 2, collectivization). As of today, this tradition is widely followed in Armenia.

161. Preparation of fruit preserves, jams, compotes and dried fruits is very popular with the public households. In fact, this tradition is very large-scale. In particular, every fruit- and berry-producing household has a practice of producing fruit preserves for their own consumption. These practices are also quite popular with urban population. It is more common in marz cities/towns and less common in Yerevan. It can be definitely stated that the **households that produce fruit preserves for their home consumption almost never buy any such products**.

162. As for natural juices, it is difficult to prepare them at home. If unable to meet their consumption needs with home-made compotes, the households usually buy the products of processing companies. It is the difference between the rates of home-made fruit preserves and juices that determines their production and sales quantities on the Armenian market: as mentioned above, natural juices prevail among the processed products.

3 Conclusions and Recommendations

3.1 Conclusions on Value Chain

The value chain of fruits and berries is a multi-segmental system with numerous actors. This system was promoted by the fruit and berry production base and conditions with an entire cluster generated around it. The main descriptors of the value chain are indicative of this.

163. The gross volume of the markets of products and services offered in various segments of the value chain total 300 million USD (without the wholesale and retail trade volumes), including:
    - the production volumes only of the fresh fruits and berries targeted under the Survey make about 200 million USD, with exports volume - about 20 million USD;
    - the sales volumes of fertilizers and pesticides make about 30 million USD;
    - the sales volumes of planting stock make by extremely rough estimates, up to 2-3 million USD;
    - the sales volumes of fruit preserves and fruit juices make about 30 million USD;
    - the dried fruits production volumes make about 4 million USD.

164. There are thousands of actors in various segments of the value chain, including:
    - producers of planting stock totaling 1,000;
    - traders of fertilizers and pesticides (wholesalers (including importers) and sellers) totaling up to 100;
    - fruit and berry producers (individual farming households) totaling about 125 thousand;
    - fruit and berry processing units, with 43 producers of preserved fruit, natural juice and fruit vodka and up to 5,000 producers (entities and individual farmers) of dried fruits;
    - cold storage facilities totaling about 1,700;
    - actors involved in foreign transportation totaling several dozens;
    - wholesalers totaling a few hundreds or a thousands;
    - retailers totaling 10-15 thousand;
    - hotels totaling 250-300;
    - public catering facilities totaling about 2,500.

165. Despite the entire scope of the issues in various segments of the value chain with no significant changes within the past 15-20 years, the monitoring of the long-term historical figures suggests that after Independence, the Armenian value chain of fruits and berries has paved a considerable way to development and shown a positive tendency in almost all the rates.

3.2 Value Chain Constraints and Proposed Solutions

The analysis of the fruit and berry value chain suggest that it is a value chain of opportunities and challenges. The actors in various segments of the value chain face fierce competition which is a major condition for them to continue their efforts towards improved performance. Yet, the value chain development is obstructed by a list of challenges, most of which have persisted for over 15-20 years.

166. Production makes up the core segment in the fruit and berry value chain. This segment faces a number of adverse factors hindering its further improvement. The most dangerous are the unpredictable and uncontrollable factors, namely the unfavorable climate conditions of Armenia. Thus, frosts and hail are quite common, and there are no sufficient and efficient ways to combat them.

This issue might be resolved by an agricultural insurance system, but there is none in place. An alternative solution to the problem is changing the composition of the crop varieties and introduction of new frost-resistant varieties. It is difficult to estimate which of these options is more feasible since they both are too cost-consuming. As for the option of significant changes in the composition of crop varieties, the key issue relates to farmers' knowledge and willingness. The fruits most affected by frost are stone fruits (apricot, peach, cherry, plum) which make up the exports of Armenia. Since these products are most popular and in greatest demand in foreign markets, no matter how desirable it might be, any change in their composition might carry risks associated with their realization.

167. The fruit and berry production geography is characterized by a low level of diversification, with 75% of the total volume of fruit and berry production produced on 14% of Armenia's territory. Therefore, the impact of unfavorable climate and weather conditions appears too large-scale.

To ensure improved geographical diversification of fruit and berry production, the further enhancement of the fruit and berry plantations should be gradually shifted from the Ararat valley to the foothill areas. There are relevant favorable conditions in the marzes of Aragatsotn, Kotayk, Lori and Vayots Dzor. The extended production of fruits, particularly stone fruits in these marzes will make it possible also to diversify the production seasonality and extend the apricot harvest time till late August.

168. Almost all the producers of fruits and berries are individual farming households with limited scale of operations (cultivated areas). This casts a very negative impact on farming efficiency and obstructs the development of such households.

There are no alternatives to extension of farming households. This is a serious challenge since it directly affects the well-being of the people. If some farms extend their farming lands at the expense of those of other farmers, the social and economic situation of farmers turned into landless peasants might become even more difficult. It is more desirable to achieve extension of farming households through merger and consolidation of farmers particularly by developing cooperatives. Since as of today, the development of cooperatives has been too slow, the State should take additional measures (privileges for cooperatives and their members) to promote it. No doubt, such measures shall be accompanied by awareness campaigns and actions to increase farmers' knowledge.

169. Within the fruit and berry value chain, the segments with high concentration cover markets of fertilizers and pesticides, with dominant market players (almost monopolistic in pesticide market). As for the other segments, the markets are highly competitive.

The product markets in the fruit and berry value chain show quite a high level of competition, and the State should spare no efforts to prevent the opposite situation. As for the activities of dominant or monopolistic actors in the fertilizer and pesticide markets, the liberalization and higher competition on such markets depend only on some manifestation of political will. The entities with dominant and monopolist status on the markets above are companies directly or indirectly owned by state officials or their close relatives.

170. The sales markets of the products manufactured in the fruit and berry value chains have a low level of diversification. The internal market acting as the major sales market of fresh fruits and berries is small and limited, with no prospects for development due to declining number of consumers and low purchasing power. As for export markets, their number is limited, with major export destination towards an unstable market which extends its instability on the local production and processing segments of fruits and berries.

The only incentive to enhance the fruit and berry production volumes is increasing their processing and export quantities. Also, the increase in processing volumes also directly depends on the export quantities of the processed products. Therefore, the State shall take coherent efforts to raise the competitive capacities of the Armenian fresh fruit and berry products. To this end, higher competitiveness level on related markets should be ensured. This may result, for instance, in a situation when the prices of agricultural raw materials are formed by the market rather than any dominant players. Also, the producers should coherently comply with the quality standards and technical conditions of fruits and berry production. Any risks of increased prices for irrigation water should be prevented; this challenge is quite urgent, especially with the continuous hikes of electricity prices.

171. The processing units also face the urgent challenge of market diversification. Currently, the processing units mostly oriented towards the Russian Federation market face serious problems related to the economic problems of Russia caused by the trade sanction policy.

While the processing units also heavily depend on the Russian markets, unlike the fresh fruit and berry production units, they enjoy a little more diversified markets. Nevertheless, the limited transport communications and high costs obstruct the export of fruit preserves and natural juices. In fact, this is a global challenge partially of political nature and its causes are not restricted to the fruit and berry value chain.

172. The processing units face cash flow management difficulties. They pay their costs at the moment of the transaction and receive payment for their sold products with delays (in installments). Such delays might last for months (which is also a consequence of Russia's economic difficulties and harsh conditions of the retail chain). Thus, the processing units constantly face the challenge of insufficient working capital.

The only sources for the processing units to replenish their working capital are loans from banks and credit organizations. The current loan market interests and other conditions do not meet the specifics and requirements of the processing companies.

The only solution to the problem lies in introducing credit products on affordable conditions (long payment terms, lower interest rates and amended approaches to liquidity assessment of companies). This is a very difficult task for Armenia with its economy constantly subject to inflationary pressures. The squeezing policy is one of the tools to curb inflation, which in its turn entirely contradicts the logic behind the policy on improving financing availability. The desired outcome cannot be achieved only through subsidizing the interest rates of loans to individual farming households. The processing units, that cannot enjoy the same methods by the State available to farmers, also need such subsidies.

Annex 5: Buckwheat and Legumes

List of abbreviations

ADC	▶	Austrian Development Cooperation
APIU	▶	Agricultural Projects Implementation Unit
CARD	▶	Center for agricultural and rural development
EBRD	▶	European Bank for Reconstruction and Development
ENPARD	▶	European Neighborhood Programme for Agriculture and Rural Development
EU	▶	European Union
FAO	▶	Food and Agriculture Organization
FI	▶	Financial institution
GoA	▶	Government of Armenia
GIZ	▶	German Technical Cooperation
IFAD	▶	International Fund for Agricultural Development
MASC	▶	Marz Agricultural Support Center
MoA	▶	Ministry of Agriculture
MoE	▶	Ministry of Economy
NGO	▶	Non governmental organization
RA	▶	The Republic o Armenia
SDC	▶	Swiss Development Cooperation
SME	▶	Small and medium enterprises
ToR	▶	Terms of Reference
UCO	▶	Universal credit organization
UNIDO	▶	United Nations Industrial Development Organization
UNDP	▶	United Nations Development Program
USAID	▶	United States Agency for International Development
USDA	▶	United States Department of Agriculture
VC	▶	Value Chain
WB	▶	The World Bank

1 Introduction

1.1 Program Background

With funding from the European Union (EU), the European Neighborhood Programme for Agriculture and Rural Development (ENPARD) supports the Government of Armenia (GoA) in ensuring an efficient and sustainable agriculture that contributes to better living conditions in rural areas. Within ENPARD - Armenia a technical assistance component focuses on producers and value chain (VC) development. This component is implemented by UNIDO and UNDP[53]. In particular the Project aims to strengthen producer groups, effectively engage them in value addition, strengthen VCs that provide improved access to affordable, better quality food, contribute to development of rural areas and improve access to local and international markets, and ensure the introduction of environmentally-friendly farming and food processing practices. Direct beneficiaries of the Project include agricultural producers, SMEs along the VCs as well as local consumers. The Project also will focus on women, youth, and other vulnerable groups.

The technical assistance component of ENPARD has three primary outputs:

- **Output 1: Strengthened and newly established primary producers**. Within the targeted VCs and marzes, the Project will develop effective, sustainable new producers, as well as assist and strengthen existing ones in the various stages of their development.
- **Output 2: Producers effectively engaged in value addition**. The Project will support the building of physical infrastructure as well as human capacity and skills that enable producers to add value to primary agricultural production.
- **Output 3: Strengthened VCs that provide improved access to affordable, better quality food**. The project will identify and develop key intervention points at any level within the selected value chains that will benefit not only stakeholders of those value chains but also Armenian consumers locally and nationally.

1.2 Assignment Background

1.2.1 <u>Purpose and objectives</u>

1.2.1.1 *Assignment task*

This consultancy is situated within Output 3, described above, with the objective of producing a comprehensive analysis of the selected VCs, including the segments of buckwheat and legumes primary production and imports, initial storing and delivery to processors, processing/packaging, supply of end-products to wholesalers and retail networks. ThisVC analysis report will provide the supporting review and information to enable the design of the activities and interventions which will be undertaken in Output 3to resolve the VCdevelopment constraints and to boost the income generation for various operators of different segments of the VC.

1.2.1.2 Theoretical guidance

[53] With funding from the EU €2.4 million and co-funding from the Austrian Government - €1 million

The UNIDO's methodology for VC analysis was applied for the implementation of the assignment. The current report conforms entirely to the structure discussed in this methodology. UNIDO's methodology is introduced in *Diagnostics for Industrial Value Chain Development: an Integrated Tool* document. This document offers a tool for diagnosing industrial VCs. It provides guidance on defining the elements necessary for the development and upgrading of entire VCs, not just parts of them. The focus is on VCs, meaning those that engage in the processing and transformation of primary products into consumable goods and thereby generate value added. Unlike conventional VC analysis, this tool places particular emphasis on the processing and manufacturing segment.

1.2.2 Methodological approach applied

1.2.2.1 *Assignment implementation process*

In general, the consultant's work included research and analysis, in the following phases:

- **Desk research**: Using existing information sources, the consultant undertook literature review to filter information into the structure of the VC analysis described in UNIDO's methodology.
- **Interviews with experts**: Specific information was collected through interviews with experts in the public, private and the State organizations' sectors.
- **Field interviews**: Discussions with farmers and other VC operators were applied to collect related information directly from primary sources.
- **Analysis and reporting**: Using the information collected, the consultant will conduct a comprehensive analysis, and present the results as it is required by UNIDO's methodology.

1.2.2.2 Information collection sources and methods

A number of various sources were envisaged for the collection of information before the start of the current analysis. Further work revealed that the most of sources are useful just marginally. Information on operation of buckwheat and legumes VC in Armenia was collected by small pieces from different sources, for being cross-checked, collated, incorporated, and analyzed. Among others, the following information sources have been addressed during the information collection:

- formal statistical materials[54];
- secondary materials available from various similar projects funded/implemented by the WB RESCAD and CARMAC Projects, and other organizations[55];
- The RA State agencies - national level[56];
- The RA State agencies - regional level[57];
- Expert agronomists;
- Grain packagers;
- Retail outlets: supermarkets[58] and shops.

3 major methods of information collection have been applied:

[54] www.armstat.am, www.armdevinfo.am; www.armstatbank.am/
[55] Most of documents have been prepared and kindly provided by AM Partners Consulting Company
[56] The RA Ministry of Agriculture, the RA Ministry of Economy, the RA Customs Service,
[57] Governorates and Marz Agricultural Support Centers (MASCs)
[58] Yerevan-City, Krpak, VAS, and SAS

d) Desk review (of secondary materials, public media publications, interviews of operators, etc.);
e) Face-to-face qualitative interviews with experts and informed persons;
f) Direct observations.

1.1.2.3 *Information processing and analyses*

All the collected data was classified by topics and themes they related to, compared, cross-checked and verified, justified and elaborated. Once all contradictions were uncovered and rectified, the analysis began. In some cases, pieces of identified information are not totally clear and unambiguous, due to total absence of any regular information collection practices, shadowed operation of almost all enterprises of the VC (especially importers), etc. Anyhow, even providing those reservations, the analysis seems to be quite comprehensive, understandable and user friendly.

1.3 Expected Results and Deliverables

The major expected results of the current analysis are the conclusions on the constraints for development of the VC operators, recommendations for overcoming those constraints, segregation of the mentioned conclusions and recommendations by the 7 dimensions of VC analysis in accordance with the methodology and approachsuggested by the UNIDO. The only deliverable of the assignment is the current report (including Annexes).

2 Buckwheat and Legumes Value Chain Analysis

2.1 Mapping

2.1.1 <u>Product</u>

Buckwheat and legumes value chain analysis mainly concentrates on buckwheat; the other products are of rather complementary nature, which, however, does not decrease their importance within the current scope. Specific products addressed in the current document are the following:

Table 75 - List of products the analysis will focus on

N	Name	Description	Visual
1.	Buckwheat	Buckwheat is one of grains having very high composition of vitamins, micro elements, protein, etc., necessary for human health. Processed end-products of buckwheat are roasted buckwheat granules, grinded grain, buckwheat flour, etc. For the ultimate consumption it is preferable to procure unhulled or raw buckwheat, since this product loses its useful features after thermal processing (which eliminates vitamins and minerals) and storing for a long time. Buckwheat is usually an ecologically clean product, since it is not afraid of weeds (no pesticides are applied) and even displaces them, has no special requirements for soil (no fertilizers are applied), etc. Finally, buckwheat is not being modified genetically.	
2.	Lentil	Lentil is rich of protein and micro elements (e.g. magnesium) and used as food from ancient times. There are many types; the most common are brown, green, “beluga”, and “puy”. Lentil is rich of elements contributing to human health. End-products from lentil are not too many: some cracks, flour, and other baked products. However, in Armenian market the variety is limited with just lentil few types.	
3.	Chickpeas	Chickpea is a thermophilic plant (in the period of formation of grains the temperature should be 24-28°C), with vegetation period of 90-110 days for early ripening and 150-220 for late ripening sorts. Main areas of growing chickpea are territories having strict continental climate. Among the specific end-products salted (dry) and marinated grains can be mentioned.	
4.	Dry peas	Another valuable grain containing a lot of protein, micro elements and vitamins. This product has a number of positive features, including supporting health and preventing serious human diseases. Very common in many regions of the World. The list of end-products is short; some narrow market products that are for rather specific segments of consumers.	
5.	Beans	Beans are a summer crop that need warm temperatures to grow. Maturity is typically 55–60 days from planting to harvest. As the bean pods mature, they turn yellow and dry up, and the beans inside change from green to their mature colour. In more recent times, the so-called "bush bean" has been developed which does not require support and has all its pods develop simultaneously (as opposed to pole beans which develop gradually). This makes the bush bean more practical for commercial production. Almost no further processed end-products from been is available.	

2.1.2 Value chain actors and their functions

There are common functions traditionally conducted by any VC operators, and sub-functions may be defined that are usually specific to a certain function. In case of buckwheat and legumes VC that VC is rather simple and the types of main segments (operators) of VC in Armenia are few:

1. Input supply:Provision of main supplies, such as seeds, fertilizers/medicine, agricultural services (including machinery services and advisory), etc.;
2. Production (i.e. growing and harvesting): growing, cultivation, harvesting, and post harvest storing;
3. Imports/Wholesale: import and distribution;
4. Processing: roasting, packaging, and distribution in retail markets;
5. Retail trade: retail sales.

Operators of a value chain are the firms and individuals who assume different functions in the value chain, engaging directly in production, processing, imports, trading and marketing. There are few types of operators in case of buckwheat and legumes VC. Main types are the following: farmers engaged in primary production and supply of products to the market, importers that are main suppliers of 4 out of 5 target products, processors mainly conducting packaging services, and the retail network selling the products to ultimate consumers.

2.1.3 Flow of products and end-markets

Often different end-markets source products through different combinations of operators and it is important that a value chain map shows these sourcing patterns. However, the process of products flowing to the end-markets in case of buckwheat and legumes is rather simple in Armenia. Major reasons for that simplicity are general underdevelopment of activities of growing the target crops in Armenia and small production volume (except of beans). Volumes of flows in buckwheat and legumes VC for 2015 were the following (commercial production plus imports[59])[60]:

1. Lentil - 2,628 tons;
2. Chickpeas - 545 tons;
3. Dry peas - 1,829 tons;
4. Beans - 5,428 tons.

2.1.4 Service provision

In any value chain, long list of possible services may be provided by supporting organizations that are not really participating in the value chain[61]. *Inter alia*, that list may include provision of machinery services, transportation, packing and handling, consulting and accounting, quality and process certification, financial support, marketing and distribution, etc. Simplicity of buckwheat and legumes VC again

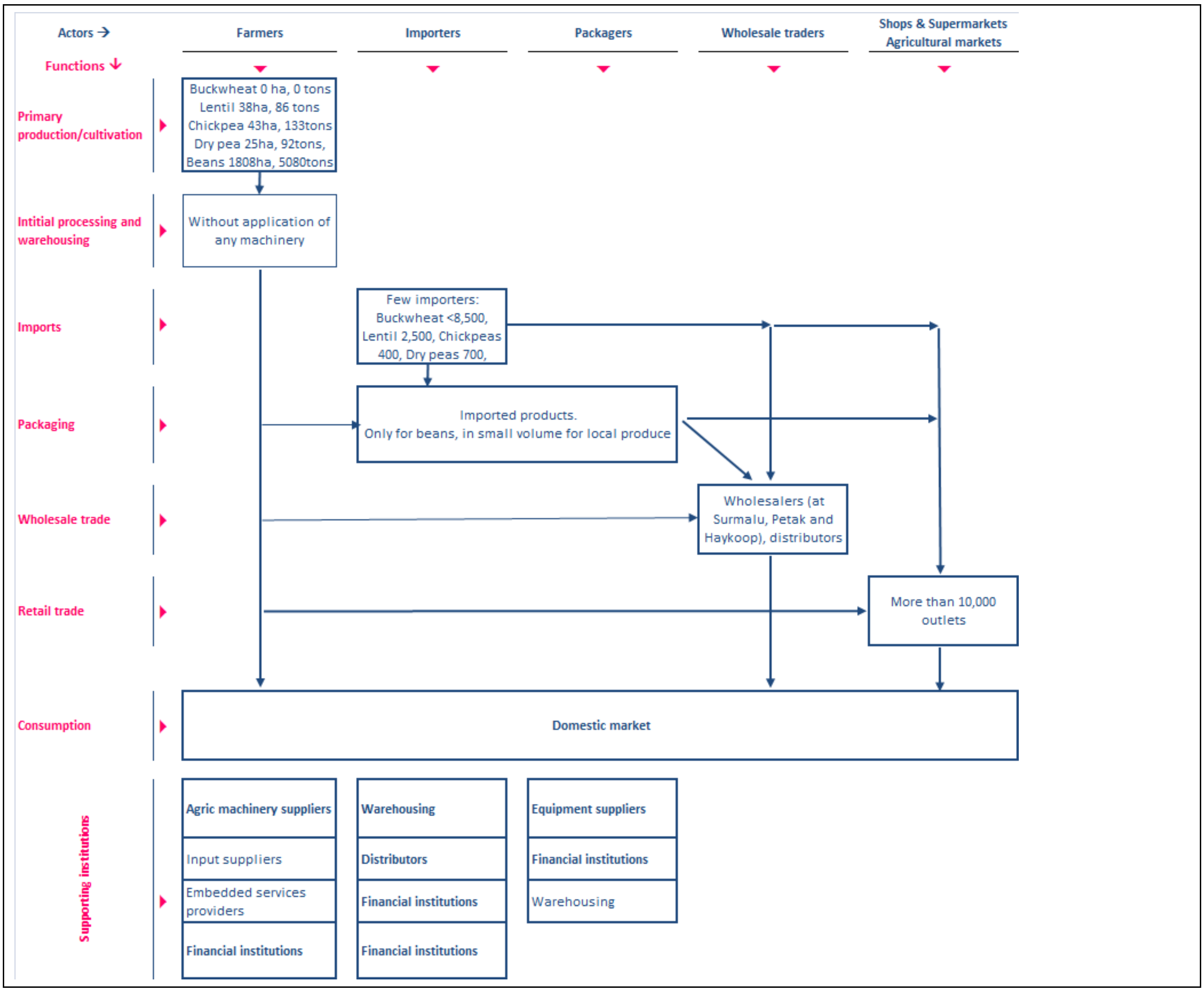
[59] Almost no exports available
[60] No buckwheat production was identified
[61] Direct suppliers and service providers are not considered in this section

conditions limited number of services applied. Main services are the following: inputs (seeds, fertilizers, medicine, fuel, etc.) supply, provision of agricultural mechanization services (plowing, seeding, cultivation, harvesting), advisory and accounting services, and financial market services.

2.1.5 Value chain map

The organogramma of buckwheat and legumes VC map below depicts major actors and functions they perform, product flows and their intensity, end-markets, service providers and services they offer, etc.

Picture 3 - Buckwheat and legumes value chain structure (Armenia 20115)



The above presented organogramma is largely self-explanatory. However, some summarization will not be useless:

1. There is almost no primary production of buckwheat in Armenia. The number of farmers involved in production of legumes is small (not related to bean producers). Tens of thousands farmers do grow beans (green and seeds) in all regions of the country;

2. Initial cleaning of locally produced legumes is being conducted by farmers, but without application of any equipment and machinery. Substantial part of production goes for subsistence consumption;
3. Few importers cover all the market supply, but do not operate under monopolistic schemes. They cooperate only in rare cases;
4. Most of large importers of in-bulk products conduct also packaging activities introducing their own brands;
5. Packagers mostly supply their products via their own distribution services, but there are aside operators/distributors, too.
6. Some retail networks promote their own (locally produced or imported) brands.

2.2 Dimension 1: Sourcing of Inputs and Supplies

2.2.1 General note

An important reservation and accent should be made before passing to the analysis of general themes of local production of buckwheat and legumes. Local commercial production volumes of target products are traditionally small in Armenia (except of beans). The registered volumes of production for the recent 4 years were the following:

1. Buckwheat - 0 tons;
2. Lentil - 14-86 tons, 86 tons in 2014;
3. Chickpeas - 42-133 tons, 133 tons in 2014;
4. Dry peas - 79-239 tons, 92 tons in 2014;
5. Beans - 4,714 - 5,080 tons, 5080 in 2014.

Reasons for tiny production volumes are many and different: absence of tradition, unfavorite natural and climatic conditions, lack of knowledge, small market, different priorities, etc. Factors mentioned are not valid for beans, which are widely and traditionally cultivated in many regions of Armenia, is of high value, and demanded in the market.

Small volumes of local production condition the way of cultivation of those products. They are mainly produced in traditional way, largely without following the necessary agronomic techniques and requirements, using “self-made” inputs, etc. Such approach influences all the aspects of production, including inputs applied, expenses, total yield and productivity, etc.

The following analysis relates the target products except of buckwheat. **There is no notable volume of buckwheat production in Armenia.**

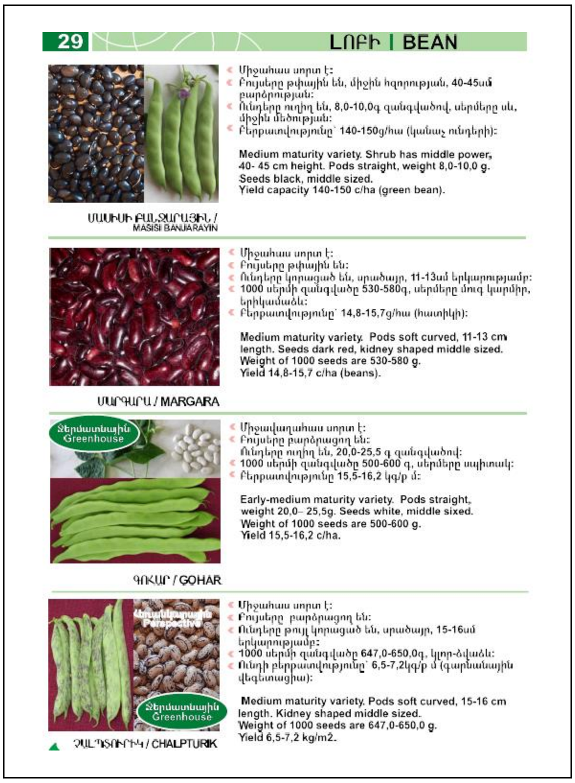
2.2.2 Input and primary product characteristics

2.2.2.1 *Input supply (agricultural inputs and services)*

Seeds are the major input used for the cultivation and production of target products. Overwhelming majority of farmers (estimated to be around 90%) producing target products use self-produced seeds. The statement especially relates to producers of beans (which comprises about 90% of total production volume of target products in Armenia in 2014). Even if farmers afford buying (high-quality, highly productive, certified, etc.) seeds of legumes once, they pick-up the seeds for the next immediately from the very first harvest providing it is possible, at all.

In case of buying seeds, ordinary farmers usually procure them from the next-door shops of agricultural inputs that are available in almost every community or at least in the closest town located few kilometers far from a village. Overwhelming majority of such seeds is being imported from abroad, and sold through a wide network of small retail shops in all the territory of Armenia. Moreover, in many cases, bigger seed packs are unpacked and re-packed in smaller packs (sometimes using just a small piece of paper) for being sold to farmers. The latter has no chance (skill, knowledge, wish, etc.) to monitor the quality of seeds. This understandably does not relate to large farmers though their number is very few in this segment.

Picture 4 - Bean seeds offered by SCVIC[62]



For such large (advanced, knowledgeable, etc.) farmers there is an offer of better quality seeds made by Scientific Centre of Vegetable and Industrial Crops (SCVIC) of the RA MoA (see the Picture 4). However, it should be mentioned again that sales volume of high-quality seeds is very limited currently, since farmers use their own seeds despite the fact of low-productivity and low-resistance to diseases.

Producers of target products do apply fertilizers and chemicals though to quite a limited extent in most cases. The logic is the same again: relatively large and advanced farmers that implement commercial production use fertilizers and chemicals more intensively. Instead, ordinary farmers limit the use of these inputs with manure and "magic chemicals" that are applied against everything.

Almost 100% of fertilizers and chemicals are being imported. Armenian market volumes for synthetic fertilizers comprise 50-55 thousand tons (totaling up to $22 million). Nitrogen fertilizers comprise 90% of this volume; 5% is phosphate, 3% is potassium, and 2% is other fertilizers. Volume of chemicals applied in Armenian agriculture totals to 500-550 tons.

[62] Excerpt from the seeds catalogue of the SCVIC

Armenian markets of fertilizers and chemicals are distinguished by their extent of monopolization; operations are not transparent, information on markets' volumes is scattered and hidden. According to official sources, 3 companies lead the market of fertilizers where more than a dozen operators work. Those leaders are "Catherine Group", "Agrimat Co", and "Masis Berriutyun" covering three fourth of the market. All 3 mentioned companies are attributed to oligarchic spheres of Armenia and regularly find themselves in the center of monopole scandals. No licensing is applied for production and trade of fertilizers in Armenia. Imports of fertilizers are made from Russia, Iran, and Georgia.

Production and sales of chemicals is a subject for licensing in Armenia by the RA MoA. So far, around 80 companies have been granted a license for operating with agricultural chemicals. In the meantime, the control of this sphere is weak; a number of re-sellers do offer chemicals in the market without having proper licensing and permits. This phenomenon is widespread especially in regions. The market of chemicals is much more monopolized – about 90% of the market supply is conducted by "Natali Agro[63]". Imports of agricultural chemicals are being conducted from Germany, Switzerland, China, Iran, etc.

Volumes of imports of fertilizers and chemicals fully meet the market demand of Armenian farmers, i.e. there is no problem of these inputs' accessibility. Instead, there are serious concerns for the affordability and quality of inputs. Organizations holding dominant positions in the markets of fertilizers and chemicals are always ready to use their privileges and increase prices, though such attempts are regularly stopped by the respective State agency – the RA State Commission for the Protection of Economic Competition (SCPEC). Besides, the State is able to intervene effectively, since it pays for almost 50% of fertilizers in the market. Fertilizer procured by the State through the RA MoA for 8,000 AMD/bag is further being sold to farmers at subsidized price of 6,000 AMD/bag.

Access to chemicals is easy and full, again, as well as affordability and quality issues are valid. There is a wide choice, starting from cheap Chinese and finishing with expensive European inputs. Understandably, the majority of farmers prefers cheap inputs, but receives respective results.

However, one important note should be made before proceeding: buckwheat is among those few plants that do not require intensive (if at all) use of fertilizers and chemicals. It is resistant to damage of pests and weeds, does not require fertile land, etc. The important input is the irrigation water only.

The major machinery applied by farmers for cultivation of (some) legumes[64] are the tractor and combine equipped with different appliances, such as ploughs, disks, sprayers, reaping harvesters, etc. Single farmers (even advanced producers) usually do not possess all the machinery necessary for the cultivation of target crops. Instead, all communities have agricultural machine and mechanization operators that provide paid services to the farmers. However, they are few, and the condition of their equipment is not always good, which causes delays in certain agricultural works' implementation.

Prices of agricultural mechanization services are largely same (or similar) in all regions of Armenia. The average prices of agricultural mechanization works per 1 ha are the following:

1. Ploughing - 30,000 - 35,000 AMD,
2. Pressing and flattening - 35,000 - 50,000 AMD,
3. Harvesting - 35,000 - 50,000 AMD.

[63] Associated with the name of Samvel Alexanyan, parliamentarian from the Republican Party
[64] Almost no cultivation of buckwheat is available

In most cases, farmers pay for the mechanization services immediately and in cash, since the machine operator should face maintenance and operation costs of the machinery, buy fuel and spare parts. In some cases, mechanization operators afford delayed or in-kind payments (but not in case of legumes).

No large investments are needed for cultivation of legumes. Farmers usually have to pay for the inputs (seeds, fertilizers, and chemicals), land preparation, irrigation, labor, service of mechanization, etc. No procurement of fixed assets is assumed. Funding of the cultivation of legumes is carried out in exactly the same way as the funding of other, more widespread activities of growing cereals (wheat, barley), vegetables, and other crops. Farmers fund the process either by their own resources (savings, last year profit, income from other employment, remittances, etc.) or from external resources attracted from financial institutions. Most often, farmers apply short-term micro and small loans for the purpose of land cultivation. Availability and affordability of financial resources is analyzed further in the current document[65].

As mentioned above, few inputs are applied for the production of buckwheat and legumes. In particular, the list is very short: seeds, fertilizers, and chemicals. Requirements for the quality of those main inputs are not many, either. Those are high-productivity of seeds, better influence of fertilizers and chemicals. In the meantime, it was already mentioned that overwhelming majority of the production of legumes in Armenia is of complementary nature; there are very few (if at all) large farmers specialized in production of legumes. Farmers rarely buy seeds, but prefer to use "selected/best" seeds picked-up from the last year harvest. Understandably, the quality/productivity of such seeds cannot be very high.

Similarly, farmers usually limit the use of procured fertilizers and chemicals to the very small quantities with the purpose of saving. However, even if they procure those inputs they do not have much choice; it was told above that market of fertilizers and chemicals is monopolized to a great extent. Moreover, farmers usually procure cheap fertilizers subsidized by the Government regardless its usefulness for the exact crop.

2.2.2.2 *Primary production*

First of all, it should be mentioned that there is no commercial production of buckwheat in Armenia. Several years ago, with the financial support of the WB funded projects, some farmers experimented with the production of buckwheat. Some smaller scale processing equipment was even operated. However, that experiment did not result in any sustainable results and all activities were ceased.

Local production volumes of target products except of beans are quite small. Total production of leguminous products comprises less than 5,500 tons, including about 5,100 tons of beans. The biggest concentration is observed in Gegharkunik (in terms of chickpeas) and Lori (in terms of lentil). Production of beans is concentrated in Armavir, Tavush, and Syunik regions.

Official statistical data on various aspects of legumes' production in Armenia is not a good one. Closer analysis reveals a number of inconsistencies if not naked mistakes. However, that is the only information available, at all. Details of that "statistics" are presented below.

[65]See - 2.7 Dimension 6: Value Chain **Finance**

Table 76 - Production of legumes by regions

N	Region	2011			2012			2013			2014		
		Area, ha	Yield, ton	Prod., ton	Area, ha	Yield, ton	Prod., ton	Area, ha	Yield, ton	Prod., ton	Area, ha	Yield, ton	Prod., ton
1.	Aragatsotn	42	95	2.26	42	95	2.26	65	150	2.31	46	115	2.50
2.	Ararat	126	536	4.25	120	586	4.88	109	544	4.99	120	589	4.91
3.	Armavir	293	1,232	4.20	334	1,387	4.15	226	1,028	4.55	226	1,283	5.68
4.	Gegharkunik	28	97	3.46	66	296	4.48	39	227	5.82	52	351	6.75
5.	Lori	194	310	1.60	169	359	2.12	185	438	2.37	196	443	2.26
6.	Kotayk	170	459	2.70	165	362	2.19	163	378	2.32	160	417	2.61
7.	Shirak	59	121	2.05	27	79	2.93	32	76	2.38	38	117	3.08
8.	Syunik	374	756	2.02	376	843	2.24	380	904	2.38	385	960	2.49
9.	Vayots Dzor	72	130	1.81	67	117	1.75	66	103	1.56	62	101	1.63
10.	Tavush	644	1,464	2.27	661	937	1.42	700	1,258	1.80	651	1,080	1.66
	Total	**2,002**	**5,200**	**2.60**	**2,027**	**5,061**	**2.50**	**1,965**	**5,106**	**2.60**	**1,936**	**5,456**	**2.82**

Table 77 - Production of lentil by regions

N	Region	2011			2012			2013			2014		
		Area, ha	Yield, ton	Prod., ton	Area, ha	Yield, ton	Prod., ton	Area, ha	Yield, ton	Prod., ton	Area, ha	Yield, ton	Prod., ton
1.	Aragatsotn	2	4.0	2.00	0	0.0	-	0	0.0	-	0	0	-
2.	Ararat	0	0.0	-	0	0.0	-	0	0.0	-	0	0	-
3.	Armavir	6	7.4	1.23	1	1.6	1.60	1	0.7	0.70	1	1	0.60
4.	Gegharkunik	0	0.0	-	0	0.0	-	0	0.0	-	0	0	-
5.	Lori	0	0.0	-	0	0.0	-	0	0.0	-	23	65	2.81
6.	Kotayk	4	9.6	2.40	7	8.7	1.24	4	7.5	1.88	5	10	1.90
7.	Shirak	2	3.3	1.65	1	3.5	3.50	6	6.5	1.08	3	7	2.17
8.	Syunik	0	0.0	-	0	0.0	-	2	2.0	1.00	5	4	0.70
9.	Vayots Dzor	0	0.0	-	0	0.0	-	0	0.0	-	0	0	-
10.	Tavush	0	0.0	-	0	0.0	-	0	0.0	-	1	1	1.00
	Total	**14**	**24.3**	**1.74**	**9**	**13.8**	**1.53**	**13**	**16.7**	**1.28**	**38**	**85.7**	**2.26**

Table 78 - Production of chickpeas by regions

N	Region	2011			2012			2013			2014		
		Area, ha	Yield, ton	Prod., ton	Area, ha	Yield, ton	Prod., ton	Area, ha	Yield, ton	Prod., ton	Area, ha	Yield, ton	Prod., ton
1.	Aragatsotn	0	0.0	-	0	0.0	-	0	0.0	-	0	0	-
2.	Ararat	0	0.0	-	0	0.0	-	0	0.0	-	0	0	-
3.	Armavir	11	14.4	1.31	8	12.3	1.54	9	9.7	1.08	3	2	0.53
4.	Gegharkunik	0	0.0	-	0	0.0	-	0	0.0	-	19	98	5.16
5.	Lori	2	2.0	1.00	2	1.3	0.65	1	0.8	0.80	0	0	-
6.	Kotayk	2	7.2	3.60	1	2.8	2.80	1	3.0	3.00	3	7	2.27
7.	Shirak	7	12.4	1.77	3	1.5	0.50	5	8.8	1.76	5	8	1.58
8.	Syunik	0	0.0	-	0	0.0	-	0	0.0	-	0	0	-
9.	Vayots Dzor	20	20.2	1.01	14	29.2	2.09	14	19.4	1.39	12	18	1.47
10.	Tavush	3	3.4	1.13	2	2.5	1.25	1	0.2	0.20	1	1	0.70
	Total	**45**	**59.6**	**1.32**	**30**	**49.6**	**1.65**	**31**	**41.9**	**1.35**	**43**	**132.9**	**3.09**

Table 79 - Production of dry peas by regions

N	Region	2011			2012			2013			2014		
		Area, ha	Yield, ton	Prod., ton	Area, ha	Yield, ton	Prod., ton	Area, ha	Yield, ton	Prod., ton	Area, ha	Yield, ton	Prod., ton
1.	Aragatsotn	0	0.0	-	0	0.0	-	0	0.0	-	0	0	-
2.	Ararat	0	0.0	-	5	27.0	5.40	0	0.0	-	0	0	-
3.	Armavir	2	9.0	4.50	37	33.0	0.89	0	0.0	-	5	17	3.40
4.	Gegharkunik	11	32.5	2.95	30	124.0	4.13	7	29.0	4.14	3	30	10.00
5.	Lori	5	1.0	0.20	3	3.9	1.30	3	2.0	0.67	2	5	2.50
6.	Kotayk	11	43.4	3.95	13	36.0	2.77	7	30.0	4.29	5	15	3.00
7.	Shirak	12	21.4	1.78	3	10.1	3.37	5	14.0	2.80	6	19	3.17
8.	Syunik	0	0.0	-	0	0.0	-	0	0.0	-	0	0	-
9.	Vayots Dzor	0	0.0	-	0	0.0	-	0	0.0	-	0	0	-
10.	Tavush	3	6.0	2.00	7	5.0	0.71	3	4.0	1.33	4	6	1.50
	Total	**44**	**113.3**	**2.58**	**98**	**239.0**	**2.44**	**25**	**79.0**	**3.16**	**25**	**92.0**	**3.68**

able 80 - Production of beans by regions

N	Region	2011			2012			2013			2014		
		Area, ha	Yield, ton	Prod., ton	Area, ha	Yield, ton	Prod., ton	Area, ha	Yield, ton	Prod., ton	Area, ha	Yield, ton	Prod., ton
1.	Aragatsotn	35	80.2	2.29	38	85.8	2.26	59	135.7	2.30	42	105	2.50
2.	Ararat	124	528.2	4.26	115	559.8	4.87	109	544.3	4.99	120	589	4.90
3.	Armavir	255	1,175.8	4.61	275	1,323.9	4.81	207	1,006.3	4.86	203	1,221	6.01
4.	Gegharkunik	17	64.7	3.81	36	172.4	4.79	32	197.5	6.17	30	223	7.44
5.	Lori	187	307.2	1.64	164	353.5	2.16	181	434.4	2.40	170	373	2.19
6.	Kotayk	150	384.7	2.56	142	311.4	2.19	151	337.7	2.24	147	386	2.62
7.	Shirak	29	67.9	2.34	15	46.5	3.10	10	37.6	3.76	20	73	3.66
8.	Syunik	374	756.2	2.02	376	843.2	2.24	378	901.6	2.39	380	956	2.52
9.	Vayots Dzor	52	110.1	2.12	53	87.9	1.66	52	83.5	1.61	50	83	1.66
10.	Tavush	641	1,454.7	2.27	654	929.8	1.42	697	1,253.8	1.80	646	1,072	1.66
	Total	**1,864**	**4,929.7**	**2.64**	**1,868**	**4,714.2**	**2.52**	**1,876**	**4,932.4**	**2.63**	**1,808**	**5,080.4**	**2.81**

Total area of legumes cultivation as of the end of 2014 decreased since 2011 for 3%, but total yield grew for 5%, and this is the first strange finding. Improvement of the productivity is rather unrealistic, providing the poor conditions of land cultivation in Armenia. The same phenomenon is observed in case of chickpeas (3% decrease of area and 123% increase of the yield), and beans (3% decrease of area and 3% increase of the yield). Slight increase is registered in case of lentil,only. However, the most probable conclusion is that quality and reliability of the presented information is rather low.

Table 81 - Comparison of productivity (norm vs. actual 2014)

N	Target crops	Productivity norm, ton/ha	Actual productivity, ton/ha
1.	Buckwheat	1.6 – 1.8	1.5-2.0 (historical)
2.	Lentil	1.4 - 2.0	0.6 - 2.8
3.	Chickpeas	1.6 - 3.5	0.5 - 5.2
4.	Peas	2.4 - 3.5	2.5 - 3.4
5.	Beans	2.0 - 3.5	1.7 - 7.5

Productivity features of locally produced target crops were not bad. On average they are even quite close to the average (sometimes even maximum) norms. However, presented figures are not fully reliable since the volume of production was not big. Making judgments based on few examples of local production is not reliable.

Promotion of legumes value chain is possible only in case of profitability of their cultivation already in the segment of primary production. Assessment of the profitability starts from the calculation of costs. Below, exemplary calculations (for Kotayk region conditions) are presented based on experts' estimations:

Table 82 - Calculation of costs for growing target legumes (example of Kotayk region)

N	Works	Unit	Buckwheat		Lentil		Chickpeas		Dry peas	
			Q-ty	Amount, AMD	Q-ty	Amount, AMD	Q-ty	Amount, AMD	Q-ty	Amount, AMD
1.	Land ploughing	ha	1	35,000	1	30,000	1	30,000	1	30,000
2.	"Chizel"	ha	1	15,000	1	15,000	1	15,000	1	15,000
3.	Land flattening	ha	1	15,000	1	15,000	1	15,000	1	15,000
4.	Seeds	kg	100	150,000	100	150,000	170	204,000	250	200,000
5.	Sowing	ha	1	15,000	1	15,000	1	15,000	1	15,000
6.	Fighting weeds	ha	1	25,000	1	35,000	1	25,000	1	30,000
7.	Harvesting	ha	1	35,000	1	35,000	1	35,000	1	35,000
8.	Transportation	AMD	1	25,000	1	15,000	1	15,000	1	25,000
9.	Land tax	AMD	1	3,500		3,500		3,500		4,000
10.	Other (5-10%)		10%	31,850	10%	31,350	10%	35,750	10%	36,900
	Total costs (TC)	**AMD**	**-**	**350,350**	**-**	**344,850**	**-**	**393,250**	**-**	**405,900**
	Average yield (AY)	Kg/ha	2,000	-	2,500	-	2,500	-	2,000	-
	Cost, kg = TC/AY	**AMD**	**-**	**175**	**-**	**137.94**	**-**	**157.3**	**-**	**202.95**

Table 83 - Calculation of costs for growing beans (example of Kotayk region)

N	Works	Unit	Q-ty	Amount, AMD
1.	Ploughing	ha	1	30,000
2.	"Chizel"	ha	1	15,000
3.	Land flattening	ha	1	15,000
4.	Grooving	ha	1	15,000
5.	Design of irrigation channels	ha	1	10,000
6.	Seeds	kg	120	180,000
7.	Sowing	man/day	5/3 day	75,000
8.	Hand weeding, loosening	man/day	6/3 day	90,000
9.	Irrigation water	m^3	8,000	88,000
10.	Salary of waters	man/day	1/8 day	160,000
11.	Fertilization	man/day	2	10,000
12.	Fertilizer (nitrogen)	kg	50	10,000
13.	Fighting diseases and pests	unit	3	45,000
14.	Fighting weeds	unit	1	15,000
15.	Harvesting	man/day	10/5 day	250,000
16.	Transportation	time	10	100,000
17.	Land tax	AMD		20,000
18.	Other costs	AMD	10%	112,800
	Total costs	AMD		1,240,800
	Average yield (AY)	kg/ha	3,500	-
	Cost, kg = TC/AY	AMD		**354.51**

Understandably, the presented calculations are rather theoretical and may not reflect all aspects of efforts invested in production of legumes. In addition, losses conditioned by climatic cataclysms are not reflected in calculations in any way. There are many other aspects that may affect the primary production of legumes and condition their costs.

Next problem that should be mentioned in relation to the profitability of target products is the large unawareness of farmers on these calculations. Very few farmers do thorough calculations of their costs due to low financial literacy and absence of any documentation kept by them. However, some of those farmers cultivating target products in Armenia were identified and shared their views in regard to the costs of target crops. Expectedly, their estimation of costs is more pessimistic: costs are notably higher. In the meantime, the bases for their calculations are vague either. Comparison of experts' estimations and farmers' calculations of costs are presented below.

Table 84 - Estimation of costs for production of legumes by different sources, AMD/kg, 2015

N	Products	Expert's estimation	Farmers' estimation	Estimated income
1.	Buckwheat	175	330	100 - 200
2.	Lentil	140	430	150 - 250
3.	Chickpeas	160	300	250 - 350
4.	Dry peas	200	160	200 - 250
5.	Beans	355	530	250 - 350

Providing the prices of target products as of the end of 2014, and taking into account average commercial margins of wholesalers and retailers on the level of 20-25% each, the income of primary producers of legumes comprises 100-350 AMD/kg on average (however, including also farmers remuneration for their labor).

Costs of target crops may differ from region to region due to 2 major factors: costs of inputs (seeds, other materials, costs of works, etc.) and crop productivity. The first parameter is rather constant or the difference is marginal for different regions. This is largely conditioned also by the fact that production of target crops is mainly concentrated in few regions/areas with similar climatic and socio-economic features.

The influence of the second factor is more notable. Productivity of certain crops in certain regions may be notably higher or lower in comparison to the same coefficient in other regions. Snapshot analyses uncovered that in other equal conditions (no natural cataclysms) the difference in costs per kg of legumes may reach to 25-30%.

Understandably, use of better inputs results in substantial increase of the yield, i.e. the productivity per unit of land, i.e. in decrease of costs. However, justified conclusions can be made in this regard only in case of beans, since the cultivation of other crops is being conducted in so small quantities that no comparisons are possible. Approximate estimation of farmers and experts in other equal conditions again vary in the range of 25-30%.

In the current context of ENPARD Project, cultivation of buckwheat and legumes is considered to be a possible alternative to production of wheat and other cereals. Comparison of the profitability is rather improper: net income from the cultivation of buckwheat and legumes often is more than the whole sales price of wheat (150 AMD/kg approximately).

Perishability period of target products largely depends on the conditions of their storing, i.e. condition of seeds at the moment of the harvest, packaging, extent of humidity, ventilation, and temperature in the storage, etc. Perishability period of target products and respective storing conditions the following:

Table 85 - Perishability periods of target products

N	Target crops	Perishability period, months	Storing conditions
1.	Buckwheat	Up to 24	It is strictly recommended to store buckwheat in cold and dark place. The best option is hermetic packaging, which prolongs the perishability period. It is also recommended to sift buckwheat before storing.
2.	Lentil	4 - 10	Lentil should be stored in dry place because it is hygroscopic and may absorb humidity very fast. This may result in rusting of lentil. That is why; lentil should be packed in either canvas bags or in carton. Storage place should be cold and well ventilated.
3.	Chickpeas	Up to 12	Only whole/undamaged seeds of chickpeas should be selected for being stored for a long time. In addition, seeds should be dry but not withered and moldy. Should be stored in dry and dark place. Sunlight is subject to avoid: seeds become bitter / rancid under the sun.
4.	Peas	Up to 12	Pears are better to store in dry and dark place at indoor temperature. In respective cold storage it can be kept for few years even.
5.	Beans	60 - 72	Beans should be stored in dry and cold place, since in some period the nutrition value of this products starts decreasing. Also, beans should be checked for the subject of bugs.

Total supply of the market of target products consists of mainly imports and some local production (except of beans in case of which the situation is vice versa). Market supplies of those products are stable in terms of assortment, types, sorts, quantity, and quality. The situation differs only in case of price. Prices of all (especially) imported products are being affected by a number of factors such as changes in local financial market (e.g. exchange rates), global changes in international markets, specific changes in major supply countries (climatic cataclysms, political instability, etc.). Changes of target products notably varied in retail market of Armenia, too. According to measurement conducted in a dozen of settlements (only towns) of Armenia revealed the following dynamics of target products prices in the recent period of 2011-2014 (in December of each year).

Table 86 - Variation of target products prices in retail markets, AMD/kg

N	Products	2011	2012	2013	2014
1.	Buckwheat	792 - 1,096	578 - 886	550 - 948	719 - 1,210
2.	Lentil	667 - 1,028	625 - 991	600 - 1,071	719 - 1,229
3.	Chickpeas	715 - 1,126	884 - 1,449	883 - 1,411	977 - 1,382
4.	Dry peas	402 - 737	428 - 856	429 - 930	513 - 1,051
5.	Beans	814 - 1,524	880 - 1,229	797 - 1,264	1,218 - 1,674

Notable increase of average prices of target products is obvious. That increase is partly conditioned by the growth of exchange rate (i.e. devaluation of AMD), but also by growth of prices at international markets. Legitimately, most expensive products were observed in capital Yerevan and remote Kapan, while the cheapest products were offered in Artashat, Vagharshapat, and Gyumri (i.e. towns located closer to rural areas). Variation of prices also depends on brand, packaging, pack size, category of product, import country, and other factors.

There are no specific requirements for the quality of target products, except of not being spoiled, withered, and moldy. Currently, this major requirement is met completely. However, this does not mean that requirements may not evolve. For example, consumption of so called "green" (i.e. unhulled but not roasted (thermally processed)) buckwheat. In reality, overwhelming majority of useful materials of buckwheat are being eliminated in the course of thermal processing although very few consumers are aware of this. Once the awareness raises among consumers, their requirements will change and suppliers (local producers or importers) will have to meet new challenges.

2.2.3 <u>Characteristics of primary producers and input providers</u>

2.2.3.1 *Input suppliers*

There are 3 main types of inputs for the production of target products: seeds, fertilizers, and chemicals. Main details related to all three inputs were already presented in the chapters above. However, some important issues must be reflected again. First, the quantity of using the mentioned inputs is small due to the following reasons:

1. There is actually no production of buckwheat in Armenia. Production of other legumes except of beans is very limited by number and volume.
2. Farmers largely prefer using their own seeds and manure from animals they bred. In other words, farmers do not tend to face much expenses sine high-quality inputs are not always affordable.
3. Farmers are largely not aware of what types of fertilizers and chemicals should be applied for effective cultivation of legumes.
4. Fertilizers and chemicals farmers procure and apply are used not for target crops cultivation exceptionally, but for all crops, the whole land plot cultivated.

Thus, the attemptsof measuring the markets of main inputs are good for nothing; they simply cannot result in any more or less accurate and/or reliable data. Introduction and wide-scale implementation of the cultivation of buckwheat and legumes (except of beans) should be conducted first.

Nevertheless, some market of the mentioned inputs definitely exists. That market operates through hundreds (less than or around a thousand) of inputs supply shops/outlets operational in overwhelming majority of Armenian communities. However, it was mentioned that almost all of them are sourcing the inputs they trade from few major operators comprising more than oligarchic 90% of supplies in the markets of inputs. The biggest input supplier is Natali-Pharm that cooperates with famous international brands of inputs, such as “Bayer” Germany, “BASF” Germany, “The New Pharm” Austria, “Singenta” Switzerland, “FMC” the USA, “Dupont” the USA, “Dau Agro” the USA, “Safa-Tarim” Turkey.

2.2.3.2 *Primary producers*

Production of buckwheat in Armenia was not traditional historically, and is not practiced currently. There were some attempts of advanced farmers (from Kotayk, Aragatsotn, and Shirak regions) to utilize pilot projects (kindly funded by development initiatives of mainly the WB – RESCAD, CARMAC). Anyhow, all those attempts actually failed due to various objective and subjective reasons. The biggest challenge, surely, was the lack of knowledge/experience and difficulty of unhulling the harvested buckwheat. No buckwheat production is available in Armenia as of the end of 2014.

There is no statistics on the number of producers of lentil, chickpeas, and dry peas in Armenia. However, hundreds of farmers cultivate these products but really few of them operate as commercial producers. Most of farmers conduct homestead cultivation of those legumes mainly for subsistence purposes, and only small surplus is supplied to the market. This conditions comparatively bigger volumes of imports.

Theoretically, the size of any agricultural product's market equals to local production (minus subsistence consumption)[66], plus imports, minus exports. Buckwheat and legumes are not exceptions, but the abovementioned formula is not always applicable. For example, official statistics suggests that almost no buckwheat is actually imported to Armenia, and analysis identified almost total absence of local production. It is obvious that such statistics cannot be true and estimations should be sourced via application of "from the opposite" method. According to experts, annual necessary consumption of buckwheat for a person comprises 3.4 kg. This totals to about 8,500 tons[67]. Providing absence of buckwheat production traditions in Armenia one can suggest even 30-50% cut-off (though huge consumption of this product in military forces is already enough for skipping such deductions). Thus, it can be concluded that volume of Armenian buckwheat market varies in the range of 4.2-8.5 thousand tons per annum. Estimation of other legumes' market sizes is suggested to bedone via the abovementioned formula. The approximated estimations are the following.

Table 87 - Estimated market sizes for buckwheat and legumes in Armenia, 2014, tons

N	Products	Local production	Imports	Exports	Total
1.	Buckwheat	0	>8,500	0	>8,500
2.	Lentil	86	2,542	0	2,628
3.	Chickpeas	133	412	0	544
4.	Dry peas	92	1,737	0	1,829
5.	Beans	5,080	349	55	5,374

Understandably, volumes of target products' market vary from year to year. Those deviations depend on tens of factors, including price dynamics, production volume of one crop influencing the import of the other legume, changes in farmers' policy of cultivation, etc. Providing current miserable volumes of local production (except of beans) it can be concluded that there is huge growth potential for buckwheat and legumes (though modest in case of beans).

The number of farmers cultivating lentil, chickpeas, and dry peas strictly commercially is rather small. Moreover, the number is not big if the filter of commercial production is skipped. Local market demand is met mainly by the efforts of importers. However, no farmer producing mentioned legumes and wishing to sell their production faces any challenge except of ordinary and natural market-related usual difficulties. No farmer is ever hindered to sell its produce, or forced-out from the market. In case of beans the situation is different in terms of the number of market operators (that reaches tens of thousands), but exactly the same in terms of openness of the market.

Ceteris paribus, some farmers may have been considered to be large, influential, advanced, etc. In reality, cultivation of several tens of hectares of legumes cannot be estimated as large production, and such farmers cannot and should not be named "large farmers" (at least in case of target products). No farmer has any domination in the market of legumes in Armenia.

Average commercialization level of legumes production is rather low in comparison of other (traditional) agricultural products cultivated in Armenia. Commercialization level varies in the range of 6% (Vayots Dzor) to 40% (Armavir).

Organic agriculture is part of Armenia's sustainable development concept and is a priority area in the government's agro-food policy. Organic farming is considered an excellent business opportunity for farmers and investors involved in agriculture and food production. The discussion on organic agriculture

[66] I.e. commercial production
[67] Based on the number of permanent population of 2.5 million people

among stakeholders started in 2002, coordinated by the USDA. These activities have continued under FAO and USAID projects. As a result, the Armenian Organic Agriculture Foundation was established; several farmer associations included organic agriculture on their agendas and some of their members started to produce organically. In Armenia the demand from processing companies for organic raw materials is the main factor for development on a farm level. The production of fruits, berries, alfalfa, some grains, vegetables, and collection of wild species as well as beekeeping are the main organic agricultural activities. The main end-products are juices, nectars, concentrates, purees, quick frozen products, and bread.

Volumes of organic production of target crops are either very tiny, or does not exist, at all. It should be noted that some volume of local produce is definitely clean of any unwanted inputs, but that is not enough for being categorized as organic. Organic certification required more features on continuous basis, which does not exist among producers of legumes in Armenia.

2.2.4 Contractual arrangements

Interactions of primary producers with their clients are very smooth and not hindered by any factor or action from aside. However, formalization level of the mentioned interactions is very low. No formal contractual arrangements are applied among the operators of various segments of buckwheat and legumes VC. Moreover, there is almost no regularity in mentioned interactions conditioned by small volumes of production except of beans.

There are no special conditions applied for regulation of interactions between various operators of buckwheat and legumes VC. No limitations are applied for the length of the cooperation, prices, delivery and payment terms, total and one-time delivery quantities; no practices are applied for disputes resolution, etc. All issues are being agreed, resolved, and implemented on spot.

2.2.5Logistics

Transportation of primary produced legumes is being conducted mainly by the farmers (though except of beans). They deliver the products to the market, including to wholesalers and retail outlets in Yerevan and adjacent regional towns, agricultural products' markets, and even to ultimate consumers. Sometimes, farmers realize their products themselves without intermediating the sales, thus saving/gaining the commercial margins of traders. Primary producers do not face much loss in the course of delivery of products to the market. Usually, delivery takes not a long time and no notable losses are possible.

Sales channels of beans are somewhat different. This statement is especially true for beans produced in specific "brand" areas of Armenia, such as towns of Goris (Syunik region) and Noyemberyan (Tavush region), villages of Bjni (Kotayk region) and Tsav (Syunik). Beans of these localities' production are famous and demanded among consumers. Intermediary traders know about that demand and regularly procure those products from farmers. In other words, the VC in case of beans is more sophisticated. However, transportation and delivery related issues in case of beans are quite similar, and no major losses take place.

2.5.5.1 *Transportation*

Transportation of target products from primary producers to the operators of next segments of VC is not a function that can be separated from the production on one side or sales on the other side (depending who conducts it). However, total transportation costs are not too much due to: a) small quantities per producer (i.e. can be delivered in bulk with other products which decreases costs significantly), and b) shorter territories due to closeness of end-markets in Armenia.

2.2.6 Infrastructure and transport facilities

2.2.6.1 *Storage/warehousing of primary production*

Warehousing of legumes is the last but not least important stage of primary production. Proper storages are required for drying the harvest; otherwise the products will be spoiled in a quite short period. Usually, storage facilities should be cool, dry, dark, and well ventilated for ensuring proper conditions. Providing comparatively small quantity of production, the sufficiency of storage facilities does not become a problem. All legumes are being stored in ordinary bags, usually of multi-purpose use.

And again, warehousing of beans is again being conducted differently. It is actually conducted in 2 stages: a) initial stage immediately after harvesting, when the beans are stored to be dried before the seeds are being unhulled, and b) final stage, when seeds are being store for a long-term.

2.2.7 Major constraints and proposed solutions

The following major constraints have been mentioned by operator of the primary production segment of buckwheat and legumes VC in Armenia:

1. Access to better inputs:
    a) seeds of buckwheat, possibly from Krasnodar or Saratov regions of Russia),
    b) combined fertilizers in case of beans.
2. Provision of primary processing equipment, including:
    a) unhulling equipment for the production of buckwheat. This is the hardest and most important stage of buckwheat production,
    b) provision of sorting/refining equipment in case of lentil.
3. Provision of irrigation in case of dry peas (though irrigated areas can be better used in production of high value fruits and vegetables);
4. Provision of proper agricultural machinery that will ensure the quality of primary production (at cultivation and especially harvesting stages);
5. Provision of proper knowledge on agricultural techniques of cultivation of legumes (maybe except of beans).

In general, all the abovementioned constraints are not impossible to overcome. Moreover, some of them are of general nature and are successfully and regularly resolved in case of other crops' production. Ignition of the interest towards production of legumes currently being imported almost totally could be the best first step, which can be conducted through a wide awareness raising campaign. The continuation could appear in the form of establishing formal and informal groups of farmers (e.g. under the status of cooperatives) for targeted interventions that can be in form of soft measures (capacity building, knowledge provision, etc.) and market channeling (e.g. provision of necessary initial processing equipment).

2.3 Dimension 2: Processing Capacity and Technology

2.3.1 Processing capacity

Before passing to presentation of the material under this chapter, it should be once again mentioned that volumes of production of target products in Armenia is very small (except of beans). Buckwheat production almost does not exist, local production volumes of lentil, chickpeas, and dry peas vary in the range of 100-135 tons annuallyper product. However, even that tiny quantity, as well as quite big volume of bean is not being processed in Armenia to any other end-product. Some quantity of locally produced legumes is being packaged (conducted cellophane packs of several volumes/sizes), but in the context of the current analysis that process is not really considered as processing.

More than a dozen of packagers supply the whole market of packed buckwheat and legumes in Armenia. Leaders of the market are the following enterprises:

1. “Alex-Grig” LLC, “Moya Semya” and “Yerevan-City” brands (affiliated with Yerevan-City network of supermarkets),
2. “Anush Lini” LLC, “Anush Lini” brand (affiliated with famous “Grand Candy”),
3. “Maranik” LLC, “Maranik” brand,
4. “Armen-Hamik Eghbayrner” JV LLC, “Original” brand,
5. "Raffael Contini Trading Company" JV LLC, “Rio Grande” brand,
6. “Tsovi Astgh” (“Sea Star”) LLC, “Aror” brand,
7. “Invest-Intorg” LLC, “Smak” brand,
8. “Sargis and Anushavan Eghbayrner” LLC,
9. “Voske Jraghats” (“Golden Mill”) LLC,
10. M.Tsarukyan SE.

Local packagers either import their inputs (buckwheat and legumes) from abroad directly, or procure them from specialized trading companies. Packagers state that imported products are of much better features in terms of olygoleptic characteristics, perishability period, appearance, cleanness of products from pests, etc. In-bulk imports are conducted from Russia, Ukraine, Canada, Belgium, India, China, etc. Large-scale procurements are sometimes conducted at quite high prices, around 500 AMD/kg, but that high quotation is being repaid by high quality and long perishability period.

In terms of local inputs, packagers procure only beans cultivated in specific areas of the country. All the other legumes are skipped due to their qualitative features though most of consumers prefer local products.

Packagers utilize more than half of their capacities (at least for their majority). However, packaging technologies currently applied in Armenian enterprises are not extraordinary specific and sophisticated in use. No special education or long training is needed for their operation. Most of enterprises operate with quite simple machinery and technologies.

2.3.2 Technology

Technologies of processing buckwheat and legumes are quite similar in the initial stages, including the warehousing and cleaning, but do vary at further stages. The following scheme reveals the sequence of target products' processing stages: warehousing, seed cleaning, sorting, stone separation, initial drying and warming, steaming, extracting humidity, calibration of seeds and separation of waste, peeling / unhulling, receipt of end-products: grinded stuff, crushed whole seeds. Whole seeds are packed in wholesale and retail packaging. Understandably, different products are being processed in different ways. The only identical process is the packaging.

As mentioned, packaging is the only process properly implemented by Armenian producers of consumable buckwheat and other legumes. Very tiny quantity of primary local production (mainly bean, and some lentil) is passing pre- and post-packaging processing. The only attempt was supported by the WB-funded development initiative in the form of provision of a grant for organization of buckwheat production and further processing. Some area was cultivated for buckwheat, processing and unhulling equipment was imported, but the activity finally failed no tangible achievement was registered.

2.3.3 Knowledge use

Processing of buckwheat and legumes is of mainly simple nature until the stage of packaging and does not require special scientific knowledge and skills. Basic technical education (even vocational) and on-job training seems to be fully sufficient for operating necessary equipment starting from delivery of products from the warehouse until packaging for retail networks.

2.3.4 Costs and margins

Direct costs of packagers in Armenia are of few types: a) main inputs - buckwheat and legumes, b) packaging material (cellophane); c) maintenance of equipment; and d) other costs (including communal costs and utilities, distribution expenses, and production labor). According to about half of local packagers their net profit margin varies in the range of 10-15%. However, other estimations, as well as wholesale and retail prices available in the market contribute to the opinion on higher level of profitability, ranging in 20-25% of net sales. This especially refers to those packagers operating in affiliated retail networks.

Packagers procure some beans provided by local primary producers from certain (brand) regions (Bjni village, towns of Goris and Noyemberyan, etc.). All the other stuff is procured from importers at wholesale terms and prices.

Almost all packagers of buckwheat and legumes are located in Yerevan and adjacent settlements. This means that all the regions of the country are supplied from the capital. *Ceteris paribus*, the farer is the region, the higher is the price of packaged buckwheat and legumes in the retail network. In the meantime, the difference is counted only for costs of transportation which is not too much and varies in the range of few tens of drams per pack.

2.3.5 Major constraints and proposed solutions

Analysis of buckwheat and legumes VC identified the following development constraints in the segments of primary production and packaging:

1. Primary producers usually do not procure elite seeds (i.e. from seed producers, importers and other qualified suppliers). They usually use seeds picked-up from their (or other ordinary farmers') yield of the previous year[68] (related mainly to beans[69]), which cannot ensure high productivity.
2. Farmers assume seeds offered at local market to be of not sufficient quality. In particular, they mentioned that specifically for buckwheat cultivation it will be necessary to import seeds from Krasnodar and Saratov regions of Russia.
3. Irrigation is among the most important inputs and pre-conditions for higher productivity of legumes. However, operation of primary, secondary, and tertiary irrigation networks still remains among the biggest problems of agriculture in rural areas of Armenia.
4. Agricultural machinery used by farmers is mostly old and obsolete. It takes a lot of efforts and costs of maintenance, and does not ensure good results, causes extra losses. This especially refers to harvesters, but problems with ploughing, cultivation and other operations also remain actual.
5. Farmers need combined/complex fertilizers. Currently they used mainly nitrogen fertilizers procured at subsidized (by the State) prices, but it is not efficient especially in case of legumes that feed the soil with nitrates.
6. There is no equipment for drying and peeling of beans, unhulling buckwheat, cleaning, etc. Sometimes, this even conditions the skipping of the cultivation of those products.
7. Primary producers are not able to clean/disinfect primary products, which shortens the perishability period of in-bulk and packaged products. The same refers to cleaning of in-bulk products from stones, soil, and other dirty stuff. Packagers spend a lot of additional efforts (face expenses) for cleaning of products before packaging.
8. Sometimes costs of locally produced legumes are much higher than the value of imported products. This is mainly due to low productivity.
9. Large packagers would definitely prefer procuring products locally, without investing huge amount of working capital, facing risks of working internationally, freezing their funds (that are often attracted at market terms from external sources), lose a lot of time on transportation, etc. However, in order to replace the imports, big packagers need big quantity of local products, at high or affordable quality and good price.
10. Processors' sales are subject for VAT, while their procurements of primary products are VAT exempted; i.e. processors take all the burden of the VAT, without an option of debit VAT clearance.

Interestingly, none of farmers and packagers mentioned such constraints as lack of knowledge, skills, and experience. Nobody mentioned also about insufficiency of funds. However, the analytical team does not

[68] Confirmed by the SCVIC and farmers
[69] Pricing at 100-1200 AMD/kg

consider those problems resolved. However, the solutions of the problems of primary production and packaging presented above are legitimate, and source from the very definition of problems:

1. Farmers should be provided a large awareness raising and other technical assistance on use of better inputs;
2. Access to better inputs should be improved mainly through public-private partnership initiatives;
3. Technical assistance in soft-support format in regard of irrigation issues (such as advisory, knowledge and experience transfer, etc.) would be useful;
4. Further cooperation of farmers and accumulation of funds and/or external support for (in the form of) obtaining agricultural mechanization and machinery is among the most important pre-conditions of improving the productivity features;
5. The same cooperation for the operation of buckwheat and legumes warehousing, initial and further processing, as well as end-products production seem to be another good option of VC development.

2.4 Dimension 3: End-Markets and Trade

2.4.1 End-product characteristics

Thus, it can be summarized that specific end-products of the analyzed VC are just primary produced legumes (produced at rather small quantities) and beans, and the same products, but packaged (locally or imported). No specific technological processing of primary products is being currently conducted in Armenia, despite few and unsuccessful attempts of processing buckwheat several years ago. We are analyzing pure commodities (buckwheat, legumes), and there are almost no specific characteristics, which make those products standing-out. Few differences are of rather subjective nature and relate to appearance of packaging and branding.

There are some sub-products that are possible to process from the analyzed primary products, such as flour, bread, pasta products, flakes for processing of buckwheat, humus for processing chickpeas, halved dry peas (yellow and green), and other products. However, consumption volumes of these products in Armenia are a subject of separate assignment, since all those products are being imported and there is no reliable market-related information available at open sources. Also, some of those end-products are results of quite sophisticated processing technologies and serious feasibility studies are required before initiating any local production of the mentioned prospective end-products.

Currently, wholesale prices of buckwheat and legumes are largely basing on those offered in the market by importers. This mainly refers to the offer of in-bulk products that are procured and packed by local packagers. Wholesale prices vary in the following ranges:

Table 88 - Wholesale prices of target products, AMD/kg

N	Products	Local production	Imports
1.	Buckwheat	N/A	450 - 600
2.	Lentil	700 - 1,000	500 - 700
3.	Chickpeas	600 - 1,000	550 - 800
4.	Dry peas	500 - 800	600 - 1,000
5.	Beans	700-1,000	700-1,200

Retail prices of target products have been presented in **Table 86**. Information is again presented in ranges: the lowest prices are assigned for unpacked products (sold without any packaging, just filled into cellophane bags at retail outlets). Highest prices are required for imported and well-branded products, and are sold at mainly authoritative retail networks, i.e. supermarkets.

2.4.2 Consumer demand

Estimation of the consumer demand of target products is extremely difficult due to large absence of reliable information on imports, very partial/scarce data on local production, etc. However, some estimation (via a series of analytical exercises) is still possible. Market sizes for buckwheat and legumes are presented in previous chapters of the current document, see **Table 87**.

As it can be understood from the presented information, Armenian local production is not self-sufficient for any of target products. Local production is quite close to the volume of self-sufficiency for beans, and is on zero level for buckwheat. Market demand for target products is satisfied by imported products. Pre-conditions for the growth of consumer demand. The strongest argument towards validity of that statement is continuous decrease of local permanent population due to large migration. There are no observable circumstances contributing to the stoppage of emigration. Thus, in the best case the current volume of the market demand of target products will remain unchanged.

The potential for added value should be sought not in suggesting the same products currently available in the market thank to large imports (although import substitution should be among the most important issues in the agenda of development of this VC), but in introduction of new local production of high-value products, such as green buckwheat and sub-products, red beans, halved lentil, etc. Indeed, the first step towards targeting such complicated objectives should be organization of efficient local production of target products, which is largely missing nowadays.

Population of Armenia seems to be the only consumer of target end-products (despite the consumption of a small quantity of exported beans). Population consumes almost total volume of market supply, though some quantity is being offered to the population via different institutions, such as public food entities, schools and kindergartens, social institutions, etc. Unlike the mentioned institutions, quite a large quantity of target products, in particular, buckwheat is being consumed by the military forces of Armenia, but information regarding to the quantities of consumption and suppliers is legitimately unavailable.

As per ordinary consumers, they can be divided into the 3 following major segments:

a) Low price segment - consumers of the cheapest products, procuring in-bulk (no packaging), no brand preferences, procuring from marketplaces (especially for beans), ordinary next-door shops, economy supermarkets, etc.;
b) Mid-price segment - consumers of locally packaged products, with some brand preferences based on promotion or previous experience, procuring from ordinary next-door shops, economy supermarkets, etc.;
c) High-price segment - consumers of imported expensive products usually of preferred brand(s), procuring mainly from prestigious supermarkets.

2.4.3 End-buyer perspectives

Retail network and entities providing food (mentioned already) are the end-buyers of buckwheat and legumes in Armenia[70]. Some retail networks introduce their own brand of packaged target products (such as “Moya Semya” in Yerevan-City supermarkets), but generally they tend to introduce wider range of products. End-buyers of intermediary retailers do not care what they sell, they care how well and how much they can sell. They are largely open for any kind of cooperation with any supplier, providing their counterparts accept their terms: delayed payments, quality requirements, discounts, regular supplies and easy accessibility, etc.

In the meantime, in special cases intermediary end-buyers may be pro-active, too. This happens when they face a demand for certain products (of a specific brand/price/colour/taste/etc.) in a continuous period of time and decide to meet that demand. However, that moment is still quite far to be achieved.

2.4.4 Marketing and trade capacities

2.4.4.1 *Wholesalers/Importers*

All target products are being traded by wholesalers/importers though in much less quantities for local production (except of beans). Part of locally produced legumes is offered by farmers at local market at wholesale terms (meaning the quantity and prices). However, smaller-scale producers sell their products in the market at retail conditions directly to consumers. Some beans are sold at wholesale terms to local packagers, but only of special types and from special areas.

The main wholesale trade is being conducted by importers. Below, the list of identified major importers is presented. Some importers use the imported products for packaging (only/mainly), others offer only packed or in-bulk products.

1. “Alex-Grig” LLC (in-bulk),
2. “Anush Lini” LLC (in-bulk),
3. “Armen-Hamik Eghbayrner” JV LLC (in-bulk and packed),
4. “MegaFood” LLC (packed, in-bulk?),
5. “Paradox Trade” LLC (packed),
6. “Mistr AL” LLC (packed),
7. “SegaFast” or “Sega”(in-bulk),
8. “VAS-Group” (in-bulk),
9. “Lucky Eagle” LLC (in-bulk),
10. “Hiksos” LLC (in-bulk),
11. “LiaFood” LLC (in-bulk).

Quantities of imports were already presented above. Obviously, the accuracy of import volumes is questioned. All the quantity of locally packaged products (except of a small quantity of beans) is being initially imported and sold to packagers, or packaged internally within the enterprise.

Costs that importers face in their operation may be segregated into the following major groups:

[70] Special reservation should be made regarding the RA Ministry of Defense

1. Import-related expenses, including the value of products paid to suppliers, transportation and insurance, custom clearance in Armenia (10% of custom tax + 20% VAT + customs fees);
2. Logistic expenses, including in-country transportation, storing and warehousing;
3. Promotion and distribution expenses;
4. Packaging expenses (for the consignment of products being sold to packagers or used by packaging units of importers).

Providing rough estimations of several operators of various segments of buckwheat and legumes VC, the profitability of importers from the wholesale varies in the range of 20-30%, comprising respectively about 15-20% for wholesalers, and up to 25% for packagers. In the retail network the commercial margin comprises up to 20%, but the profitability is simply impossible to calculate due to impossibility of reliable attribution of total costs of retailers to the certain groups of products.

In any case, cost of imported products offered at wholesale market seem to be notably less than for local production despite prevailing qualitative features of imported products (appearance, perishability, cleanness, etc.). The major reason for that is small volume of production and extremely low productivity. This, in turn, is conditioned by a number of factors already addressed in Dimension 1.

Wholesalers of target products can be conditionally divided into 2 major groups:

1. Wholesalers and re-sellers of in-bulk target products that are located and operating at known wholesale markets of Surmalu/Petak, former HayCoop Warehouses, and Gum Market. Volume of operations at other destinations is rather small, operations are not regular.
2. Wholesalers supplying target products in-bulk via their own delivery and distribution network.Among others, such function is conducted by “Sega”, “Anush Lini”, “My-Anna” companies delivering target products in larger bags,
3. Wholesalers supplying target products packaged, including distributors of imported and locally packaged products.

The number of major wholesalers that import and offer target products does exceed a dozen in Armenia, and the market is quite centralized, i.e. it operates by rather oligopoly rules. However, Few large importers do operate quite independently, without thorough coordination of their operations in the market. They rather compete, but not very severely. Unlike the scarcity of large importers, the number of re-sellers is not few; it reaches several tens in various places of Yerevan. In addition, distribution several distribution companies also conduct functions of re-selling and smaller-scale wholesales.

2.4.4.2*Retailers*

Target products of buckwheat and legumes VC reach to ultimate consumers via intermediation of various retail networks: supermarkets (and their chains), ordinary or next-door food shops and trade outlets (including traders of agricultural products – fruits and vegetables), agricultural marketplaces, etc. Total number of such retailers comprises approximately 10,000. These retailers receive from suppliers and trade with all types of target products, selling the end-products in-bulk (in few kilograms) and packaged.

Commercial margins (i.e. retail prices) for target products are decided by each retailer, individually. Wholesalers have no influence on retailers in this regard. Instead, wholesalers most often reject to provide proper sales documents, indirectly making the retailers to enter the shadow side of the business.

In the meantime, this situation is also understandable. How can the importers that hide the imports of buckwheat totally provide proper sales documentation?!

Sales margins for target products vary in the range of 15-25% on top of the procurement price at various retail outlets. Size of the margin depends on many factors, such as type of the retailer (large supermarkets add-on more), location (the far is the retailer from capital Yerevan, the higher are costs, and bigger is the commercial margin), specialization/profile of the retailer (the smallest commercial margins are add-on by retailers at open-air markets trading with legumes and cereals, spices), etc.

None of retailers conduct any promotion of target products. Retailers promote only their brands, and this is actually conducted only by large retail networks, such as Yerevan-City or SAS. However, retailers never spend money on promotion of this or that brand. Instead, that promotion is largely conducted by packagers of target products. Leaders are “Maranik” and “Anush Lini”.

2.4.5 Standards

Target primary and end-products are not included in the list of products that are subject for mandatory standardization in Armenia. There are no accepted standard requirements for primary and packaged products officially adopted by the Government of Armenia. However, standards exist and if necessary local entities apply Russian GOSTs. Those GOSTs specify such important features of products as types, size, color, humidity, and other features. However, local producers hardly remember about those standards and prefer to coincide with the requirements (if any at all) just on paper.

Introduction of well thought and analyzed, properly designed local standards for target products will be another task to assign and implement for the development of buckwheat and legumes VC. Generally, local standardization and metrology institutions possess sufficient knowledge and experience for amendment and application of new standards for target products.

2.4.6 Major constraints and proposed solutions

Analysis of the operation of buckwheat and legumes VC in Armenia identifies that there are no major gaps for the VC development in terms of the following aspects:

- Wholesalers and retailers create no problems for selling locally produced and packaged products. Actually local production volume is so small that such difficulties could not appear by default;
- Wholesalers and retailers do not face many problems for attracting external capital or finance. Actually, traders do not need much finance, since they usually benefit from using delayed payment privileges provided by major suppliers/importers. In turn, large importers widely use external financing;
- Operator of buckwheat and legumes VC actually “do not care” of meeting any standards. Small volume of local primary production is not a subject for any standardization, packagers are taking care for just proper promotion, including nice packaging and labeling.
- Market size is also not a hindering factor for the development of VC. Huge imports provide very good opportunities for import substitution. The demand for target products is available and should be met via supply of high-quality and affordable local products.

Gaps and constraints appear rather on the side of primary production. In addition to constraints presented in conclusion of Dimension 1, the following factors can be added:

1. Small and scattered primary production, which causes inefficiency and high costs of production, ineffective application of agricultural inputs and techniques, machinery and equipment.
2. Low quality of local primary production that negatively affects the perishability of target products.
3. Lack of knowledge and experience on effective and efficient primary production of target products.
4. Lack of knowledge and experience on effective and efficient processing of target products. This especially relates to initial processing and unhulling of buckwheat.

Ways of overcoming the mentioned problems are the following:

1. Collection of farmers around the core idea of concentration of efforts for effective production of buckwheat and legumes. Cooperation of small farmers and creation of producers' groups is fully in-line with the RA MoA policy and strategy, as well as with the ENPARD Project ideology and objectives.
2. Knowledge possessed and accumulated by certain advanced farmers and especially Agricultural Extension services in regions will be invaluable contribution and support to the effective operation of the abovementioned producers' groups.

2.5 Dimension 4: Governance of Value Chains

2.5.1 <u>Actor domination</u>

There is no domination of any operator in the primary production segment of buckwheat and legumes VC in Armenia. Though the number of producers is small, none of them dominates in the market. In other equal conditions this means that no primary producer coordinates the VC or any chain of it, none of them is significantly ahead of others with the quality or quantity (productivity), none of them has any influence on wholesale or retail market, etc.

The term domination might be applied, though with a big concern, for some operators of importing and local packaging segment of buckwheat and legumes VC. It was mentioned that some big importers (such as "Alex-Grig" LLC, "MegaFood" LLC, "Anush Lini" LLC, "Armen-Hamik Eghbayrner" JV LLC) may have achieved leading positions and even (local and general/spatial) domination in the market, but that leadership does not hinder the operation of other organizations. There are no formal or informal restrictions of imports or wholesale activities in the market. In case of local packaging, wholesale and retail trade, the situation is more obvious: there is no domination and influence of some operators on others. However, leaders of the packaged products market are "Maranik". "Yerevan-City", and "Anush Lini" brands.

Although some operators of buckwheat and legumes VC are quite developed, financially strong, and politically affiliated organizations, they mainly operate in the segment of importing and packaging. They cannot anyhow hinder the development of local primary production, negatively influence the trading segments of the VC, or prevent a new entrant (such as a cooperative or producers' group) especially in the segment of primary production. On the other hand, existing importers may theoretically agree on and control the prices of buckwheat and legumes (except of beans) in the market. However, local primary producers should position their products in the market differently, making an accent on the origin of their products, taste and other features that will make their products exceptional. In that situation, importers will face additional difficulties for the identification f their products with locally produced ones and for influencing the market with dumping of prices. In addition, if local producers are efficient enough, they will be able to achieve competitive prices in the market.

2.5.2 Participation in and distribution of value addition

Before reaching to ultimate consumers, target products pass several chains/segments of local production or imports, delivery and distribution, wholesale, packaging, and retail trades. It was mentioned that in each segment the values of target products grow for 15-30% on top of costs and commercial margins assigned by different operators are changing continuously. This means that the same operator may change the ultimate value added to a certain product at its segment of the VC every month due to its wish, market circumstances, changes in imports terms, changes in consumers' preferences, and many other factors.

Thus, it is concluded that summative added value varies in the range of the above presented range for total volume of products passing through each segment. The largest benefits are registered in the segment of imports since the number of operators here is the smallest. In simpler words, importers are the most profitable operators in absolute figures. Moreover, these operators usually do not stop on that and look for additional profit generation opportunities, such as local packaging, retail sales, etc.

2.5.3 Cluster concentration

Concentration of primary producers of legumes (except of beans) is observable in Gegharkunik (41%[71]), Lori (22%),Shirak (11%), and Kotayk (10%) regions. However, none of the mentioned regions can be assumed to be an area of concentrated production of legumes due to very small territories cultivated (about 100 hectares) and small yield received (about 300 tons for target legumes except of beans)[72]. Primary production of beans is concentrated in Armavir (24%), Tavush (21%), and Syunik (19%) regions. Unlike the case of legumes, both the cultivation area and production volume are significant: almost 2,000 hectares and more than 5,000 tones. However, the presented analyses are very approximate since the reliability of statistical information for presented legumes is very low and was questioned already. The usefulness of the analyses lies in assumption that general trends will remain the same though absolute figures may be wrong, i.e. concentrations will not change if statistical data become more accurate.

With few exceptions, substantial packagers are located either in capital Yerevan or at adjacent areas. This is legitimate - they tend to operate as close to the major market as possible. It is widely known that almost all supplies of imported food products to different regions of the country are made in a centralized way from Yerevan. In general, the presented centralization refers to wholesale trade segment, too.

2.5.4 Type of governance

Markets of target products are identified to be supplier driven (except of beans). Local production is of very small quantity and importers became the major suppliers of the market. In turn, the number of importers is also few (especially related to importers of in-bulk or unpacked products) and they cover the overwhelming majority of the market. Those few importers theoretically may control the volumes of market supply, prices, assortment of products in the market. In reality, they do not much coordinate their operations and work rather in extended oligopoly format. They have some control on process in the primary wholesale trade segment, but they lose that direct control in the segment of packaging, when other factors participate in formation of the value of end-products.

[71] Share in total/summarized yield of target products for 2014
[72] As of 2014

Thus, it can be concluded that in the segment of imports and primary wholesale trade the market of target products is partially competitive, due to small number of operators. In the further segments of processing, secondary wholesale trade, and retail trade the market becomes fully competitive.

There is certain network dependence among operators of different segments of buckwheat and legumes VC in Armenia. Substantial cooperation and inter-dependence exists among importers, processors, wholesale and retail traders. Moreover, in some cases the networks dependence turns into affiliation or identification. In such cases, the major suppliers/importers may somehow influence the decisions of packagers and traders in the market. However, from the practical point of view, operators of the VC prefer to strictly separate their activities for practical and well-justified reason: they prefer to ensure the profitable operation of all segments of the value chain.

2.5.5 Major constraints and proposed solutions

The analyses presented in the previous chapters shows that the current governance of buckwheat and legumes VC is quite effective providing the existing input parameters. Added value appears in all segments of the VC and it is distributed more or less among those segments. The number of operators is small only in the segment of importers, which means that few enterprises share quite a big added value generated at the segment of imports. On the other hand, none of operators hinder the entry of new operators at any segment of the VC and any organization can easily enter the market even despite the status of some importers and their presumable affiliation with high-rank State officials and political circles.

Situation with the governance of the VC may drastically change along with formation and development of local producers' groups. They will enter into direct and severe competition with other primary suppliers of the market (i.e. importers). Importers are stronger and possess much more resources by all means and facing substantial competition may change their behavior and start "playing unfairly". The "best" instrument applied by sustained operators in such situations is dumping the price. Sufficiently long dumping may simply kill the initiative of local production, while importers will be able to recover their losses (or not earned profit) via further significant increase of prices.

Understandably, the described theoretical risk may generate huge losses for producers' groups causing serious negative social consequences. The GoA should take the responsibility of controlling the market through its extended institutions, namely via the RA MoA and the State Commission for the Protection of Economic Competition (SCPEC).

2.6 Dimension 5: Sustainable Production

2.6.1 Use of inputs and water

One of the major advantages of cultivation of target products (especially the buckwheat) is their resistance to negative external influence, such as diseases. These plants require much less medicine and fertilizers (if at all), are stronger than many other species of cereals or other crops, easier in cultivation. However, all these benefits will appear only if necessary knowledge and experience is gained, and proper agricultural techniques are applied by primary producers.

Cultivation of buckwheat and legumes does not harm the soil, environment and bio-diversity anyhow. Moreover, cultivation of these plants enriches the soil with natural nitrates, which is very good from the viewpoint of crop turnover.

Cultivation of buckwheat and legumes becomes much more effective on irrigated lands. Average use of irrigation water comprises 350-500 m^3/ha. This is twice less than the use of irrigation water for cultivation of winter wheat. However, decrease of the use of irrigation water is possible and the best way is the installation of drip irrigation systems. Drip irrigation cuts-off the use of irrigation water for about half and increases the productivity 2-3 times. However, it would be completely unrealistic to talk about installation of drip irrigation system in Armenia, at least for several years. Farmers should yet be convinced to (re)start the cultivation of target products in much bigger scale and only after sustaining big volumes and generating sufficient income they will consider investing in advanced and cost/resource-effective technologies.

2.6.2 Other factors

Primary production of buckwheat and legumes does not negatively affect any other sustainability aspect. Primary production does not use energy (not counting the use of agricultural mechanization); it does not affect the bio-diversity, but improves it; there are no emissions and waste sourcing from that production. Ground waters, soil, air are not polluted anyhow.

2.7 Dimension 6: Value Chain Finance

2.7.1 Financial attractiveness

Cultivation of buckwheat and legumes is theoretically proposed as an alternative to cultivation of wheat or other cereals. More precisely, the accent is rather made on primary production of buckwheat, since the potential for import substitution is the highest in case of this product (reaching to about 8,000 tons per year). Analyses presented in Dimension 1 of the current document reveal the experts' estimation of buckwheat COGS at 175 AMD/kg, while farmers estimate the costs at around 330 AMD/kg. In the current context, experts' estimation seems to be more reliable. Only few farmers in Armenia experimented with cultivation of buckwheat, but it was just a test for them. They had no proper knowledge, applied inefficient technologies and unreliable inputs, did not irrigate the land plots. All these resulted in low productivity of 1,250 kg/ha which conditioned high COGS.

Normally, financial attractiveness of any commercial/business activity is being measured by the level of profitability and its comparison with alternative activities and with the safest option of the use of funds, i.e. rates for depositing funds with financial institutions. Estimated total costs (equivalent to investments) of production of about 2,000 kg of buckwheat comprise about 350,000 AMD. Estimated income per total yield comprises 200,000 AMD at least[73]. Obviously, depositing financial resources (even if they exist) with the bank is not an option for any comparison providing the highest rates for deposit in Armenia are 14% annually).

As to alternatives, the most comparable activity is the cultivation of wheat. Average sales prices of wheat for 2014 comprised 140 AMD, average productivity - 3,000 kg/ha. Profit generated from cultivation of wheat will equal to the profit from cultivation of buckwheat only of the cost of wheat production comprises 75 AMD/kg, which is hardly possible. In reality, cultivation of buckwheat (especially if the productivity is increased to 2,500 kg/ha via application of proper agricultural techniques) may reach to 400-500 thousand AMD, which is really incomparable with other field crop growing alternatives in Armenia.

[73] Though this figure contains the labor of farmers

2.7.2 Financial risks

In order to make the analysis of financial risks within the operation of buckwheat and legumes VC comprehensive, those risks should be assessed separately for various segments of the VC. Financial institutions in Armenia usually do not distinguish specific activities of primary agricultural production for making credits. This especially relates to micro and group lending products widely offered by a number of banks and UCOs in Armenia. Providing small amounts of such lending (though those amounts are sufficient for example for cultivation of 1 ha of buckwheat) and high interest rates applied, financial institutions usually do not face big problems in getting their loans repaid and losses from non-repayments covered from proceeds of interest.

The situation may be different in case of formalized application of a legal entity (such as a production cooperative) for a loan. The amount of required external financing will be already not so small (reaching to several tens of thousands), interest rate may be lower, but financial institutions will request additional guarantees, most probably. Under guarantees tangible pledge of real estate or movable assets is presumed, most often. This is not the end: situation will be further aggravated in case of start-up applicants that are the most risky (say unwanted) audience for financial institutions.

Financial institutions may assume the following risks faced by their potential borrowers (operators of buckwheat and legumes VC) that may cause inability of repaying loans by start-up cooperatives and producers' groups:

1. Lack of knowledge and experience on cultivation and processing. So far few attempts of cultivation of buckwheat ended with negative results and failure. Experience exists only for production of beans. Farmers need professional advice on agricultural techniques, as well as on business model to be applied for the operation of initial processing facilities.
2. Natural and climatic cataclysms are among the most often happening force majeure causing huge risks and losses for farmers. Unfortunately the institute of agricultural insurance is not developed in Armenia and almost no mitigation of those risks and losses are applied (despite miserable compensations delivered from the State budget in form of fuel).
3. Inability to access the market is a probable risk especially for ordinary farmers who are not aware how to access the market. The major risk may appear in the form of farmers'/cooperatives' inability to introduce their product in the market, position it properly, and inform the consumers about their products.
4. Severe competition from the side of importers that may appear in the form of price dumping may kill the initiative of primary producers. Importers are strong, sustained in the market, and possess much more financial resources. They can afford temporary losses for the sake of kicking primary producers out of the market. Solution of this problem lies in proper reaction from the side of the State agencies dealing with ensuring proper competition in the market.

2.7.3 <u>Norms and practices</u>

It is impossible to estimate the exact number of farmers using attracted financial resources for the following reasons:

1. FIs usually do not uncover such information;

2. Even if they do, it is not accurate and contains a lot of double counting and other misleading pieces;
3. Nobody knows the extent of using loans purposefully (e.g. for agriculture) by farmers;
4. Number of borrowers changes every day (some repay and get out of the list, others receive loans).

However, it can be surely stated that over 90% of farming households (including those involved in production of legumes) sooner or later took loans (at least micro or small, agricultural or consumer, from a bank or UCO, etc.) to finance their ongoing or capital needs. Borrowers with extended credit history never close their credit lines, i.e. once receiving a loan they register it in a form of credit line that allows them to receive and repay loans within the assigned amount without additional checking and assessment, providing no cases of delayed repayments or non-payments happened. FIs usually finance the current needs via short-term loans or credit-lines (of up to 12 months), and capital needs - via mid or long-term loans of 3-5 years.

2.7.4 Availability of financing

There are no specific types of financing for exactly target products' VC operators. Instead, in financial market of Armenia there are financial products assigned for primary agriculture (farmers), mainly in the form of micro loans. Similarly, there are small and medium enterprises (SME) lending programs, lending products for food processing sector enterprises, or programs targeting certain regions. Some FIs offer leasing services for procurement of any equipment and machinery. Moreover, sometimes, some development initiatives provide also grant financing for food sector enterprises, such as the WB funded RESCAD and CARMAC Projects, IFAD funded projects in food processing sector, etc.

Aside from all the above mentioned sources of external financing, the buckwheat and legumes VC operators may attract funds also from formal sources as consumer loans under the pledge of assets of high liquidity (car, gold, etc.), or even from informal sources. Such financing costs rather expensive – 3-5% monthly, sometimes even more. However, especially processing enterprises usually avoid using such funding, and actually do not need.

Finally, external funding resources do exist also within the VC, though the process may happen without actual circulation of finances. For example, importers and/or other primary suppliers may provide substantial quantity of products under the term of delayed payments. Similarly, packagers of legumes may use delayed payments schemes for working with retail networks, etc.

Lending to farming households and food processing enterprises is among the most popular activities of Armenian FIs. At least 15 financial institutions provide loans to individuals and legal entities working in these 2 sectors of economy. Ranges of terms and conditions provided to farmers are the following:

- 50,000 AMD - 60,000,000 AMD and $80,000 -$150,000;
- 8% - 12% annual interest rate;
- 84 months repayment period;
- Collateral: real estate, gold, guarantees, movable assets;
- Purposeful and consumer loans.

Ranges of terms and conditions provided to processing enterprises are the following:

- $10,000 - $350,000 or even much above based on individual negotiations;
- 11% - 18% annual interest rate;
- Up to 84 months repayment period;
- Collateral: real estate, gold, guarantees, movable assets.

Detailed description of financial products of 15 FIs are presented in the attached document that can be accessed via the link in **XXXX**. However, any financial institution will be ready to discuss provision of non-featured lending service to their good clients. Moreover, financial products and services do regularly change in the market.

2.7.5 Major constraints and proposed solutions

As it was mentioned already, there is no specific product offered to operators of buckwheat and legumes VC at financial market of Armenia. Financial institutions do not specify and separate this sub-sector (or the VC) from other agricultural activities and offer funding at the same terms and conditions as for other farmers. Similarly, primary producers and other operators working in the VC of target products face rather general and not specific problems, as the majority of borrowers from the agricultural sector. In general the following constraints for better access to finance are observed in buckwheat and legumes' VC:

1. Expensiveness of available (especiallymicro and small) financing significantly hinders the scale of investments in primary production by more farmers. Many primary producers simply do not dare to lend external financing at existing high interest rates.
2. Unaffordable requirements of guarantees advanced by financial institutions substantially restricts the primary producers' demand for external financing. Very often, the liquidity value of the pledge (land, real estate in rural area) that farmers are able to offer is very low and cannot serve as guarantee for the attraction of substantial external financing.
3. Absence of experience in certain spheres is another hindering factor for attracting financing from financial institutions. Start-up initiatives have always been the most unwanted client for financial institutions.

These are only few but major constraints hindering the attraction of external financing to buckwheat and legumes VC. All three constraints (as well as other problems) may be overcome through development of a certain agenda and implementation of a targeted/addressed intervention aimed at development of buckwheat and legumes' VC. In reality, the intervention should not necessarily be of a big scale; the first hint will cause a positive plume of replications and scale-up. The intervention may be designed and implemented via an effective partnership and cooperation of the State and international donor community. The intervention may contain the following major components of:

1. Support the cooperation of local primary producers of buckwheat and legumes, i.e. establishment of producers' groups and cooperatives;
2. Provision of technical/professional advice for cultivation of buckwheat and legumes;
3. Technical support for upgrade of primary producers' cooperatives into production/industrial units possessing and operating initial processing and packaging facilities and equipment, including training and knowledge transfer also in the sphere of business and financial planning;

4. Implementation of capital investment projects targeting processing and packaging processes/segments of buckwheat and legumes VC;
5. Support in positioning and promoting locally produced buckwheat and legumes in the market.

2.8 Dimension 7: Business Environment and Socio-political Context

2.8.1 Business environment

Armenian legislation specifies the following major types (legal statuses) of organizations allowed to run a business in the country: Open Joint Stock Company (OJSC), Closed Joint Stock Company (CJSC), Full Liability Company (FLC), Additional Liability Company (ALC), Limited Liability Company (LLC), and Production Cooperatives (PC). Overwhelming majority (above 95%) of private legal entities in Armenia do operate with the legal status of LLC. This is the easiest form of a legal business entity (Sole Entrepreneurs (SEs) do not have a status of legal entity) to register and run in the country.

Providing real volume of operations, limited number of participants/owners, and other features of processing enterprises, the best option for establishment a legal entity is assumed to be the LLC. Establishment of LLC in Armenia is regulated by a several legal acts. One of the main advantages of this option is that you can open LLC without any significant assets invested as the capital. For example, you can invest a computer (the minimum size of the authorized capital to open LLC. Yet the Law does not determine the minimal investment size, but in some cases this is obligatory). A number of documents is required for the establishment of the LLC that are openly presented in the official website of the State Register of the Legal Entities of the RA MoJ. The registration of the commercial entities in the first time is free of charge; for further amendments the fee comprises 10,000 AMD (slightly more than $20). Theoretically, the organization can be established in 2 working days (the least).

Additional costs related to the establishment of a legal commercial entity in Armenia are expenses on preparation of a seal ($25 approximately), opening a bank account ($2-$10 depending on the bank and embedded services), installation of internet banking tools, etc. Or, a business person may chose to outsource the whole process to a specialized legal advisory entity for about $100-$150.

Armenia also has been continuously reforming its business incorporation regulations in recent years. Armenia established a one-stop shop in 2010, allowing electronic registration and merging procedures for reserving a business name, registering a business and issuing a tax identification number. In 2013 Armenia eliminated company registration fees.

One of the best indicators of the business environment in a country is the Ease of Doing Business index. The index ranks World economies from 1 to 183. For each economy the index is calculated as the ranking on the simple average of its percentile rankings on each of the 10 topics covered in Doing Business 2010, i.e. exclusive of the electricity pilot data. The ranking on each topic is the simple average of the percentile rankings on its component indicators[74]. Dynamics of the compound index in recent years for Armenia was the following: 2012 - 55, 2013 - 32, and 2014 - 37.

Armenia's position engaged by the Ease of Doing Business index is quite high. In the meantime, this does not mean that Armenia is very attractive for foreign direct investments, or the competitiveness of Armenian products is high at international markets. There are a number of factors seriously affecting (by

[74] http://www.doingbusiness.org/~/media/FPDKM/Doing%20Business/Documents/Reforms/DB10Easeofdoingbusinessrankmethod.pdf

the negative mean of the term) the business environment. Among others, we can mention unfair treatment of business enterprises by State authorities (including and lead by the State Revenue Committee of the RA MoF), monopolization of very important sectors of economy, availability of too many investigation and controlling entities, high level of corruption, etc.

2.8.2 Product and trade regulations

It is too early to talk about exporting buckwheat or other legumes from Armenia, except of experimental exports of some small consignments, which are delivered as seeds by specialized organizations. Instead, the potential of import substitution is significant. Based on current (and not much reliable) figures the total potential for imports substitution comprises some 14,000 tons. This quantity of legumes can be produced on the area of about 7,000 hectares of possibly unused lands.

There are no specific national standards and trade regulations for buckwheat and legumes VC enterprises in Armenia. Primary production does not require specific licensing or certification. Similarly, no international regulations affect the activities of the VC operators.

2.8.3 Social and cultural context

No social/cultural norms and institutions have more or less notable influence on business culture of buckwheat and legumes VC operators in Armenia. Similarly, operation of the VC does not specifically affect any social or cultural group of people. Existing business links and relations among operators of various segments are not unique or exclusive.

Women are involved in operation of the VC to a limited extent. Harder operations are conducted either by men, or by application of agricultural mechanization. However, except of beans the scale of production operations is so small that number of involved women remains very small. In case of beans, the main cultivation is being made by women. They are involved in all production activities quite intensively.

3 Conclusions and Recommendations

3.1 Development Constraints

Analysis of buckwheat and legumes VC in Armenia identified the following major development constraints:

1. Primary producers usually do not procure elite seeds (i.e. from seed producers, importers and other qualified suppliers). They usually use seeds picked-up from their (or other ordinary farmers') yield of the previous year, which cannot ensure high productivity. Farmers assume seeds offered at local market to be of not sufficient quality. In particular, they mentioned that specifically for buckwheat cultivation it will be necessary to import seeds from Krasnodar and Saratov regions of Russia. Farmers need combined/complex fertilizers. Currently they used mainly nitrogen fertilizers procured at subsidized (by the State) prices, but it is not efficient especially in case of legumes that feed the soil with nitrates.
2. Irrigation is among the most important inputs and pre-conditions for higher productivity of legumes. However, operation of primary, secondary, and tertiary irrigation networks still remains among the biggest problems of agriculture in rural areas of Armenia.
3. Agricultural machinery used by farmers is mostly old and obsolete. It takes a lot of efforts and costs of maintenance, and does not ensure good results, causes extra losses. This especially refers to harvesters, but problems with ploughing, cultivation, and other operations also remain actual.
4. There is no equipment for drying and peeling of beans, unhulling buckwheat, cleaning, etc. Sometimes, this even conditions the skipping of the cultivation of those products. Primary producers are not able to clean/disinfect primary products, which shortens the perishability period of in-bulk and packaged products. The same refers to cleaning of in-bulk products from stones, soil, and other dirty stuff. Packagers spend a lot of additional efforts (face expenses) for cleaning of products before packaging.
5. Small and scattered primary production of legumes in Armenia causes inefficiency and high costs of production, ineffective application of agricultural inputs and techniques, machinery and equipment.
6. Lack of knowledge and experience on effective and efficient primary production of target products. Lack of knowledge and experience on effective and efficient processing of target products. This especially relates to initial processing and unhulling of buckwheat.
7. Current stable/balanced situation with the governance of the VC may drastically change along with formation and development of local producers' groups. They will enter into direct competition with importers, who are much stronger and possess more resources. They may start "playing unfairly", i.e. dumping prices. Sufficiently long dumping may simply kill the initiative of local production.
8. Financial risks of financing the primary production of buckwheat and legumes may appear due to the following factors:
    a. Lack of knowledge and experience on cultivation and processing.
    b. Natural and climatic cataclysms; institute of agricultural insurance is not developed.
    c. Inability to access the market is a probable risk especially for ordinary farmers.
    d. Severe competition from the side of importers.

3.2 Recommendations on Overcoming the Constraints

The following specific solutions are suggested for overcoming the above presented development constraints:

1. Farmers should be provided a large awareness raising and other technical assistance on use of better inputs; Access to better inputs should be improved mainly through public-private partnership initiatives;
2. Technical assistance in soft-support format in regard of irrigation issues (such as advisory, knowledge and experience transfer, etc.) would be useful;
3. Further cooperation of farmers and accumulation of funds and/or external support for (in the form of) obtaining agricultural mechanization and machinery is among the most important pre-conditions of improving the productivity features;
4. The same cooperation for the operation of buckwheat and legumes warehousing, initial and further processing, as well as end-products production seem to be another good option of VC development.
5. Collection/cooperation of farmers around the core idea of concentration of efforts for effective production of buckwheat and legumes is the solution of problems caused by smaller-scale production.
6. Knowledge possessed and accumulated by certain advanced farmers and especially Agricultural Extension services in regions will be invaluable contribution and support to the effective operation of the abovementioned producers' groups.
7. Theoretical risk of unfair competition may generate huge losses for producers' groups causing serious negative social consequences. The GoA should take the responsibility of controlling the market through its extended institutions, namely via the RA MoA and the State Commission for the Protection of Economic Competition (SCPEC).
8. Implementation of a targeted/addressed intervention aimed at development of buckwheat and legumes' VC may ensure overcoming financial (and not only) constraints. The intervention may contain the following major components of:
    a. Support the cooperation of local primary producers of buckwheat and legumes,
    b. Provision of technical/professional advice for cultivation of buckwheat and legumes,
    c. Technical support for upgrade of primary producers' cooperatives into industrial units,
    d. Implementation of capital investment projects,
    e. Support in positioning/promoting locally produced buckwheat and legumes in the market.

Annex 6: Non-Traditional High-Value Vegetable/Value Chain Analysis

List of abbreviations

ADC	Austrian Development Cooperation
APIU	Agricultural Projects Implementation Unit
CARD	Center for agricultural and rural development
EBRD	European Bank for Reconstruction and Development
ENPARD	European Neighborhood Programme for Agriculture and Rural Development
EU	European Union
FAO	Food and Agriculture Organization
FI	Financial institution
GoA	Government of Armenia
GIZ	German Technical Cooperation
IFAD	International Fund for Agricultural Development
MASC	Marz Agricultural Support Center
MoA	Ministry of Agriculture
MoE	Ministry of Economy
NGO	Non-governmental organization
NTHVV	Non-traditional high value vegetables
RA	The Republic of Armenia
SDC	Swiss Development Cooperation
SME	Small and medium enterprises
ToR	Terms of Reference
UCO	Universal credit organization
UNIDO	United Nations Industrial Development Organization
UNDP	United Nations Development Program
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VC	Value Chain
WB	The World Bank

1 Introduction

1.1 Program Background

With funding from the European Union (EU), the European Neighborhood Programme for Agriculture and Rural Development (ENPARD) supports the Government of Armenia (GoA) in ensuring an efficient and sustainable agriculture that contributes to better living conditions in rural areas. Within ENPARD - Armenia a technical assistance component focuses on producers and value chain (VC) development. This component is implemented by UNIDO and UNDP. In particular the Project aims to strengthen producer groups, effectively engage them in value addition, strengthen VCs that provide improved access to affordable, better quality food, contribute to development of rural areas and improve access to local and international markets, and ensure the introduction of environmentally - friendly farming and food processing practices. Direct beneficiaries of the Project include agricultural producers, SMEs along the VCs as well as local consumers. The Project also will focus on women, youth, and other vulnerable groups.

The technical assistance component of ENPARD has three primary outputs:

- Output 1: Strengthened and newly established primary producers. Within the targeted VCs and marzes, the Project will develop effective, sustainable new producers, as well as assist and strengthen existing ones in the various stages of their development.
- Output 2: Producers effectively engaged in value addition. The Project will support the building of physical infrastructure as well as human capacity and skills that enable producers to add value to primary agricultural production.
- Output 3: Strengthened VCs that provide improved access to affordable, better quality food. The project will identify and develop key intervention points at any level within the select-ed value chains that will benefit not only stakeholders of those value chains but also Armenian consumers locally and nationally.

1.2 Assignment Background

1.2.1 <u>Purpose and objectives</u>

1.2.1.1 *Assignment task*

This consultancy is situated within Output 3, described above, with the objective of producing a comprehensive analysis of non-traditional high-value vegetable (NTHVV) VC, including the segments of primary production, initial storing, some processing, supply of end-products to retail networks and exports. The NTHVV VC analysis report will provide the supporting review and information to enable the design of the activities and interventions which will be undertaken in Output 3 to resolve the VC development constraints and to boost the income generation for various actors.

1.2.1.2 Theoretical guidance

The UNIDO's methodology for VC analysis was applied for the implementation of the assignment. The current report conforms entirely to the structure discussed in this methodology. UNIDO's methodology is introduced in *Diagnostics for Industrial Value Chain Development: an Integrated Tool* document. This document offers a tool for diagnosing industrial VCs. It provides guidance on defining the elements necessary for the development and upgrading of entire VCs, not just parts of them. The focus is on VCs, meaning those that engage in the processing and transformation of primary products into consumable goods and thereby generate value added. Unlike conventional VC analysis, this tool places particular emphasis on the processing and manufacturing segment.

1.2.2 Methodological approach applied

1.2.2.1 *Assignment implementation process*

In general, the consultant's work included research and analysis, in the following phases:

- Desk research: Using existing information sources, the consultant undertook literature review to filter information into the structure of the VC analysis described in UNIDO's methodology.
- Interviews with experts: Specific information was collected through interviews with experts in the public, private and civil society sectors.
- Field interviews: Discussions with farmers and other VC operators were applied to collect related information directly from primary sources.
- Analysis and reporting: Using the information collected, the consultant will conduct a comprehensive analysis, and present the results as it is required by UNIDO's methodology.

1.2.2.2 *Information collection sources and methods*

A number of various sources were envisaged for the collection of information before the start of the current analysis. Further work revealed that the most of sources are useful just marginally. Information on operation of NTHVV VC in Armenia was collected by small pieces from different sources, for being cross-checked, collated, incorporated, and analyzed. Among others, the following information sources have been addressed during the information collection:

- Formal statistical materials;
- Secondary materials available from various similar projects funded/implemented by the WB, OXFAM, IFAD, and other organizations;
- Sectoral NGOs,
- The RA State agencies - national level;
- The RA State agencies - regional level;
- Experts: agronomists and technologists;
- Retail outlets: supermarkets and shops.

3 major methods of information collection have been applied:

- Desk review (of secondary materials, public media publications, interviews of operators, etc.);
- Face-to-face qualitative interviews with experts and informed persons;
- Direct observations.

1.1.2.3 *Information processing and analyses*

All the collected data was classified by topics and themes they related to, compared, cross-checked and verified, justified and elaborated. Once all contradictions were uncovered and rectified, the analysis began. In some cases, pieces of identified information are not totally clear and unambiguous, due to total absence of any regular information collection practices. Anyhow, even providing that reservation, the analysis seems to be quite comprehensive, understandable and user friendly.

1.3 Expected Results and Deliverables

The major expected results of the current analysis are the conclusions on the constraints for development of milk VC operators, recommendations for overcoming those constraints, segregation of the mentioned conclusions and recommendations by the 7 dimensions of VC analysis in accordance with the methodology and approach suggested by the UNIDO. The only deliverable of the assignment is the current report (including Annexes).

2 Non-Traditional High-Value Vegetable Value Chain Analysis

2.1 Mapping

2.1.1Product

This report outlines a market analysis of certain non-traditional high value vegetables: broccoli, kohlrabi, artichoke, physalis, cherry tomato, leek, green bean, bell pepper. It explicitly describes and maps the status of the mentioned vegetables from the production to final consumption and attempts to identify the constraints and opportunities for development in high value market segment.

Most of these crops are cool season crops and require mild temperatures. The **Table 1** below shows the recommended temperature and relative humidity for target crops.

Table 89 - Recommended temperature and relative humidity for target NTHVV

Crop Name	Temperature	Relative Humidity (%)	Relative Perishability
Artichoke	0	95-100	High
Broccoli	0	95-100	Very High
Bell Pepper	7-13	90-95	High
Cherry Tomato	8-10	90-95	High /partially ripe/
Green Pea	0	95-98	Very High
Kohlrabi	0	98-100	Moderate
Leek	0	95-100	Moderate
Physalis	7-13	85-90	Moderate

Adopted from FAO

This study analyses in a thorough way all the eight crops with three of these crops broccoli, cherry tomato, green pea in a more elaborative manner as the area allocated to the production of these crops is larger compared to the other crops and these three crops are by far the dominant product groups in this study.

The main areas of focus of this study has been made on the expansion of domestic market potential, constraints of current production systems and processing opportunities for some of the NTHVV.

2.1.2 VC actors and their functions

NTHVV market functioning is shown in the **Figure 1**. This model is elaborated based on the information collected through field visits to the dominant and smallholder farms, data compiled from various sources, as well as interviews with the retail market representatives. Core functions in the NTHVV value chain are more or less limited. It includes input supply, production, collection, trading, retailing and ultimate consumption.

It was revealed that there are no wholesale markets for the studied NTHVV in Armenia. Production, collection and delivery of the cultivated products are conducted by farmers. So, they are responsible for more than one function in the value chain. Both large firms and smallholder farmers ensure the supply of NTHVV to the retailers, vegetable shops or supermarkets. The number of sub-functions for each function in the VC depends on the crop. But usually the common sub-functions for the majority of NTHVV include post harvest handling for collection function (this sub-function has product-driven approach and it usually improves the value of farmers produce), storage and transportation are the sub-functions for trading function.

Green pea should be separated from the rest of the crops as it is the only crop in the commodity group that undergoes processing before reaching to the ultimate consumer. It should be noted also that for green pea after the production and collection functions and their sub-functions another typical sub-function for instance is using agricultural machinery in performing pea shelling operation. This adds little value to the raw crop produced along the chain, thus facilitating the task of the farmer in producing the raw material for further selling it to processing company.

In any value chain analysis the networks should be visualized to get a better understanding of the connections between different actors and their functions in the chain. The linkages between various operators show the competitiveness of NTHVV production and their marketing commodities. In our study area the primary actors of the value chain are farmers. In regard with almost all crops 4 types of operators were identified in the NTHVV VC. The primary actors are farmers who perform more than one function in this VC such as production processes, cultivation, harvest, and marketing. There are no official or informal statistics on NTHVV producers and production volumes. All types of non-traditional vegetables and fruits are categorized under a general name; hence it would be impossible to track even approximate estimates of the target crop volumes.

Input suppliers are also important actors in the supply chain. There are not many organized input suppliers who have adequate stocks of inputs, for instance NTHVV seeds. The reason is the lack of demand on these seeds. In case of certain crops big firms (producers) act as input dealers. In general input providers do not have contractual arrangements with the farmers except in case of big firms producing cherry tomato and smallholder farmers cultivating green pea.

2.1.3 Flow of products and end-markets

The flow of target NTHVV through the chain is developed and optimized. For most of the crops the flow from production to the ultimate consumer does not go through many actors and the relations between the actors in the chain (input suppliers, producers, traders, for green pea only processors) are favorable. It could be mentioned that in this chain the producers manage to retain larger part of their final product price as there are practically no middlemen in the chain. Producers have taken the role of other possible actors. This functional upgrading is very beneficial for the producers. In recent years farmers have the opportunity to sell their own produce in farmer markets/public markets to consumers directly. Of course this is not the case with the small farmers operating in remote areas away from Yerevan. For instance a smallholder farmer growing all the target vegetables and many more, in little quantities, cannot afford transporting expenses to Yerevan market given the small volumes. Most of the vegetables are not transformed into processed food and the finished products are usually the same fresh produce. In cases of big supermarkets the packaging is done by themselves. The cost of packaging materials is relatively low though it also adds some value to the final product, among other factors.

As it was mentioned earlier in this report there are no statistics on the production volumes of target vegetables, but according to the data provided by Green Lane NGO on their partner farmers we can assume the overall number of commercial farms cultivating target NTHVV which may not be comprehensive or accurate.

Table 90 - Data on NTHVV growers

Crop name	Location	Cultivated land, ha	Number of farmers
Broccoli	Ararat	2	7
	Armavir	1.5	5
	Lori	1.5	7
	Syunik	0.5	25
	Other marzes	2.3	35
Leek	Ararat	1	N/A
	Lori	0.3	N/A
	Other marzes	0.3	N/A
Kohlrabi	Aragatsotn	0.1	3
	Other marzes	0.3	13
Artichoke	Ararat	0.02	1
	Other marzes	0.03	3
Physalis	Lori	0.07	11
	Other marzes	0.02	9
Bell pepper	Armavir	2	5
	Other marzes	3	10
Cherry tomato	Kotayk	35	2 LLCs
	Other marzes	11	3 LLCs &Farmers

2.1.4 Business interactions

Business interactions among these VC actors vary depending on the type of the crop. For cherry tomato, where the producers are mainly big firms and have dominant share in the market, they supply the retailers with their products. They usually have big clientele and do not have problem with marketing by the time import volumes of cherry tomato are in the market, available at lower prices. Usually they do not enter into formal contractual arrangements. It will be difficult to unveil even the approximate volumes, given the absence of accurate data on the number of producers of NTHVV and the volumes produced.

The picture is more or less the same with the small producers though some of them not being able to compete with the big producers (in terms of quality, quantity, marketing, and network) sell their produce in the wholesale markets with less attractive prices because in this case the intermediary traders add value to the end-product.

Regarding broccoli, producers from Ararat valley or from other near regions provide them to small retail vegetable shops or sometimes to wholesale market.

The analysis results revealed that for the sales of certain types of target NTHVV such as kohlrabi, artichoke, leek, and physalis there is a trend to purchase the vegetables immediately from the farm. Usually this is common among the staff of international organizations based on informal purchase arrangement.

Formal contractual arrangements are not well established for the target NTHVV. It could have been a solid base for the processing of target crops and finding additional markets for instance for organic produce or frozen products. Informal contract system is generally applied among the value chain actors. In this sense market linkages are rather poor for most of the target NTHVV. This reduces farmers' incentives to improve the quality of their produce and meet market demand.

These informal contracts are usually verbal arrangements and there is no predetermined price for the NTHVV. Prices for the vegetables are variable and are set on daily basis.

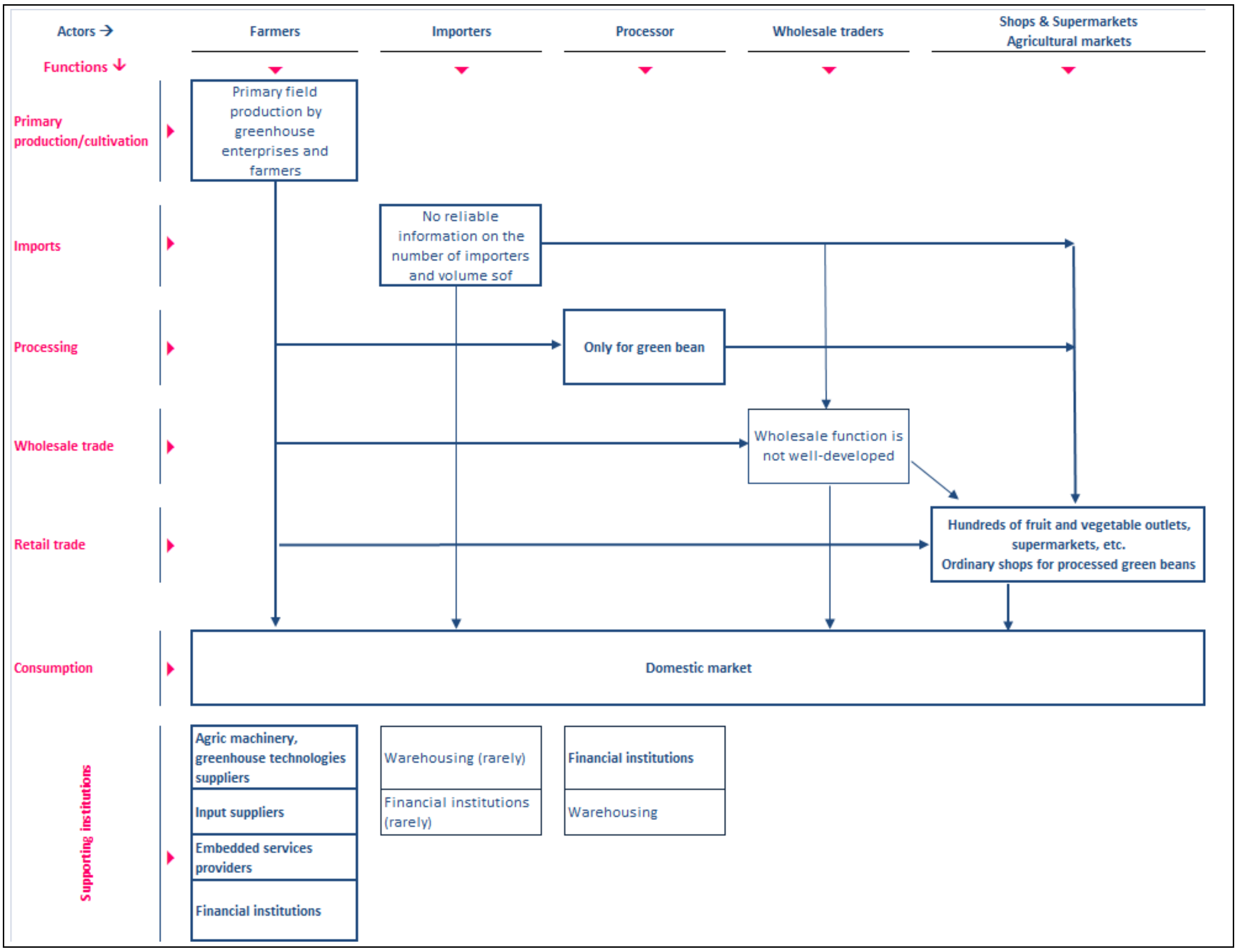
2.1.5 Service provision

Some of the NTHVV growers in Armenian have benefited from different international organizations interventions and were provided with opportunity to participate in trainings where new techniques and technologies of vegetables cultivation, were introduced. Assistance has been provided in a few post-harvest operations such as freezing, packaging, marketing during the whole year. In the result of such interventions some of the farmers who have succeeded in their intervention supported undertakings have opened up another layer of production, i.e. seedling production of new vegetable varieties in Armenia.

2.1.6 Value chain map

The organogramma of NTHVV VC map below depicts major actors and functions they perform, product flows and their intensity, end-markets, service providers and services they offer, etc.

Figure 3 - Non-traditional high-value vegetable value chain structure (Armenia 20115)



2.2 Dimension 1: Sourcing of Inputs and Supplies

2.2.1 Input and primary product characteristics

2.2.1.1 *Input supply*

Vegetable cultivation requires input supplies in terms of improved seeds, fertilizers, pesticides and other planting materials. For most of the target crops the trend has been dominant for imported seeds rather than seeds adjusted to local environment. There are many seed/seedling shops across the country where farmers have access to a wide range of seeds (not for all target crop varieties) and planting materials. Since most of the smallholder farmers do not have guarantee for the high quality of the seeds they opt for the cheaper seeds. Hence some of the smallholder farmers are often based on “low input supply - low output yield” system. Moreover, the price for imported NTHVV seeds is much higher than the local counterparts. The reasons indicated for not using improved imported seeds are high prices and the lack of guarantee for quality. Best quality for seeds can be ensured by hybrid seed varieties which are not affordable and often unavailable in supply market.

Local seeds of NTHVV are produced and available at Scientific Centre of Vegetable and Industrial Crops (SCVIC). The staff provides explanation on technical aspect of cultivation for the target seeds. Another possible source of seeds/ seedlings are some farmers who benefitted from grants in the framework of various international projects and have established nurseries for NTHVV. They organize the sales of the seeds/seedlings directly from the nursery. These farmers have managed to capture the techniques of cultivation of NTHVV and keep-on experimenting and coming up with new varieties of NTHV crops. Growing number of farmers who succeeded in NTHVV cultivation testifies that it is feasible to replicate efficient farmers' undertaking and develop current market of NTHVV.

The main produce of big firms growing NTHVV is cherry tomato. They usually cooperate with world’s leading brands and adopt their innovative cultivation technologies. The imported seeds are used only in their own greenhouses through direct purchase arrangement with foreign sellers and the seeds are not available in the market.

In case of green pea production the seeds were imported from Holland by "Artashat Cannery" OJSC factory and provided to certain farmers who started green pea cultivation and became the main green pea suppliers for the factory. The cannery here acted as the most significant and primary connector firm, providing the seeds to the farmers, as well as embedded technical assistance. The supply of these inputs is at no cost to the green pea grower farmers and plus it reduces the risk for the processor and ensures availability of better quality produce for processing.

As mentioned, target NTHVV production in Armenia is dominated by one commodity, cherry tomato. The production volumes of broccoli have increased in one year period thus decreasing the final cost by almost 70%. As for green pea the production volumes are the same. In case of the other target NTHVV the volumes are rather low as a result of low demand which is conditioned by the lack of culture or a matter of non-existent habit of consuming artichoke, physalis, leek and some other NTHVV. Low demand is also driven by the low level awareness about the nutrition value and usefulness of target NTHVV. To be fair, it should be mentioned that the situation for some of the target NTHVV (broccoli, cherry tomato, bell pepper) in this regard has ameliorated since a few years back the consumption and knowledge of these NTHVV was much more modest and there is a trend of more awareness and wider consumption with the increase of producers, more frequent emergence of these products on retail shelves and more or less affordable prices.

Regarding other input supplies such as fertilizers and agro-chemicals farmers need for NTHVV cultivation it should be mentioned that some farmers use only natural fertilizers (manure, compost) and some farmers use both natural and synthetic fertilizers depending on the crop type and fertility of the soil. So it can be assumed that both fertilizers and other planting materials are easily acquired and commonly used by NTHVV growers.

Regarding machinery inputs farmers who grow crops on open ground use agricultural machinery mainly for ploughing, leveling, treating the plants. Most often the usage of the specific agro machinery is on rental terms, where the machinery operator undertakes the job at an affordable price. Hiring cost of agro machinery is usually fixed, so farmers know the cost in advance. It is also common that mechanizations are not always available for everyone, especially during the busy seasons. Moreover the parks in rural communities are not at all fully equipped.

For green pea growers their only partner "Artashat Cannery" OJSC has installed a production line in Hrazdan sub-region, where they grow the crop. It removes light foreign matters separating light particles from the heavier particles. This adds value to the raw product which moves along the path to the retailer[75].

The access to financial services is an essential element for success during the whole VC processes for all the actors. For the purchase of high quality improved seeds and other farming inputs farmers need financial resources. There are several financial sources available in the market for NTHVV growers, for example, grants for agricultural innovative non-traditional crop cultivation by different donor organizations, low interest rate loans from government's finance institutions and loans for working capital as well as investment loans from specialized commercial banks and micro-finance institutions.

Small scale farmers hardly manage to meet local consumers and local market demands in terms of quality or quantity. These farmers are still a long way from entering foreign markets and they are completely excluded from global value chains. There is no major “export country” for target NTHVV to set specific standards (licenses, phytosanitary standards, etc.) or requirements on their produce to which they will adhere. The absence of export opportunities for small-scale farmers and of the need to oversee the compliance of produce enable to bypass cultivation standards.

2.2.1.2 *Primary production*

In Armenian market the availability of NTHVV varieties are increasing in the last two years. Though main route for these vegetables are imports domestic production is also within reach in small quantities. The main NTHVV grown/sold in local market are asparagus, zucchini, French green bean, Brussels sprouts, sweet potato and soy bean, red cabbage, ginger Napa cabbage. It provides an option of diversified income source.

During recent years some of these vegetables have found their way into diet of local population such as broccoli, cherry tomato, bell pepper, red cabbage, asparagus but some of NTHVV (Brussels sprouts, sweet potato, soy bean, zucchini and Napa cabbage) though available in the market have not been yet broadly adopted by the locals.

Recent trends of some of the Armenian farmers to go into the production of NTHVV is rather for the sake of diversifying their agricultural production with new high value crops or for experiment than for export potentials. Armenia falls into the temperate climate zone and the cropping seasons are limited. Though economically not viable, production can be ensured in greenhouses all year round which entails further

[75] www.artfood.am

price hike. Under these circumstances domestic produce hardly manages to compete with imported products, bringing along weightier challenges for realization both in domestic market and overseas.

We separate the target crop growers in 4 groups.

1. Big firms producing cherry tomato (they usually cultivate other traditional crops as well but as they are not among the target list we do not mention them),
2. Green pea producers (this is comparably small group concentrated in one region only, where there is obvious developed and organized value chain. There may be other green pea growers throughout the country whose produce is mainly for family consumption or the realization among the neighbors),
3. Comparably small-scale farmers who grow broccoli and traditional crops,
4. Farmers who grow all types of non-traditional crops available in the country. Usually these farmers have mixed farms where they operate diverse agricultural activities. The number of this cohort is few.

Cherry tomato is mainly grown in greenhouses by three main big firms using cutting-edge technologies which give them opportunity to grow year round. The plants are grown hydroponically with conservative usage of fertilizers and pesticides and efficient use of improved seeds which ensures safe and high quality produce as reported by these firms. This is the most labor intensive crop from the target crops, but a single plant puts out good yield. Of course there are other smallholder farmers who grow cherry tomato either in small greenhouses or sometimes in open ground, though the volumes of the small farms are not big and sometimes it is rather difficult for them to compete with the produce of big firms, in terms of quality and quantity, resulting in lower prices and revenues. The production volumes can reach from 10 to 65kg per $1m^2$ depending on the production type and seed quality.

Green pea for processing is cultivated on 150 ha land area in Hrazdan region as it was mentioned before in this report. More than 5 family households are engaged in green pea cultivation in this region that harvest and sell the crop to the processing company. Usually it ensures about 2 tons of yield per hectare and the production line they operate processes from 1-1.5 tons of crop per hour.

As reported by the third “crop group” who mainly grow broccoli the overwhelming majority cultivates the crop on open ground as the production volumes are comparably small to justify the expenses for greenhouse facility. So field cultivation is the main choice for this group of farmers as it is considered to be comparably economical production.

This is true for the last group of farmers, too. Farmers who grow wide variety of NTHVV usually have mixed farms and try to diversify their income sources. These farmers have mastered cultivation techniques of NTHVV and fruits and as they mention these are not hard-to-achieve crops. It provides them up to 30% net income if manage to sell it.

Most of the targets NTHVV are cool-season crops and suit well to the climate of pre-mountainous regions in Armenia, except for sun-loving cherry tomato which grows well in Ararat valley in case of open-ground cultivation. As to the cultivation in greenhouse no discrimination can be made among the target NTHVV.

Table 91 - Perishability and other features of target NTHVV

NTHVV	Perishability Rate	Seasonality	Vegetation period	Frost Resistance
Broccoli	2 days	Sow: March through May Harvest: June through October	90-100 days	Can withstand hard frost (-5 -7 °C)
Kohlrabi	1 week	Sow: Feb through August Harvest: April through October	55-75 days	Can withstand hard frost
Artichoke	1-2 days	Sow: Feb through April Harvest: November through January		Can withstand light frost
Cherry Tomato	5-6 days	Sow: Early spring/summer Harvest: Autumn	70-90 days	Likely damaged by light frost
Leek		Sow: Feb through April Harvest: August through February		Can withstand hard frost
Physalis	1 month	Mid March		
Green Pea	1-2 days	Sow: March through July Harvest: June through October	60-70 days	Can withstand light frost
Bell pepper	3-4 days	Sow: Feb through April Harvest: July through Oct	60-90 days	Likely damaged by light frost

Armenian agriculture is dominated by traditional low-value vegetables where popular demand is higher hence, small-scale farmers most often find it risky and do not have willingness to grow non-traditional crops. Prices for cherry tomato and broccoli are being fixed on daily bases. They manage to obtain high prices in domestic market until the domestic market is filled with cheap imports of the same crops which compete with local products more in terms of price.

So revenues of NTHVV were stated as being high in case of big firms operating in the market where they have made huge investments. For smallholder farmers net revenues from most of NTHVV (kohlrabi, artichoke, physalis, bell pepper, leek) account small percent. Farmers usually lack sufficient crop volumes to obtain favorable prices and the differences in price and cost between marzes are the same. Compared to these crops higher returns stem from the production of broccoli. Domestic demand is comparably higher hence they produce sufficient quantities.

Expanding lands for cultivation of NTHVV can be considered a promising opportunity for poverty reduction and employment creation in rural areas because of their high economic returns compared to traditional vegetables. The volumes could be doubled for almost all target crops as stated by specialists of the sector. This sub sector has a growth potential more in terms of human recourses than in terms of unused land availability. There is not large prospect for the expansion of agricultural land as it is largely in use already. Thus the focus should be directed towards enhancement of agricultural productivity. Therefore locally produced volumes of NTHVV would affect the prices in domestic market making them competitive to the detriment of imports volumes and prices.

There is also a good potential for developing export markets though in this case cultivation of NTHVV should be organized in greenhouse facilities with increased yield and prolonged growth season. This will enable Armenian farmers to meet foreign market standards, to fulfill phytosanitary standards and high quality controls of importing countries. It is seen as a viable tool to spur economic growth and increase farmers' incomes.

2.2.2 Characteristics of input suppliers and primary producers

2.2.2.1 *Input suppliers*

Owing to occasional interventions by international organizations farmers receive assistance in the form of knowledge base through trainings on the cultivation techniques of NTHVV and provision of inputs, such as seeds, seedlings and work tools. As to commercial availability of the seeds for NTHVV, 30 seed sellers have been identified according to available data, though not all seed varieties are available, for instance seeds of kohlrabi, artichoke or physalis are not in stock. There are also small scale retailers both registered as sole proprietors or non-registered informal home based resellers.One farmer who is a beneficiary of a World-Bank funded project is operating a nursery where almost all types of target crop seedlings are retailed.

Green Lane NGO not only provides seeds to interested farmers (in small quantities) but also provides consulting/advice on the cultivation methods and timing of NTHVV planting and other practices based on the experience they have during the cultivation experiments they undertake with non-traditional crops.

Seeds for NTHVV are both produced locally by SCVIC and imported by private sector. As reported by interviewed agronomists in the scope of this study, among the imported seeds and chemicals the ones that have best quality are “Bayer”, “Yara” and “Syngenta”. There is no shortage of seeds and seedlings supply but rather lack of demand from farmers’ side.

Most commonly used fertilizers are nitrogen fertilizers. The subsidized price for one kg fertilizer is about 120 AMD. Versus non subsidized 160 AMD per one kg. In the recent years the usage of phosphorus and potassium fertilizers is becoming more popular which costs 140 AMD per one kg. The quantity of fertilizers applied for greenhouses and open ground cultivation varies. The former requires more fertilizers. Daily dosage of fertilizers and micro-elements per ha is 22 kg and 8 tons annually. Only 60-70% of these inputs are retained, the rest is eliminated through drainage. Regarding hydroponics greenhouses the usage of calcium nitrate and a great number of micro-elements are prevalent /since the hydroponics environment is devoid of minerals and micro-elements/. The quantity of fertilizers applied differs also as to whether the cultivation in greenhouse is hydroponics or soil based. For soil based greenhouse cultivation the amount of nitrogen fertilizers used is about 750-800 kg per ha, 300 kg potassium and 400 kg phosphorus fertilizers per ha (-/+ 10% depending on the crop). For open ground cultivation method the dosage of fertilizers applied is about 20% less.

For the majority of target NTHVV land plots are too small to hire extra labor force. This does not include green pea and cherry tomato land plots which are relatively larger; for the cultivation of the letters extra labor is hired. The daily payment for hired labor is 5,000 AMD per person.

Regarding fertilizers and pesticides, they are mostly imported. Fertilizers are imported from Iran, Russia and Georgia, etc. Local producers and sellers of fertilizers can produce and sell without any license as opposed to the production and sales of pesticides which requires certification and license. There are about 80 licensed sellers of pesticides in Armenia though the actual number of sellers of pesticides is many more who do so without any license. Pesticides are imported from Switzerland, Iran, and China etc.

Organic fertilizers as well are widely used in agriculture, especially those farms that are also engaged in livestock development; appear in a win-win situation making good use of the manure generated in the result of animal husbandry. The price of manure amounts to 5,000 AMD per one ton.

2.2.2.2 *Primary producers*

As there are no reference data available on the exact number of NTHHV growers, production volumes or other related info in Armenia, any data provided will be approximate.

There is no centralized production in any specific region in Armenia, except for cherry tomato, the production of which is targeted in Kotayk marz, where two big firms producing cherry tomato are operating. These two firms are providing the biggest share of the market with not only the mentioned crop but traditional crops as well. The geography of the other target crop producers is more or less evenly distributed across the country. In Vayots Dzor region, for instance, after promotional activities (introduction of NTHVV cultivation opportunities in greenhouse facilities) undertaken in the framework of international support programme not only the direct beneficiaries farmer households took advantage from the intervention but also neighboring communities tried to replicate the practice of cultivation of NTHVV. Given the suitability of certain crops in terms of climate tolerance, palatal preferences, health benefits and other factors the adoption of some of the target NTHVV (such as broccoli) has been immediate. Despite the smooth adoption process this farmers are not yet able to ensure large production volumes and the commercialization will take time to be largely prevalent.

Regarding most of the target NTHVV there is no apparent domination by any large farms, except for cherry tomato. The average farm size for most of the target crops is small (0.2 ha) and in case of physalis, artichoke, kohlrabi even smaller (> 0.1 ha).

The cultivation initiative of target NTHVV was triggered in the scope of interventions by the international organizations alongside with cultivation techniques and other auxiliary vegetable growing operations (innovative farming methods, production of non-traditional improved seed varieties, use of pest management, tilling methods, etc.).

It can be stated that improved knowledge and skills have been accepted and used which ensures that it will be sustained by farmers.

2.2.3 <u>Contractual arrangements</u>

Among target NTHVV growers green pea producers benefit from contract arrangements with one processing factory who is the main buyer of their produce. These farmers benefit also from better access to high quality inputs and technical assistance from the processing factory. Contract farming arrangements regarding other target NTHVV growers and processing companies' contractual arrangements are not yet developed in the market.

There are no contract arrangements between primary producers and local vegetable merchants, other retailers, supermarkets. Sales within this group are mainly informal procurement arrangement without predetermined price. Supply of needed vegetable quantity is arranged by phone and the payment is made on the delivery.

Even in case of green pea growers who have reliable business partners on behalf of the cannery there are not any produce quantity stated in the contract thus the processing of the current year is usually yield-based.

2.2.4 Logistics

Supply of certain NTHVV to district vegetable markets in Yerevan as well as other towns in Armenia is organized differently for different crops. Certain retailers prefer obtaining the vegetables from farmer gate or village wholesale markets where producers sell their produce early in the morning; others prefer to pay more so that the producers are responsible for the transportation and associated delivery costs. As reported by some retailers and producers the supply of broccoli is usually twice a week, the needed quantity is supplied. The volumes of the sold fresh vegetables varies depending on the district the market is located.

Cherry tomato is supplied by big as well as small producers every day, about 10 kg maximum per day, per market unit; the market demand for this crop is rather strong as compared to the other target crops. In case of broccoli, the delivery and sale volumes of this vegetable is twice a week only and the sale capacity of these markets is 20 kg per week maximum. One of the biggest supermarkets sells 250 kg broccoli per day through its 11 chains during thehigh season. The demand is low or in most small retail markets there is no demand for kohlrabi, physalis, and leek. These vegetable varieties are usually sold in two big supermarket chains though in rather small volumes and sometimes by order.

The relations between the producers and traders are usually trustworthy. Delays are not common in this type of interactions. If any misunderstanding occurs in terms of delivery of low quality products are traders usually discontinue cooperation. The above pattern is always on informal bases.

Within this study transportation losses have not been revealed either by traders or by producers. Usually the produce of smallholder farmers in distant marzes are consumed within the region and produce from closer marzes are delivered to Yerevan, where the market demand is the highest. The network of roads in closer mazes is comparably better than that of remote regions; therefore transportation losses are minimal as the biggest sale is concentrated in Yerevan market. Losses of production, harvesting and handling nature if appropriate care is not taken of the plant are more than that of transportation losses risks.

2.2.5 <u>Infrastructure and transport facilities</u>

2.2.5.1 *Storage/warehousing of primary production*

The only producers are big firms growing cherry tomato who have sufficient resources and capacity for good post-harvest handling technologies and adequate storage facilities before transporting the products to retailers. Smallholder farmers do not usually have adequate storage facilities. Usually these are chambersarranged as storage places for their agricultural produce. The exact requirements of temperature or humidity control for each crop is not strictly kept. They just try to keep the place cool. If the delivery of the produce is not done within few days after harvest, taking into account the perishability rates of the crops, farmers suffer post harvest losses in the result of inadequate storage. Each crop has its own characteristic and storage requirement and it must be stored according to these requirements if they want to prolong the shelf life of the fresh vegetables and gain profit. The reality is that these requirements are not always kept resulting in storage losses.

For new starter farmers who do not have much experience and expertise in cultivation of non-traditional crops, post-harvesting as well as handling, losses are inevitable. These factors can result in many cases up to 25% crop loss which devastating for smallholder farmer who then refrain from cultivating the same crop next year. It could be prevented if pre-harvest works are dully performed, appropriate handling is done, adequate storage facilities are installed in the farms or at least there are storage providers in the community ensuring affordable and quality services.

2.2.5.2 *Transportation*

Farmers usually use their vehicles to convey their produce to the local markets. There are not special means of transportation delivering specifically the NTHVV. Usually it includes entire the horticultural produce from the farm. For small farmers it is difficult to plan delivery schedule, since they are constrained by the lack of immediate or ensured market demand It also happens that farmers from remote regions may ask milk collectors, who travel around the regions on daily basis, to deliver their NTHVV to Yerevan.

Big firms make use of special vans for delivering their produce from the greenhouse to the market. In both cases the transportation means are not specifically equipped, for instance with well-ventilated system.

Road networks are more or less improved which eases the transportation from producer to consumer. Nevertheless, market participation of certain NTHVV growers residing in remote areas is significantly affected by high transportation costs and with the current production volumes it becomes not viable to deliver their produce to Yerevan markets and supermarkets.

2.2.6 Communication

Producers of NTHVV could have had better positions in the market than traditional crop growers as their produce has higher value, though this advantage is compromised by the low demand compared to their counterparts. Recent years have been witnessed the adoption of non-traditional crops by consumers and crop cultivation techniques by producers. Nevertheless, despite the efforts of some of the NGOs operating in Armenia who have started propaganda on organic cultivation of traditional as well as non-traditional crops we should state that the adoption has not been massive. Farmers get disappointed because domestic market of NTHVV cannot yet realize even the small production they provide.

2.2.7 Major constraints and proposed solutions

NTHVV growers usually do not encounter constraints in sourcing inputs. There are input supply outlets available around the country where they can find seeds (non-traditional seeds usually by order only), fertilizers and other farming supplies. But taking into account low domestic demand for NTHVV farmers refrain from investing in this sub-sector. NTHVV growers in Armenia are not many and they have chosen this ''path'' in the industry because the majority of them have participated in some development programme organized by international organizations promoting sustainable high value agriculture through inclusion of smallholder farmers. They have received technical assistance on sustainable agriculture, organic cultivation and other related topics.

GAPs among NTHVV growers are not adhered to systematically but mostly driven by occasional contributions from mentioned sources.

The target crops are mainly high-value though **low-volume**. The volumes of target commodities are so low that it is not always possible to deliver the yield to the markets on the same day. And in case of not delivering the produce on time the appropriate storage facilities **are not always available**. Moreover, the **perishability** of the produce is very short hence, if not sold on the same day there will be significant degree of losses (for instance in case of broccoli, leek, etc.) for the farmers.

Armenian market demand needs improvements in **commodity diversity** as well as **production volumes**. Customers do not know how some of the target crops looks like moreover taste like, so they are not actively demanding the products.

Marketing campaigns should be developed In Armenia to promote NTHVV with targeted advertising on useful and healthy characteristics of the crops, which could lead to market demand increase and higher prices for the NTHVV. **Attitude of population** could be changed towards non-traditional crops by organizing cooking festivals, exhibitions, promotions, TV broadcasts, etc.

2.3 Dimension 2: Processing Capacity and Technology

A major processed product among the target commodities is green pea. As we have detailed earlier in the report the producers from Kotayk marz benefit from the cooperation with ''Artashat Cannery'' as a reliable business partner and their main buyer. The green pea produce from this region has good quality compared to other regions. The representatives of the cannery have tested growing green pea in other geographic regions trying to reach other farmer households and expand their processing potential but couldn't get the same quality as in case of Hrazdan region. This is a mountainous region with high relative humidity which makes salutary for growing this crop.

Part of the Hungarian modern conveyer for processing of green pea mass is installed in Hrazdan region. Green pea growers harvest usually in June-August and process their yield in the production line then the sorted crops are delivered to the factory for further processing. The second part of the production line is placed in the factory where raw peas undergo special treatment. They are washed in a special floating washer to remove stones and sand, go through hydraulic de-stoner and before final canning process they are sorted, eliminating incomplete peas. This product competes for its quality with the imported counterparts ensuring high profitability. The whole produce is sold in the local market. Regarding human resources of this specific operator before starting the green pea production ''Artashat Cannery'' invited specialists from Hungary for consulting and training the staff on the specific knowledge on technical and technological processes of pea cultivation and processing.

There is no commercialized processing activity for the rest of the target NTHVV.

Freezing is also a processing option for broccoli. One of the growers of target NTHVV from Lori region is making frozen products in very small scale and trying to sell off season through the neighbors or in the region, it does not reach Yerevan as the volumes are very small. The same farmer is making homemade vodka from his garden physalis and he has got his clientele again from the same region. It could be an option also to freeze raw peas. In this case it also maintains taste, color and nutrients.

Regarding the processed options for the other target crops SCVIC for instance is making demo processing from varieties of NTHVV of their own produce. Making marinated broccoli, cherry tomato, kohlrabi and physalis jam. They are highly committed to promote the use and cultivation of NTHHV which can be considered for scaling up and replication.

Artichoke which seems to be one of the least popular target crop is increasingly gaining popularity all over the world. This plant is rather sensitive to frost so it is mainly cultivated as summer crop in Armenia. Though it has many wholesome properties it is not adopted by our population yet. The most wide spread processing option for artichokes is marinated, which has a large popularity especially in Italy and Spain.

2.4Dimension 3: End-Markets and Trade

2.4.1 End-product characteristics

Within this study the end products are the same raw agricultural commodity, except for green pea. Thus the perishability of the target crops is presented in **Table 1**. Similarly, retail and wholesale prices of the target NTHVV is shown in **Table 4**.

Some of the target crops are not sold in retail shops, supermarkets as well as wholesale markets all year long. The availability is very limited, resulting in lack of interest from consumers' side.

Table 92 - Retail and wholesale prices for the target NTHVV

Crop name	Retail price in AMD	Wholesale price in AMD
Kohlrabi	1000 per kilo	-
Artichoke	-	-
Leek	2100 per kilo, 450, per unit	1500 per kilo
Physalis	1000 (80 gram, imported)	-
Bell pepper	1700 per kilo, 500 AMD per unit	-
Cherry tomato	2000-4500 per kilo	700-1500 per kilo
Green pea	700-750 per jar	680
Broccoli	500-1000 per kilo	300-400 per kilo

2.4.2 Consumer demand

The farmers who grow almost all target NTHVV organize the sales from their farm or nearby markets where they already have their clientele, though few in number. For some of these farmers who are also members of the Green Lane NGO there is an opportunity to sell their produce on the internet market. This NGO is promoting organic agriculture and has initiated an internet market selling of the “organic”[76] produce of its member farmers. This opportunity is open for the member famers since 2005 and any farmers who will become member of the NGO and adopt organic cultivation methods and techniques[77].

Not all target vegetables are sold in the same markets. Regarding green pea the sale is in supermarkets mainly. Cherry tomato, bell pepper and broccoli can be found in many vegetable small markets around the country, though the consumption of these vegetables is not affordable for all consumers. Usually consumers who want to shop economically would buy ordinary tomatoes instead of cherry tomatoes, green onion instead of leek, and ordinary pepper instead of bell-pepper and cauliflower instead of broccoli. The price difference is rather big, almost twice cheaper.

Concerning physalis one can find it not in all supermarkets, solely in big ones in Yerevan. It is sold as an exotic fruit. The consumers are mostly foreigners for whom consumption of NTHVV is ingrained in their diet culture; hence they search the target crops in Armenian market as well. The market size for this crop is very limited. Based on its decorative properties, it is bought by cake shops, but again not in large qualities.

The absence of any statistics on the target NTHVV as well as non-permanent availability in the market of the target crops makes it difficult to estimate the exact demand as well as exact growth potential. However it is undeniable that the curve for development of demand is upwards with the growing availability in market and knowledge among consumers.

Armenian consumers’ perception of domestic vegetables and fruits is associated with tasty and ecologically grown products. For most of the consumers it is important to know where the product comes from. Next important issue is the perception of price for the majority of consumers since they are usually price-conscious. This is another essential factor that limits the market share for NTHVV particularly taking into account the difference between similar traditional crops. Low income consumers are less likely to buy these products.

evertheless consumers’ behavior is a dynamic process. Continuous changes in ideas, perceptions, increasing popularity of target crops, decreasing prices will all be incentives for the assimilation of NTHVV in Armenian market.

[76] Their products are claimed as organic but they are not accompanied by any documented evidence stating that those products have been grown in a manner required by organic agricultural practices.
[77]www.greenlane.am

The reality is that consumers in Armenia are accustomed to use more traditional vegetables which are both affordable and it can be purchased from all markets and supermarkets. Thus eating habits and traditions make the introduction of some of the target NTHVV difficult. This refers especially to those which can be replaced by more affordable traditional/indigenous ones. On one hand the adoption of NTHVV production and processing is mostly determined by the consumer demand. On the other hand, the supply is not large-scale and systematic, which would in its turn entail prices on a par with the prices of the traditional crops and would boost awareness of NTHVV among Armenian consumers. Moreover, the major constraint in boosting the market share of NTHVV in Armenia is the lack of consumer awareness. There are not many large scale interventions on the promotion of non-traditional crops in Armenia which would target at the increase of consumer awareness and open up new opportunities for farmers in cultivating non-traditional crops in enhanced volumes.

2.4.3 <u>End-buyer perspectives</u>

Retail sales are organized mainly through certain supermarket chains and groceries, earlier mentioned internet shop. Retail prices differ depending on the market. Value-adding through product packaging that is done by certain retailers is tailored to the specific requirements of their customers, hence makes the prices of fresh produce higher than in other markets.

Cherry tomato, broccoli, bell pepper are available in many retail shops around the country whereas the rest of the target crops are not commonly sold vegetables and cannot be found on daily basis. For instance, within this study the only market where it was possible to find out the current retail price for kohlrabi was Green Lane internet market; in other markets it was not available. In case of artichoke it was impossible to find this crop available in any market.

Retailers are good source of information for the farmers about the current market situation. They are the first to perceive any change in consumers' behavior and market situation and they can direct farmers to grow products that are marketable thus becoming possible buyers of their agro-products.

As claimed by interviewed retailers the popularity of certain target crops such as cherry tomato and broccoli has grown significantly in recent years. The adoption rates of the rest of the target NTHVV into the diet of local population

It is difficult to separate one main consumer group of NTHVV. We can highlight the consumer groups as reported by most of the retailers within this study as follows:

- People who used to live abroad and are accustomed to utilizing these vegetables either fresh or in their culinary
- People who travel frequently and taste non-traditional fruits and vegetables are starting to buy these crops when they see any in the market.
- Foreigners living in Armenia, though this is comparably a small group.

The growers of non-traditional crops are promoting their produce among their neighbors and relatives, trying to generate interest among them highlighting the nutrient characteristics of the crops they grow.

2.4.4 Marketing and trade capacities

2.4.4.1 *Wholesalers*

Wholesale markets in Armenia usually do not have a big share in the value chain of locally produced NTHVV. The main reason for this phenomenon is the small volumes of non-traditional vegetables grown in the country. There are no statistics on these products separately. Wholesalers source their stocks either from farmers or from importers. These crops both imported and locally produced are either categorized under a name for example as cabbage (which includes all cole crop family vegetables: cabbage, cauliflower, red cabbage, kohlrabi, broccoli, etc.), tomato (tomato, cherry tomato), onion (onion, leek, etc.) or under a general name of exotic fruits and vegetables.

Table 93 - Export and import data under general crop name for 2014, ton

Crop Name	Export	Import
Tomato	220	187
Pepper	691	180
Onion	0.25	5,810
Cabbage	3,004	3,048

Some of the importers play overlapping roles as importers, wholesalers and retailers. As the market for these crops are very limited and for most of the target crops the competition is not tough, they also manage to control the prices.

Table 5 below shows the import and export volumes of certain vegetable group names which include some of the target NTHVV though it is impossible to estimate even approximate volumes of the target commodities which are included in the data. Of these crops vast majority are common varieties that are grown locally. For local producers it is tough usually to compete with the imported cheap and quality counterparts.

The information was gathered and compiled from different sources (online recourses, ArmStat, MoA).

Table 94 shows the import and export countries again for general category crops. Main export countries are Russia and Georgia and main import countries for these crops are Georgia, Islamic Republic of Iran and Turkey.

Table 94 - Import export countries and volumes (ton) for 2014

Countries	Tomato	Pepper	Onion	Cabbage
Export				
Russia	127	159	-	2,164
Georgia	93	532	0.25	840
Czech Republic	0.1			
Ukraine			0.01	
Import				
Georgia	5		2,928	1,004
Spain	0.2	0.6		0.13
Islamic Republic of Iran	3.6	160	288	1,941
Italy				0.1
France				0.02
Peru				0.2
Turkey	179	5	1,963	102
Netherlands		0.1	0.1	0.2
Morocco		0.01		
Israel			0.1	
Ukraine			632	

As for green pea in this case as well there is no separate categorized group name which could enable us to have an accurate data on the import and export volumes of this crop. The data in the table above includes not only green pea but also bean. Judging from equal and even overwhelming popularity and availability in the market of canned green pea we can assume that the major imports are for green pea rather than for bean. The volume as well as value of imports are apparently very high taking into account the fact that we can produce the same high quality product domestically thus strengthening national food security.

There is good potential for achieving self-sufficiency by expanding the production of this crop. So government should consider options in increasing the domestic green pea production and consequently reduce import dependence.

Table 95 - Green pea export and import 2014

Crop name	Measurement unit	Export		Import	
		Volume, ton	**Value, USD**	**Volume, ton**	**Value, USD**
Green pea/bean	kg	6.2	7,789	1,869	2,302,838

Usually no re-packaging operations are performed by wholesalers or importers. Re-packaging is more common for supermarkets usually printing the packing date on the products and trying to make more attractive and present in more marketable chunks.

After becoming member of WTO in 2003 Armenia made several changes in taxation policies by reforming existing customs system. Today Armenian trade regime is liberal. Only two tariff rates apply on imports of goods in Armenia: 0% and 10%. The 0% tariff applies to imports of capital goods, and the 10% tariff to imports of consumer products. Besides, all imports are subject to payment of a VAT of 20%. There are no tariffs, licensing requirements on imports or minimum import prices[78].

2.4.4.2 *Retailers*

Vegetable and fruit retail market is obviously unorganized in Armenia. There are different types of retail units selling NTHVV in Armenian market: major supermarket chains, greengrocers, fruit and vegetable markets and an online market. Retailers either purchase their stocks of target vegetables at wholesale market or buy it directly from the producers.

The retailers, especially the ones who add some value to the fresh product by packaging before showing in the shelves, are usually giving better shelf space and place to these value added products as they provide them with better profit margins. They set comparably higher prices to these products because of low demand and perishability concerns. So in order not to suffer higher losses depending on the crop type they add from 25 up to 40% margin. The majority of these NTHVV are not available in every grocery so they take advantage of the situation to earn more money.

Supermarkets apply different strategies to attract customers' attention to the fresh produce. Yerevan-City chain for instance sets the cheapest price in the market not paying much attention to the quality and appearance of the crops they are working on quantity rather than quality. Another big chain in Yerevan, SAS supermarket has employed a different strategy drawing attention of those consumers who are ready to pay

[78]www.investinarmenia.am

more for packaged and nicely presented fresh produce. They are working more on quality than quantity. Regarding the internet market almost all variety of the assessed crops are available there. This

As for broccoli and cherry tomato, Yerevan-City supermarket chain can be assumed as the dominant retailer though the volumes sold cannot in essence be deemed dominant. In case of other crops there is no conspicuous or specific retailer dominant.

2.4.5 Standards

The sphere of food products quality in Armenia is governed by RA Law on Food Safety, RA Law on Standardization, RA Law on Phytosanitary, RA Law on Consumers Rights. The Law of the Republic of Armenia on Food Safety defines the requirements for establishing safe procedures for food production from primary production to food consumption ensuring all requirements for food safety are met. RA Law on Phyto-Sanitary among other requirements sets forth the maximum amounts of fertilizers and other chemical inputs allowed using during all stages of food production. Local laws, regulations, standards on ensuring the quality of food are on the current agenda of the country's relevant strategy so as to improve them and make them in line with international requirements. One such example is the RA Government requirement to introduce HACCP standards for certain products by 2020. HACCP standards do not apply to the stages of primary production, therefore in the scope of this research they will not be elaborated upon.

Cultivation of NTHVV does not require special certification in Armenia to testify adherence to any standards, as long as they are marketed and realized within Armenia, but they will be subject to HACCP, ISO or GOST standards once they start exporting the end-products.

The traceability throughout the value chain is to be conducted by State Service for Food Safety. The reality is that this organization does a good job on the management and control of processed food rather than supervision of fresh horticultural produce, however food safety hazards can occur and cause illness to any food product whether processed or unprocessed. Though it is stated in the law that the application of chemical inputs should be used in such quantities so that it does not contaminate the foodstuff implying risk to human health, no inspections are carried out by SFSS. Food safety management systems have been modernized with the adoption of the law on Food Safety and the governance body on behalf of SFSS. Nevertheless, it can be concluded that there is no on-farm assurance program on horticultural fresh produce in Armenia.

So, it is still an open question to what extent the food safety requirements adhered to in cultivation of horticulture products including the target crop varieties and if the control systems are in compliance with international requirements. Conversely, the quality standards for export are very strict.

2.4.6 <u>Major constraints and proposed solutions</u>

Given the limited demand for NTHVV and small-scale production associated with the former constitute issues hampering the elaboration of end markets and trade in this sub-sector of the industry. Farmers do not encounter any constraints in realization of their farm produce in domestic market upon the availability of demand. The constraints will arise once farmers undertake export operations, i.e. they will have to meet international standards and bear associated costs for the adoption of standards to sell their products in CIS or European market. Apart of low demand and lack of marketing skills of both producers and retailers there is no other major constraint to sell their fresh produce in domestic market.

Financial challenges the wholesalers and retailers face are connected with several interrelated factors:

- Small-scale production,
- Sparse geography of target crop producers,
- Lack of immediate cash,
- Low demand.

All the factors mentioned above contribute to the fact that both retailers and wholesalers refrain from making large investments for procuring such big volumes of fresh produce as they would venture in case of traditional vegetables.

The recommended ways of overcoming constraints hindering the development of this sub-sector are as follows:

- Developing marketing policy on NTHVV,
- Awareness raising campaigns on the health benefits of NTHVV,
- Government intervention in subsidizing input costs thus encouraging farmers to increase the production volumes of NTHVV,
- Knowledge building on international standards (HACCP, ISO, etc.).

2.5 Dimension 4: Governance of Value Chains

2.5.1 Actor domination

Production of any of the target NTHVV is not monopolized. The only processor of green pea is ''Artashat'' Cannery though the market is open and there are no hampering factors for any of the processing factories to produce the same product. The market is flooded with imported canned green pea so any processing company deciding to enter this market should be ready to compete with big brands in terms of high quality and adequate quantity. So far this role has been taken only by ''Artashat'' Cannery and the product they produce is of superior quality.

As of cherry tomato it has been stated in this report more than once about ''relatively dominant'' cherry tomato producers (Biga, Bio Group, Mavas Group (the latter has been the leader in 2014 in cherry tomato production though this year they have not planted the crop). Each firm has more than 10 ha modern hi-tech greenhouse cultivating more than one crop variety. They have carved out dominant position in the market with the quality produce they provide the market with. The produce of these firms is of high quality and can compete with any imported cherry tomatoes from Turkey, Georgia, etc. Particularly Biga is considered the dominant source of cherry tomato production technologies in Armenia.

These dominant firms have the power to affect the market price of this product only temporary. They take a dominant role and set the price until the cheaper imported cherry tomatoes appear in the market. It drives this crop prices below the cost of production. This is definitely not a monopoly because there are other producers in the market with different production volumes. These producers are simply major firms growing in larger plots and they have temporary market power to increase their profits.

2.5.2 Participation in and distribution of value addition

As it was mentioned in Dimension 2 there is no processing for the majority of target crops, thus there is no major value added processing operation in the value chain of target crops except for green pea. There is a need to conduct marketing research to find out new value added opportunities for target NTHVV.

2.5.3 Cluster concentration

Cluster of green pea growers is concentrated in one region (it was described in details earlier in the report). It is convenient that crop production is centralized in clusters so that harvested crop from all nearby villages is collected easily and post-harvest operations are implemented jointly in the vicinity. This cluster development started in 2005. It proved to be sustainable and long lasting production and it increased participation of farmers and created incentives for them to expand cultivated lands, adopt innovative cultivation techniques.

In case of other crops there are no specific clusters to be mentioned.

2.5.4 Type of governance

The sector of NTHVV particularly for the majority of target crops (broccoli, kohlrabi, artichoke, physalis, bell pepper, and leek) is characterized by relatively small producers. Due to lack of various selling options for these crops (high domestic demand, processing, and export opportunities) they realize their produce mainly in Yerevan market which is also very limited.

NTHVV market is predominantly supplier driven. This market model does not always induce quality and quantity improvements. The situation needs to be addressed through awareness creation among the consumers of the target NTHVV. So initiating proper information and communication flow between value chain actors will make it possible to have buyer driven and competitive market for NTHVV based on market opportunities.

2.5.5 Major constraints and proposed solutions

For most of the target NTHVV there are no domination in the chain and the producers are mainly small scale farmers, nevertheless in the VC of cherry tomato there are major producers who manage to fulfill large portion of market demand leaving smallholder growers of the same commodity to struggle with the tough competition in terms of quality, quantity and broad distribution network.

The main constraint in terms of governance of the NTHVV value chain is the poor interaction between the value chain actors affecting the flow of target products to market. To facilitate the cooperation between these actors and ensure better access to market for small scale farmers it is recommended to join efforts and form cooperatives. This way it would be easier to address the challenges that occur in the value chain enabling inclusion of marginalized chain participants and establishing more salutary environment.

2.6 Dimension 5: Sustainable Production and Energy Use

2.6.1 Use of materials

It is the right of each consumer to know where the product comes from and what it contains. The law on Food Safety explicitly describes what should not contain food products that could lead to food contamination and imply risks to human life. The reality is that there usually are no inspections for fresh farm produce checking the pesticide levels or presence of toxic chemicals in crops before they appear on the shelves in supermarket or any other local market.

Most of the growers of target crops interviewed during this study claimed that they use mainly organic agricultural materials for growing their nontraditional crops. Use of chemical fertilizers is minimal and in some farms it is completely absent. Though these are only cited from the interviews with farmers. Governance on these issues should be continuous and consistent.

2.6.2 Energy use

Energy use is large scale in case of cherry tomato growing where everything is computerized (though heating system is based on gas usage) and in case of green pea where there is processing operation in factory. As for other crop cultivation energy use is minimal in both cases when the cultivation is on open ground and in greenhouse (mainly plastic greenhouse facilities) as the cultivated areas are rather small.

The type of the energy used in all segments of the value chain is electricity. The main source of electricity is Electric Networks of Armenia CJSC. NTHVV value chain actors acquire electricity from the latter. There may be separate cases for alternative energy uses but it is not prevalent, thus it has not been analyzed in the scope of this study. In case of cherry tomato producers and green pea processors are additionally equipped with electricity generators. Electricity usage is not the major expense for the growers of target NTHVV.

2.6.3 Use of water

Access to water is sometimes the most vital concern for farmers. Irrigation is the essential tool for ensuring crop production, thus if plants experience moisture stress the crop yield declines. The amount of irrigation water resources varies across regions in Armenia. In some regions it is a real challenge and farmers have to source from nearby rivers to irrigate their farmlands.

Some of the target NTHVV such as peas, broccoli, and kohlrabi are cool season crops and are not drought-resistant. There are differences in water use per each crop. As for cherry tomato it requires larger amounts of water than most of the other types of target crops. The amount of water needed for crops depends also on various factors such as weekly rainfalls (in case of open ground cultivation), plant size, type of soil, temperatures, humidity, etc.

Drip irrigation systems installed in the greenhouses as well as in open ground ensure efficient use of water resources. Big firms with modern greenhouses are equipped with drip irrigation system ensuring efficient water use. The injection of fertilizers is also applied through drip irrigation system, ensuring the delivery of nutrient directly to the roots of the plant.

Nevertheless, drip irrigation systems are not widely installed in cultivation of most of the NTHVV, so insufficient water supply has been mentioned as one of the hampering issues. According to several growers there is enough ground water available and it needs to be pumped up which adds additional expenses for the farmers as there is need for advanced pumping equipment. Another challenge is the high cost of pumping water since gravity water resources are scare. So the research stresses that high costs for pumping water as well as installment of irrigation systems and shortage of irrigation water are the hindering factors in farming operations in Armenia.

2.6.4 Effects on bio-diversity

All forms of farming have more or less some impact on biodiversity. Pollution in terms of nutrient overloading which could lead to threats to bio-diversity and increase human health problems is negligible in case of target NTHVV cultivation as according to most of the interviewed growers they use mainly natural fertilizers.

2.6.5 Emissions

In value chain of target NTHVV emissions in terms of loud, unpleasant noise of machinery, bad smells from factory or air pollutants such as ozone depleting substances which may come from generation of energy used in the factory, is rather low taking into account the fact that there is limited processing operations. Emissions are almost nonexistent as there is no large-scale freezing or cooling operations as well in these value chains.

2.6.6 Waste management

The volume of waste materials is also marginal as in case of emissions, due to lack of industrial processing operations in the value chain for most of the target NTHVV. According to several smallholder farmers growing NTHVV they have adopted sustainable production practices, hence they reuse and recycle waste turning it into compost. Using compost instead of chemical fertilizers helps them to reduce the need for pesticides, fertilizers as well as water.

Waste management in terms of generating energy from waste is not a commonly used practice among the NTHVV growers. This could have been an efficient method for producing energy and providing economical, environmental and social benefits.

2.7 Dimension 6: Value Chain Finance

2.7.1 Financial attractiveness

Given the high value of NTHVV and their potential profitability one would assume that investors would be highly interested in investing in these businesses. However, their attractiveness is distorted in the absence of proper demand and export opportunities. Besides, the non-permanent nature of NTHVV cultivation operation, i. e. the cultivation is limited to experimental and demonstrative practices and non-continuous/successive over the years. This is explained by lack of knowledge on proper cultivation techniques, seed quality, etc. resulting in low productivity. One year failure is sometimes enough for certain farmers to switch on to traditional crop growing where they have more expertise and ensured market demand. Usually smallholder farmers would need small loans for working capital throughout the cultivation period. Most of the interviewed smallholder farmers claimed that they had not sought for any loan for this purpose. They are not willing to take up any risks since they have caveats that they would not be able to realize their produce and not be able to repay the loans in time.

2.7.2 Financial risks

Financial institutions operating in Armenia and offering various loan products are commercial banks and UCOs. These institutions undertake proper business feasibility analysis focusing on the actual cash flow stability as a guarantee for payback as well as on loan history as an indicator of conscientious and responsible behavior. For big investment loans besides the above mentioned factors the provision of a high liquidity collateral is a mandatory requirement. The FIs operate under the everyday strict regulation, oversight and control of the Central Bank of Armenia (CBA). It is already more than a decade that stability of Armenian FIs is out of any observable and justified doubt. This stability has been achieved not only by the introduction of financial sector reforms and toughening the financial sector regulations, but also adoption of internal control mechanisms, improvement of lending capacities, etc. All those reforms followed the shocks at Armenian financial market in the beginning of 2000s and closure of several banks. Remaining FIs reassessed their capacities, and adopted drastically improved strategies for further operations and development. Conservative strategy of operating in the zone of minimum risks became the major policy of many FIs in the market. Loan products targeted at NTHVV value chain are categorized as agricultural loans. There is no specific loan product for NYHVV financing.

The main potential risks that can pose threat to payback can be summarized as the following:

- Yield loss resulting for various factors (wrong cultivation practice, bad quality inputs, natural hazards , etc)
- Crop price decline in market due to market load for the respective commodity (domestic overproduction or imported counterparts)
- Spike in prices of the main inputs which will consequently increase product cost, thus shrinking market competitiveness of target commodity.

Despite the general positive situation related to possible risks management, there some hidden factors that may cause unpredictable situations in the market. Snapshot to such factors is presented below:

- Huge number of farmers (tens of thousands) totally used to taking and repaying loans for every need of their households (including also business purposes). If the availability of external financing is suspected even once, they will find themselves in a very risky situation.
- As a continuation of the previous comment - sometimes farmers are not able to repay the previous loan (and interest) and have to apply to other FI for taking another loans and repaying the old one. The worst aspect of this is the capitalization of the interest; in other words it transforms into a small model of financial pyramid.
- “Other” FIs are usually well aware of the previous statement, but they still risk lending the same farmers thus feeding the formation of already mentioned “pyramid”. The major argument is rather psychological - FIs are sure that farmers will always be able to attract finances from “other” FIs if they fail to repay themselves. This assumption is true until the amount of a borrowing remains in the frames of micro or small (up to 1-2 million AMD). Beyond that amount the case turns to become very risky.
- Many FIs in Armenian financial market adopted quite aggressive expansion strategy. Among others we can mention Ameria Bank (extending larger loans), ACBA - Credit Agricole Bank (extending large, medium, small, and micro loans), FINCA UCO (extending small and micro loans). Though the average rates of interest grew in Armenia since December 2014, many FIs have sufficient funds envisaged for being allocated and generating interest. That is why; some FIs do their best to attract as many clients as possible, even at some expense of safe lending procedures.

2.7.3 Norms and practices

The lack of information on the accurate number of NTHVV growers makes it impossible to provide exact data on the financial history of the target farmers. Besides, in line with Armenian legislation on bank secrecy FIs cannot unveil any information about the borrowers. Nevertheless, the fact that the majority of farmers in Armenia are loaded with loan liabilities cannot be denied.

Within this study the interviewed farmers reported of having invested in the production of target NTHVV from the surplus of their other business activities rather than taken loans for this purpose.

Agricultural loans are available both short term and long term. Short term (up to 2 years) small loans are usually for working capital and can be provided without collateral whereas long term (up to 7 years) big loans are mainly investment loans.

2.7.4 Availability of financing

There are no specific types of financing for exactly for NTHVV growers. Instead, in financial market of Armenia there are financial products assigned for primary agriculture (farmers), mainly in the form of micro loans. Similarly, there are small and medium enterprises (SME) lending programs, food processing sector enterprises lending products, or a certain region(s) targeting programs. Some FIs offer leasing services for procurement of any equipment and machinery. Moreover, regularly, various development initiatives provide also grant financing for food sector enterprises. Best examples can be grant initiatives successfully completed by the USDA MAP, USAID ASME, WB funded RESCAD and CARMAC Projects, IFAD funded projects in food processing sector, etc.

Lending to farming households and food processing enterprises is among the most popular activities of Armenian FIs. At least 15 financial institutions provide loans to individuals and legal entities working in these 2 sectors of economy. Ranges of terms and conditions provided to farmers are the following:

- 50,000 AMD - 60,000,000 AMD and $80,000-$150,000;
- 8%-12% annual interest rate;
- 3-84 months repayment period;
- Collateral: real estate, gold, guarantees, movable assets;
- Purposeful and consumer loans.

Detailed description of financial products of 15 FIs are presented in the attached document that can be accessed via the link in XXXX. However, any financial institution will be ready to discuss provision of non-featured lending service to their good clients. Moreover, financial products and services do regularly change in the market.

2.7.5 Major constraints and proposed solutions

Currently target NTHVV are not in high demand and this is the main disincentive for farmers to take a risk especially financial and expand the production of NTHVV. There are several other issues except this main constraint that holds these farmers back.

- Limited market share,
- Lack of contractual arrangements,
- Absence of export strategy resulting in limited investments in the sector,
- Flexible loan products for smallholder farmers (particularly for novice NTHVV growers),
- Local currency fluctuation.

The reality is that the **market share for NTHVV is very small** in comparison with other agricultural products and the growers usually count on interventions by donor/ international organizations in making investments in this sector attempting to make the market for NTHVV dynamic and more functional. Driven by small scale supply of NTHVV there are **no contractual arrangements** between the VC actors which would attest about the feasibility and revenue generation of the target business interactions, thus enabling both growers and financial institutions to be confident in the uptake up financial risks. The immediate solution in this situation could be expansion of domestic market demand and enlargement of cultivated plot areas for the target NTHVV. In the long run **export and processing** opportunities should be established and in place.

Also, the financial products offered by FIs are not attractive for the smallholder start up NTHVV growers. The provision of FIs services are hindered by the absence of **appropriate financial products** which are designed to address specific agricultural lending needs. Thus, financial market situation needs improvements in this respect through application of innovative financial instrument. The interest rates offered by FIs for only firm-currency loans (around 12% annually). This interest rate though the lowest in the market, is not at all affordable for the novice NTHVV growers taking into account that they may suffer losses in the first few years until they obtain firm footing in the market.

Furthermore, negative experience attests that almost every year in recent period the **Armenian Dram devaluates** and local enterprises face additional serious expenses since their proceeds are almost totally in local currency. Mitigation of currency devaluation risks is not realistic, but options for provision of local currency loans at affordable interest rate (let it be subsidized by the State) would be helpful very much. There are many cases when the access to finance is easy and it reaches to farmers without difficulty but they are costly and do not assist in increasing productivity or generating employment in rural areas.
If all the above mentioned barriers were not there and the potential market for these crops was reliable farmers wouldn't fear to take an investment loan for the production and expansion of these crop varieties.

2.8 Dimension 7: Business Environment and Socio-political Context

2.8.1 Business environment

Armenian legislation specifies the following major types (legal statuses) of organizations allowed to run a business in the country: Open Joint Stock Company (OJSC), Closed Joint Stock Company (CJSC), Full Liability Company (FLC), Additional Liability Company (ALC), Limited Liability Company (LLC), and Production Cooperatives (PC). Overwhelming majority (above 95%) of private legal entities in Armenia do operate with the legal status of LLC. This is the easiest form of a legal business entity (Sole Entrepreneurs (SEs) do not have a status of legal entity) to register and run in the country.

Establishment of LLC in Armenia is regulated by a several legal acts. One of the main advantages of this option is that you can open LLC without any significant assets invested as the capital. For example, you can invest a computer (the minimum size of the authorized capital to open LLC. Yet the Law does not determine the minimal investment size, but in some cases this is obligatory). A number of documents are required for the establishment of the LLC that are openly presented in the official website of the State Register of the Legal Entities of the RA MoJ. The registration of the commercial entities in the first time is free of charge; for further amendments the fee comprises 10,000 AMD (slightly more than $20). Theoretically, the organization can be established in 2 working days (the least).

Additional costs related to the establishment of a legal commercial entity in Armenia are expenses on preparation of a seal ($25 approximately), opening a bank account ($2-$10 depending on the bank and embedded services), installation of internet banking tools, etc. Or, a business person may chose to outsource the whole process to a specialized legal advisory entity for about $100-$150.

Armenia also has been continuously reforming its business incorporation regulations in recent years. Armenia established a one-stop shop in 2010, allowing electronic registration and merging procedures for reserving a business name, registering a business and issuing a tax identification number. In 2013 Armenia eliminated company registration fees.

One of the best indicators of the business environment in a country is the Ease of Doing Business index. The index ranks World economies from 1 to 183. For each economy the index is calculated as the ranking on the simple average of its percentile rankings on each of the 10 topics covered in Doing Business 2010, i.e.

exclusive of the electricity pilot data. The ranking on each topic is the simple average of the percentile rankings on its component indicators[79]. Dynamics of the compound index in recent years for Armenia was the following: 2012 - 55, 2013 - 32, and 2014 - 37.

Armenia's position engaged by the Ease of Doing Business index is quite high. In the meantime, this does not mean that Armenia is very attractive for foreign direct investments, or the competitiveness of Armenian products is high at international markets. There are a number of factors seriously affecting (by the negative mean of the term) the business environment. Among others, we can mention unfair treatment of business enterprises by State authorities (including and lead by the State Revenue Committee of the RA MoF), monopolization of very important sectors of economy, availability of too many investigation and controlling entities, high level of corruption, etc.

2.8.2 Product and trade regulations

Currently Armenia has liberalized trade and investment regime. Export restrictions are not set and export taxes in Armenia are not levied, and no system of minimum export prices is in place. Exported goods and ancillary services are zero rated for VAT purposes. Despite these efforts to boost export volumes, as of the end of 2011, food products made only 14% of total exports.

In pursuance of the RA Strategy of Sustainable Agricultural Development for 2010-2020, expanding exports volumes of agricultural products (specially processed products) are one of the country priorities. According to available data none of target NTHVVs is exported in any form. Constraints in the export of agro-products in general are conditioned and undermined by several factors:

- the main constraint of non-compliance with international food quality standards (HACCP, ISO),
- small size farms and small scale production,
- low perishability rate of most fresh agro-produce,
- absence of branding of agricultural products from Armenia,
- drastic currency fluctuations,
- high cost of locally produced products,
- tough/stiff competition in foreign markets in terms of price and quality.

Therefore facilitating and improving business environment through creation of transparent regulatory trade environment and functional markets for export diversification is of utmost importance if we want to see changes in this respect though this is not enough. Mechanisms should be developed for enabling not only access to new dynamic markets but also sustaining market demands which would ensure survival and growth in new export markets.

2.8.3 Public and private service provision

NTHVV individual growers and enterprises are equipped with public and private services, such as public utilities (electricity, gas, water etc., the latter with some reservation). Condition of some infrastructure may be not so good, but still remains usable. Services of FIs (including also insurance companies) are available in all towns of Armenia and are widely accessible for any enterprise. Main consultancy and knowledge suppliers are available in capital Yerevan.

2.8.4 Social and cultural context

[79] http://www.doingbusiness.org/~/media/FPDKM/Doing%20Business/Documents/Reforms/DB10Easeofdoingbusinessrankmethod.pdf

Social and cultural factors affecting NTHVV business are the following:

- Engagement of mostly women in the production phase and their absence in marketing and realization stages;
- Lack of appreciation of NTHVV nutrition profile;
- Low solvency of most buyers.

3 Conclusions and Recommendations

3.1 Conclusions on Value Chain Mapping and Diagnostic Dimensions' Analyses

With the present analysis an attempt has been made to describe the existing situation regarding NTHVV value chain in Armenia. The specific objectives of this study was to identify major constraints encountered in the target NTHVV value chain development (current production systems and processing opportunities for target NTHVV), how these constraints affect profit opportunities as well as revealing the opportunities for expansion of domestic market potential.

The fresh produce market is rather dynamic and new non-traditional crops emerge in the market though slowly. In this context government interference/intervention in terms of adoption of functional national policy on non-traditional crop production could be an asset for the country to be able to enter new markets and stabilize their market position. Specific approaches should be developed for the promotion of marketing linkages, technology uptake, and ensured delivery of financial resources to agricultural sector.

3.2 Conclusions on Development Constraints

The market share of target NTHVV is small and limited, which is a direct result of lack of consumer awareness and low market demand for the majority of these commodities. There have been several small scale interventions in this respect aiming at the promotion of non-traditional crops in Armenia and enhancing utilization of new agricultural technologies, thus opening up new opportunities for farmers. It is indisputable and evident that there are certain improvements and progress though it is still early to talk about reliable and organized markets for the target commodities. Given the suitability of certain crops in terms of climate tolerance, palatal preferences, health benefits and other factors the adoption of some of the target NTHVV (such as broccoli, cherry tomato) has been immediate. Despite the smooth adoption process these farmers are not yet able to ensure large production volumes and the commercialization will take time to be largely prevalent. Most of target farmers are novices in NTHVV growing, they lack knowledge on the cultivation methods of non-traditional crops and organize farming based on the practices and experiences. Armenian market demand needs improvements in commodity diversity as well as production volumes. Some level of ignorance is prevalent on the nutrition profile, taste features and usage of target crops.

3.3Recommendations on Overcoming the Constraints

The recommended ways of overcoming constraints hindering the development of this sector are as follows:

1. **There is a gap in the knowledge of international standards and best agricultural practices.**There is a need in building up knowledge base through training sessions on the cultivation techniques of NTHVV, international standards (HACCP, ISO, etc.).
2. **Small scale production:**Given the limited demand for NTHVV and small-scale production associated with the former constitute issues hampering the elaboration of end markets and trade in this sub-sector of the industry. Driven by small scale supply of NTHVV there are **no contractual arrangements**between the VC actors which would attest about the feasibility and revenue generation of the target business interactions, thus enabling both growers and

financial institutions to be confident in the uptake up financial risks. The immediate solution in this situation could be expansion of domestic market demand and enlargement of cultivated plot areas for the target NTHVV.

3. **Lack of processing operation for the majority of target NTHVV:**No commercialized processing activity exists for most of the target NTHVV which means that there is no value adding before supplying to the final consumers. This factor narrows the market opportunities hence, marketing research and assistance will be needed to identify potential value added market opportunities for this value chain development. However several processing options could be recommended identified as a result of this study. The following options for processing scenario can be recommended:
    - Marinated-broccoli, cherry tomato, kohlrabi, artichoke,
    - Jam made from physalis,
    - Freezing broccoli, raw pea.

4. **Poor food safety management for fresh produce:**Absence of food safety certification, food safety management systems and traceability throughout the supply chain decreases consumers' confidence in quality of agricultural products and undermining the access to international markets. The adoption of GAP, abidance by international standards and consistent oversight/supervision would ensure high quality and safe produce, thus facilitating access to foreign markets. Export market development could have a significant impact on economic growth and employment generation through inclusion of small scale farmers into the supply chain. At this stage it would be appropriate to address branding as a further development tool for export market.

5. **Unattractive financial products:**Financial constraints that are hindering the improvement of the sector are several. Irrespective of the volume of farming operations, liquidity related problems arise and financial institutions can play key role here. But as indicated by the majority of interviewed small farmers high interest rates and exchange rate fluctuations refrain them from applying for standard agricultural loans for cultivation of NTHVV bearing in mind that this sector is more risky and there are no hedging instruments or insurance market for agricultural sector that could mitigate their risks. In this respect financial institutions should tailor their financial products to customers needs (loan duration, grace period, interest rate, pledge, etc.,) by developing attractive lending products.

6. **Poor level of consumer awareness, demand and lack of marketing policy on NTHVV:**The adoption of NTHVV production and processing is mostly undermined by the consumer demand. Besides, the supply is not large-scale and systematic. Moreover, the major constraint in boosting the market share of NTHVV in Armenia is the lack of consumer awareness. There are not many large scale interventions on the promotion of non-traditional crops in Armenia which would target at the increase of consumer awareness and open up new opportunities for farmers in cultivating non-traditional crops in enhanced volumes.

Marketing campaigns should be developed In Armenia to promote NTHVVs with targeted advertising on useful and healthy characteristics of the crops, which could lead to market demand increase and higher prices for the NTHVVs. Attitude of population could be changed towards non-traditional crops by organizing cooking festivals, exhibitions, promotions etc..

All the above mentioned constraints/obstacles should be tackled in sequence on the national level with the support of donor/international organizations to ensure the achievement of desired results otherwise any small scale separate attempt is bound to fail, thus collective effort and commitment from all the interested parties will generate constructive outcomes.

Annex 7: Value Chain Business Model: Buckwheat

Value Chain Upgrading Strategy

The project's buckwheat value chain upgrading strategy aims to launch one processing plant per marz in four marzes, with two plants launched per year in 2016 and 2017. A number of primary producer cooperatives would be clustered around each of the cleaning, hulling and packaging enterprises, with eight cooperatives formed in the first year, and ten in the second year, per processing plant. The enterprise reaches nearly a 100% return on investment in the third year, when processing capacity is estimated to reach 82%. Farmer earnings would be AMD 227,848 per ha in the first year, and would increase overall as each farmer brings more land under buckwheat cultivation and with increasing efficiencies. Based on the proposed business model, buckwheat production would be about 2.4 times more profitable than wheat production, while buckwheat can also be cultivated on currently abandoned land. Summary data for the value chain intervention overall, including the launch of four processing plants and the accompanying clusters of primary producer cooperatives, is provided below.

	Unit	2015-2016	2017
Number of new processing plants (one per marz)	marzes	2	2
Cumulative number of processing plants	marzes	2	4
Number of new primary cooperatives	coops	16	16
Cumulative number of primary cooperatives	coops	16	32
Number of farmers/farms	farmers	80	260
Area under buckwheat production	ha	80	340
Buckwheat cleaned & packaged	ton	97.2	413.1
Total producer earnings from buckwheat production	AMD	18,227,800	77,468,150
Average profit per farm	AMD	227,848	297,954

With financial support for semi-subsidized equipment of 22,252,560 AMD able to be provided by the ENPARD project, an additional 20,640,000 AMD would be required to complete the physical infrastructure and to purchase a vehicle. A bank loan of 3,000,000 AMD in working capital would also be necessary to cover the processing plant operational costs in the first year. UNIDO and UNDP would also provide intensive business coaching and start-up support.

Description of the Concept

Description of the opportunity:

According to various sources, Armenia's buckwheat annual consumption is around 8,400 tons, which is 100% imported from Russia and Ukraine. Though, Armenian climatic conditions are favorable for buckwheat cultivation, there is no local buckwheat production or processing facilities. An Agricultural Support Center (ASC) supported trial cultivation of buckwheat organized in Shirak marz achieved good productivity (1.8 tons/ha).

Thus far, efforts to organize cleaning of buckwheat failed due to the improper technology. Equipment provided by CARMAC was poor and the processed buckwheat had a low commercial value. Presently, locally produced buckwheat can be used for seeds only, although the quality is questionable.

Business model:

The model organizes primary production within cooperatives in dedicated communities (with available land and the suitable climatic conditions for buckwheat production). Primary production cooperatives will be the founders of the processing cooperative, structured as a cooperative of cooperatives. The production cooperatives will provide a number of services to their members, including seed storage, centralized procurement and distribution of fertilizer and chemicals, and transportation services. As they develop, the primary cooperatives could purchase agricultural machinery, other inputs or even extension services, to provide to the members.

The processing cooperative will provide cleaning/hulling, sales and marketing services to its members. Based on the members' decision, additional services can be provided. The processing cooperative will provide services to its members at the lowest price, to cover the operational costs of processing only. For the similar services, market prices will be charged to non-members. The generated profit will be passed through and distributed to the members at the primary cooperative level, to avoid profit tax. The profit received at the primary coop level will be treated as surplus and will be free of taxation[80]. The following formula shows the profit distribution among in the cooperatives:

PM = WSP – ((PRC+PRF) + (PPC+PPF))

PM – price paid to the members for raw/unclean buckwheat

PPC – the primary coop operational cost (storage, transportation, others)

PPF – the primary coop development fund (%, based on the members decision)

PRC – the processing coop operational cost (cleaning, packaging, M&S, others)

PRF – the processing coop development fund (%, based on the members decision)

WSP – wholesale price for packaged buckwheat/market price

Market Analysis *(For decorticated, cleaned, and packaged buckwheat)*

Market size (quantity and value):

Annual buckwheat consumption per capita is **2.8 kg** and the total country consumption is approximately **8.4 mln. kg**.

[80] According to the current law on cooperatives

Based on the snapshot survey the buckwheat price varies from AMD 620 to 1,400 per kg. Retail market approximate value is **6,740 mln. AMD** (average buckwheat price is **800 AMD/kg**). Wholesale market value is **5,391 mln. AMD** based on estimated average wholesale price of **640 AMD/kg**. Since the Armenian population is not growing (but actually declining since 2011), the size of the buckwheat market is also not growing. However, the Georgian market offers an export opportunity, as like Armenia, the country imports nearly 100% of the buckwheat it consumes.

Product characteristics desired by the market:

Based on grain wholeness, color, smell and other indicators, the locally sold buckwheat has 3 categories: I, II and III grade[81]. Two main methods of buckwheat processing are used, differentiated according to the method of buckwheat husk cleaning: the kernel parboil before cleaning method and the “green” method. The buckwheat sold at the local market is not differentiated by the method of processing. However, the greatest share of buckwheat presented at the local market is passes thermal treatment (parboiling).

The customer’s preference is for buckwheat with no husks, without impurities, and with uniform shape and color. Hulled/clean buckwheat is imported mainly from Russia, and packed by local companies or sold by kg. Currently the packed buckwheat is sold under more than 6 local brands and 4 Russian brands. Depending on the quality and brand, buckwheat retail prices range from 630 to 2000 AMD per kg. The most expensive variety is “green” buckwheat sold under the Russian brand “Mistral,” which costs 3200 AMD per kg.

Competitors:

Table below summarize competing brands, country of origin, packaging types and price range[82]:

Brand	Country origin	Packaging, kg	Price, AMD	Price per 1 kg/AMD
CITY	Armenia	1	630	630
Maranik	Armenia	0.5	710	1420
Maranik	Armenia	1	1410	1410
Makfa	Armenia	0.8	850	1062.5
Petrovskie Nivi	Russia	0.7	690	986
Moya Semya	Armenia	0.5	400	800
Mistral	Russia	0.8	1100	1375
Mistral (green)	Russia	0.45	1440	3200
Yarmarka	Russia	0.8	830	1037.5
Yarmarka (cardboard box)	Russia	1	2000	2000
Sto receptov	Russia	0.9	790	878
Voske Jraxac	Armenia	0.5	590	1180
Smak	Armenia	1	680	680

[81] According to the GOST (Food standards adopted during Soviet time and in force in many CIS countries)
[82] Observation made in CITY supermarket.

According to various sources, the purchasing behavior of local consumers shows a preference for the cheaper product, with a relatively better/cleaner production. In this case, about 80-90% of the buckwheat market share belongs to the brands within the price range of 800 to 1100 AMD per kg.

Marketing Plan *(For decorticated, cleaned, and packaged buckwheat)*

Product:

Locally processed buckwheat will be "green", meaning that hulling/cleaning process will be performed without kernel parboiling. The buckwheat will enter to the local market with attractive, modern and innovative packaging, including a brand name, emphasizing the social importance of agricultural cooperatives. There will be 0.5 kg and 1 kg packaging for the retail market and 5 kg bags for wholesale and HORECA sectors. The World Food Program's Purchase for Progress (P4P) program has expressed interest in bulk purchases of locally produced buckwheat. The packaging will also contain the cooperative logo, cooperative contact details, innovative cooking recipes and cooperative promotional context.

Sales outlets/channels:

Depending on production volume supermarkets and grocery stores will be considered as the primary sales channels. Alternatively kindergartens, cafes and canteens will be targeted for locally grown "green" buckwheat.

Price:

The cooperatives will have flexible pricing strategy. Based on the market requirements and growing demand the buckwheat price can increase in upcoming years. However, in the financial forecast wholesale price for packed buckwheat is estimated at 490 AMD/kg (Ist year) to 520 AMD/kg (3^{rd} year).

Promotion: For wider coverage, it is advisable to organize a promotional campaign in supermarkets and relatively bigger grocery stores. Promotional packaging (100 gr) of buckwheat will be distributed in the shops for tasting. Additionally, promoters will present the whole production process to the potential customers and explain "green" methods of production. Innovative recipes for "green" buckwheat usage will be presented, e.g. sprouted buckwheat used in salad.

Financial Plan *(For the processing enterprise)*

Annual capacity of the factory (tons):

The processing equipment with the minimal cleaning capacity of 200 – 250kg/h was identified for start-up operation. It is projected that the processing plant will work with the following schedule: 7 hours per shift, 20 working days, 10 months. The total annual capacity will be **350 tons**.

Value @ wholesale price of quantity of factory capacity (AMD): 171,500,000 AMD

Value @ producer price of quantity of factory capacity (AMD): 145,781,198 AMD

Estimated operational cost of factory (electricity, water, fuel): 1,443,651 AMD

Estimated transport cost of primary production to factory (fuel, driver): 400,000 AMD

Estimated salaries of managers: 530,400 AMD

Estimated salaries of factory workers: 697,000 AMD

Cost of the equipment/technology: 22,252,560 AMD

Cost of the building (capital investment): 16,800,000 AMD

Annual depreciation ((cost of equipment + cost of building) * 10%): 467,326 AMD

Interest rate for short term credit (for working capital) (%): 18%

Tax rate (%): 30%

PROCESSING ENTERPRISE

INCOME STATEMENT (Processing Enterprise)	**2016**	**2017**	**2018**
Factory operates at (%) of capacity	16%	59%	82%
Revenue			
Quantity processed (use processing coefficient)	43,200	154,950	216,300
Whole sale price	490	504.7	519.8
Buckwheat sales	21,168,000	78,203,265	112,441,608
Husks sales	1,440,000	5,319,950	7,649,089
Total revenue, AMD	22,608,000	83,523,215	120,090,697
Costs of goods sold			
Cost of purchasing primary production	17,704,886	65,409,105	94,046,008
Operational cost of factory	1,443,651	5,178,094	7,228,278
Transport cost (field to factory)	623,127	2,235,036	3,119,964
Total COGS	19,771,664	72,822,235	104,394,251
Gross profit	2,836,336	10,700,980	15,696,447

Sales, general and administrative			
Salaries of co-op/business managers	530,400	1,591,200	2,386,800
Salaries of workers in factory	697,000	2,091,000	3,136,500
Other costs	122,740	368,220	552,330
SG&A	1,350,140	4,050,420	6,075,630
Earnings before tax, interest & depreciation (EBITDA)	1,486,196	6,650,560	9,620,817
Depreciation	467,326	467,326	467,326
Earnings before tax & interest (EBIT)	1,018,870	6,183,234	9,153,491
Interest	300,480	-	-
Earnings before tax	718,390	6,183,234	9,153,491
Tax			
Net income	718,390	6,183,234	9,153,491
CASH FLOW (Processing Enterprise)	**2016**	**2017**	**2018**
Net income	718,390	6,183,234	9,153,491
Plus depreciation	467,326	467,326	467,326
Cash flow from operations	1,185,716	6,650,560	9,620,817
Investing			
Construction of building	16,800,000		
Capital cost of equipment	22,252,560		
Other capital costs (vehicle)	3,840,000	1,680,000	1,680,000
Cash flow from investing	42,892,560	1,680,000	1,680,000
Financing			
Grants from ENPARD	22,252,560		

Grants from third party	-		
Equity investment from third party	20,640,000		
Short term loan (working capital)	3,000,000		
Repayment of short-term loan	3,000,000		
Long term loan			
Repayment of long-term loan			
Cash flow from financing	42,892,560	-	-
Cash flow	**1,185,716**	**4,970,560**	**7,940,817**
Cumulative cash flow	**1,185,716**	**6,156,276**	**14,097,092**

A pessimistic projection shows that the factory will reach its full operational capacity in 2018, providing only 3% of the country's buckwheat consumption. Therefore, the market will not be a limiting factor in achieving the financial projections.

NATIONAL MARKET SHARE	**2016**	**2017**	**2018**
Market share captured by processing factory (%)	1%	2%	3%
Factory operates at (%) of capacity	16%	59%	82%

Additionally, three mln. AMD working capital is required for the first year of operation. Cash flow analysis will show the cash requirement in detail. An 18% of annual interest rate was projected, based on the current average offered by the local MFIs.

Primary Production Plan *(For the producer cooperatives)*

PRODUCTION PLAN	**2016**	**2017**	**2018**
Quantity of primary production	68,000	221,000	306,000
Yield/ha	1,700	1,700	1,700
Number of hectares	40	130	180
Number of hectares per farmer	1	1,4	2
Number of farmers	40	90	90
Number of farmers per cooperative	5	5	5
Number of cooperatives	8	18	18

ENPARD will support the creation of 8 primary cooperatives in each of the targeted marzes, which will supply to processing cooperative. Later, the number of primary cooperatives will increase without ENPARD support. Technical support will be provided to the processing cooperatives to improve management, marketing, administrative, food safety and other skills required for smooth operation. This business model with primary cooperatives clustered around processing cooperatives could potentially be launched in Shirak, Lori, Aragatsotn, Kotayk, and Gegharkunik.

Primary Cooperatives Financial Plan

The primary producer cooperatives will accumulate the harvest of all members and deliver it to the processing cooperative. At the initial stage of operation the primary cooperative will provide a seed storage service for the upcoming sowing season. With the further development, the primary cooperative will/can provide additional services, such as organizing transportation of raw buckwheat to the processing plant, or buying fertilizer and other input in bulk to distribute among the members, etc. The following statement shows the financial results for all of the primary cooperatives combines, but cab be adapted to a single cooperative in the business planning phase.

INCOME STATEMENT (Consumption cooperative)	**2016**	**2017**	**2018**
Revenue			
Storage services			
Quantity of seeds	3,200	10,400	14,400
Storage price, AMD/kg	9	8.8	9.0
Total from storage	190,400	637,364	908,979
Total revenues	190,400	637,364	908,979
Cost of services provided			
Storage operation	89,600	299,936	427,755
Cost of agricultural inputs purchased for members			
Operations cost: combines (fuel, driver)			
Marketing costs (if any)			
Total COGS	89,600		
Gross profit	100,800	337,428	481,224
Sales, general and administrative			
Salaries of co-op manager & accountant	95,280	285,840	428,760
Payments to workers	-	-	-
Other costs	-	-	-
SG&A	95,280	285,840	428,760

Earnings before tax, interest & depreciation (EBITDA)	5,520	51,588	52,464
Depreciation (tractors, combines, other)	0	0	0
Earnings before tax & interest (EBIT)	5,520	51,588	52,464
Interest	0	0	0
Earnings before tax	5,520	51,588	52,464
Tax	0	0	0
Net income	5,520	51,588	52,464
CASH FLOW (Consumption Cooperative)	**2016**	**2017**	**2018**
Net income	5,520	51,588	52,464
Plus depreciation	0	0	0
Cash flow from operations	5,520	51,588	52,464
Investing			
Cost of tractor with accessories	0	0	0
Cost of combine with accessories	0	0	0
Other capital costs (storage maintenance)	250,000	100,000	150,000
Cash flow from investing	250,000	100,000	150,000
Financing			
Grants from ENPARD	0	0	0
Grants from third party	0	0	0
Equity investment from third party (farmers)	250,000	100,000	150,000
Dividend from processing enterprise	0	0	0
Short term loan (working capital)	0	0	0
Repayment of short-term loan	0	0	0
Long term loan	0	0	0
Repayment of long-term loan	0	0	0
Cash flow from financing	250,000	100,000	150,000
Cash flow	**255,520**	**151,588**	**202,464**
Cumulative cash flow	**255,520**	**407,108**	**609,572**

Production Financial Forecast

FARMER

FARMER INCOME STATEMENT	2016	2017	2018
Revenue			
Total production of cooperatives	68,000	221,000	306,000
Producer price/kg	**307.4**	316.6	326.1
Unprocessed buckwheat sales	20,901,602	69,968,113	99,785,293
Straw sales	816,000	2,731,560	3,895,625
Total revenue	**21,717,602**	**72,699,673**	**103,680,918**
Production costs			
Certified seeds	3,200,000	2,150,047	3,066,298
Tillage	480,000	1,560,000	2,160,000
Sow, cultivate	480,000	1,560,000	2,160,000
Diesel	1,400,000	4,550,000	6,300,000
Fertilizer	4,200,000	13,650,000	18,900,000
Pesticide	400,000	1,300,000	1,800,000
Labor	1,400,000	4,550,000	6,300,000
Harvesting costs			
Harvesting	1,200,000	3,900,000	5,400,000
Harvesting other/baling	404,000	1,313,000	1,818,000
Storage & transport			
Warehouse storage fee (for seeds)	82,571	268,357	371,571
Transport of harvest to warehouse	400,000	1,300,000	1,800,000
Depreciation of farm equipment			
Depreciation	-	-	-
Tax			
Land tax	200,000	650,000	900,000

Bank interest			
Interest rate	-	-	-
Total cost	**13,846,571**	**36,751,404**	**50,975,869**

Farmer net income from production	**7,871,031**	**35,948,269**	**52,705,049**

Average net income per ha	**196,776**	**276,525**	**292,806**
Average net income per farmer	**196,776**	**399,425**	**585,612**

Given that the average farmer in the cooperative will produce 1 ha of buckwheat, earnings for first year per farmer will be 196**,776** AMD.

Technical Specifications *(For the processing plant)*

Description of the equipment and of the steps in processing:

Among the appropriate buckwheat processing lines there is a line that consists of two units: a cleaning and sizing unit, and a hulling and separating unit.

The cleaning and sizing unitcleans out various impurities in the buckwheat (such as large and small impurities, light impurities, heavy impurities, etc.), and sizes the buckwheat seeds into 7 grades.

The hulling and separating unit hulls each one of the grades (except the smallest grade) respectively by adjusting the distance between the two grinding wheels of huller, then removes the shells, and thoroughly separates the un-hulled seeds from the kernels. Un-hulled seeds are run back through the huller automatically for hulling again.

Components:

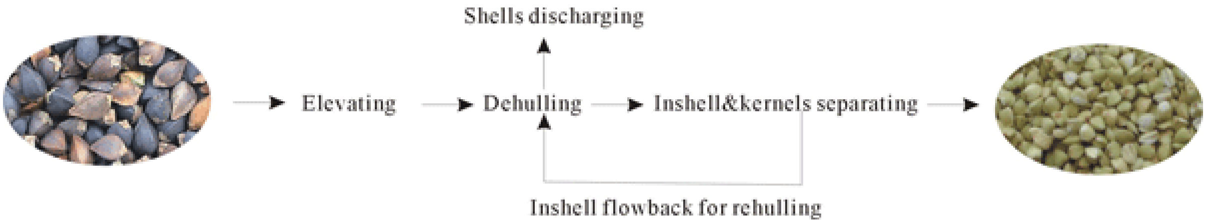
The cleaning and grading unit consists of an input hopper, a cleaner, a bucket elevator, a sizing machine (3 sets) and an electric control cabinet. The hulling and separating unit consists of an input hopper, a bucket elevator, the main part of the machinery (4 sets of huller, cyclone, shells collector, separator for shells-seeds-kernels, a separator for seeds-kernels), and an electric control cabinet.

Process description:

Cleaning and sizing unit:

Input → cleaning → elevating → sizing → buckwheat seeds (7 grades).

Hulling and separating unit:



Main parameters:Total Power: 13.95kw (380v)

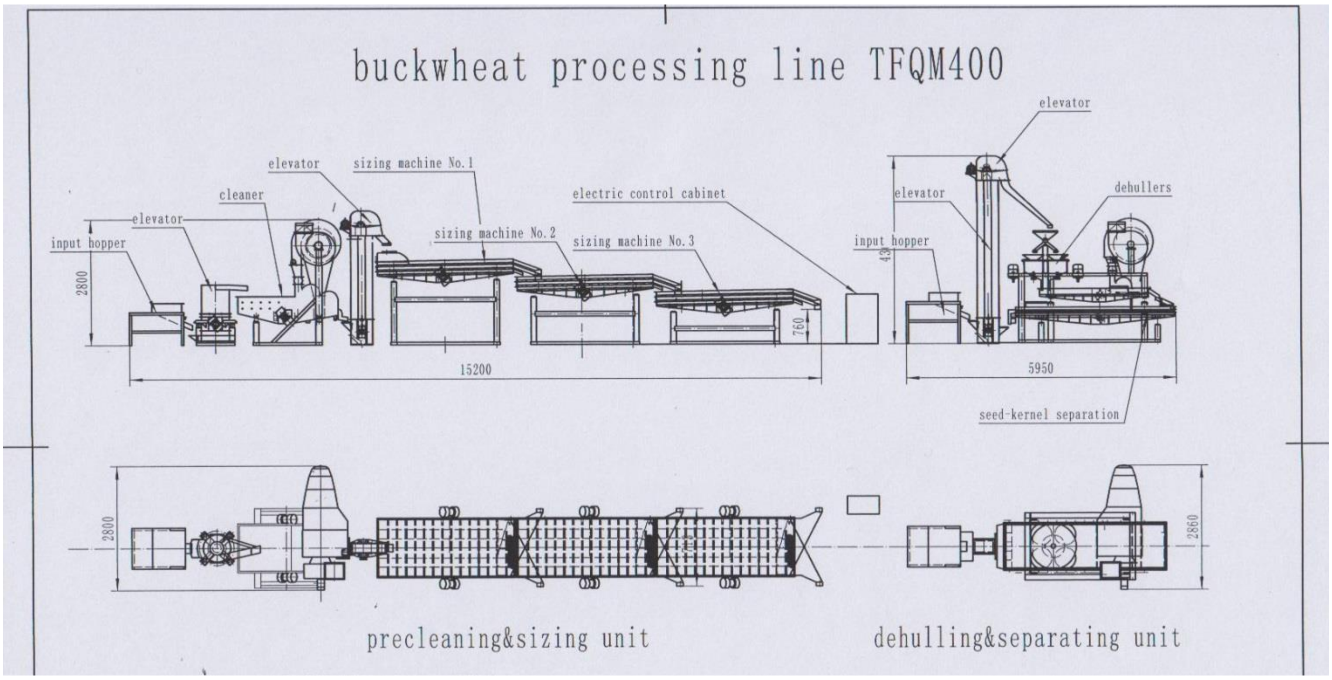
Cleaning and sizing unit:

- Power: 4.11kw
- Capacity: 800-1000kg/h
- Occupied area: 15.2 m × 2.8m
- Height: 2.8m

Hulling and separating unit:

- Power: 9.84kw
- Output: 200kg/h -250kg/h kernels
- % of buckwheat kernels: 75% (i.e. 1kg of buckwheat seeds can be produced into 0.75kg of buckwheat kernels).
- % of unhulled seeds in the kernels: less than 2%
- % of the broken kernels (Broken kernel is less than 3/4 of whole buckwheat kernel): 2% max.
- Occupied area: 5.95m × 2.86m
- Height: 4.3m

The equipment and processing line layout are shown below.



Weighting and packaging unit:

<u>YB-6 Semi-automatic Weighting and Filling Machine</u>

Packing speed	6-12 bags/min
Packing range	500g-6kg
Filling accuracy	≤ ±4g

Power	250 W
Power supply	1ph AC220V, 50/60Hz
Net weight	180kg
Machine dimension	L800 × W850 × H2150mm
Price (USD), FOB Dalian China	4,000

<u>YB-ZT Z type material elevator</u>

This machine is suitable for automatic transporting of candies, chocolate, beef granules, potato chips, rice crust, shrimp strips, plastic, small hardware, and various food, medical and chemical granule products. Some characteristics include the following:

1. Lifting products to vertical packaging machine/electronic scale by chain bucket, it automatically controls supply of the raw products.
2. The machine's overall height depends on the packing machine's height.
3. The machine body can be made by carbon steel or stainless steel. (Material bucket is made from food grade plastic PP).

Price (USD), FOB Dalian, China 2,900 USD

<u>YB-600 Semi-automatic sealing machine</u>

Pulse power	1.2kw
Bag width	600-800mm
Sealing width	8mm
Load weight	Max 6kg
Electric adjustable time	0.2-2 seconds
Machine size	850*600*950mm
Machine weight	40kg
Price (USD), FOB Dalian, China	410

Factory layout:

The processing machines can be installed into two separate rooms or can be accommodated in a single area. The area should meet basic food safety requirements. A concrete floor will be sufficient to run the operation. The table below shows technical requirements for the processing plant:

Units	Plant area, m (LxWxH)
Cleaning and sizing unit	17x4x3.5
Hulling and separating unit	8x4x6

Weighting and packaging unit	4x4x4
Total required area, m (LxWxH)	29x12x6

The total required area for processing plant will be 29m by 12m. The height of the site will be 6 meters. The additional distance between units for operating and maintenance has been considered.

Technical Plan and Comparative Analysis *(For primary* production*)*

The following table describes the technology and methods used to produce buckwheat

Activity	Buckwheat
Sowing time (depend the zones)	May-June
Sowing rate	80-100 kg/ha
Sowing depth	4-6 cm
Vegetation period	80-90 days
Sowing	Grain drill
Harvesting	Grain combine

Description of the differences between buckwheat production and wheat production:

Financial analysis of Wheat and Buckwheat value chains (for Shirak Marz)

2013	Unit	Wheat	Buckwheat
Production	000 ton	311.6	0.0
Export	000 ton	17.5	0.0
Import	000 ton	371.4	
Annual Consumption in Armenia	000 ton	665.5	8.4

(per 1 ha)

Production			
		Wheat	Buckwheat
Grain (average last 10 years)	kg	2,500	1,700
Seed for next year	kg	300	80
For sale	kg	2,200	1,620
Straw	kg	2,500	1,020

	Unit	Before ENPARD (wheat)	After ENPARD (buckwheat
Production costs			
Certified seeds	kg	300	80
Price for 1 kg	AMD	250	1,000
Seeds value	AMD	75,000	80,000
Tillage	AMD	12,000	12,000
Sowing, cultivate	AMD	12,000	12,000
Harvest	AMD	20,000	30,000
Diesel	AMD	35,000	35,000
Fertilizer	kg	250	300
Price for 1 kg fertilizer	AMD	120	350
Fertilizer value	AMD	30,000	105,000

Pesticide	AMD	15,000	10,000
Labor	person/day	7	7
Average pay/day	AMD	5,000	5,000
Labor costs	AMD	35,000	35,000
Transport costs	AMD	10,000	10,000
Land tax	AMD	5,000	5,000
Other costs	AMD	3,000	3,000
Subtotal-Production costs	**AMD**	**249,000**	**334,000**
Production costs	AMD/kg	99.6	196.5

Cleaning & packaging			
Cleaning waste coefficient	%	5	25%
Wastes	kg	110	405
Cleaned grain	kg	2,090	1,215
Grain packaging	AMD/kg	2	73.5
Grain packaging costs	AMD	4,180	89,303
Straw bale (1 bale-20kg)	piece	125	51
Straw packaging	AMD/bale	100	100
Straw packaging costs	AMD	12,500	5,100
Subtotal-Cleaning & packaging costs	**AMD**	**16,680**	**94,403**

Total production, cleaning & packaging costs	**AMD**	**265,680**	**428,403**
Processing costs	AMD/kg	127.1	352.6
Revenue & income			
Price of cleaned grain	AMD/kg	150	490
Price of straw	AMD/bale	300	400
Price of wastes	AMD/kg	80	100
Revenue from grain sales	AMD	313,500	595,350
Revenue from straw sales	AMD	37,500	20,400
Revenue from wastes sales	AMD	8,800	40,500
Total revenue	**AMD**	**359,800**	**656,250**

Profit	**AMD**	**94,120**	**227,848**
Profitability	**%**	**35.4**	**53.2**
Increasing of profitability due to ENPARD project for I year	**%**		**17.8**
Increasing of profitability due to ENPARD project for II year*	**%**		**129.4**

*- conditioned with the availability of own production seeds

Institutional/Ownership Model

The processing unit will belong to the cooperative of primary producer cooperatives. The primary producer cooperatives will be founders and members of the processing cooperative. During the duration of the project, the granted equipment will be owned by the project and after cooperative registration (in the State Registry) will be transferred to the cooperative as indivisible assets. Other terms of new members and membership fees will be discussed with the groups and incorporated in the cooperative charter. Under the current law, cooperatives must have seven members, while under the expected law on cooperatives the required membership is expected to be reduced to 5.[83]

Founding/activities of the primary cooperatives:

The cooperatives will be open to everyone in the communities interested in receiving services offered by the cooperative, and ready to undertake the responsibilities of a cooperative member.

[83] If the law is not passed in 2015 as expected, then the number of members per groups will need to be increased to the minimum of 7 by the end of 2016, by when the cooperatives will be registered.

Each of the members of the cooperatives will have one vote. The membership of the cooperatives could grow over the years.

As noted above, during the first year the services offered by the cooperative will include distributing fertilizers and seeds, as well as providing the mechanism through which members will be trained in GAP. Based on the members' decision revolving fund of seeds, fertilizers, fuel, etc. can be established after the first harvest sales.

The management of these activities, along with other responsibilities will undertake the president/manager of the cooperative in accordance with his or her job contract. The cooperative will receive these production inputs as a donation of ENPARD project (UNDP). In the future, cooperative members will purchase these inputs from earned income, as they currently purchase inputs for wheat. However, the cooperatives will be supported to make bulk purchases.

The amount of membership payment is fixed by the statutes considering expenses of founding the cooperative (normally it is about AMD 50,000 and includes duties, bank payments, stamps, etc.).

Founding/activities of the processing cooperative:

The primary cooperatives will be the members of the processing cooperative of cooperatives. The president of this cooperative will be elected by all the members and should not be the president of any of the first-level cooperatives. The founding of the processing cooperative will be a new precedent based on the opportunities offered by the new law, as such an option does not exist currently.[84]

The activities of the processing cooperative will be regulated by RA legislation. The job contracts of members will be concluded according to the labor legislation. The cooperative will operate transparently and openly.

Staff (of the processing cooperative and the primary cooperatives):

The processing cooperative staff will consist of 11 people who would report to the board of the cooperative, including 4 production and 7 administrative employees. For the first year of operation the total annual gross salary will be **1,227,400 AMD.** Based on the processing volume the number of operational months will increase from 2 to 9 months during forecasted duration. The sales/distributor will receive a monthly salary and a percentage from sales. Other employees will receive monthly salaries.

Each primary cooperative will have president/accountant selected by the members, who will receive a monthly salary. The accountant of the processing cooperative will provide accounting services to the primary cooperatives at no charge.

[84] The processing activities can be performed under current law and it can operate as consumption cooperative, which will provide services to its members.

A detailed salary scheme is presented below.

Direct salary, AMD

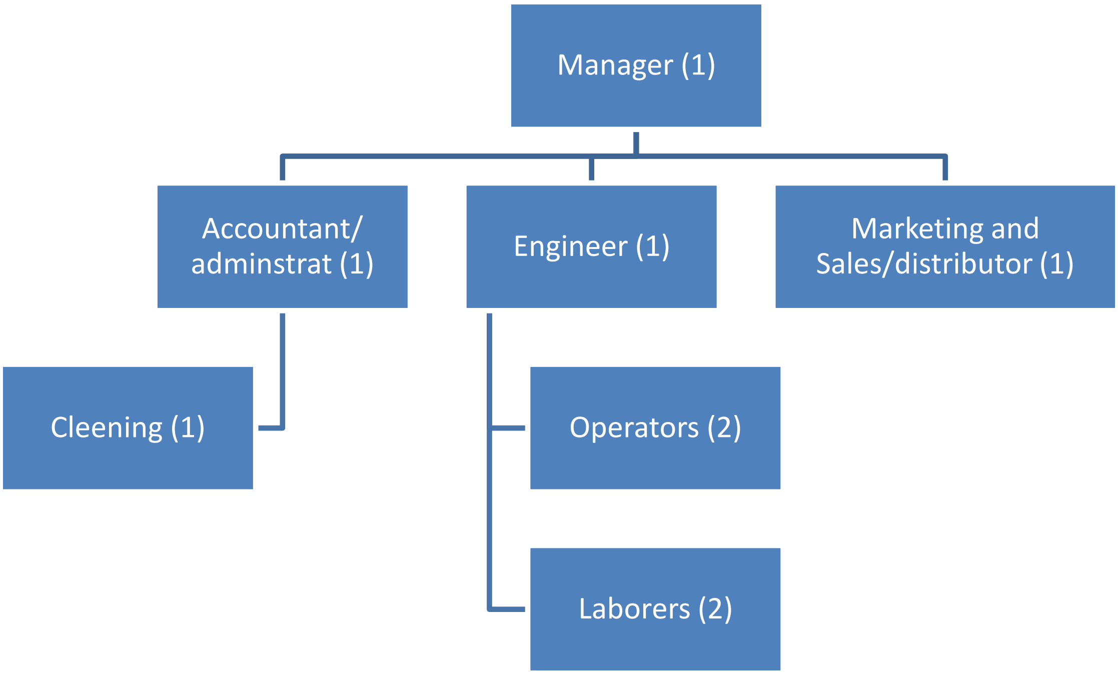
Position	Number	Monthly gross salary	Income tax	Total salary
Operators	2	106,000	26,000	212,000
Laborer	2	92,600	22,600	185,200
Sales/distributor	1	50,000	12,000	50,000
Total, direct monthly	**4**			**447,200**

Indirect salary, AMD

Position	Number	Monthly gross salary	Income tax	Total salary
Manager	1	132,600	32,600	132,600
Accountant	1	132,600	32,600	132,600
Cleaning	1	79,400	19,400	79,400
Engineer	1	119,100	29,100	119,100
Sales/distributor	1	150,000	37,000	150,000
Total, indirect salary	**5**			**613,700**

Salary, primary production cooperative						
Position	**Number**	**Monthly gross salary**	**Income tax**	**Total salary**	**Working days**	**Salary**
President	1	79,400	19,400	79,400	3	11,910

Organizational chart



Annex 8: Value Chain Business Model: Lentil (Lens culinaris)

Value Chain Upgrading Strategy

The project's lentil value chain upgrading strategy aims to launch one processing plant per marz in four marzes, with two plants launched per year in 2016 and 2017. A number of primary producer cooperatives would be clustered around each of the cleaning and packaging enterprises, with eight cooperatives formed in the first year, and ten in the second year, per processing plant. Due to the relatively low cost of the necessary equipment, the enterprise reaches nearly a 200% return on investment by the second year, when processing capacity is estimated to reach 6%. Farmer earnings would be AMD 311,905 per hectare in the first year, and would increase overall as each farmer brings more land under lentil cultivation and with increasing efficiencies. Based on the proposed business model, lentil production is about 3.3 times more profitable than wheat production, while lentil can also be cultivated on currently abandoned land. Summary data for the value chain intervention overall, including the launch of four processing plants and the accompanying clusters of primary producer cooperatives, is provided below.

	Unit	2015-2016	2017
Number of new processing plants (one per marz)	marzes	2	2
Cumulative number of processing plants	marzes	2	4
Number of new primary cooperatives	coops	16	16
Cumulative number of primary cooperatives	coops	16	32
Number of farmers/farms	farmers	80	260
Area under lentil production	ha	80	340
Lentil cleaned & packaged	ton	88.96	378.08
Total producer earnings from lentil production	AMD	24,952,385	106,047,636
Average profit per farm	AMD	311,905	407,876

With financial support for semi-subsidized equipment of 9,667,680 AMD able to be provided by the ENPARD project, an additional 8,640,000 AMD would be required to complete the physical infrastructure and to purchase a vehicle Working capital requirements would be minimized if farmers do not require cash at harvest for their lentils. These arrangements will be explored and developed in detail at during the business planning phase with the farmers. UNIDO and UNDP would also provide intensive business coaching and start-up support.[85]

[85] The lentil and buckwheat processing equipment could be housed under the same roof, with the cooperatives alternating between lentil and buckwheat production year by year. Such an approach would also reduce the capital investment requirements by merging them into a single facility. On the other hand, as shown in both business model plans, the both crops are profitable as stand-alone operations.

Description of the Concept

Description of the opportunity:

According to various sources, Armenia's lentil annual consumption is around 5,400 tons, which 98% is imported from Turkey, Canada, Ukraine, India and Russia. Though, Armenian climatic conditions are favorable for lentil cultivation, there is only small lentil production and no processing facilities. In 2014 good productivity was achieved in Lori marz (2.8 tons/ha). A summary of lentil production during 2010 – 2013 is presented below.

Lentil production										
	2010		2011		2012		2013		2014	
	ha	ton	ha	ton	ha	ton	ha	ton	ha	ton
Aragatsotn	-	-	2	4	-	-	-	-	-	-
Armavir	5	7.8	6	7.4	1	1.6	1.0	0.7	1.0	0.6
Lori	-	-	-	0	-	-	-	-	23.0	64.6
Kotayk	1	2.0	4	9.6	7	8.7	4.0	7.5	5.0	9.5
Shirak	6	26.4	2	3.3	1	3.5	6.0	6.5	3.0	6.5
Syunik	-	-	-	0	-	-	2.0	2.0	5.0	3.5
Tavush	-	-	-	0	-	-	-	-	1.0	1.0
Total	**12**	**36**	**14**	**24.3**	**9**	**13.8**	**13**	**16.7**	**38**	**85.7**

Business model:

The model organizes primary production within cooperatives in dedicated communities (with available land and the suitable climatic conditions for lentil production). Primary production cooperatives will be the founders of the processing cooperative(s), structured as a cooperative of cooperatives. The production cooperatives will provide a number of services to their members, including seed storage, centralized procurement and distribution of fertilizer and chemicals, and transportation services. As they develop, the primary cooperatives could purchase agricultural machinery, other inputs or even extension services, to provide to the members.

The processing cooperative will provide cleaning, packaging, sales and marketing services to its members. Based on the members' decision, additional services could be provided. The processing cooperative will provide services to its members at the lowest price, to cover the operational costs of processing only. For the similar services, market prices will be charged to non-members. The generated profit will be passed through and distributed to the members at the primary cooperative level, to avoid profit tax. The profit received at the primary coop level will be treated as surplus and will be free of taxation[86][87]. The following formula shows the profit distribution among in the cooperatives:

[86] Lentil processing provides a higher ROI than buckwheat. Additionally, lentil production generates more income farmers per ha. However, the lentil market is significantly smaller than that of buckwheat. Thus, opportunities for export will be explored early in the development of the enterprise.
[87] According to the law on cooperatives

PM = WSP – ((PRC+PRF) + (PPC+PPF))

PM – price paid to the members for raw/unclean buckwheat

PPC – the primary coop operational cost (storage, transportation, others)

PPF – the primary coop development fund (%, based on the members decision)

PRC – the processing coop operational cost (cleaning, packaging, M&S, others)

PRF – the processing coop development fund (%, based on the members decision)

WSP – wholesale price for packaged buckwheat/market price

Market Analysis

Market size (quantity and value):

Annual lentil consumption per capita is **1.8 kg** and the total country consumption is approximately **5.4 mln. kg**.

Based on the snapshot survey the lentil price varies from AMD 690 to 1,590 per kg. Retail market approximate value is 4**,320 mln. AMD** (average lentil price is **800 AMD/kg**). Wholesale market value is **3,456 mln. AMD** based on estimated average wholesale price of **550 AMD/kg**. Since the Armenian population is not growing (but actually declining since 2011), the size of the lentil market is also not growing. However, the Georgian market offers an export opportunity, as like Armenia, the country imports nearly 98% of the lentils it consumes.

Product characteristics desired by the market:

Lentils are marketed in four general categories: brown, green, red/yellow and specialty. Based on bean's shape, size, color and origin there are more than 15 types of lentil. Indian green (German green, Egyptian lentil) and brown lentils are the most common variety consumed by the local population. According to the GOST[88] requirements, ready for consumption lentils should have the following characteristics:

- Humidity 15%
- Impurities 3%
- Other seeds, including cracked lentil beans 2%.

The customer's preference is for lentil with no husks, without impurities, and with uniform shape and color. Clean lentil is imported from Canada, Turkey, India, Russia and Ukraine and packed by local companies or sold by the kg. Currently the packed lentil is sold under more than 6 local brands and 3 Russian brands (red and yellow lentil). Depending on the quality and brand, the lentil retail price ranges from 690 to 1,590 AMD per kg. The most expensive lentil is sold under the local brand "Maranik", which costs 1,590 AMD per kg.

[88] http://docs.cntd.ru/document/1200023718

Competitors:

The table below summarizes competing brands, country of origin, packaging types and price range[89]:

Brand	Country origin	Packaging, kg	Price, AMD	Price per 1 kg/AMD
Maranik	Armenia	1	1,590	1,590
Moya semya	Armenia	1	1,070	1,070
Yerevan City	Armenia	1	820	820

According to various sources, the purchasing behavior of local consumers shows a preference for the cheaper product, with a relatively better/cleaner production. In this case, about 80-90% of the lentil market share belongs to the brands within the price range of 700 to 820 AMD per kg.

Marketing Plan

Product:

The lentils will enter to the local market with attractive, modern and innovative packaging, including a brand name, emphasizing the social importance of agricultural cooperatives. There will be 0.5 kg and 1 kg packaging for the retail market and 5 kg bags for the wholesale and HORECA sectors. The World Food Program's Purchase for Progress (P4P) program has expressed interest in bulk purchases of locally produced lentil. The packaging will also contain the cooperative logo, cooperative contact details, innovative cooking recipes and cooperative promotional context.

Sales outlets/channels:

Depending on the production volume, supermarkets and grocery stores will be considered as the primary sales channels. Alternatively, kindergartens, cafes and canteens will be targeted for locally grown lentil. The team will explore additional sales channels, such as suppling the WFP's "School Feeding" program.

Price:

The price of the locally produced lentils will be 10% less than the current market prices in both the retail and wholesale markets. The retail price of packaged lentil will range from 700 to 750 AMD/kg, since the average retail margin is 20%. The cooperatives will be trained on marketing, including pricing strategy, and will apply flexibility in setting the prices for various customers.

Promotion:

For wider coverage, it is advisable to organize a promotional campaign in supermarkets and relatively bigger grocery stores. Promotional packaging (100 gr) of lentils will be distributed in such locations for trial tasting. Different varieties of lentils in one package, or soup mixes (with lentil, peas and bean mixed together, as shown below), is an alternative approach under consideration to gain share in the market.

[89] Observation made in CITY supermarket.

Financial Plan *(For the processing enterprise)*

Annual capacity of the factory (tons):

The processing equipment with the minimal cleaning capacity of **2 tons/h** was identified for start-up operation. This machine cleans a variety of grain and legume types, and has the smallest capacity of any grain cleaning machine available for purchase. It is assumed that for full capacity utilization the processing plant would work on a schedule of 7 hours per shift, 20 working days per month, and 10 months per year. However, to reach the processing volumes projected, the unit would only need to work for 4.2 days in year 1, 13.9 days in year 2, and 19.2 days in year 3. Thus, in actuality, the machines will work on an as needed basis, likely only a couple of hours per day, based on production volumes and market demand. The processing capacity not used to process the cooperatives' production could be used by providing a cleaning and/or packaging service to non-members. This service offering has not been included in the financials below. The total annual installed capacity will be **2,800 tons**.

Value @ wholesale price of quantity of factory capacity (AMD):	**2,970,000,000**
Value @ producer price of quantity of factory capacity (AMD):	**1,540,000,000**
Estimated operational cost of factory (electricity, water, fuel):	**499,026**
Estimated transport cost of primary production to factory (fuel, driver):	**523,473**
Estimated salaries of managers:	**613,700**
Estimated salaries of factory workers:	**248,600**
Cost of the equipment/technology:	**13,507,680**
Cost of the building (capital investment):	**4,800,000**
Annual depreciation ((cost of equipment + cost of building) * 10%):	**221,477**
Interest rate for short term credit (for working capital) (%):	**18**
Tax rate (%):	**30**

PROCESSING ENTERPRISE

INCOME STATEMENT (Processing Enterprise)	**2016**	**2017**	**2018**
Factory operates at (%) of capacity	2%	6%	9%
Revenue			
Quantity processed (use processing coefficient)	36,560	140,160	196,640
Whole sale price	550	566.5	583.5
Lentil sales	20,108,000	79,400,640	114,738,457
Waste sales	914,000	3,609,120	5,215,384
Total revenue, AMD	21,022,000	83,009,760	119,953,841
Costs of goods sold			
Cost of purchasing primary production	18,658,141	73,675,569	106,465,403
Operational cost of factory	499,026	1,913,115	2,684,039
Transport cost (field to factory)	523,473	2,006,836	2,815,527
Total COGS	19,680,640	77,595,521	111,964,970

Gross profit	1,341,360	5,414,239	7,988,871
Sales, general and administrative			
Salaries of co-op/business managers	265,200	265,200	265,200
Salaries of workers in factory	348,500	348,500	348,500
Other costs	61,370	61,370	61,370
SG&A	675,070	675,070	675,070
Earnings before tax, interest & depreciation (EBITDA)	666,290	4,739,169	7,313,801
Depreciation	221,477	221,477	221,477
Earnings before tax & interest (EBIT)	444,813	4,517,692	7,092,325
Interest	-	-	-
Earnings before tax	444,813	4,517,692	7,092,325
Tax			
Net income	444,813	4,517,692	7,092,325
CASH FLOW (Processing Enterprise)	**2016**	**2017**	**2018**
Net income	444,813	4,517,692	7,092,325
Plus depreciation	221,477	221,477	221,477
Cash flow from operations	666,290	4,739,169	7,313,801
Investing			
Construction of building	4,800,000		
Capital cost of equipment	9,667,680		
Other capital costs (vehicle)	3,840,000	480,000	480,000

Cash flow from investing	18,307,680	480,000	480,000
Financing			
Grants from ENPARD	9,667,680		
Grants from third party	-		
Equity investment from third party	8,640,000		
Short term loan (working capital)	-		
Repayment of short-term loan	-		
Long term loan			
Repayment of long-term loan			
Cash flow from financing	18,307,680	-	-
Cash flow	**666,290**	**4,259,169**	**6,833,801**
Cumulative cash flow	**666,290**	**4,925,459**	**11,759,260**

A pessimistic projection shows that the factory will reach only 9% of its operational capacity in 2018, providing only 4% of the country's lentil consumption. Therefore, the market will not be a limiting factor in achieving the financial projections.

NATIONAL MARKET SHARE	**2016**	**2017**	**2018**
Market share captured by processing factory (%)	1%	3%	4%
Factory operates at (%) of capacity	2%	6%	9%

Additionally, some working capital is required for the first year of operation. The exact amount of required finance will be identified during detailed business plan development. An 18% of annual interest rate will be used for the projection, based on the current average offered by the local MFIs.

Primary Production Plan

PRODUCTION PLAN	**2016**	**2017**	**2018**
Quantity of primary production	60,000	195,000	270,000
Yield/ha	1,500	1,500	1,500
Number of hectares	40	130	180
Number of hectares per farmer	1	1,4	2
Number of farmers	40	90	90
Number of farmers per cooperative	5	5	5
Number of cooperatives	8	18	18

ENPARD will support the creation of 8 primary cooperatives in each of the targeted marzes, which will supply one processing cooperative per marz. Later, the number of primary cooperatives will increase without ENPARD support. Technical support will be provided to the processing cooperatives to improve management, marketing, administrative, food safety and other skills required for smooth operation. This business model with primary cooperatives clustered around processing cooperatives could potentially be launched in any of Shirak, Lori, Aragatsotn, Kotayk, or Gegharkunik.

Production Financial Forecast

The primary producer cooperatives will accumulate the harvest of all members and deliver it to the processing cooperative. At the initial stage of operation, the primary cooperatives will provide a seed storage service for the upcoming sowing season. With the further development, the primary cooperatives could provide additional services, such as organizing transportation of raw lentils to the processing plant, or buying fertilizer and other inputs in bulk to distribute among the members, etc. The following statement shows the financial results for all of the primary cooperatives combined, but could be adapted to show a single cooperative in the business planning phase.

PRIMARY PRODUCTION COOPERATIVE

PRODUCTION PLAN	2016	2017	2018
Quantity of primary production	60,000	195,000	270,000
Yield/ha	1,500	1,500	1,500
Number of hectares	40	130	180
Number of hectares per farmer	1.0	1.4	2.0
Number of farmers	40	90	90
Number of farmers per cooperative	5	5	5
Number of cooperatives	8	18	18

INCOME STATEMENT (Consumption cooperative)	2016	2017	2018
Revenue			
Storage services			
Quantity of seeds	4,400	14,300	19,800
Storage price, AMD/kg	9	8.8	9.0
Total from storage	261,800	876,376	1,249,846
Total revenues	261,800	876,376	1,249,846
Cost of services provided			
Storage operation	-	-	-
Cost of agricultural inputs purchased for members			
Operations cost: combines (fuel, driver)			
Marketing costs (if any)			
Total COGS	-		
Gross profit	261,800	876,376	1,249,846
Sales, general and administrative			
Salaries of co-op manager & accountant	95,280	285,840	428,760
Payments to workers	-	-	-
Other costs	-	-	-
SG&A	95,280	285,840	428,760
Earnings before tax, interest & depreciation (EBITDA)	166,520	590,536	821,086
Depreciation (tractors, combines, other)	0	0	0
Earnings before tax & interest (EBIT)	166,520	590,536	821,086
Interest	0	0	0
Earnings before tax	166,520	590,536	821,086
Tax	0	0	0

Net income	166,520	590,536	821,086
CASH FLOW (Consumption Cooperative)	**2016**	**2017**	**2018**
Net income	166,520	590,536	821,086
Plus depreciation	0	0	0
Cash flow from operations	166,520	590,536	821,086
Investing			
Cost of tractor with accessories	0	0	0
Cost of combine with accessories	0	0	0
Other capital costs (storage maintenance)	250,000	100,000	150,000
Cash flow from investing	250,000	100,000	150,000
Financing			
Grants from ENPARD	0	0	0
Grants from third party	0	0	0
Equity investment from third party (farmers)	250,000	100,000	150,000
Dividend from processing enterprise	0	0	0
Short term loan (working capital)	0	0	0
Repayment of short-term loan	0	0	0
Long term loan	0	0	0
Repayment of long-term loan	0	0	0
Cash flow from financing	250,000	100,000	150,000
Cash flow	**416,520**	**690,536**	**971,086**
Cumulative cash flow	**416,520**	**1,107,056**	**2,078,142**

Production Financial Plan

FARMER

FARMER INCOME STATEMENT	2016	2017	2018
Revenue			
Total production of cooperatives	60,000	195,000	270,000
Producer price/kg	**408.3**	420.5	433.1
Unprocessed buckwheat sales	24,496,465	82,001,918	116,947,351
Straw sales	1,200,000	4,017,000	5,728,860
Total revenue	**25,696,465**	**86,018,918**	**122,676,211**
Production costs			
Certified seeds	3,080,000	10,310,300	14,704,074
Tillage	800,000	2,600,000	3,600,000
Sow, cultivate	800,000	2,600,000	3,600,000
Diesel	1,440,000	4,680,000	6,480,000
Fertilizer	2,800,000	9,100,000	12,600,000
Pesticide	600,000	1,950,000	2,700,000
Labor	1,400,000	4,550,000	6,300,000
Harvesting costs			
Harvesting	1,000,000	3,250,000	4,500,000
Harvesting other/baling	500,000	1,625,000	2,250,000
Storage & transport			
Warehouse storage fee (for seeds)	72,857	236,786	327,857
Transport of harvest to warehouse	400,000	1,300,000	1,800,000
Depreciation of farm equipment			
Depreciation	-	-	-
Tax			
Land tax	200,000	650,000	900,000

Bank interest			
Interest rate	-	-	-
Total cost	**13,092,857**	**42,852,086**	**59,761,931**

Farmer net income from production	**12,603,608**	**43,166,832**	**62,914,280**

Average net income per ha	**315,090**	**332,053**	**349,524**
Average net income per farmer	**315,090**	**479,631**	**699,048**

Given that the average farmer in the cooperative will cultivate 1 ha of lentil, earnings for first year per farmer will be **315,090AMD**.

Technical Specifications *(For the processing plant)*

Description of the equipment and of the steps in processing:
Among the appropriatelentil processing lines, there is one whichis suitable for the de-stoning and cleaning of grain, maize, legumes and pulses.

MS-5 - grain cleaning machine is suitable for cleaning and calibration of all cereals, legumes, melons, vegetable and herb crops, as well as all kinds of granular mixtures. High efficiency separation is performed when working with the following crops: wheat, corn, oats, flax, barley, rye, millet, sorghum, peas, soybeans, beans, lentils, buckwheat, canola, mustard, sunflower, coffee beans.

Processing grain separators IMS-5 can take place in 4 modes:

- pre-cleaning of grain;
- primary treatment of grain;
- calibration of grain (grain sorting);
- mixed mode (simultaneous cleaning and calibration).

Pre-cleaning: At the pre-cleaning stagethe separator can be operated at its maximum capacity. At this stage light impurities, fine dust and crushed grains are blownfrom the grain.

Primary treatment: At the primary treatment stage, the machine separates stones, weed seeds, husks and straw, dust and other possible contaminants.

Calibration: At this stage, the cleaned grain calibrated/sorted according to the size. The grain can be sorted for sowing and commercial purposes.

Mixed mode: during **a** single pass the equipment separates impurities and grain for seed. However, the purity of the seed will be lower in comparison with the full cleaning process mode.

The main advantage of IMS-5 isits mobility and the ability to work from a conventional 220 V socket or a generator. It is easy to move, as it is equipped with wheels and weighs only 100 kg.

Loading the separator is made using the auger, pneumatic or belt conveyors. Processed grain is usually collected in bags. The separator has clips to lock bags for cleaned grain.

Process description:

Cleaning and sizing unit:

Input → cleaning → calibrating/sizing → lentils

Main parameters:

- Power: 0.55 kw (220 W)
- Capacity: 2,5 – 5 tons/h
- Equipment size: 1.450 m × 0.5 m
- Height: 1.8m

The equipment is shown below.

Weighting and packaging unit:

YB-6 Semi-Automatic Weighting and Filling Machine

Packing speed	6-12 bags/min
Packing range	500g-6kg
Filling accuracy	≤ ±4g
Power	250 W
Power supply	1ph AC220V, 50/60Hz
Net weight	180kg
Machine dimension	L800 × W850 × H2150mm
Price (USD), FOB Dalian China	4,000

<u>YB-ZT Z type material elevator</u>

This machine is suitable for automatic transporting of candies, chocolate, beef granules, potato chips, rice crust, shrimp strips, plastic, small hardware, and various food, medical and chemical granule products. Some characteristics include the following:

1. Lifting products to vertical packaging machine/electronic scale by chain bucket, it can realize auto stopping when full and auto starting when lacking in products.
2. The machine's overall height depends on the packing machine's height.
3. The machine body can be made by carbon steel or stainless steel. (Material bucket is made

in food grade plastic PP).

Price (USD), FOB Dalian, China **2,900 USD**

YB-600 Semi-automatic sealing machine

Pulse power	1.2kw
Bag width	600-800mm
Sealing width	8mm
Load weight	Max 6kg
Electric adjustable time	0.2-2 seconds
Machine size	850*600*950mm
Machine weight	40kg
Price (USD), FOB Dalian, China	410


Factory Layout:

The processing machines can be accommodated in single area. The area should meet basic food safety requirements. A concrete floor will be sufficient to run the operation. The table below shows technical requirements for the processing plant:

Units	Plant area, m (LxWxH)
Cleaning and sizing unit	2x1x2.5
Weighting and packaging unit	4x4x4
Total required area, m (LxWxH)	10x10x4

The total required area for the processing plant will be 10m by 10m. The height of the site will be 4 meters. The additional distance between units for operating and maintenance has been considered.

Technical Plan and Comparative Analysis *(For primary production)*

The following table describes the technology and methods used to produce lentils.

Activity	Lentil
Sowing time (depend the zones)	April-May
Sowing rate	120 kg/ha
Sowing depth	4-5 cm
Vegetation period	100 days
Sowing	Grain drill
Harvesting	Grain combine

Description of the differences between lentil production and wheat production:

Financial analysis of Wheat and lentil value chains (for Shirak Marz)

2013	Unit	Wheat	Lentil
Production	000 ton	311.6	16.7
Export	000 ton	17.5	-
Import	000 ton	371.4	2115
Annual Consumption in Armenia	000 ton	665.5	5.4

(per 1 ha)

Production			
		Wheat	Lentil
Grain (average last 10 years)	kg	2,500	1,500
Seed for next year	kg	300	110
For sale	kg	2,200	1,390
Straw	kg	2,500	1,500

	Unit	Before ENPARD (wheat)	After ENPARD (lentil)
Production costs			
Certified seeds	kg	300	110
Price for 1 kg	AMD	250	700
Seeds value	AMD	75,000	77,000
Tillage	AMD	12,000	20,000
Sowing, cultivate	AMD	12,000	20,000
Harvest	AMD	20,000	25,000
Diesel	AMD	35,000	36,000
Fertilizer	kg	250	200
Price for 1 kg fertilizer	AMD	120	350
Fertilizer value	AMD	30,000	70,000
Pesticide	AMD	15,000	15,000
Labor	person/day	7	7
Average pay/day	AMD	5,000	5,000
Labor costs	AMD	35,000	35,000
Transport costs	AMD	10,000	10,000
Land tax	AMD	5,000	5,000
Other costs	AMD	3,000	3,000
Subtotal-Production costs	**AMD**	**249,000**	**316,000**
Production costs	AMD/kg	99.6	**210.7**
Cleaning & packaging			
Cleaning waste coefficient	%	5	20%
Waste	kg	110	278
Cleaned grain	kg	2,090	1,112
Grain packaging	AMD/kg	2	30.6
Grain packaging costs	AMD	4,180	33,995
Straw bale (1 bale-20kg)	piece	125	75
Straw packaging	AMD/bale	100	100
Straw packaging costs	AMD	12,500	7,500

Subtotal-Cleaning & packaging costs	**AMD**	**16,680**	**41,495**

Total production, cleaning & packaging costs	**AMD**	**265,680**	**357,495**
Processing costs	AMD/kg	127.1	321.5
Revenue & income			
Price of cleaned grain	AMD/kg	150	550
Price of straw	AMD/bale	300	400
Price of waste	AMD/kg	80	100
Revenue from grain sales	AMD	313,500	611,600
Revenue from straw sales	AMD	37,500	30,000
Revenue from husks sales	AMD	8,800	27,800
Total revenue	**AMD**	**359,800**	**669,400**

Profit	**AMD**	**94,120**	**311,905**
Profitability	**%**	**35.4**	**87.2**
Increasing of profitability due to ENPARD project for I year	**%**		**51.8**
Increasing of profitability due to ENPARD project for II year*	**%**		**129.4**

*- conditioned with the availability of own production seeds

Institutional/Ownership Model

The processing unit will belong to the cooperative of primary producer cooperatives. The primary producer cooperatives will be founders and members of the processing cooperative. During the duration of the project, the granted equipment will be owned by the project and after cooperative registration (in the State Registry) will be transferred to the cooperative as indivisible assets. Other terms of new members and membership fees will be discussed with the groups and incorporated in the cooperative charter. Under the current law, cooperatives must have seven members, while under the expected law on cooperatives the required membership is expected to be reduced to 5.[90]

Founding/activities of the primary cooperatives:

The cooperatives will be open to everyone in the communities interested in receiving services offered by the cooperative, and ready to undertake the responsibilities of a cooperative member. Each of the members of the cooperatives will have one vote. The membership of the cooperatives could grow over the years.

As noted above, during the first year the services offered by the cooperative will include distributing fertilizers and seeds, as well as providing the mechanism through which members will be trained in GAP. Based on the members' decision revolving fund of seeds, fertilizers, fuel, etc. can be established after the first harvest sales.

[90] If the law is not passed in 2015 as expected, then the number of members per groups will need to be increased to the minimum of 7 by the end of 2016, by when the cooperatives will be registered.

The management of these activities, along with other responsibilities will undertake the president/manager of the cooperative in accordance with his or her job contract. The cooperative will receive these production inputs as a donation of UNDP. In the future, cooperative members will purchase these inputs from earned income, as they currently purchase inputs for wheat. However, the cooperatives will be supported to make bulk purchases.

The amount of membership payment is fixed by the statutes considering expenses of founding the cooperative (normally it is about AMD 50,000 and includes duties, bank payments, stamps, etc.).

Founding/activities of the processing cooperative:

The primary cooperatives will be the members of the processing cooperative of cooperatives. The president of this cooperative will be elected by all the members and should not be the president of any of the first-level cooperatives. The founding of the processing cooperative will be a new precedent based on the opportunities offered by the new law, as such an option does not exist currently.

The activities of the processing cooperative will be regulated by RA legislation. The job contracts of members will be concluded according to the labor legislation. The cooperative will operate transparently and openly.

Staff (of the processing cooperative and the primary cooperatives):

The processing cooperative staff will consist of 7 people who would report to the board of the cooperative, including 2 production and 5 administrative employees. For the first year of operation the total annual gross salary will be **862,300 AMD.** Based on the processing volume the number of operational months will increase from 2 to 9 months during forecasted duration, with lentil processing is performed on an intermittent, as needed basis. The sales/distributor will receive a monthly salary and a percentage from sales. Other employees will receive monthly salaries.

Each primary cooperative will have president/accountant selected by the members, whowill receive monthly salary. The accountant of the processing cooperative will provide accounting services to the primary cooperatives at no charge.

A detailed salary scheme is presented below.

Direct salary, AMD

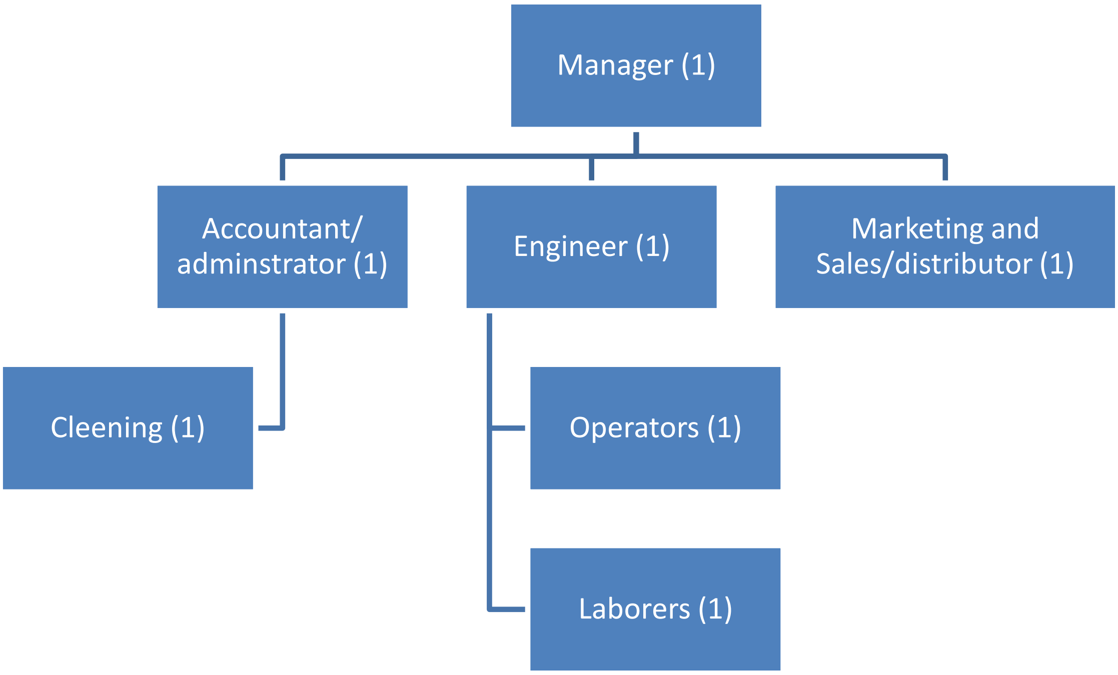
Position	Number	Monthly gross salary	Income tax	Total salary
Operators	1	106,000	26,000	106,000
Laborer	1	92,600	22,600	92,600
Sales/distributor	1	50,000	12,000	50,000
Total, direct monthly	**2**			**248,600**

Indirect salary, AMD

Position	Number	Monthly gross salary	Income tax	Total salary
Manager	1	132,600	32,600	132,600
Accountant	1	132,600	32,600	132,600
Cleaning	1	79,400	19,400	79,400
Engineer	1	119,100	29,100	119,100
Sales/distributor	1	150,000	37,000	150,000
Total, indirect salary	**5**			**613,700**

Salary, primary production cooperative						
Position	**Number**	**Monthly gross salary**	**Income tax**	**Total salary**	**Working days**	**Salary**
President	1	79,400	19,400	79,400	3	11,910

Organizational chart



Annex 9: Business Model for Non-Traditional Vegetable Value Chain/ Broccoli

Introduction

In the recent years the cultivation of non-traditional vegetables (broccoli, kohlrabi, artichoke, Brussels sprouts, etc.) has gained a wider popularity due to their high-yield capacity and high market prices in comparison to the traditional vegetables. In the case that certain obstacles to the increased cultivation of non-traditional crops can be addressed (e.g. availability of quality seeds, cultivation of seedlings, refrigeration storage of the produce, organization of packaging and sales), the cultivation of non-traditional crops will grow and contribute to the income growth of the rural households of Armenia. In Gargar community of Lori Marz, the average yield capacity of broccoli cultivated by a women's group about twice exceeds the yield capacity of the cauliflower they grow. If considering that the market price of broccoli is 2-3 times higher in comparison to cauliflower, then replacing cauliflower with broccoli (as well as other non-traditional vegetables) has a significant economic effect. During the development of this business model the results of the Gargar community women's group activities have been considered (throughout 3-4 years the group has been cultivating non-traditional vegetables with the support of "Green Lane" NGO). The main share of the vegetable produced by the women's group is used for their own consumption and only a small share is sold. The objective of this business model is to identify the main weak links of the non-traditional vegetable value chain and suggest solutions to strengthen those links and eliminate obstacles. This will contribute to the growth of the production volumes, which will set premises for sales and will promote income growth ofrural households.

Taking into consideration the fact that broccoli is quite well-known vegetable in Armenia, the business model for non-traditional vegetables has been developed based on the case of broccoli, and can be applied for the cases of other non-traditional vegetables.

Summary of the Value Chain Intervention Strategy

The strategy for developing the value chain of non-traditional vegetables focuses on strengthening the weak links of the value chain: production planning, access to appropriate seedlings, proper post-harvest management, and creating market linkages. Cooperatives will obtain high-quality seeds for seedling productionin greenhouses, which will subsequently be distributed to members.The high-quality and affordable seedlings and will reduce the production cost of non-traditional vegetable production. A vegetable collection center on the level of each cooperative will provide refrigerated storage, sorting, packaging and sales—functionwhich is currently donot exist in the Armenia vegetable value chain. Thesepost-harvest activities will also contribute to maintain the produce quality and increase of sales volumes.

As a result of interventions in the value chain of non-traditional vegetables, the following outcomes are expected:

Development of a Non-Traditional Vegetable Value Chain

	Unit	2015-2016	2017
Number of new primary cooperatives	Coops	2	2
Cumulative number of primary cooperatives	Coops	2	4
Number of seedling greenhouses	greenhouses	2	2
Cumulative number of seedling greenhouses	greenhouses	2	4
Number of collection centers	centers	2	2
Cumulative number of collection centers	centers	2	4
Number of farmers/farms	farmers	20	20
Cumulative number of farmers/farms	farmers	20	40
Area for broccoli production	ha	2	2
Cumulative area for broccoli production	ha	2	4
Broccoli total production	ton	40	40
Cumulative broccoli total production	ton	40	80

According to the preliminary estimates, the total construction and operational costs of 4 greenhouses and 4 collection centers planned within the project will be AMD 50 million, out of which AMD 31 million will be the input of ENPARD project. At the same time, UNIDO and UNDP will provide the applicant farmers with necessary training.

The Concept

Description of Opportunities

The cultivation of non-traditional vegetables started in Armenia in the recent years and, according to observations, has a tendency of growth involving the expansion of cultivated lands. The consumers, in general, are aware of the beneficial qualities of those vegetables and according to the data collected from Yerevan's supermarkets, the consumer demand for non-traditional vegetables is also on the rise. Additionally, with the support of the Regional Agricultural Support Centers of the Ministry of Agriculture, a number of non-traditional vegetable cultivation pilot projects have been implemented in different regions of the country, resulting in good indicators (high-yield capacity, good quality). Particularly, the results of test cultivation have shown that the yield capacity of broccoli is twice more than that of cauliflower.

Business Model

The business model consists of the construction and use of one greenhouse and one collection center, with cooling, sorting, packaging and marketing functions, per each cooperative. Since the farmers have expressed concern regarding their ability to market their produce in Yerevan, the project will assist to develop sales linkages, including motivating buyers to come to the collection center through their own transportation later.

For each of the farmers' groups selected for support in developing innon-traditional vegetable cultivation, one greenhouse will be constructed based on the co-financing principles (10-20% of input from the group). The greenhouses will have 120 m2 sowing area, plastic film cover and drip irrigation system. The project will provide the groups with quality non-traditional vegetable seeds and seedling pots, to organize seedling production. The seedlings will be provided to the group members at a production cost to start vegetable cultivation. The excess of the seedlings, with extra 20-30% on their production cost, will be sold to the community other farmers (or in other communities) and/or any potential customers.

Each beneficiary group of the project will have a greenhouse of 120m2, with a plastic cover and drip irrigation system. The area of the greenhouse is calculated based on the quantity of seedlings necessary to be planted on 1 ha area, i.e. 40,000-45,000 seedlings. The 1 ha is considered based on the average size of the group (10 farmers) and on the average area cultivated by 1 farmer, i.e. 1,000 m2 (or 5 farmers and 2,000 m2). The seedlings can be grown in the greenhouse both by direct sowing into the ground, and also by growing them in plant pots. The dimensions of the pots are 4cm x 4cm, with 5-7cm depth. Thus, in 1 greenhouse 45,000 seedlings can be grown, from which 42,500 will be healthy and good quality seedlings. When the seedlings are grown in the land and afterwards movedto the field, the growth of the plants is slow due to the adaptation difficulties of the roots to the new soilIn case of growing seedlings in the pots and afterwards planting them in the ground, the roots of the plants are not being separated from the soil mass they have grown into, but are planted in the field together with the soil. In this case the difficulty is to fill the pots with new soil mass each year, which increases the expenses of seedling production. However, the high-yield crop harvested from the seedlings grown in pots with enriched soil and compost mixture, completely justify the additional expenses.

The non-traditional vegetables can be grown also through a natural process – by directly sowing the seeds in the ground. However, in this case, the yield capacity is low. Nevertheless, since the 120 m2 greenhouse can provide seedlings for only 1 ha of vegetable production, and the project foresees construction only one greenhouse per cooperative, this limits the potential re-planting area per cooperative to 1 ha.Therefore, the project will also purchase a manual seed drill for each group/cooperative, to enable them to further expand production. In the first year the groups will both use the greenhouses and do natural sowing in small areas; based on the results of these trails, future approaches will be determined.

A collection center will be established for each group, equipped with cooling storage, packaging and sales functions. The allocation of the area for the collection centers and their construction will be done by the groups by their own means, whereas all the necessary equipment and assets will be provided by the project. The expenses of the equipment and assets will also be co-financed by the group at 10-20% of their price.

Each collection center will have a territory of at least 150 m2, which is necessary for cooling and packaging equipment. The cooling storage will have a capacity of at least 300m^{3}which will suffice for storing 20 tons of vegetables. The 20 tons of vegetables is the estimated yield from the one hectare to be cultivated by the cooperative.

During the second year of the project, the group will be organized as a cooperative and, after registering in the State Registry, all the assets (greenhouse, collection center) provided by the project will become the property of the cooperative.

Market Analysis

There is a lack of comprehensive data about the market of non-traditional vegetables in Armenia. The National Statistical Service (NSS) does not register data on non-traditional vegetables and this data falls under the “Other Vegetables” general category. According to the NSS data, in 2013 the cauliflower cultivation lands were around 316 ha. According to the estimations of the “Green Lane” NGO, the cultivation areas for non-traditional vegetables are around 5 ha, equating to a 150 ton production capacity, most of which is consumed by the producer households. In the markets and supermarkets of Yerevan the prices of non-traditional vegetables vary from AMD 600 to 1,000/kg, and during winter months that price reaches up to AMD 2,000/kg. The non-traditional vegetables are being imported to Armenia mostly from Russia, Iran and Turkey. The data on import volumes is also unavailable or is not reliable. According to the study at the Yerevan supermarkets, the consumption of non-traditional vegetables increases year by year. The main obstacle to the increase of consumption volumes is the unawareness of a large share of population about the vegetables. A campaign about healthy and useful qualities of the non-traditional vegetables will potentially increase their demand in the market.

The business model for the non-traditional vegetables defines a very low price of sales (AMD 400/kg for broccoli), that will ensure the project beneficiary cooperatives to have a good competitive advantage and flexibility in the market. Therefore, the production of non-traditional vegetables on two to four hectares, by the cooperatives supported by ENPARD, will not meet with sales limitations due to market size or uncompetitive pricing.

Marketing Plan

Buyers prefer packaging of 0,5 and 1 kg broccoli, packaged with a plastic cover. The package label will contain information about the place of production, name of the cooperative and the useful qualities of the vegetable. If necessary, the sales can be organized also without packaging.

The sales of the produce will be mainly channeled through supermarkets and markets. As mentioned, the packaged produce (vegetable) will be sold at a price of AMD 400/kg, which is considerably lower than the existing market price and, at the same time, is quite profitable. The low price suggested by the business model is conditioned by the fact that theprice of vegetables imported to Armenia from Russia will be reduced (due to Armenia's membership to the Eurasian Union). ArmenianArmenian producers will need to reduce prices to maintain their competitiveness. The low price of the vegetables will also boost consumption volumes, which, in turn, will increase the production of non-traditional vegetables in the country.

In order to raise the consumers' awareness it is also important to organize information campaigns about the usage of non-traditional vegetables. Informing the consumers about the useful qualities of the vegetables will increase the consumption volumes.

Financial Plan

The greenhouses and collection centers will operate as cost centers, with the aim of minimizing the cost of operations, so as to maximize the earnings accruing to the members of the cooperatives. The cooperatives will hire workers as laborers in the greenhouses, who may also be cooperative members. All members of the cooperatives will purchase the seedlings from the greenhouses at the beginning of the growing season for cash. At harvest, the cooperative members will bring their non-traditional vegetable production to the collection center, where it will be weighted, and records taken on the volumes provided by each member. Initially ENPARD will assist the cooperatives to develop sales connections to supermarkets and shops. The production of all of the cooperatives will be bulked to develop these market connections. After the vegetables have been sold, the cooperatives will pay their members based on the quantities of vegetables provided by each member. Certain costs will be subtracted from the payment to the members before they are paid for the vegetables provided. These costs include the service of using the collection center (cooling, packaging, and sales logistics), the cost of the salary of the manager/accountant of the cooperative, and an additional sum of about 5-10% to develop a cooperative fund. The financial statements below show the overall financial operations of one cooperative.

INCOME STATEMENT	**2016**	**2017**	**2018**
Revenue			
Revenues from sales of vegetables	6,090,000		
Revenues from sale of seedlings	1,889,847		
Total revenues	7,979,847		
Cost of goods sold			
Vegetable production cost (paid to members)	4,384,250		

Collection, sorting, packaging, & sales logistics	1,000,000		
Cost of greenhouse operations	1,515,000		
Total COGS	**6,899,250**		
Gross profit	1,080,597		
Sales, general and administrative			
Salaries of co-op manager & accountant	100,000		
Funds retained for co-op development fund			
Other costs			
SG&A	100,000		
Earnings before tax, interest & depreciation (EBITDA)	980,597		
Depreciation (greenhouse and collection center)	940800		
Earnings before tax & interest (EBIT)	39,797		
Interest	0	0	0
Earnings before tax	39,797		
Tax	0		
Net income	39,797		
CASH FLOW	**2016**	**2017**	**2018**
Net income	39,797		
Plus depreciation	940,800		
Cash flow from operations	980,597		
Investing			
Cost of collection center and materials	7,500,000		
Cost of greenhouse with irrigation and materials	1,908,000		
Other capital costs	0		
Cash flow from investing	9,408,000		
Financing			
Grants from ENPARD	7,526,400		
Grants from third party	0		
Contribution of cooperative members	1,881,600		
Cash flow from financing	9,408,000		
Cash flow	**980,597**		
Cumulative cash flow	**980,597**		

Financial Plan: Seedling production

The cost of the seedling production in the greenhouse is estimated based on the criteria that the greenhouse production is self-sufficient (covers own expenses) and brings amargin (10%) sufficient to to cover the maintenance expenses of the greenhouse.

Financial Analysis of the Production of Broccoli Seedlings in Greenhouses

(per 1 greenhouse - 100 m^2)

Capital Costs		
Construction of greenhouse (120 m^2)	AMD	1,500,000
Drip irrigation installation costs with water content	AMD	400,000
Wheel drill	AMD	80,000
Hand drill	AMD	10,000
Lifting equipment	AMD	8,000
Humidity controller, thermometer, pH meter	AMD	80,000
Other tools (shovel, pitchfork, watering can, hoe, others)	AMD	20,000
Total capital costs	**AMD**	**1,898,000**
Production Costs		
Seeds	pieces	45,000
Price	AMD/piece	7
Seed cost	AMD	315,000
Seedling pots (4x4 cm)	pieces	45,000
Price	AMD/price	8
Cost	AMD	360,000
Soil mixture	kg	4,500
Price	AMD/kg	180
Cost	AMD	810,000
Labor costs	AMD	200,000
Treatment	AMD	3,000
Nutrition	AMD	3,000
Traps and hunting tapes	AMD	4,000
Irrigation water	AMD	2,000
Electricity costs	AMD	3,000
Other costs	AMD	10,000
Total production costs	**AMD**	**1,710,000**
Prime costs/healthy seedling	AMD/seedling	40
Revenue & Income		
Production of seedlings	piece	42,750
Price of seedling	AMD/seedling	44
Total revenue	**AMD**	**1,899,800**

Profit	**AMD**	**189,800**
Profitability	**%**	**11**

Financial Plan: Broccoli production

The estimates of broccoli production costs are done for 1 ha land, which is estimated to be provided with seedlings from one 120 m^2 greenhouse.

Financial Analysis of Broccoli Value Chain (for Stepanavan region of Lori Marz)

per 1 ha

Production		
Yield (average last 2 years)	ton	20.0
Wastes (green mass)	ton	3.0

	Unit	per 1 ha
Production Costs		
Seedlings	piece	42,750
Price for 1 piece	AMD	44
Seedlings cost	AMD	1,899,800
Autumn tillage (including fuel)	AMD	35,000
Spring tillage (including fuel)	AMD	25,000
Cultivation (including fuel)	AMD	20,000
Making beds*	AMD	20,000
Planting seedlings*	AMD	106,875
Loosening, removal of weeds (manually)	AMD	100,000
Hilling (manually)	AMD	100,000
Nutrition	AMD	90,000
Treatment 4 times	AMD	120,000
Irrigation 6 times	AMD	60,000
Harvesting (manually)	AMD	400,000
Transportation costs	AMD	30,000
Other costs	AMD	10,000
Subtotal production costs	AMD	3,016,675
Production prime costs	AMD/kg	151
Conservation and packaging prime costs	AMD/kg	116
Total prime costs	AMD/kg	266

Total production, conservation, packaging and marketing costs	**AMD**	**5,326,675**

Revenue & Income		
Price of vegetable	AMD/kg	400
Price of wastes	AMD/kg	30
Revenue from vegetable sales	AMD	8,000,000
Revenue from wastes sales	AMD	90,000
Total revenue	**AMD**	**8,090,000**

Profit	**AMD**	**2,763,325**
Profitability	**%**	**51.9**

*-including labor costs

Financial Plan: Cold Storage and Packaging of Broccoli

Financial Analysis for the Collection Center

(cold storage capacity - 20 ton)

Capital costs		
Construction/reconstruction of the building for collection center	AMD	1,000,000
Refrigeration equipment (for 300m^3), humidity controller, and fridge door	AMD	4,000,000
Storage shelves	AMD	400,000
Electronic scales (5 kg, 30 kg)	AMD	100,000
Hand loader	AMD	500,000
3 washtub sink	AMD	700,000
Packaging machine	AMD	500,000
Stainless tables with drawers, 2 pieces	AMD	300,000
Total capital costs	**AMD**	**7,500,000**
Production costs		
Packaging packs and materials (0.5 kg, 1 kg)	pieces	30,000
Average price	AMD/piece	7
Cost of packs	AMD	210,000
Boxes	pieces	2,000
Cost	AMD/piece	150
Cost of cardboard boxes	AMD	300,000
Labour costs	AMD	600,000
Electricity costs	AMD	300,000
Transportation costs	AMD	100,000
Other costs	AMD	50,000
Total production costs	**AMD**	1,560,000
Depreciation	**AMD**	750,000

Prime costs	AMD/kg	116
Revenue & Income		
Cold storage and packaging services	kg	20,000
Price of cold storage and packaging services (prime costs+10%)	AMD/kg	127
Total revenue	**AMD**	**2,541,000**

Profit	**AMD**	**231,000**
Profitability	**%**	**10.0**

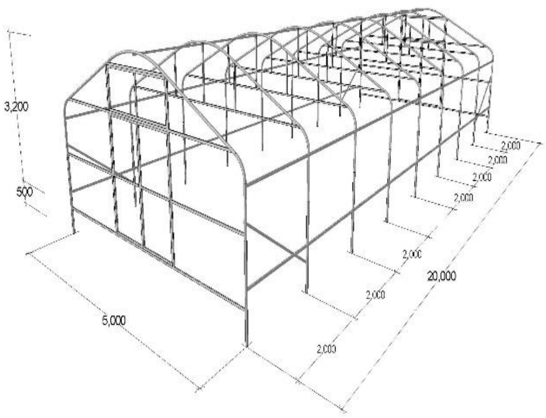
Capital Investment Plan

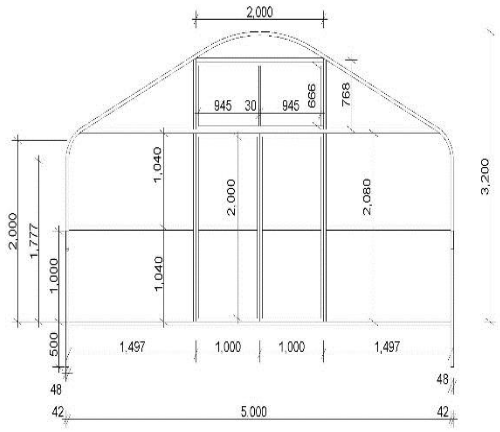
	Unit	2015-2016	2017
Number of cooperatives	coops	2	2
Number of greenhouses	greenhouses	2	2
Construction of greenhouses	AMD	3,796,000	3,796,000
Of which: ENPARD	AMD	3,036,800	3,036,800
Cooperatives	AMD	759,200	759,200
Operation costs of the greenhouses	AMD	3,420,000	3,420,000
Of which: ENPARD	AMD	1,350,000	1,350,000
Cooperatives	AMD	2,070,000	2,070,000
Number of collection centers	centers	2	2
Creation of collection centers	AMD	15,000,000	15,000,000
Of which: ENPARD	AMD	10,400,000	10,400,000
Cooperatives	AMD	4,600,000	4,600,000
Operational costs of the collection centers	AMD	3,120,000	3,120,000
Of which: ENPARD	AMD	1,020,000	1,020,000
Cooperatives	AMD	2,100,000	2,100,000
Total costs	**AMD**	**25,336,000**	**25,336,000**
Of which: ENPARD	**AMD**	**15,806,800**	**15,806,800**
Cooperatives	**AMD**	**9,529,200**	**9,529,200**

Technical Plan

Greenhouse for Seedling Production

The greenhouse that will have 120 m2 territory (5m x 20m), will be built on metal constructions, covered with inflatable double-layered plastic film and will be equipped with drip irrigation system, planting equipment, humidity controller, thermometer, pH meter, as well as other necessary tools - shovel, rake, watering can, hoe, etc. As mentioned before, sowing drill will be purchased for testing seeds sowing in the fields.





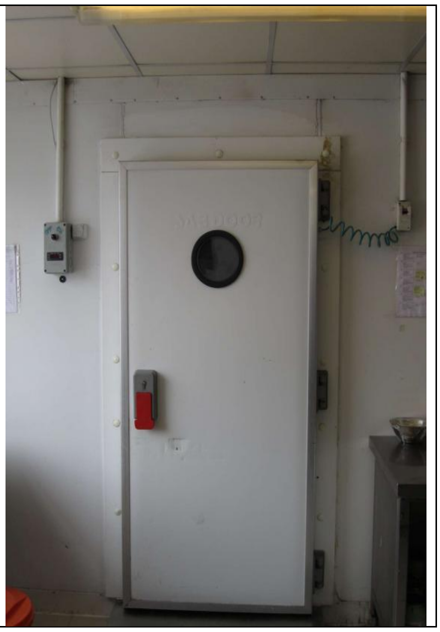
<u>Cold Storage and Packaging of Broccoli</u>

The fridge should have a capacity of at least 300 m3 which is enough for storing 20 tons of vegetable at a given time. The fridge will also be equipped with a humidity controller, a manual hoist (loader) shelves, washing sinks, boxes, etc.

The cold storage should meet the following requirements:

- Product protection mode - vegetable
- Power supply - 360 V
- Total fridge capacity - 300 m^3 (surface- 100 m^2)
- Fridge temperature - 4-10 ^0C
- Fridge humidity level - 85-90 %
- Management and control systems - automatic temperature and humidity control systems

- Fridge door - 1 x 2 meter-sized

The collection center will be equipped with packaging machines and the necessary materials and tools. The packaging equipment will have the following parameters:

8. Standard 220 V power supply
9. Solid state controlled film cut off rod
10. Heavy gauge aluminum base
11. Aluminum and stainless steel construction
12. Stainless steel wrapping surface
13. Large well-fixed rubber feet

The following table describes the technology and methods used to produce broccoli:

Activity	Broccoli
Sowing time (depending on zones)	April-May
Sowing rate	40.000-45.000 seedlings/ha
Vegetation period	50-80 days
Sowing	Manually
Harvesting	Manually

Description of the Differences between Broccoli and Cauliflower Production

According to estimates, the yield-capacity of broccoli is at least twice higher than that of cauliflower. In the local market the price of cauliflower is AMD 150/kg, while in our financial estimations the average price of broccoli is set AMD 400/kg, which is considerably low compared to the current market price. Thus, according to the estimation the profitability of cauliflower is 12,6%, while the profitability level of broccoli is around 50%.

Financial Analysis of Broccoli and Cauliflower Value Chains
(for Srepanavan region of Lori Marz)

(per 1 ha)

Production			
		Cauliflower	Broccoli
Yield (average last 2 years)	Ton	10.0	20.0
Wastes (green mass)	Ton	1.5	3.0

	Unit	Before ENPARD (cauliflower)	After ENPARD (broccoli)
Production Costs			
Seedlings	Piece	35,000	42,750
Price for 1 piece	AMD	15	44
Seedlings cost	AMD	525,000	1,899,800
Autumn tillage (including fuel)	AMD		35,000
Spring tillage (including fuel)	AMD	25,000	25,000
Cultivation (including fuel)	AMD	20,000	20,000
Making beds*	AMD	20,000	20,000
Planting seedlings*	AMD	87,500	106,875
Loosening, removal of weeds (manually)	AMD	100,000	100,000
Hilling (manually)	AMD	100,000	100,000
Nutrition	AMD	90,000	90,000
Treatment 4 times	AMD	120,000	120,000
Irrigation 6 times	AMD	60,000	60,000
Harvesting (manually)	AMD	200,000	400,000
Transportation costs	AMD	15,000	30,000
Other costs	AMD	10,000	10,000
Subtotal production costs	**AMD**	**1,372,500**	**3,016,675**
Production costs	AMD/kg	137	151
Conservation & Packaging			
Cold storage and packaging costs	AMD	0	2,541,000
Total production, conservation & packaging costs	**AMD**	**1,372,500**	**5,557,675**
Revenue & Income			
Price of vegetable	AMD/kg	150	400
Price of wastes	AMD/kg	30	30
Revenue from vegetable sales	AMD	1,500,000	8,000,000
Revenue from wastes sales	AMD	45,000	90,000
Total revenue	**AMD**	**1,545,000**	**8,090,000**

Profit	**AMD**	**172,500**	**2,532,325**
Profitability	**%**	**12.6**	**45.6**
Increasing of profitability due to ENPARD project	**%**		**33.0**

*-including labour costs

Institutional/Ownership Model

The greenhouses and the collection centers will belong to the primary producer cooperatives. During the first year of operation, the granted equipment will be owned by the project and after registration of the cooperative in the State Registry, the equipment will be transferred to the cooperative as indivisible assets. The terms for new members and membership fees will be discussed with the groups and incorporated in the Charter of the Cooperative. Under the current Law, cooperatives must have seven members, while under the expected Law on Cooperatives, the required membership is expected to be reduced to 5.[91]

Establishment/activities of the primary cooperatives:

The cooperatives will be open to everyone in the communities interested in receiving services offered by the cooperatives, and ready to undertake the responsibilities of a cooperative member. Each member of the cooperative will have the right to one vote. The membership of the cooperatives may grow over the years.

As circulating assets (revolving fund), during the first year of the project the groups will be provided with broccoli seeds and planting pots for seedling growing. Also the members will be provided with training in GAP. The rest of the running expenses will be ensured by the group members. In the case fo the seeds, the revolving fund will be created by selling the seedlings to the farmers. The proceeds from the sale of the seedlings will enable the continued operations of the greenhouse.

To initialize the cooperatives, an agreement will be signed with the group members which will state the terms of registering the group as a cooperative by the end of the first year of activity. This agreement is an important precondition for providing the groups with the above mentioned investments and circulating assets. According to the agreement, if the group refuses to register as a cooperative, then the property of the greenhouses and collection centers will not be transferred to the group members, but will become a community property, and the provided circulating assets (seeds, planting pots), will be returned to the project.

91 *If the Law is not adopted in 2015 (as expected), then the number of members per groups will need to be increased to the minimum of 7 by the end of 2016, by the time when the cooperatives should be registered.*

According to the agreement, all the main assets, and the seeds and planting pots will be provided to the group in the form of a grant allocation, however the co-funding share (10-20% from the group) will be observed. During the following years all the expenses should be carried out by the cooperative.

The operational costs of the seedling production and the collection center should be ensured by the cooperative members, who will be paid according to the defined standards of the cooperative.

Annex 10: Buckwheat agronomist report

Prepared by B. Voronichev

Expert-consultant UNIDO, Yerevan, Armenia

Buckwheat production expert-consultant B. Voronicheva's report

This report has been prepared on the basis of modern scientific knowledge about the biological characteristics of buckwheat and the best practices of its cultivation taking into account available data on soil and climatic conditions of the Republic of Armenia. The report is a result of meetings with farmers who participate in the project, with governmental and non-governmental organizations.

Buckwheat cultivation harvesting and postharvest processing technology recommended in the report needs to be specified and refined with regard to the conditions of industrial activity of each particular group of farmers, as well as with regard to the existence or absence of relevant experience.

For the successful implementation of the project it is appropriate to organize it on the basis of local research institutions that carry out pilot studies on the biology and improvement of buckwheat cultivation technology with prompt delivery of the results to the broader agricultural communities.

Отчет эксперта-консультанта по производству гречихи Б. Вороничева

Данный отчет подготовлен на основе современных, научных знаний о биологических особенностях гречихи и передовом опыте ее возделывания, имеющихся сведений о почвенно-климатических условиях Республики Армения, результатов встреч и общения с фермерами-участниками проекта, правительственных и неправительственных организаций.

Рекомендуемая в отчете технология возделывания гречихи, ее уборки и послеуборочной обработки должна детализироваться и уточняться применительно к условиям производственной деятельности каждой конкретной группы фермеров, а также по мере накопления ими соответствующего опыта.

Для более успешной реализации проекта представляется целесообразным организовать на базе местных научно-исследовательских учреждений проведение экспериментальных исследований по изучению биологии и совершенствованию технологии выращивания гречихи с оперативным доведением полученных результатов до сведения широкой аграрной общественности.

I. Требования, предъявляемые гречихой к условиям произрастания, и соответствие им климата и почв Армении

Гречиха (Fagopyrumesculentum Moench.) - однолетнее травянистое энтомофильное цветковое растение ярового типа развития высотой от 40-50 до 120-150 и болеесантиметров; корень имеет стрежневой, проникающий в почву на глубину до 80 сантиметров; стебель коленчато-изогнутый, внутри полый; листья средние и крупные сердцевидные, при созревании краснеют и опадают.

Вегетационный период у наиболее распространенных сортов гречихи колеблется от 70 до 110 суток. От заделки семян в почву до появления всходов при благоприятных условиях приходит 5-7 суток. Цветение гречихи начинается на 15-25 сутки после всходов и продолжается 5-6 недель, постепенно перемещаясь от нижних соцветий на стебле к верхним, что обусловливает неодновременность созревания урожая.

Для максимальной реализации потенциальной продуктивности гречихи необходимо знать ее отношение к основным факторам внешней среды.

Температура.

Для формирования урожая зерна гречихе требуется 1300-1600°С активных (выше 10°С) температур. Несмотря на относительно невысокую общую потребность в активном тепле, гречиха теплолюбивая культура. Это обусловлено прежде достаточно высоким биологическим оптимумом температур по этапам органогенеза: в период прорастание семян – появление всходов – 15-18°С, в период бутонизации – цветения – 16-20°С, на завершающей стадии плодообразования - созревания семян – 17-21°С. Гречиха чувствительна к заморозкам во все периоды роста. Снижение температуры воздуха до -1°С в течение 4-6 часов вызывает существенные повреждения растений, а до -2,0 -2,5°С – их полную гибель.В то же время, гречиха плохо переносит и высокие температуры. Так, при прогревании воздуха выше 25°С резко ухудшаются условия опыления и оплодотворения, снижается продуктивность растений, что приводит к недобору урожая.

Однако, при хорошей агротехнике, при наступлении после экстремально жаркой погоды более благоприятного температурного фона, гречиха способна возобновить интенсивный рост, цветение и плодообразование, обеспечивая получение полноценного урожая зерна.

Влага

Среди зерновых культур гречиха самое влаголюбивое растение. На образование единицы сухого вещества гречихе требуется в среднем около 530 единиц воды, что значительно превышает расход воды у ячменя, овса, гороха, в 2 раза больше транспирационного коэффициента пшеницы и в 3 раза – проса. Расход воды на формирование урожая варьируется в зависимости от плодородия почвы. При внесении под гречиху полного минерального удобрения транспирационный коэффициент снижается до 70% по сравнению с неудобренными посевами. Вследствие особенностей корневой системы (не глубокое проникновение вглубь почвы,ограниченное распространение в ширину) гречихи она сравнительно слабо использует запасы влаги в почве, особенно из нижних ее горизонтов, в то же время, развитая листовая поверхность гречихи достаточно интенсивно испаряет влагу. В среднем для создания урожая 20 центнеров зерна и 50 центнеров соломы гречихе требуется до 3500 тонн воды. Требовательность растений к влажности почвы по фазам развития неодинакова. Семена гречихи при прорастании потребляют воды 45-50% от своего веса. Сравнительно немного расходует воды гречиха в период от всходов до бутонизации (до 11% от общей потребности). Наибольшее ее количество (примерно 53%) используется я фазе от начала цветения до начала созревания, около 36% во время созревания. Хорошие урожаи зерна гречихи получают при достаточном количестве осадков (60-90мм) в первой половине цветения, даже если на ранних стадиях растения испытывали недостаток влаги. Избыточное количество осадков в течение вегетации и особенно в первой половине развития растений способствует усиленному росту вегетативной массы и снижает урожай зерна. Высокие температуры воздуха и суховеи при недостаточной влажности почвы в период цветения и плодообразования оказывают отрицательное воздействие на продуктивность растений. Таким образом, наиболее благоприятные условия для цветения и плодоношения гречихи – ясная, теплая, тихая погода с умеренной влажностью воздуха и кратковременными дождями.

Свет

Наиболее благоприятные условия светового режима складываются для гречихи при 17-19 часовом освещении в течение суток. Минимальная освещенность необходимая для цветения и образования плодов гречихи составляет 850-1100 лк, тогда как для пшеницы и ячменя требуется 1800-2200 лк. Горизонтальное расположение листьев у гречихи создает неравномерное освещение, что снижает интенсивность фотосинтеза. Листья нижних ярусов получают света меньше, особенно в утренние и вечерние часы. Это следует учитывать при выборе способа сева, установление нормы высева семян, направлении рядов при посеве и при уходе за посевами. Также необходимо принимать во внимание, что большинство современных сортов гречихи являются фотонейтральными по отношению к продолжительности светового дня.

Почва

Гречиха может произрастать на разных типах почв, но лучшие результаты получаются при ее возделывании на легких суглинистых и супесчаных почвах, которые быстро прогреваются, хорошо аэрируемы и достаточно обеспечены питательными веществами и влагой. Малопригодны для нее тяжелые, склонные к уплотнению и заплываниюпочвы. Эта культура хорошо развиваются на почвах со слабокислой и нейтральной реакцией, но может расти и при колебаниях pH в довольно широких пределах. Установлено, что наиболее благоприятна для гречихи почва с pH солевой вытяжки 5 – 6, несколько хуже она развивается при pH 4.5, а в среде с pH 8-9 отмечается угнетение растений.

II. Макроэкономические предпосылки и организационно-технические возможности выращивания гречихи в общинах-участницах проекта.

Анализ текущей ситуации в сфере производства и потребления гречневой крупы в Республике Армения позволил выявить следующие макроэкономические предпосылки необходимости освоения сельскохозяйственными товаропроизводителями современных адаптированных к местным условиям экологически чистых с высокой рентообразующей способностью технологий выращивания и переработки гречихи:

высокая пищевая и лечебно-профилактическая ценность гречневой крупы, в белках которой соотношение и содержание незаменимых аминокислот (триптофана, метионина, лизина) максимально близко к стандартам Продовольственной и сельскохозяйственной организации ООН (ФАО);значительные и постоянно растущие объёмы потребления гречневой крупы в стране, покрываемые исключительно за счет поставок из России и с Украины;

высокие затраты денежных средств субъектами внешнеэкономической деятельности на импорт гречневой крупы;необходимость диверсификации сельскохозяйственного производства за счет внедрения новых культур и создания новых производств по их переработке, что повысит занятость сельского населения, особенно в осенне-зимний период, увеличит уровень его доходов и будет способствовать дальнейшему развитию сельских общин;

настоятельная потребность внедрения в сложившиеся севообороты культур, не относящихся к семейству Злаковые и способных выполнять фитомелиоративные и фитосанитарные функции, за счет чего будет обеспечено общее повышениепродуктивности пахотных угодий(здоровый севооборот (с гречихой) – здоровая экономика в сельской общине).

Проведенные встречи с фермерами-участниками проекта показали высокий уровень их профессиональных компетенций, способность воспринимать, анализировать и формулировать правильные выводы из новой и достаточно сложной информации. Во всех без исключения группах участники встреч проявили активность, задавали много сугубо профессиональных вопросов по биологии и технологии возделывания гречихи, организации ее пчелоопыления и даже орошения, особенностям и способам уборки, послеуборочной обработки и хранения; тем более, что в ряде общин уже имелся положительный часто многолетний опыт выращивания гречихи.

Система машин для производства зерна и семян гречихи абсолютно та же, что и для возделывания наиболее распространенных в Республике Армения зерновых культур – пшеницы, ячменя, полбы, овса, гороха и включает в себя орудия для обработки почвы (плуги, зубовые и дисковые бороны, культиваторы), машины для внесения минеральных удобрений (разбрасыватели), сеялки, машины для ухода за посевами (катки, зубовые бороны, опрыскиватели), уборочную технику (валковые жатки, комбайны), автомобильный и тракторный транспорт, сортировальные и семяочистительные машины;сушильное, токовое и складское хозяйство.

Осмотр имеющихся в распоряжении фермеров-участников проекта машин и механизмов выявил значительную степень их износа. Но надлежащее техническое обслуживание и грамотный ремонт еще позволят определенное время обеспечивать их пригодность к эксплуатации, Тем не менее, представляется необходимой проработка вопроса о возможности комплексного перевооружения сельскохозяйственных общин современными техническими средствами для эффективного ведения отрасли земледелия.

Также объективно нуждается в модернизации складское и токовое хозяйство, находящееся в собственности и пользовании намеченных для участия в реализации проекта общин, требуется приобретение специального лабораторного оборудования (в том числе влагомеров).

В целом же, на наш взгляд, для начала реализации практической части проекта по выращиванию гречихи никаких серьезных системных ограничений экономического и организационно-технического характера нет.

III. Рекомендуемая технология возделывания, уборки и послеуборочной обработки гречихи.

Размещение в севооборотеВажнейшее условие получения высоких и устойчивых по годам урожаев гречихи – правильное определение ее места в севообороте.

Предшественники. Биологические особенности гречихи обусловливают ее требования к условиям питания, обеспеченности влагой, воздушному и тепловому режимам, фитосанитарному состоянию почв. Гречиха эффективно использует для формирования урожая последействие удобрений, внесенных под предшествующие культуры, для нее предпочтительнее предшественники, обогащающие почву пожнивными остатками, обеспечивающие рыхлое сложение корнеобитаемого слоя, эффективно подавляющие сорную растительность.

Научными исследованиями установлено, что размещение гречихи после озимых зерновых, бобовых и пропашных культур обеспечивает получение урожая на 15-40% выше, чем после зернофуражных предшественников. Если ее урожай по гречихе принять за 100%, то после клевера он составит 140%, гороха – 129%, картофеля – 125%, озимой пшеницы – 115%, ячменя – 84%, овса – 79%.

При выборе предшественников следует также учитывать, что гречиха чувствительна к последствию отдельных гербицидов. В связи с этим, необходимо при планировании размещения гречихи на конкретном поле севооборота уточнять наличие эффекта отрицательного воздействия на нее применившихся на предшественнике гербицидов.

Гречиха как предшественник для других культур.Качество предшественника определяется степенью и характером его влияния на последующую культуру, которое зависит от биологических особенностей предшествующей культуры и осуществляется через почву.

Гречиха с урожаем выносит умеренное количество элементов минерального питания, а после нее остаются пожнивные и корневые остатки с большим содержанием питательных веществ. В слое почвы 0-20см на 1га поля масса корней гречихи составляет 1.5-2.0 т, в которых содержится (кг/га): общего азота – до 22, P_2O_5 – до 10-11, K_2O – 22-24, CaO – 53-55.

Корневая система гречихи обладает свойством повышать растворимость фосфатов, способствуя усвоению их труднодоступных соединений последующими культурами. Благодаря посеву гречихи в относительно поздние сроки возможно проведение дополнительных обработок почвы, направленных на уничтожение сорняков. Угнетению сорняков способствует также короткий период от посева до всходов культуры, интенсивный рост и значительная облиственность ее растений. При высоком уровне агротехники гречихи обеспечивается накопление, сохранение и рациональное использование влаги, благодаря чему содержание ее на полях, занятых гречихой, бывает обычно более высоким, чем на участках под другими зерновыми культурами сплошного посева.Относительно короткий вегетационный период с отмеченными выше другими биологическими особенностями позволяют считать гречиху хорошим предшественником под озимые и яровые зерновые культуры, кукурузу и картофель (имеются данные, что в его клубнях в этом случае повышается содержание крахмала и белка).

Сорта

Величина урожая гречихи в значительной степени зависит не только от применяемой агротехники возделывания, но и от того, семена какого сорта используются для посева. В последние годы селекционерами выведены новые адаптированные к широкому диапазонупочвенно-климатических условий сорта, отличающиеся высокой и устойчивой по годам урожайностью, стойкостью к пониженным температурам, засухе в период плодообразования и осыпаемости семян, имеют высокое качество и выход крупы, отвечать другим требованиям производства.

К одним из наиболее ценных достижений селекции относятся сорта с ограниченным ветвлением и детерминантным типом роста побегов. Данные сорта более подходят для условий с высокими температурами и неустойчивым увлажнением. Среди таких сортов, выведенных в ведущем селекционном центре Российской Федерации – Всероссийском НИИ зернобобовых и крупных культур г. Орел и получивших международное признание, наибольший практический интерес для Республики Армении представляют Девятка, Диалог и Дикуль. Ниже приведены их краткие агробиологические характеристики.

Девятка

Рекордсмен по урожайности среди сортов гречихи в Российской Федерации – 49 ц/га; характеризуется повышенной устойчивостью к ранневесеннем холодам и засухе; конкурентоспособен по отношению к сорнякам; способен мобилизовывать для роста и развития труднодоступные соединения фосфора из почвы; тип роста – детерминантный (ограниченный, не непрерывный); стебель высотой 80-130см, прочный, практически не полегающий; верхушечное соцветие – длинная кисть, цветки бело-розовые с хорошей нектаропродуктивностью; цветение и созревание дружное; среднеспелый (вегетационный период 83-95); плоды крупные, масса 1000 штук 30-36 г; выравненность зерна более 80%, выход крупы-ядрицыдо 70%; сорт высокотехнологичный, может возделываться в широкорядном посеве с пониженными нормами высева, пригоден к уборке прямым комбайнированием; сорт Девятка удостоен Большой золотой медали Всероссийского выставочного центра (г.Москва).

Диалог

РЕЗУЛЬТАТ ПРЕВОСХОДИТ ОЖИДАНИЯ

Высокоурожайный (до 45 ц/га), среднеспелый (82-88 дней), с детерминантным типом роста. Отличается высокой пластичностью, обеспечивает получение высоких урожаев в широком диапазоне почвенно-климатических условий. Устойчивость к полеганию высокая. Отзывчив на внесение умеренных доз минеральных удобрений (прибавка урожая достигает 28%). Хорошо использует последействие минеральных удобрений. Дружность созревания повышенная. Пригоден к уборке прямым комбайнированием. Сорт крупнозерный, масса 1000 семян 32 -34 г. Ценный по качеству зерна, отличается высоким выходом и крупностью крупы.

Дикуль

Высокоурожайный (до 44 ц/га), среднеспелый (85 -92 дня), с детерминантным типом роста сорт; цветки белые и бело-розовые с обильной нектаропродуктивностью; отличается отзывчивостью на удобрения, при этом не накапливает в продукции вещества – поллютанты (тяжелые металлы, радиоактивные элементы и др.); формирует плотный, дружносозревающий стеблестой высотой 70-125 см, устойчивый к полеганию и пригодный к уборке прямым комбайнирование; высокий уборочный индекс (30-35%) и технологичность снижают энергозатраты на уборку и послеуборочную обработку урожая на 15-20%; характерная особенность сорта – исключительно выровненное крупное зерно (массой 1000 штук 32-37г) с высоким выходом из него крупы-ядрицы, отличающейся прекрасными кулинарными, диетическими и лечебно-профилактическими достоинствами.

Обработка почвы.Главная задача обработки почвы – создать оптимальные условия для роста и развития культурных растений.

Осенняя обработка почвы под гречиху после стерневых предшественников (пшеница, ячмень, горох и др.) начинается с дискования (лущения) на глубину 6-8см агрегатируемыми с тракторами лущильниками ЛДГ – 10М или боронами БДН-3 и их аналогами. Этот агроприем выполняют сразу после уборки предшественника. Его назначение – спровоцировать прорастание семян сорняков и осыпавшихся семян предшествующей культуры, заделать растительные остатки, уменьшить потери влаги с поверхности поля за счет разрушения сети капилляров в верхнем слое почвы. Основные агротехнические требования к лущению (дискованию) таковы: отсутствиеогрехов, отклонения от заданной глубины не более чем на ±1см, полное подрезание сорняков и хорошая заделка пожнивных остатков.

По прошествии 15-20дней проводят зяблевую вспашку на глубину 20-25 см (в зависимости от мощности гумусирования слоя). Отвальной пахотой достигается оптимальная для гречихи плотность корнеобитаемого слоя 1,05-1,20 г/$см^3$ - полная заделка пожнивных останков и сорняков в почву, где они деструктурируются и минерализуются, создание мелкокомковатой агрономически цепной структуры почвы, снижение численности вредителей и болезней, отрицательно влияющих на величину урожая и ухудшение его качества, обеспечение лучших условий для влагонакопления. Вспашку следует проводить плугами с предплужниками (ПЛН 4-35; ПЛН5-35 и др.). Отклонение средней фактической глубины от заданной на выровненных полях ±1 см, а на участках с неровным рельефом ±2см. Необходимо, чтобы пласт почвы был перевернут, раскрошен на мелкие комки и плотно уложен без образования пустот. При этом невыровненность (т.е. длина контура поверхности поля на отрезке 10м) не должна превышать 10,7м. Количество запаханных пожнивных остатков, сорняков и минеральных удобрений должно составлять не менее 95%. Нельзя допускать разрыв между смежными проходами плуга, незапаханных участков как на всем гоне, так и при въезде и выезде из борозды. Свальные гребни и развальные борозды после проведения вспашки выравнивают, а поворотные полосы на краю полей запахивают.

Весенняя обработка почвы. Благодаря наличию продолжительного периода от начала полевых работ до посева гречихи представляется возможным выполнить ряд эффективных агротехнических мероприятий по сохранению и накоплению влаги в почве, а также по борьбе с сорными растениями. Первым весенним агротехническим приемом обработки почвы является боронование. Этот прием способствует разрыхлению поверхностного слоя почвы до мелкокомковатого состояния, частичному уничтожению всходов и проростков сорняков, выравниванию поверхности поля и замедлению процесса испарения влаги. Боронование проводят с цепями зубовых борон БЗТС-1,0 и БЗСС-1,0(зиг-заг) по мере подсыхания и наступления физической спелости почвы в максимально сжатые сроки. В разрыхленном слое почвы количество комьев диаметром 20-50мм не должно превышать 20%, наличие комьев большего размера не допускается. Чтобы исключить огрехи, необходимо обеспечить перекрытие смежных проходов агрегата не менее 15см. Правильно проведенное боронование позволяет уничтожить не менее 70% проростков сорняков. На склоновых участках боронируют поперек склона или под углом 5-6° к горизонталям.

После ранневесеннего боронования почвы обычно бывает 3-4 недели до начала посева гречихи. В этот период проводят две сплошные культивации с одновременным боронованием. Первую – при достижении почвой состояния физической спелости на глубине 10-12 см, вторую – непосредственно перед посевом на глубину заделки семян (4-6см). Культивация улучшает воздушный и водный режим почвы, способствует созданию рыхлого мелкокомковатого слоя, препятствует капиллярному подъёму влаги и ее интенсивному испарению, а также уничтожению сорных растений и выравниванию поверхности поля. При обработке почвы необходимо следить, чтобы нижние слои не выносились на поверхность. Сорных растений должно быть подрезанию не менее 95%. Перекрытые между смежными проходами агрегатов допускается не менее 15см. Культивацию проводят агрегатом КПС-4 с боронами БЗСС – 1,0 или его аналогами. Направление движения – поперек или под углом к направлению вспашки, а повторные обработки – поперек предыдущих культиваций, на склонах – в направлении горизонталей. Последнюю предпосевную культивацию обычно выполняют поперек или под углом к направлению будущего посева.

Применение удобрений. Для формирования 1 кг зерна и соответствующего количества незерновой части урожая гречиха использует 3,0-3,4 кг азота, 2,5-3,1 кг фосфора и 4,5-5,6 кг калия. При этом необходимо учитывать, что корневая система гречихи обладает высокой физиологической активностью и способна усваивать из почвы труднорастворимые соединения фосфора и калия, которые недоступны многим другим полевымкультурам. Гречиха хорошо также использует последействие раннее внесенных удобрений. Однако излишнее азотное питание вызывает буйное развитие вегетативной массы и снижение урожая зерна. При расчете конкретных доз и норм минеральных удобрений (в кг действующего вещества на 1 га) можно для ориентировки использовать сведения, приведенные в таблице.

Таблица

Элемент питания	Содержание питательных веществ в 100 г почвы, мг	Планируемая урожайность, ц/га			
		15	20	25	30
Азот	Очень низкое — 0-7	33-76	58-100	83-125	108-150
	Низкое — 7,1-15	0-33	10-58	35-83	60-108
	Среднее — 15,1-25	-	0-10	0-10	0-60
	Высокое — более 25	-	-	-	-
Фосфор	Очень низкое — менее 3	68-90	98-120	128-120	158-180
	Низкое — 3,1-8	32-68	62-98	92-128	122-158
	Среднее — 8,1-15	0-32	12-62	42-92	72-122
	Повышенное —15,1-20	-	0-12	6-42	36-72
	Высокое — 20,1-25	-	-	-0-6	0-36
	Очень высокое — более 25	-	-	-	-
Калий	Очень низкое — менее 4	56-84	84-112	112-139	139-162
	Низкое — 4,1-8	29-56	56-84	84-112	112-139
	Среднее — 8,1-13,5	0-29	18-50	46-84	75-112
	Повышенное — 13,6-18	-	0-18	16-46	43-75
	Высокое — 18,1-27	-	-	0-16	18-43
	Очень высокое — более 27	-	-	-	0-18

Зависимость урожайности гречихи и применяемых доз минеральных удобрений. На практике для удобрения гречихи обычно используют сложные удобрения (нитрофоска,азофоска, нитроаммофоска)и/или тукосмесипри норме 100-150 кг физического веса на 1 га. Вносят их либо под предпосевную культивацию, либо сеялками одновременно с посевом (при дефиците минеральных удобрений данный способ наиболее эффективен). При наличии технических возможностей и трудовых ресурсов минеральные удобрения вносят и под предпосевную культивацию, и при посеве. Подкормку посевов гречихи проводят редко, обычно приурочивая ее к фазе бутонизация – начало цветения. При поверхностном внесении неравномерность распределения удобрений по ширине захвата и длине года не должна превышать 25%, при внесении в рядки туковысевающими аппаратами сеялок – 15%.

Для поверхностного внесения удобрений применяют машины НРУ – 0.5, МВУ-5 и их аналоги, при посеве удобрения в рядки вносят туковысевающими аппаратами сеялок СЗ-3,6; СЗ-5,4 и другими. Дозы внесения минеральные удобрений этими машинами регулируют в соответствии с инструкцией по эксплуатации (за счет изменения передаточных отношений на туковысевающими аппаратах и величины зазоров на заслонках дозаторов.

Подготовка семян и посев.Получение высокого урожая гречихи в большой мере зависит от качества семян. “От плохого семени не жди хорошего племени” – гласит народная мудрость.

И, действительно, хороший урожай можно получить только от семян хорошо адаптированного к местным почвенно-климатическим условиям сорта, доведенных до высоких посевных кондиций – всхожести – не менее 92%, содержащих семян других растений – не более 20 шт/кг, в том числе сорняков – не более 10 шт./кг; с влажностью не более 15%, с высокой массой 1000 штук и с чистотой не менее 98,5% (по ГОСТ-52325-2005). Одним из наиболее простых и действенных способов повысить энергию прорастания и полевую всхожесть семян является воздушно тепловой обогрев. Выполняют его в течении 4-5 дней до посева следующим образом: в солнечную и теплую погоду семена тонким слоем (5-7см) рассыпают на открытых площадках с твердым покрытием и время от времени перелопачивают.

При наличии финансовых возможностей положительный результат дает обработка семян гречихи биостимуляторами – Мивал-агро (5-10 г/т), гуматом натрия “Сахалинский” – 3-5 л/т; Альбит (30-40мл/т) и другими. Для обработки небольшого количества семян вполне применим ручной опрыскиватель. Расход рабочей жидкости 10-12л/т семян.

Если в результате фитопатологического анализа семян гречихи выявляется необходимость обработки их протравителями (что, впрочем, бывает крайне редко), используют для влажного протравливания ТМТД в дозе 4-6л/т (против плесневения семян, некоторых бактериозов, серой гнили и пероноспороза). Такую обработку семян можно проводить заблаговременно до посева серийными протравителями (ПС-10 АМ, ПСШ-10 и др).

Посев. Посев в лучшие агротехнические сроки – одно из решающих условий получения высокого урожая гречихи. Оптимальный срок посева должен обеспечивать такие условия, чтобы всходы не попали под весенние заморозки, а период цветения – плодообразования, который продолжается в среднем 40-50 дней, не совпал с сухой и жаркой (>30°C) погодой. Срок начала посева устанавливают исходя из конкретны погодных условий, типа почв, рельефа местности, особенностей сорта и других факторов. Наукой доказано и практикой подтверждено, что лучшие сроки посева гречихи наступают при устойчивом прогревании почвы на глубине 8-10 см до 12-14°C.

Гречиху высевают узкорядным (ширина междурядья 7,5см), обычным рядовым (ширина междурядья 15 см) и широкорядным (ширина междурядья 45см). При выборе способа посева следует принимать в расчет, что широкорядно обычно сеют участки размножения новых сортов в первичных звеньях семеноводства на хорошо окультуренных и высокоплодородных землях, при обеспечении своевременного и высококачественного ухода за посевами (2-3 междурядные культивации), Узкорядный и обычный рядовой способы посева находят более широкое применение в производственных посевах урожай с которых будет использован, преимущественно для переработки на крупу.

Норма высева гречихи зависит от почвенно-климатических условий местности, срока и способа посева, уровня засоренности полей сорняками, сортовых особенностей. Как правило, норма высева семян варьирует в диапазонах: для узкорядного и рядового способа посева – 2,5-3,5 миллиона всхожих семян на 1 га, для широкорядного – 1,5-2,5.

Для получение дружных всходов, равномерного созревания растений семена гречихи необходимо заделывать на одинаковую глубину во влажный слой почвы. Глубина заделки семян зависит прежде всего от механического состава почвы, ее влажности, температуры, крупности и массы семян. На тяжелых, быстрозаплывающих почвах оптимальной глубиной заделки являются 4-5 см, на окультуренных структурных почвах – 5-6 и даже 7-9 см, если верхний слой пересушен. При этом допустимое отклонение от заданной нормы высева должно находится в пределах ±5%, неравномерность высева отдельными сошниками ±3%, отклонение от заданной глубины ± 0,5см.

Современные сеялки удовлетворяют указанным требованиям лишь в том случае, если соблюдены все агротехнические требования к основной (вспашка) и предпосевной (боронование, культивация) обработке почвы и используются качественные семена. Кроме того, необходимо отметить, что только правильно настроенная и отрегулированная техника сможет удовлетворить требованиям, предъявляемым к посеву гречихи. Только в этом случае возможна качественная работа машин на высоких скоростях, а поле после прохода агрегата останется ровным, без гребней, борозд и огрехов как на гонах, так и на поворотных полосах.

Посев узкорядным и обычным рядовым способом выполняют зернотуковыми сеялками СЗ-3,6, СЗУ -3,6 и их аналогами. Для посева гречихи широкорядным способом используют сеялку ССТ-12А(Б) или ее аналоги.

Уход за посевами.Своевременное и качественное проведение работ по уходу за посевами гречихи в значительной мере определяет условия развития и продуктивности растений. Основными агротехническими мероприятиями в этот период являются послепосевное прикатывание почвы, боронование посевов, обработка(культивация) междурядий (в широкорядных посевах) и организация пчелоопыления гречихи. В отдельных случаях посевы гречихи могут требовать подкормки жидкими и/или гранулированными удобрениями, обработки их стимуляторамироста (в дозировках, определенных регламентами их применения) и в порядке исключения химическими средствами защиты растений от вредных организмов.

Прикатывание проводят при посеве гречихи в недостаточно увлажненную почву. При этом выравнивается и уплотняется верхний слой почвы, усиливается поступление влаги из нижних слоев и контакт семян с более увлажненной почвой, что способствует ускорению появления дружных всходов. Прикатывают посевы кольчато-шпоровыми ЗККШ-6, кольчато-зубчатыми ККН-2,9 или гладкими водоналивными катками ЗКВГ-1,4. После прохода агрегата должен оставаться мелкокомковатый разрыхленный слой почвы.

Размер комков не более 50мм. Не допускается чрезмерное уплотнение почвы повышенной влажности и распыление пересохших почв взоне повышенной ветровой эрозии. Направление движения агрегата при прикатывании поперек или под углом к посеву. Пропуски и сгруживание почвы на засеянных участках не допускается.

Для борьбы с сорняками и разрушения почвенной корки, иногда образующейся после выпадения осадков ливневого характера может потребоваться боронование посевов до и после всходов. Для этой работы обычно используют зубовые бороны ЗОР-0,7 ЗБП-0,6А, БСО-4А, БЗСС-1,0 и другие.

Глубина обработки почвы при довсходовом бороновании (за 2-3дня до появления всходов) не должна превышать ½ глубины заделки семян. Крошение верхнего слоя почвы должно быть таким, чтобы комья диаметром 30мм составляли не более 10% общего количества, а уничтожение сорняков – 65-80%, направление движения агрегата – поперек посева или под углом к нему, скорость 1,6-2,2м/с.

Боронование гречихи по всходам лучше выполнять в фазе первого настоящего листа. Во время послевсходового боронования наряду с уничтожением проростков и всходов сорняков повреждается и часть растений гречихи. Поэтому проводить эту агротехническую операцию следует с определенной осторожностью со скоростью 1,0-1,5м/с, поперек посева или под углом к нему, в ясные полуденные часы, когда растения гречихи потеряют тургор, на глубину не более 3см. Уничтожение сорняков должно быть не менее 50%, изреживания посевов гречихи – минимальным. Сгруживание и оголение нижних слоев почвы не допускается.

Международная обработка широкорядных посевов способствует улучшению воздушного и водного режимов почвы, очищению посевов от сорняков, что преимущественно и обеспечивает в определенных условиях повышению урожая по сравнению с рядковыми сплошными посевами.

Первую международную обработку проводят при обозначении рядков, служащих ориентиром для движения агрегата, вторую – в фазе бутонизации, третью - перед смыканием рядков. Рыхление почвы в междурядьях должно быть равномерным по длине гона и ширине захвата агрегата. При первом мелком рыхлении отклонение от заданной глубины не должно превышать ±1см, а при более глубоких второй и третей культивации ±2см.

Ширину защитной зоны выдерживают в пределах 10-12см от оси рядка при первой обработке. Допустимое отклонение от данных величин ±2 см. После прохода культиватора допускается образование борозд глубиной 1,5-2,0см, почва должна быть мелкокомковатой. Количество комков диаметром 20мм не более 20%. В междурядье уничтожение сорняков должно быть полным, в защитной зоне рядке – не менее 40%, а число поврежденных растений гречихи – не более 4%. Для этого скорость движения агрегатов ограничивают до 1,5м/с. Для обработки междурядий гречихи используют культиватор УСМК-5,4 или его аналоги, оборудованные односторонними лапами-бритвами, ротационными батареями и защищенными дисками.

Гречиха – одна из немногих культур современного земледелия, не требующая обязательного применения химических средств защиты от сорняков, вредителей и болезней, что обеспечивает получение экологически чистой продукции. Основные меры защиты гречихи осуществляются, прежде всего,путем строго соблюдения комплекса агротехнических мероприятий (севооборот, удобрения, приемы обработки почвы, подготовка семян, сроки посева, уход за посевами). Только в редкие годы, при массовом размножении вредителей (тли, совки, и некоторых других), а также распространении болезней (преимущественно серой гнили) может потребоваться обработка посевов до фазы цветения допущенными к использованию инсектицидами и фунгицидами. Для борьбы с сорняками иногда применяют обработку полей после уборки предшественников гербицидами общеистребительного действия (Раундап, Ураган, Торнадо, и др.) в дозе 2-3 г/га. В случае превышения экономического порога вредоносности злаковых сорняков (2,5-3,5 шт/$м^2$) в период до бутонизации гречихи эффективно применение гербицида Фюзилада Супер в дозе 1,0-1,5 л/га. Эти гербициды не накапливаются в зерне гречихи, идущем на переработку, и в почве.

Гречиха – перекрестноопыляемое растение, 95% цветков которого опыляются пчелами.

Для лучшего опыления за один-два дня до цветения гречихи на поле вывозят пасеки из расчета 2-3 полноценные пчелосемьи на 1га посева. Организация пчелоопыления посевов гречихи позволяет существенно повысить урожай, а также обеспечить получение до 50-70кг ценного гречишного меда от каждой пчелосемьи.

Уборка, послеуборочная обработка и хранение урожая.

Период созревания у гречихи растянутый, что несколько затрудняет определение правильного срока уборки. Преждевременная уборка снижает урожай из-за увеличения количества невыполненных зерен. Запаздывание с уборкой ведет к потерям урожая из-за осыпания зерна. При определении сроков уборки гречихи необходимо учитывать, что у нее возможно возобновление плодообразования в период, когда после засухи, приходившейся на начальную фазу плодообразования, начинают выпадать дожди и устанавливается умеренная температура воздуха.

Практикуется три способа уборки гречихи.

Первый – раздельный. К нему приступают при побурении75-80% образовавшихся плодов. Вначале гречиху косят в валки жатками ЖЗБ-4,2, ЖБВ-4,2, ЖВПУ-6 и другими. Оптимальная высота среза 15-20см, при такой стерне растения не проваливаются на землю, быстро и хорошо просыхают. Частоту вращениямотовила устанавливают такой, чтобы окружная скорость его планок была больше поступательной скорости жатки в 1,2-1,3 раза (с таким расчетом, чтобы порция скашиваемой массы подвергалась однократному воздействию планок мотовила).

Через 3-5дней, когда влажность скошенной в валки вегетативной массы уменьшится до 30-40%, а зерна до 15-17% валки подбирают и обмолачивают.

Для этих целей, а также для прямого комбайнирования применяют зерноуборочные комбайны СК-5А «Нива», Дон-1500Б и др., отрегулированные таким образом, чтобы потери, обрушивание и дробление зерна гречихи были наименьшими. В зависимости от влажности массы, число оборотов барабана устанавливают в диапазоне 400-500в минуту, зазоры между планками деки и бичами барабана на входе – 18-24, выходе 4-8мм. Окончательную регулировку комбайна, включая обороты вентилятора, проводят при пробном обмолоте.

Второй способ уборки гречихи предусматривает проведение десикации (подсушивания) посевов и используется на мощных, хорошо облиственных участках, иногда на участках с обильно сорной растительностью, при прогнозе неустойчивой погоды с обильным выпадением осадков. В качестве десикантов используют Реглон (2-3 л/га), Раундап (2-3 л/га) и их аналоги. Фаза развития растений гречихи, обеспечивающая эффективность химической обработки посевов, также что и при первом способе уборки – побурение 75-80% плодов. При подсыхании растений обмолот ведут прямым комбайнированием.

Третий способ уборки – однофазное прямое комбайнирование обычно применяют на посевах относительно дружносозревающих детерминантных сортов современной селекции (Девятка, Диалог, Дикуль и др.); растения гречихи должны находиться в фазе полной спелости и поддаваться качественному обмолоту.

Зерно гречихи, намолоченное комбайном, как правило имеет повышенную влажность, содержит семена сорняков, кусочки стеблей и листьев. В связи с чем оно может самосогреваться, что негативно сказывается на его семенных и продовольственных качествах. Поэтому при поступлении бункерной массы с поля ее требуется сразу очистить и при необходимости высушить.

Для предварительной очистки поступающего от зерноуборочного комбайна зернового вороха применяют машины МПО-50, ОВС-25 и др. Для первичной - воздушно-решетные машины СМ-4, МС-4,5, И-531/1 и др.

Для обеспечения высокого качества очистки зерна и семян гречихи необходимо в воздушно-решетных машинах первичной и вторичной очисток установить разделительное решето с отверстиями 4-5мм или треугольными размером 5,5мм колосовое решето с треугольными решетками размером 5-6мм, подсевное решето с продолговатыми решетами размером 2,6-3мм или круглыми 2,5-3 мм, сортировальное решето с круглыми решетами 3,6-4,0 мм.

Семенной материал и материал предназначенный для переработки на крупу, содержащий трудноотделимые примеси (семена дикой редьки, семена хлебных злаков и др.), требуют дополнительной обработки на пневматических сортировальных столах СПС-5, МОС-9А и пневмосепараторах СП-5, ПС-30 и др.

Надлежащая сохранность семян и зерна, предназначенного для переработки на крупу, обеспечивается при их влажности менее 15%, что в отдельные годы может потребовать их сушки после уборки. В зависимости от объема материала и его влажности, сушку проводят естественным способом – используя солнечное тепло, либо в сушилках разных конструкций и производительности.

Семенное и продовольственное зерно гречихи надо хранить в сухом проветриваемом помещении, в мешках, каждую партию укладывать отдельным штабелем на деревянный поддон. Высота штабеля не более 8 мешков, ширина не более 2,5м. При хранении семян и зерна насыпью высота ее (насыпи) не должна превышать 2,5м.

Annex 11: Equipment needs and processing details for production of High value cheese in Armenia

DRAFT ONLY

UNIDO Project No 120603

Producer Group and Value Chain Development

Project Manager Mr. Frank HARTWICH

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1 Recommendations

Use the marketing report to help the dairy groups decide what <u>varieties</u> of cheese to make as well as what <u>weight</u>, <u>shape</u> and <u>maturity</u> to make.

In principle, Gouda cheese is strongly recommended. Edam, Emmentaler and Gruyere are mildly recommended and blue cheese such as Roquefort is not recommended.

Carefully and thoroughly explain the equipment schedules, layouts with the five dairy groups to discuss which items they would like UNIDO to buy, which ones they will locate and buy and overall affordability of their plans.

Discuss the likely investment costs to make high value cheese with the dairy groups for new and used equipment to ensure they have the resources and willingness to invest or borrow.

Discuss the Berdashen (Group 1) design issues with both the group and their consultant. Be prepared to proceed without this group if the difficulties cannot be resolved or satisfactorily explained,

Discuss the relative merits of the original (300kg manual vat) and revised (500kg mechanical vat) schemes with Agarak Group (Dairy group 4) because of limitations with the building.

Confirm with Gerasim Agri-Production Consumer Cooperative, (Dairy group 5) inVayots Dzor Marz that they interested in the larger of the two investments proposed.

1. Smaller investment with two existing vats and buy only extra equipment needed for making Dutch cheese at rate of one 300kg batch per day
2. Larger investment with new 1,000kg vat plus extra equipment and facilities.

Continue the search for new and second hand equipment urgently.

On the farm, sealed cans of fresh warm milk can be placed in cool running water to reduce its temperature. This will help to retard quality deterioration.

Conduct training for milkers on how to provide good quality milk

Consider quality incentives for supply of good quality milk

2 Recommended high value cheeses to produce, by each farmer group

Different dairy groups will decide to make a particular variety of cheese because they believe they can make it well and can sell it profitably.

The choice of which particular cheese to make is a business decision for the individual groups. Information that will support that process is given below.

All groups are understandably at an early stage in this decision making process. None of the five groups have all the cheese making equipment needed and will be relying on information from the project's marketing consultants to help make the decision.

The groups' ideas and preferences on making particular varieties of cheese evolved in late 2015 are shown in the table below.

No	Group name	Preferred cheese varieties to make
1	BerdashenShirak Marz	Roquefort and cheese that sells at New Year. Intend to make 70% hard cheese and 30% soft cheese
2	Mets Mantash, Shirak Marz	Mets Mantash, Shirak Marz Sheep cheese, Gouda
3	Khachaghbyur, Gegarkhunik Marz	Gouda, Lori, possibly Ricotta, not blue cheese
4	Agarak Group,	Traditional cheese, Gouda, Siluguni (Mozzarella type), any cheese with a good demand. Would like to create their own kind of cheese. Would consider making yoghurt too.
5	Gerasim Agri-Production Cooperative,Vayots Dzor Marz	Sheep cheese, hard cheese that will sell well in St Petersburg, Mozzarella

Marketing aspects

The cheese marketing survey commissioned in October 2015 will have practical information on different kinds of high value cheese. It is recommended that project staff use this report in discussions with the dairy groups to help them decide what varieties of cheese to make.

The shape of the cheese is critical from a marketing point of view. Certain cheeses are made in certain shapes. Part of the high value comes from the customer's recognition that the cheese is a "correct" shape. For example classic Gouda and Edam cheeses are both round but Edam is taller than Gouda.

The weight of the cheese is also critical from a marketing point of view.

Taking Gouda cheese as an example, it is produced in many different sizes including 200g, 1.5-2kg, 2.5-3kg, 4-5kg, 5-6kg, 8kg and 10kg but not all sizes are popular in all markets. This has a financial impact on the business, as the moulds needed to produce these cheeses are expensive. The dairy groups need to buy the right mould for the right market.

The maturity of the cheese is also important. High value cheeses tend to have a long shelf life and up to a certain time increase in value as they age. Younger and therefore cheaper Gouda sells more readily than aged and more expensive Gouda in most markets. Longer storage times demand more working capital too.

Well known varieties of high value cheese

Gouda This traditional Dutch semi-hard cheese is recommended as it has won wide acceptance in many markets. It is marketed in different sizes and flavour variations are acceptable. It is generally considered to be a "robust" cheese, relatively straightforward to make and with a low chance of producing unsaleable product.

Edam another traditional Dutch cheese is recommended. Virtually the only difference between Gouda and Edam is that Edam is made from partly skimmed milk and is packed in a taller and narrower mould than Gouda.

Emmentaler and **Gruyere** are well known Swiss high value cheese. To achieve high prices their taste, appearance of the pack and appearance of the cut cheese must be very similar to the original. Gouda can be much more variable

Roquefort. Making soft blue cheese such as Roquefort is not recommended for start up cheese makers. Roquefort itself is a traditional French cheese and has protected geographical indication (PGI). Blue cheese is so named because of the blue *Penicillium* mould that grows on its surfaces. Temperature control, humidity control and hygiene management are much more critical when making this kind of cheese. Product losses can be expected if production and storage conditions exceed limits. Further, start-up cheese makers are recommended to not make mould ripened cheese and ordinary cheese in the same factory to avoid the risk of unwanted mould accidentally contaminating the conventional cheese.

Having said that, it is common practice for experienced cheese makers to maintain good production practices and make both kinds of cheese in the same factory. In conclusion, it is recommended that start-up cheese makers make blue cheese only after they have gained a few years successful experience of making conventional cheese

Potential for high value traditional Armenian cheese

Switzerland, a mountainous dairying country only 30% bigger than Armenia produces 450 different cheeses, almost all are high value. Much of the Armenian cheese is Lori-Chanakh generic and there is an opportunity to drive up its value. This needs a combination of

Consistent high quality milk

Consistent quality products

Products distinctly different in taste, shape, appearance, colour, texture

Unique selling point(s) such as

Geographic location e.g. a particular mountain or valley,

Breed of animal

Type of pasture e.g. mountain herb fields,

Process e.g. made in historic building, hand made, stored in a cave

Recognisable packaging and branding

Promotion of the variety/brand

Promotion of Armenian cheese in general

High value cheese does not mean centralised large scale production. The most expensive cheese in the world, the Italian Caciocavallo Podolico, which retails forAMD 36,000/kg, is made on a small scale.

3 Recommended complete equipment needed to produce and package these cheeses, for each of the 5 farmer groups

This section describes the equipment necessary for each of the five groups.It explains how items are calculated so that the groups who must buy a substantial amount of this equipment can talk to potential suppliers of both new and old equipment and make the necessary choices.

A consistent numbering system is used for all the groups

It is recommended that project staff go carefully and thoroughly through the equipment schedules with the individual groups to determine which items they would like UNIDO to buy and which ones they will locate and buy.

Descriptive not prescriptive

The equipment described below for each of the farmer groups was hoped to be highly specific. Instead it is descriptive rather prescriptive.

The details are based on information from several resources; the consultant's own knowledge, discussions with several small scale cheese makers in New Zealand. Correspondence with two consulting cheese makers in New Zealand and a CARD specialist in Armenia, a quotation from Van't Riet of Netherlands which included full specifications for processing a 1,000kg vat of milk into 5kg packs of Gouda, a quotation from Borsch of Austria and CARD of Armenia for several items of equipment, quotations from Turkey, two reference books on cheese making and internet research.

It was hoped, to keep it simple, that all the groups would want pretty much the same thing but it became much more complex for several reasons i) each group had different ideas and constraints on what they wanted to produce, ii) their ideas were still quite formative in terms of product mix and pack size, iii) the project's budget for each group of around EUR20,000 did not buy much European equipment and iv) finding that the groups would be comfortable with spending their own money on second hand equipment, v) time constraints in translating material and visiting the widely scattered groups and vi) equally supportive technical alternatives with equipment that the groups would have to face before buying.

These technical choices are discussed below in the same order as the cheese making process.

Milk cooling. It is prudent to allow for a raw milk-cooling tank of the same capacity or greater than the cheese vat so that if there is a delay for any reason, the milk can be kept cool. One group, Berdashen has rationalised that they will not need a cooling tank, as the milk will be made into cheese immediately. Their solution is technically acceptable but carries a risk as explained above. Two groups already collect milk and have milk-cooling tanks. They can avoid buying a new one. A 1,000kg European milk cooling tank costs around EUR11,000. They are very durable and can be bought for much less second hand. A second hand 1,000kg or 1,500k or even 2,000kg cooling vat is an acceptable technical solution for a factory with 1,000kg cheese vat.

Pasteuriser. A lot of Armenian cheese is made from non pasteurised milk. In Europe some Gouda is made from unpasteurised milk and there is even a small minority of people who pay extra to buy cheese made from unpasteurised milk. From food safety perspective, pasteurising is an important step and should not be bypassed. The food safety inspections and procedures that must be followed to produce ISO acceptable cheese from non pasteurised milk are much more severe. While pasteurising is strongly recommended, the decision is up to individual groups.

Pasteurising can be accomplished in essentially two ways; a low temperature long time batch process and a high temperature short time process using a plate heat exchanger. The latter process, often abbreviated as HTST is more suitable for larger processes and the equipment is very expensive.

Berdashen who have a 2,600kg cheese vat have bought a second hand 1,000kg/hr HTST pasteuriser. There are risks that this may never work.

Other groups that wish to have a 1,000kg vat might choose to buy a second hand plate pasteuriser but it is not recommended.

The consultant recommends batch pasteurising and using the cheese vat itself. In this case the vat is commonly known as a pasteurising cheese vat. It is also possible to use a separate vessel to batch pasteurise and then pump to a cheese vat that is not set up to pasteurise. There is a further complication. The heating part of the pasteurising process can be done in two ways; by electrical heating elements built into the jacket of the pasteurising vessel or an external hot water generator is used that is powered by gas or electricity.

Cheese vat As mentioned above, the cheese vat may be pasteurising or non pasteurising. A pasteurising cheese vat is recommended for the sake of simplicity. However, it is an acceptable solution to use an external pasteuriser, whether batch or continuous and pump to the cheese vat.

A cheese vat is either elevated or mounted on the floor. Both are acceptable solutions. An elevated vat is recommended as the curd can freely discharge onto a curd draining table at a convenient working height. A floor mounted vat is cheaper but involves more work in bending and lifting curd out. This is less of an issue for a 500kg vat.

Moulds. Many sizes and shapes are available. Different qualities are also offered. Without seeing any of the cheaper offerings, the consultant recommends the Kadova® brand as this is the industry standard in Europe. As stated elsewhere in this report it is critical that the groups order the right moulds for their market. Not all groups will make the same choice. As an interim measure the consultant has used the 3kg Kadova® Gouda mould as the basis for design calculations throughout.

Press. Gouda cheese must be pressed firmly by using a pneumatic or mechanical press. Pneumatic presses are expensive but convenient. Mechanical presses are cheaper but involve a lot of lifting weights. On balance, the consultant recommends a pneumatic press for 1,000kg vat and a mechanical press for a 500kg vat. Both are technically equally valid solutions.

Brining. Surface area of the brine tank is calculated for each group. This is based on the diameter of a 3kg Gouda cheese plus a safety margin and the fact that Gouda is brined for 24 hours or less. The measurements of the brine tank depend on the shape of the available space and whatever suitable tank can be made or found.

Brining shelf Shelving was allowed in the brine room for cheeses to drain after brining. Sufficient shelving was allowed to take the contents of one batch of 3kg Gouda plus a safety margin. The shelves are specified as being wide enough to take a 5kg Gouda cheese.

Storage room Sufficient shelving was calculated to store one month's production of 3kg Gouda cheese. Some groups expressed a wish to fully utilise their available space or make two or three batches per day. These specific requests are addressed in the details for the individual groups.

Cold water supply Maximum water demand is given so that groups can figure what reserve water capacity if any they need to have.

Budgetary constraints

A complete set of Dutch equipment to process 1 tonne batch of milk into Gouda cheese on a daily basis costs about EUR150,000. If the project were contributing $130,00 per dairy group this consultant would strongly recommend the dairy groups contribute the remaining EUR20,000. As it is, the project is contributing around EUR 20,000 per groups. This consultant cannot recommend the groups each put in the balance of EUR 130,000 because i) they don't have that amount of money, ii) cheaper equipment is available from lower cost producing countries such as Turkey and Russia, iii) second hand equipment both local and imported is a possibility and iv) there are choices of technical solutions.

3.1 Equipment for dairy group 1 Berdashen, Shirak Marz

Concept

In the peak season, collect 10 tonnes cow milk per day.

In the winter, collect one tonne cow milk per day.

Equipment needs are based on these assumptions

Intended cheese production is 70% hard cheese, 30% brined cheese.

Sometimes milk will not be not suitable for making hard cheese because of milk quality and time of the year.

Each day's milk will be made into to either hard OR brined cheese

- 1x 2,500kg batch cow milk per day
- Hard cheese yield is 11%. One batch produces about 275kg hard cheese and 2500 litres of whey
- Brined cheese yield is 1kg cheese per 7 litres milk. One batch produces about 357kg/da

Caution. It is not possible to sensibly fit all the equipment detailed below that is needed to handle curd from the already installed 2,600kg cheese vat. A rethink is necessary for the group.

Equipment for dairy group 1 Berdashen, Shirak Marz		
No	**Name**	**Description**
	Raw milk reception	
1	Raw milk collection; milk cans, milk tanker vehicles, scales	You already have this
2	2,600 litre raw milk cooling capacity in one or more tanks.	Stainless steel, insulated, with stirrer, drain valve, lid and cooling unit. Recommendations. 1. New Turkish tulsan.com milk vertical cooling tanks are available in sizes of 1070, 1518 and 2130 litres. 2. They also make bigger capacity horizontal cooling tanks. 3. Some milk cooling tanks may be kept outside. They use "cleaning in place" and a hygienic opening, not a lid that lifts up. 4. Have 2 or more smaller tanks e.g. 2 x 1518 litre tanks 5. Cooling tanks do not deteriorate. They can safely be bought second hand in a combination of sizes.
3	1 milk pump with fittings and 8metres flexible hoses	Stainless steel centrifugal type. Mounted on a trolley. Pump body and impeller should be 316 grade stainless steel. Motor cover and frame can be made of 304 grade stainless steel. Recommendation. 1. If the pump is on a trolley you may be able to avoid buying an extra pump. You may consider putting your existing pump on a trolley. 2. Flexible hoses are much cheaper than stainless steel pipes and bends 3. New stainless steel pipe fittings are expensive. Try and match equipment to minimise the number of different size fittings
3A	Pasteuriser	You have a new but old style 1 tonne/hour PIM plate pasteuriser. You intend to power it with gas balloons. Heating milk from 5C to 75C needs 82KW at 1,000litres per hour. Assume your pasteuriser has 70% heat recovery then heating requirement for your gas balloons is about 20KW. Recommendations 1. Get technical assistance from the makers. They can tell you the required flow rates for heating water and cooling water http://www.pimbg.com/ 2. Search for a local dairy engineer who has had experience with this equipment. 3. Expect some difficulties and extra costs with installing the pasteuriser.
	Cheese production	
4	1 x 2600kgoval shape, elevated second handnon-pasteurising cheese vat with;	You have this and you have made a motorised stirrer Recommendations. Stirring starts at 2RPM and builds up to 8RPM so we

Equipment for dairy group 1 Berdashen, Shirak Marz		
	Mechanical stirrer Mechanical or hand curd cutting Electrical warming elements	recommend a variable speed drive. The curd needs to be cut accurately to make good quality cheese. Motorised curd cutting generally gives better results than hand cutting but hand cutting may be better in your case. You will find this out during test production.
6	3 x curd draining vat(s)	Stainless steel, on wheels capable of taking contents of the 2,500kg batch Recommendation Have 3 vats; 2 for 1,000kg curd and 1 for 500kg This gives flexibility when making smaller batches Buy second hand, they do not deteriorate
7	2 or 3Cheese moulding table	Stainless steel, on wheels. Use this to fill moulds and move to the press. You need two tables for making Lori plus Gouda cheese and three tables if making Chanakh plus Gouda cheese
8	1 set of moulds to make hard cheese e.g. Gouda	Choose the sizeafter market study is complete. Moulds are expensive and you want to buy the size that suits your intended market. For example 95 round 3kg Gouda moulds or 65 x 4-5kg rectangular moulds is enough for a 2,500kg batch
9	1 set of moulds to make soft cheese e.g. Chanakh	80x 4-5kg stainless steel or hygienic plastic rectangular moulds will cover production for one day
10	Hydraulic press sufficient to put 20kg pressure on to the moulds Air compressor to operate the press	Stainless steel, capable of pressing 275kg curd at a time. Recommendation. A mechanical press is cheaper but a pneumatic press will handle this quantity much easier and more consistently. New European ones are very expensive so we are researching it. Van't Riet of Netherlands offered a pneumatic press suitable for 1,000kg batch for EUR 11,000. The air compressor is extra. CARD in Yerevan offered a press suitable for 1,000kg batch at EUR 23,000.
	Brining (24 hours)	
13	Hard cheese Brine tanks total surface area 6 sq m and minimum depth of 30cm. Tanks made of stainless steel, plastic or concrete coated with a surface that is suitable for food.	The newly pressed cheese stays in the brine for 8 hours to one day depending on the size. They float in a single layer. Assume each day you make 92x3kg round cheeses that have a diameter of 23cm. Total area of floating cheese is 92x0.23x0.23 = 4.4 sq m For safety allow 6 sq m for area of brine tanks.
14	20 linear metres of 316 grade stainless steel shelving plus stainless steel supports	After brining, cheeses can rest on a shelf to dry. This helps keep steady humidity in the storeroom. Some cheese makers do not use shelves; they put the wet cheese directly into the storeroom. Shelving. Good quality stainless steel is needed to prevent corrosion. Total length of shelving is calculated below. 92 cheeses each 23cm diameter gives total length of 21m. Shelf is 30cm wide and cheese is 23cm wide so they can be packed tighter than in a straight line. 20m shelving will be OK.

Equipment for dairy group 1 Berdashen, Shirak Marz		
		Note. Adapt the length and number of shelves to suit shape of the room. For example a stack of 4 shelves x 5.0m long x 32cm wide.
15	Brine room air cooling system	The air conditioning unit helps to keep the room at the desired temperature of 12-14°C.
16	Brine cooling system; Insulated ice accumulator	Ice water is pumped through stainless steel pipes in the brine tanks to keep the brine at 12-14°. The cheese goes in at about 30°C and should be cooled to 12°C within one hour. Specification below is generous for one 1,000kg batch per day. 700 litre ice water 0.55 KW motor Total cooling capacity 1083KW Reloading time 8 hours We scale this up 2.5x for 2,500kg batch as follows 2 tonne ice water 1.5KW motor Total cooling capacity 2707 KW Reloading time is 8 hours. We can discuss these calculations with your preferred refrigeration engineer
	Storage (ripening) room 4 weeks	Cheese storage needed for one 1,000 kg batch of milk per day for one month is 30sq m by 2.5m high. Therefore size for 2,500kg daily production is 75 sq. m by 2.5m high
17	1 x Hard cheese cooling system with 5.75KW of 230/400V cooling	Recommended capacity for 1 tonne batch per day is 5740kcal/hr (6,7kW/hr) and that needs a 2.3KW 230/400V cooling motor. Recommended capacity for 2,500kg batches is 2.5 times or 5.75KW. Recommendation It may be cheaper to use 2 or three smaller motors. The calculation was based on European conditions. A basement storage room is naturally cooler and may well need less refrigeration.
17 A	1 x Soft brined cheese air cooling system	As needed
18	1 x set stainless steels posts and brackets with 240m wooden shelves 32cm wide by 2.5cm thick.	Each day needs minimum 20m of shelf 30 days needs 600 metres shelf. The shelves can be 10 high. Shelf lengths to suit shape of storage room e.g. 12 x 5m lengths The wood must not taint the cheese.
18 A	Soft brined cheese tanks	Size as needed. These will be in a different room as brined cheese is stored at a cooler temperature than hard cheese.
	Whey equipment	
19	1 x whey pump capacity about 10 cubic metre/hour.	Stainless steel centrifugal pump. To be supplied on a stand and with enough flexible hose to reach whey tank. Pump body and impeller should be 316 grade stainless steel. Motor cover and frame can be made of 304 grade stainless steel.

Equipment for dairy group 1 Berdashen, Shirak Marz		
20	1 x 2,500 litres whey tank(s)with outlet tap(s). A hose tap is needed nearby for washing out.	Made of food grade plastic or stainless steel, located outside the factory on a stand so can be emptied daily. A mobile tank is also suitable.
	Laboratory equipment	
21	1 digital hand thermometer 1 x pH meter with calibration liquids 1 glass brine density meter 5 plastic 100mlmeasuring cups	Additional milk testing equipment as required e.g. Lactoscan analyser for fat content Acidity titration equipment
	Packing equipment	
22	Vacuum packer	Stainless steel and food grade plastic contact parts. Vacuum chamber must be big enough to take the biggest size cheese.
23	1 x set 0 to 10kg electronic scales	Food grade with hygienic surface
	Auxiliary equipment	
24	1 or more electric or gas hot water boilersto supply 400 litres hot water and with necessary piping	Drinking quality hot water at55°C to 65°C is used to wash the curd and for cleaning. Typically 10-15% of the batch volume is added to the cheese vat i.e. 250 to 375 litres. You MIGHT be able to collect waste warm water from the pasteuriser and use it for cleaning.
25	1 x 5,000 litre plastic fresh water tank	Reserve water supply. This water used for cooling milk after reaches pasteurising temperature and for cleaning. You must not run out of cold water. Size of tank depends on how reliable your water supply is
26	1 x 400 litre Washing tub tank	Plastic or stainless steel on stand and with drain plug For cleaning moulds, stirring blade, cutting blade and general cleaning
27	Hygienic shelving that lets equipment drain dry	8
	Miscellaneous items	
28	Protective clothing; disposable hats, disposable gloves, hot water gloves, plastic aprons, gumboots	
29	Cleaning supplies; scrubbing brushes, detergent, sanitiser, hoses and water spray pistols,	

3.2 Equipment for dairy group 2 Mets Mantash, Shirak Marz

Concept

In the peak season, milk collecting and processing will work like this every day.

6AM receive 500 kg cow milk. Immediately put into 500kg cheese vat and start making cheese.

2PM receive 250-300kg sheep milk. The cheese vat will be empty as the morning's cow milk production will already be in the press. Immediately put sheep milk into cheese vat and start making cheese.

6PM receive 500kg cow milk. The morning's cow milk will already be in the brine bath and the sheep milk will already be in the press. Immediately put into 500kg cheese vat and start making cheese.

When new milk arrives and the cheese vat is <u>not</u> available because of a delay the new milk is put into the 500 litre milk cooling tank, cooled and held there until the cheese vat is ready.

Equipment needs are based on these assumptions

- 2 x500kg batches cow milk plus 1 up to 500kg batch sheep milk per day;
- Yield is some 110kg hard cow cheese plus up to 55kg hard sheep cheese and more than 1500 litres of whey
- If packed into 3kg circular moulds, there will be up to 20 sheep cheeses and 40 cow cheeses produced per day
- Note. Sheep milk has a higher solids content than cow milk so produces more cheese per litre of milk.
- The entire day's production is used to make hard OR soft brined cheese.

Equipment for dairy group 2 Mets Mantash, Shirak Marz		
No	**Name**	**Description**
	Raw milk collection	
1	Raw milk collection; milk cans, milk tanker vehicles, scales	Dairy group already has or buys as needed
2	500 litre raw milk cooling tank	Stainless steel, insulated with stirrer, drain valve, lid and cooling unit
3	1 milk pump with fittings and 8metres flexible hoses	Stainless steel centrifugal type. Mounted on a trolley. Pump body and food contact parts should be 316 grade stainless steel. Motor cover and frame can be made of 304 grade stainless steel.
3A	Pasteuriser	Not needed
	Cheese production	
4	1 x 500kgcircular, pasteurising cheese vat	Pasteurising is done in the cheese vat. Has stairs, platform to stand on, motorised stirrer and curd cutting blades.
5	Hot water generator for pasteurising	Heating capacity sufficient to heat 500 litres milk to 68°C. e.g. 45KWh. elements Milk is then cooled to 34°C with cold water. Total time less than one hour

Equipment for dairy group 2 Mets Mantash, Shirak Marz		
6	1 x curd draining vat	Stainless steel, on wheels capable of taking contents of the 500kg vat
7	1 x worktable to fill moulds and move to press	Stainless steel, with one lower shelf and on wheels
8	Moulds to make hard cheese e.g. Gouda	Size to be chosen after market study; possibly 20 x 3kg round Gouda moulds or 12x 4-5kg round Gouda moulds or 12 x 4-5kg rectangular moulds. Have 3x1kg moulds to take final amount of curd
9	1 set of moulds to make soft cheese e.g. Chanakh	30 stainless steel or hygienic plastic rectangular moulds
10	I x 2 stamp mechanical cheese press to put about 20kg pressure on to the moulds	Stainless steel, supplied with weights, capable of pressing 55kg curd at a time.
	Brining (24 hours)	
13	3 x brine tanks each with minimum surface area 1.5 sq. m and minimum depth of 30cm. Tanks made of stainless steel, plastic or concrete coated with food grade surface such as epoxy	Keep Cow and sheep cheese in separate brining tanks. NB each brine tank surface minimum area is 1.5 sq. m as the actual cheese occupies 1.1 sq. m (20x0.23x0.23 sq. m)
14	12 linear metres of 316 grade 30cm wide stainless steel shelving plus stainless steel supports .	After brining, cheeses can rest on a shelf to dry. This helps keep steady humidity in the store room. Some cheese makers do not use shelves; they put the wet cheese directly into the store room. Shelving Good quality stainless steel is needed to prevent corrosion. Total length of shelving is calculated below. 60 cheeses each 23cm diameter gives total length of 14m. Shelf is 30cm wide and cheese is 23cm wide so they can be packed tighter than in a straight line. 12m shelving will be OK. Note. Adapt the length and number of shelves to suit shape of the room. For example a Shelf 3.0m long x 32cm wide and 4 shelves high
15	Brine room air cooling system	The air conditioning unit helps to keep the room at the desired temperature of 12-14°C.
16	Brine cooling system; Insulated ice accumulator to supply ice water to brine tank. Complete with circulation pump Can also cool cheese vat if required	The brine is kept at 12-14°C by pumping ice water through stainless steel pipes that run through the brine tanks. The cheese goes in at about 30°C and should be cooled to 12°C within one hour. Specification below is suitable for 1x1,000kg batch per day. It is also suitable for 3x500kg batch per day 700 litre capacity

Equipment for dairy group 2 Mets Mantash, Shirak Marz		
17		0.55 KW motor Total cooling capacity 1083KW Reloading time 8 hours
	Storage for hard cheese and soft brined cheese	Cheese storage needed for daily batches of 1,000 kg milk for one month is 30sq. m by 2.5m high. Therefore size for 1,500kg daily production is 45 sq. m by 2.5m high
17	1 x Hard cheese cooling system with 3.5KW 230/400V cooling motor	Recommended capacity for 30 sq m storage is 5740kcal/h (6.7kW/h) and that needs a 2.3KW 230/400V cooling motor. Recommended capacity for 3x500kg batches is 50% more.
17A	1 x Soft brined cheese air cooling system	As needed
18	Hard cheese 1 x set stainless steels posts and brackets with 300m wooden shelves 32cm wide by 2.5cm thick.	Each day needs 12m of shelf. 30 days needs You can get some extra capacity on the shelves by packing the cheeses closely rather than in a straight line. The wood must not taint the cheese.
18A	Soft brined cheese tanks	As needed
	Whey equipment	
19	1 x whey pump capacity 3 cubic metre/hour. (Pump not needed if can have natural drainage)	Stainless steel centrifugal pump. To be supplied on a stand and with 8m flexible hose to reach whey tank. Pump body and food contact parts should be 316 grade stainless steel. Motor cover and frame can be made of 304 grade stainless steel.
20	1 x 1,500 litres whey tank with outlet tap and nearby hose tap for washing out.	Made of food grade plastic or stainless steel, located outside the factory on a stand so can be emptied daily. A mobile tank is also suitable.
	Laboratory equipment	
21	1 digital hand thermometer 1 x pH meter with calibration liquids 1 glass brine density meter 5 plastic 100ml measuring cups	Additional milk testing equipment as required e.g. "Lactoscan" analyser for fat, protein and added water content Acidity titration equipment
	Packing equipment	
22	Vacuum packer	Stainless steel and food grade plastic contact parts. Vacuum chamber must be big enough to take the biggest size cheese.
23	1 x set 0 to 10kg electronic scales	Food grade with hygienic surface
	Auxiliary equipment	
24	1 x 120 litre 7.5KW electric hot water boilerwith necessary piping	Drinking quality hot water at55°C to 65°C is used to scald the curd and for cleaning. Typically 10-15% of the batch volume is added to the cheese vat
25	1 x 2,000 litre plastic fresh water tank	Reserve water supply. This water is used for

Equipment for dairy group 2 Mets Mantash, Shirak Marz		
		cooling milk after reaches pasteurising temperature and also for cleaning. Maximum cold water demand by the equipment is 500 litres per hour. Size of tank depends on reliability of your water supply.
26	Washing tub	Plastic or stainless steel on stand and with drain plug. For cleaning moulds, stirring blade, cutting blade and general cleaning
27	Hygienic shelving that lets equipment drain dry	Stainless steel to store moulds, blades, Locally made. Size and shape as required.
	Miscellaneous items	
28	Protective clothing; disposable hats, disposable gloves, hot water gloves, plastic aprons, gumboots	
29	Cleaning supplies; scrubbing brushes, detergent, sanitiser, hoses, hose reels and water spray pistols,	

3.3 Equipment for dairy group3Khachaghbyur, Gegarkhunik Marz

Current situation They collect 15 tonnes cow milk per day in the high season.

Originally they said they would like to:

- Process high value cheese using 1500 litres pasteurised milk 7 days a week.
- Make several kinds of high value cheese (including Gouda but not including blue cheese) so they can identify one type that suits them and their milk
- Process the whey into ricotta cheese
- Have 15 tonnes cheese in storage
- They mentioned that sheep milk is available but processors don't want it

After discussions they said they would like to

- Make 1,000kg batches of cheese
- Fully utilise the space in their new factory before extending it further.
- Sometimes make two batches cheese per day to fully use the storage room
- Put whey through a separator to make whey cream then make whey butter. (They say local whey can contain 0.3-0.5% butterfat).

Production assumptions

1x1000kg batch cow milk per day in new cheese vat makes 110kg cheese, therefore makes 34 x3kg packs

Equipment for dairy group3Khachaghbyur, Gegarkhunik Marz		
No	**1 x1,000kg batch cow milk**	**Description**
	Raw milk collection	
1	Raw milk collection; milk cans, milk tanker vehicles, scales	Not needed. Dairy group already has milk collecting business
2	1x1,000 raw milk cooling tank	Not needed. Raw milk will be supplied from milk collecting business
3	1 milk pump with fittings and 8metres flexible hoses	Not needed id of can take one from milk collecting business. Stainless steel centrifugal type. Mounted on a trolley. Pump body and food contact parts should be 316 grade stainless steel. Motor cover and frame can be made of 304 grade stainless steel.
3A	Pasteuriser	Not needed. Pasteurising is done in cheese vat
	Cheese production	
4	1 x new 1,000kgcircular, pasteurising cheese vat	Pasteurising is done in the cheese vat. New vat has stairs, platform to stand on, motorised stirrer and curd cutting blades.
5	Hot water generator for pasteurising	Gas hot water heater with recirculating pump. Needs gas equivalent of 3 x30KWhr electrical heating elements. Heats 1,000 kg milk to 68°C in less than one hour. Milk is cooled to 34°C with cold water. Cold water pump needed if flow is less than 1,000 litres/hour
6	2 x 140 litre curd draining vats	Stainless steel, on wheels each capable of taking half the batch. I larger vat is also acceptable.
7	1x worktable 1600 x 900mm	Stainless steel, with one lower shelf and on wheels. To fill moulds on and move to press
8	1 set of moulds to make hard cheese e.g. Gouda	Size to be chosenafter market study; possibly 36 x 3kg round Gouda moulds. Also have 3x1kg moulds to take final amount of curd.
9	1 set of moulds to make soft cheese e.g. Chanakh	Not needed. Brining area is designed for Gouda
10	Mechanical or pneumatic cheese press	Pneumatic presses are expensive but convenient. Mechanical presses are cheaper and supplied with weights Stainless steel, put about 20kg pressure on to the moulds Capable of pressing 110kg curd at a time.
	Brining (24 hours)	
13	1-x brine tank with minimum surface area 3 sq. m and minimum depth of 30cm.	Not needed. Already have 1 stainless steel tank measuring 2.5m by 1.8m, which is 4.5sqm. This gives sufficient capacity to brine cheese from 1,500kg milk each day.
14	10linear metres of 316 grade 30cm wide stainless steel shelving plus stainless steel supports.	After brining, cheeses can rest on a shelf to dry. This helps keep steady humidity in the storeroom. Some cheese makers do not use shelves; they put the wet cheese directly into the storeroom. Total length of shelving is calculated below. 34 cheeses each 23cm diameter gives total length of 7.8m.

Equipment for dairy group3Khachaghbyur, Gegarkhunik Marz		
		Note. Adapt the length and number of shelves to suit shape of the room. For example a rack 2.5m long x 32cm wide and 4 shelves high gives 10 linear metres.
15	Brine room air cooling system	The air conditioning unit helps to keep the room at the desired temperature of 12-14°C.
16	Brine cooling system; Insulated ice accumulator to supply ice water to brine tank. Complete with circulation pump	The brine is kept at 12-14°C by pumping ice water through stainless steel pipes that run through the brine tanks. Can also cool cheese vat after pasteurising if quicker cooling is required. Each batch of about 55kg curd cheese goes into the brine at about 30°C and should be cooled to 12°C within one hour
	Storage for hard cheese and soft brined cheese	Cheese storage needed for daily batches of 1,000 kg cow milk for one month is 30 sq. m by 2.5m high. The store needs to hold 34 x30 = 1020 x 3kg cheeses, a total of 3090kg Note. The planned storage room measures
17	1 x Hard cheese cooling system with 3.5KW 230/400V cooling motor	Recommended capacity for 30 sq. m storage is 5740kcal/hr. (6.7kW/hr.) and that needs a 2.3KW 230/400V cooling motor. NB. You may get away with a smaller capacity motor depending on local conditions
17A	1 x Soft brined cheese air cooling system	Not needed
18	Hard cheese 1 x set stainless steels posts and brackets with 235m wooden shelves 32cm wide by 2.5cm thick. The wood must not taint the cheese.	Each day produces 34 cheeses each 23cm diameter. This needs minimum 7.8m of shelf, 30 days needs minimum 235 metres shelf. The Version 2 design gives allows 40 linear metres of 10 high shelving with a 1m walkway between shelves. This is enough to store daily throughput of 1700kg milk. Further, the 3.2m ceiling allows for higher shelves if desired. By improving the shelving layout it is possible to put through 2x1,000kg batches of milk per day.
18A	Soft brined cheese tanks	Not needed
	Whey equipment	
19	1 x whey pump capacity 3 cubic metre/hour.	Stainless steel centrifugal pump. To be supplied on a trolley and with enough flexible hose to reach whey tank. Pump body and food contact parts should be 316 grade stainless steel. Motor cover and frame can be made of 304 grade stainless steel.
20	1 x 1,000 litres whey tank with outlet tap and nearby hose tap for washing out.	Made of food grade plastic or stainless steel, located outside the factory on a stand so can be emptied daily. A mobile tank is also suitable.
	Laboratory equipment	
21	1 digital hand thermometer 1 x pH meter with calibration liquids 1 glass brine density meter	Use existing equipment and buy extra as needed e.g. Acidity titration equipment

Equipment for dairy group3Khachaghbyur, Gegarkhunik Marz		
	5 plastic 100ml measuring cups	
	Packing equipment	
22	Vacuum packer	Vacuum chamber must be big enough to take the biggest size of cheese planned to be made
23	1 x set 0 to 10kg electronic scales	Food grade with hygienic surface
	Auxiliary equipment	
24	1 x 120 litre 7.5KW electric hot water boilerwith necessary piping Or 2 x 60 litre, whatever is available	Drinking quality hot water at55°C to 65°C is used to scald the curd and for cleaning. Typically 10-15% of the batch volume is added to the cheese vat
25	1 x 2,000 litre plastic fresh water tank	Reserve water supply. This water is used for cooling milk after reaches pasteurising temperature and also for cleaning. Maximum cold water demand by the equipment is 1,00 litres per hour. Size of tank depends on reliability of your water supply.
26	1 x 400 litre or similar Washing tub	Plastic or stainless steel on stand and with drain plug. For cleaning moulds, stirring blade, cutting blade and general cleaning
27	Hygienic shelving that lets equipment drain dry	Stainless steel to store moulds, blades, Locally made. Size and shape as required.

3.4 Equipment for dairy group 4Agarak GroupLori Marz

Current situation. They collect 13 tonnes cow milk per day in the high season and 2 tonnes per day in the low season.

They have a small empty factory close to their raw milk cooling tanks, which is where they started their business 14 years ago and they would like to use for making cheese. The factory has a low ceiling. It is just 2.0m high and this is a further limitation.

Second concept

Make 1 batch cheese per day in a mechanical 500kg vat

Dig out 2.6m of the room with the sloping floor to allow a raised vat to be installed at the roadside end of the enlarged room. Build a wall.

Upgrade wooden floored room to make a cheese storage room

Use maximum electrical energy, as has a low-cost supply

500kg milk makes 55kg Gouda cheese.

This can be packed 19 x 3kg cheeses.

Note 1.The original concept, which is still recommended, is to start small. Make cheese in a second hand manual 300kg vat to learn about cheese making and check the economics. If successful then build a new factory with higher capacity.)

Note 2. The storeroom is big enough to take cheese from 2x500kg batches per day but brine tank capacity will need to be doubled to achieve this.

Equipment for dairy group 4Agarak Group,Lori MarzOption 2		
No	**Name**	**Option 2 1 x 500kg batch Gouda**
	Raw milk collection	
1	Raw milk collection; milk cans, milk tanker vehicles, scales	Already has
1A	Milk pump	Use an existing one
2	500 litre raw milk cooling tank	Already has
3	Pasteuriser	Not needed. Pasteurise in the cheese vat
	Cheese production	
4	1 x 500kg pasteurising circular cheese vat	New vat has stairs, platform to stand on, motorised stirrer and curd cutting blades.
5	Hot water generator for pasteurising	45KW heating is needed. Either built in to the vat or separate hot water generator
6	1 x curd draining vats	Stainless steel, on wheels each capable of taking half the batch Each measures 1000mm by 700mm
7	1 x worktable to fill moulds, move to press	Stainless steel, with one lower shelf and on wheels say 900x800 mm to fill moulds on and move to press. Size is not critical
8	1 set of moulds to make hard cheese e.g. Gouda	Size to be chosen after market study; say20 x 3kg round Gouda moulds
9	1 set of moulds to make Lori cheese	Needed if you want to make Lori or Chanakh but brining space has not been calculated
10	Mechanical or pneumatic cheese press, Stainless steel, to put about 20kg pressure on to the moulds	Pneumatic presses are expensive but convenient. Mechanical presses are cheaper and supplied with weights Capable of pressing 110kg curd or 20 x 3kg moulds at a time
	Brining (24 hours)	
13	Brine tank(s) with minimum surface area 1.5 sq. m and minimum depth of 30cm.	Tanks made of stainless steel, plastic or concrete coated with food grade surface such as epoxy. Shape can be whatever suits the room
14	4 linear metres of 316 grade 30cm wide stainless steel shelving plus stainless steel supports .	After brining, cheeses can rest on a shelf to dry. This helps keep steady humidity in the storeroom. Some cheese makers do not use shelves; they put the wet cheese directly into the storeroom. Shelving Good quality stainless steel is needed to prevent corrosion. Adapt the length and number of shelves to suit shape of the room.
15	Brine room air cooling system	The brine room is small and has a door opening to the storage room so a separate air conditioning unit will not be needed.

Equipment for dairy group 4Agarak Group,Lori MarzOption 2		
16	Brine cooling system; Insulated ice accumulator to supply ice water to brine tank. Complete with circulation pump	The brine is kept at 12-14°C by pumping ice water through stainless steel pipes that run through the brine tanks. The cheese goes in at about 30°C and should be cooled to 12°C within one hour. 700 litre capacity 0.55 KW motor Total cooling capacity 1083KW Reloading time 8 hours The ice water can also be used to cool milk in the cheese vat after pasteurising.
	Storage for hard cheese and soft brined cheese	Cheese storage needed for daily batches of 1,000 kg milk for one month is 30sq. m by 2.5m high. Therefore size for 500kg daily production is 15 sq. m by 2.5m high. Note. The area of the wooden floored room is 7.8m by 3.9m, which is 30sq m. The room will therefore store cheese from 2 full batches per day.
17	1 x Hard cheese cooling system 0.7KW cooling motor	!,000kg batches need 5740kcal/hr (6,7kW/hr) which needs a 2.3KW cooling motor. A 500kg batch per day will need a 1.15KW cooling motor
17A	1 x Soft brined cheese air cooling system	This is not allowed for
18	Hard cheese 1 x set stainless steels posts and brackets with 72m wooden shelves 32cm wide by 2.5cm thick.	1,000 kg batch needs 8 linear m per day, so 30 days is 240 linear metres. 500kg batch therefore need 120 linear metres. Can use single and double shelves 9 high with aisles between. The low ceiling height reduces the number of shelves in each stack from 10 to 9. The plan shows 27 linear metres of shelving which at 9 high gives 243 metres of shelving. This is enough for 2x500kg batches per day. The wood must not taint the cheese.
18A	Soft brined-cheese tanks	As needed
	Whey equipment	
19	1 x whey pump capacity 3 cubic metre/hour. (Pump not needed if can have natural drainage)	You may be able to avoid this as you have sloping land and can drain freely
20	1 x 500 litres plastic or stainless steel whey tank with outlet tap and nearby hose tap for washing out.	A mobile tank or two smaller tanks are also suitable
	Laboratory equipment	
21	1 digital hand thermometer 1 x pH meter with calibration liquids 1 glass brine density meter 5 plastic 100ml measuring cups	Use existing equipment and buy extra as needed e.g. “Lactoscan” analyser for fat protein and added water content Acidity titration equipment
	Packing equipment	
22	Vacuum packer	The chamber of a vacuum packer measuring 30cm by

Equipment for dairy group 4Agarak Group,Lori MarzOption 2		
		40cm by 18cm is big enough for a 3kg Gouda
23	1 x set 0 to 10kg electronic scales	Food grade with hygienic surface
	Auxiliary equipment	
24	1 x 120 litre 7electric hot water boilerwith necessary piping	Drinking quality hot water at55°C to 65°C is used to scald the curd and for cleaning. Typically 10-15% of the batch volume is added to the cheese vat i.e. 30-45 litres
25	1 plastic fresh water tank Size depends on reliability and flow of water supply, say 5,000 litres	Peak water demand for 1,000kg batch is 8.5 cubic metres per hour for I hour when cooling the pasteurised milk
26	Washing tub	Plastic or stainless steel on stand and with drain plug. For cleaning moulds, stirring blade, cutting blade and general cleaning
27	Hygienic shelving that lets equipment drain dry	Stainless steel to store moulds, blades, Locally made. Size and shape as required.

The earlier concept and working for Agarak are shown in the highlighted text below in case they revert to that plan,

EARLIER concept for dairy group 4 Agarak Group Lori Marz		
	Raw milk collection	
1	Raw milk collection; milk cans, milk tanker vehicles, scales	Already has
1A	Milk pump	Use an existing one
2	500 litre raw milk cooling tank	Already has
3	Pasteuriser	Not needed. Pasteurise in the cheese vat
	Cheese production	
4	1 x 300kg pasteurising circular cheese vat	Buy second hand. Gerasim Agri-Production Consumer Cooperative, Vayots Dzor Marz has one
5	Hot water generator for pasteurising	Use gas heating facility that comes with the cheese vat
6	1 x curd draining vat	EITHER, buy one 1000mm by 700mm curd draining vat OR fill the moulds in the cheese vat
7	1 x worktable to fill moulds, move to press	Stainless steel, with one lower shelf and on wheels say 1200x900 to fit all moulds at once
8	1 set of moulds to make hard cheese e.g. Gouda	Size to be chosen after market study; possibly 12 x 3kg round Gouda moulds
9	1 set of moulds to make Lori cheese	Needed if you want to make Lori or Chanakh?
10	I single stamp mechanical cheese press to put about 20kg pressure on to the moulds	Stainless steel, supplied with weights, capable of pressing 12x3kg moulds at a time.
	Brining (24 hours)	
13	1x brine tank with minimum	Tanks made of stainless steel, plastic or concrete coated with

EARLIER concept for dairy group 4 Agarak Group Lori Marz		
	surface area 1 sq. m and minimum depth of 30cm.	food grade surface such as epoxy
14	2.4 linear metres of 316 grade 30cm wide stainless steel shelving plus stainless steel supports .	After brining, cheeses can rest on a shelf to dry. This helps keep steady humidity in the storeroom. Some cheese makers do not use shelves; they put the wet cheese directly into the storeroom. Shelving Good quality stainless steel is needed to prevent corrosion. Adapt the length and number of shelves to suit shape of the room. For example a stack of 2 shelves x 1.5m long x 32cm wide is plenty.
15	Brine room air cooling system	The brine room is so small and has a door opening to the storage room so a separate air conditioning unit will not be needed.
16	Brine cooling system; Insulated ice accumulator to supply ice water to brine tank. Complete with circulation pump	The brine is kept at 12-14°C by pumping ice water through stainless steel pipes that run through the brine tanks. The cheese goes in at about 30°C and should be cooled to 12°C within one hour. A 1,000kg batch per day needs700 litre capacity 0.55 KW motor Total cooling capacity 1083KW Reloading time 8 hours A 300kg batch needs 250l capacity with a 0.2KW motor. Total cooling capacity 325KW, reloading timem8 hours Can also be used to cool cheese vat after pasteurising.
	Storage for hard cheese and soft brined cheese	Cheese storage needed for daily batches of 1,000 kg milk for one month is 30 sq. m by 2.5m high. Therefore size for 300kg daily production is 9 sq. m by 2.5m high. The new storage area has an area of 7.8m by 3.9m which is 30 sqm and sufficient to hold enough cheese for 2x500 kg batches for one month.
17	1 x Hard cheese cooling system 0.7KW cooling motor	! 000kg batches need 5740kcal/hr. (6,7kW/hr.) which needs a 2.3KW cooling motor. 500kg batch will need 1.2KW cooling motor
17A	1 x Soft brined cheese air cooling system	This is needed if you make Armenian cheese
18	Hard cheese 1 x set stainless steels posts and brackets with 72m wooden shelves 32cm wide by 2.5cm thick.	1,000 kg batch needs 8 linear m per day, so 30 days is 240 linear metres. The layout plan shows 300kg batch will need 72 linear metres shelf. Can use single and double shelves 10 high with aisle between. For example use 2 sets of 3.6m long shelves that are 10 high You can get extra capacity on the shelves by packing the cheeses closely rather than in a straight line. The wood must not taint the cheese.
18A	Soft brined-cheese tanks	As needed

EARLIER concept for dairy group 4 Agarak Group Lori Marz		
	Whey equipment	
19	1 x whey pump capacity 3 cubic metre/hour. (Pump not needed if can have natural drainage)	You may be able to avoid this as you have sloping land and can drain freely
20	1 x 300 litres plastic or stainless steel whey tank with outlet tap and nearby hose tap for washing out.	A mobile tank and 2x200 litre drums are both also suitable
	Laboratory equipment	
21	1 digital hand thermometer 1 x pH meter with calibration liquids 1 glass brine density meter 5 plastic 100ml measuring cups	Use existing equipment and buy extra as needed e.g. "Lactoscan" analyser for fat protein and added water content Acidity titration equipment
	Packing equipment	
22	Vacuum packer	The chamber of a vacuum packer measuring 30cm by 40cm by 18cm is big enough for a 3kg Gouda
23	1 x set 0 to 10kg electronic scales	Food grade with hygienic surface
	Auxiliary equipment	
24	1 x 80 litre electric hot water boiler with necessary piping	Drinking quality hot water at 55°C to 65°C is used to scald the curd and for cleaning. Typically 10-15% of the batch volume is added to the cheese vat i.e. 30-45 litres
25	1 plastic fresh water tank Size depends on reliability and flow of water supply, say 4,000 litres	Peak water demand for 1,000kg batch is 8.5 cubic metres per hour for I hour when cooling the pasteurised milk. Demand for 300kg vat will be about 3 cubic metres per hour
26	Washing tub	Plastic or stainless steel on stand and with drain plug. For cleaning moulds, stirring blade, cutting blade and general cleaning
27	Hygienic shelving that lets equipment drain dry	Stainless steel to store moulds, blades, Locally made. Size and shape as required.

3.5 Equipment for dairy group 5 Gerasim Agri-Production Consumer Cooperative, Vayots Dzor Marz

Current situation They collect 1,000 litres cow milk per day in the high season and 300 litres per day in the low season. They intend to mix cow and sheep milk in the same batch if necessary

Concept

Two concepts are proposed

Smaller investment with two existing vats and buy only extra equipment needed for making Dutch cheese at rate of one 300kg batch per day

Larger investment with new 1,000kg vat plus extra equipment and facilities

Concept 1 smaller investment

This concept assume one 300kg batch of soft cheese is replaced by one 300kg batch of Gouda or similar Dutch cheese

300kg milk makes 33kg hard cheese.

This can be packed as 11x3kg Gouda cheese

Description of equipment needed for 1 x 300kg batch Gouda per day

Equipment for dairy group 5 Gerasim Agri-Production Consumer Cooperative, Vayots Dzor Marz Smaller investment			
No	**Name**	**Description 1 x 300kg batch Gouda**	**Need**
	Raw milk collection		
1	Raw milk collection; milk cans, milk tanker vehicles, scales	Already has	
1A	Milk pump	Not needed for small quantity	
2	500 litre raw milk cooling tank	Not needed if milk comes in quickly and is good quality	
3	Pasteuriser	Not needed for small capacity	
	Cheese production		
4	1 x 300kg pasteurising circular cheese vat	Use existing vat. Fill the moulds in the vat	
5	Hot water generator for pasteurising	Use existing	
6	1 x curd draining vat	Not needed but do need a screen to stop curd from coming out with the whey	
7	1 x worktable to fill moulds, move to press	Stainless steel, with one lower shelf and on wheels	X
8	1 set of moulds to make hard cheese e.g. Gouda	Size to be chosen after market study; possibly 12 x 3kg round Gouda moulds	X
9	1 set of moulds to make soft cheese e.g. Chanakh	Use existing moulds	
10	I single stamp mechanical cheese press to put about 20kg pressure on to the moulds	Stainless steel, supplied with weights, capable of pressing 12x3kg moulds at a time.	X
	Brining (24 hours)		
13	1x brine tank with minimum surface area 1 sq. m and minimum depth of 30cm.	Gouda should have its own brine tank to avoid contamination of flavours. Temperature should be 12-14°C.	X

Equipment for dairy group 5 Gerasim Agri-Production Consumer Cooperative, Vayots Dzor Marz Smaller investment			
	Tanks made of stainless steel, plastic or concrete coated with food grade surface such as epoxy		
14	2.4 linear metres of 316 grade 30cm wide stainless steel shelving plus stainless steel supports.	After brining, cheeses can rest on a shelf to dry. This helps keep steady humidity in the storeroom. Some cheese makers do not use shelves; they put the wet cheese directly into the storeroom. Shelving Good quality stainless steel is needed to prevent corrosion. Adapt the length and number of shelves to suit shape of the room. For example a stack of 2 shelves x 1.2m long x 32cm wide.	X
15	Brine room air cooling system	The air conditioning unit helps to keep the room at the desired temperature of 12-14°C.	?
16	Brine cooling system; Insulated ice accumulator to supply ice water to brine tank. Complete with circulation pump Can also cool cheese vat if required	The brine is kept at 12-14°C by pumping ice water through stainless steel pipes that run through the brine tanks. The cheese goes in at about 30°C and should be cooled to 12°C within one hour. We can discuss cheaper ways of doing this for that small capacity.	?
	Storage for hard cheese and soft brined cheese	Cheese storage needed for daily batches of 1,000 kg milk for one month is 30sq. m by 2.5m high. Therefore size for 300kg daily production is 9 sq. m by 2.5m high	X
17	1 x Hard cheese cooling system 0.7KW cooling motor	!,000kg batches need 5740kcal/hr (6,7kW/hr) which needs a 2.3KW cooling motor. 300kg batch will need 0.7KW cooling motor This is a small capacity unit	X
17 A	1 x Soft brined cheese air cooling system	As needed	
18	Hard cheese 1 x set stainless steels posts and brackets with 72m wooden shelves 32cm wide by 2.5cm thick.	1,000 kg batch needs 8 linear m per day, so 30 days is 240 linear metres. 300kg batch will need 72 linear metres shelf. Can use single and double shelves 10 high with aisle between. For example use 2 sets of 3.6m long shelves that are 10 high You can get extra capacity on the shelves by packing the cheeses closely rather than in a straight line. The wood must not taint the cheese.	X
18 A	Soft brined-cheese tanks	As needed	

Equipment for dairy group 5 Gerasim Agri-Production Consumer Cooperative, Vayots Dzor Marz Smaller investment			
	Whey equipment		
19	1 x whey pump capacity 3 cubic metre/hour. (Pump not needed if can have natural drainage)	Not needed	
20	1 x 300 litres whey tank with outlet tap and nearby hose tap for washing out.	Gouda whey can be mixed with other whey as needed so you can use existing whey disposal system	
	Laboratory equipment		
21	1 digital hand thermometer 1 x pH meter with calibration liquids 1 glass brine density meter 5 plastic 100ml measuring cups	Use existing equipment and buy extra as needed e.g. "Lactoscan" analyser for fat protein and added water content Acidity titration equipment	
	Packing equipment		
22	Vacuum packer	The chamber of your vacuum packer measures 30cm by 40cm by 18cm. This is big enough for 3kg Gouda but not big enough for 4-5kg Gouda	
23	1 x set 0 to 10kg electronic scales	Food grade with hygienic surface	X
	Auxiliary equipment		
24	1 x 60 litre 7electric hot water boilerwith necessary piping	Drinking quality hot water at55°C to 65°C is used to scald the curd and for cleaning. Typically 10-15% of the batch volume is added to the cheese vat i.e. 30-45 litres	X
25	1 x 1,000 litre plastic fresh water tank	Reserve water supply. This water is used for cooling milk after reaches pasteurising temperature and also for cleaning. Size of tank depends on reliability of your water supply. You can use your existing facilities	
26	Washing tub	Plastic or stainless steel on stand and with drain plug. For cleaning moulds, stirring blade, cutting blade and general cleaning	X
27	Hygienic shelving that lets equipment drain dry	Stainless steel to store moulds, blades, Locally made. Size and shape as required.	

Concept 2 larger investment

This assumes

1x1000kg batch cow milk per day in new cheese vat makes 110kg cheese, therefore makes 34 x3kg packs

1 x 300kg batch sheep milk per day in existing cheese vat makes say 41kg cheese, makes 14x3kg packs (Cow milk is about 13 total solids and sheep milk is about 16% total solids). Therefore yield of Gouda cheese from sheep milk is 16/13 or 23% more than from cow milk

Equipment for dairy group 5 Gerasim Agri-Production Consumer Cooperative, Vayots Dzor Marz Larger investment		
No	**1 x1000kg batch cow milk 1x300kg batch sheep milk**	**Description**
	Raw milk collection	
1	Raw milk collection; milk cans, milk tanker vehicles, scales	Dairy group already has or buys as needed
2	1x 500 litre and 1x1,000 raw milk cooling tank	Stainless steel, insulated with stirrer, drain valve, lid and cooling unit
3	1 milk pump with fittings and 8metres flexible hoses	Stainless steel centrifugal type. Mounted on a trolley. Pump body and food contact parts should be 316 grade stainless steel. Motor cover and frame can be made of 304 grade stainless steel.
3A	Pasteuriser	Not needed. Pasteurising is done in cheese vats
	Cheese production	
4	1 x new 1,000kgcircular, pasteurising cheese vat 1 existing 300kg vat	Pasteurising is done in the cheese vat. New vat has stairs, platform to stand on, motorised stirrer and curd cutting blades.
5	Hot water generator for pasteurising	Heating capacity sufficient to heat 1,000 kg milk to 68°C e.g. 3 x30KWhr elements. This can be built into the vat or hot water is pumped from an external electric or gas heater. Milk is cooled to 34°C with cold water. Heating and cooling time each one hour
6	3 x 140 litre curd draining vats	Stainless steel, on wheels each capable of taking half the batch
7	2 x worktable to fill moulds and move to press	One larger for cow milk 1800 x 1000mm and one smaller for sheep milk 1100x 1000 mm. Stainless steel, with one lower shelf and on wheels.
8	1 set of moulds to make hard cheese e.g. Gouda	Size to be chosenafter market study; possibly 36 x 3kg round Gouda moulds for cow milk plus 14 for sheep milk. Total including a few extras; 55 moulds
9	1 set of moulds to make soft cheese e.g. Chanakh	Extra hygienic plastic rectangular moulds as you need
10	Mechanical or pneumatic cheese presses to press cow and sheep cheese, presumably at the same time	Pneumatic presses are expensive but convenient. Mechanical presses are cheaper and supplied with weights Stainless steel, put about 20kg pressure on to the moulds Capable of pressing 150kg curd at a time.

Equipment for dairy group 5 Gerasim Agri-Production Consumer Cooperative, Vayots Dzor Marz Larger investment		
	Brining (24 hours)	
13	3-x brine tanks each with minimum surface area 1.5 sq. m and minimum depth of 30cm. Tanks made of stainless steel, plastic or concrete coated with food grade surface such as epoxy	Keep Cow and sheep cheese in separate brining tanks, all the same size NB each brine tank surface minimum area is 1.5 sq. m as the actual cheese occupies 1.1 sq. m (20x0.23x0.23 sq. m)
14	15 linear metres of 316 grade 30cm wide stainless steel shelving plus stainless steel supports.	After brining, cheeses can rest on a shelf to dry. This helps keep steady humidity in the storeroom. Some cheese makers do not use shelves; they put the wet cheese directly into the storeroom. Shelving Good quality stainless steel is needed to prevent corrosion. Total length of shelving is calculated below. 60 cheeses each 23cm diameter gives total length of 14m. Shelf is 30cm wide and cheese is 23cm wide so they can be packed tighter than in a straight line. Note. Adapt the length and number of shelves to suit shape of the room. For example a shelf 5.0m long x 32cm wide and 3 shelves high
15	Brine room air cooling system	The air conditioning unit helps to keep the room at the desired temperature of 12-14°C.
16	Brine cooling system; Insulated ice accumulator to supply ice water to brine tank. Complete with circulation pump Can also cool cheese vat if required	The brine is kept at 12-14°C by pumping ice water through stainless steel pipes that run through the brine tanks. The cheese goes in at about 30°C and should be cooled to 12°C within one hour. Specification below is suitable for 1x1,000kg batch per day 700 litre capacity 0.55 KW motor Total cooling capacity 1083KW Reloading time 8 hours We need a 30% increase in capacity to handle cheese from both vats i.e. 1000 litre capacity 0.75 KW motor Total cooling capacity 1400KW Reloading time 8 hours Note. You might be able to avoid this expenditure if you have plenty of underground cold water at 12 °C and the tanks are deeper.
	Storage for hard cheese and soft brined cheese	Cheese storage needed for daily batches of 1,000 kg cow milk for one month is 30sq. m by 2.5m high. Additional

Equipment for dairy group 5 Gerasim Agri-Production Consumer Cooperative, Vayots Dzor Marz Larger investment		
		area for 300kg sheep milk 11 sq. m Total is 41 sq. m
17	1 x Hard cheese cooling system with 3.5KW 230/400V cooling motor	Recommended capacity for 30 sq. m storage is 5740kcal/hr. (6.7kW/hr.) and that needs a 2.3KW 230/400V cooling motor. Recommended capacity for 41sq m is 7844kcalhr and that needs a 3.1KW 230V/400V cooling motor NB. You may get away with a smaller capacity motor depending on local conditions
17A	1 x Soft brined cheese air cooling system	As needed
18	Hard cheese 1 x set stainless steels posts and brackets with 360m wooden shelves 32cm wide by 2.5cm thick.	Each day produces 48 cheeses each 23cm diameter. This needs minimum 11m of shelf, 30 days needs minimum 330 metres shelf, say 360m for safety The shelves can be10 high. Shelf lengths to suit shape of storage room e.g. 12 x 3m lengths You can get extra shelf capacity by packing the cheeses closely rather than in a straight line. The wood must not taint the cheese.
18A	Soft brined cheese tanks	As needed
	Whey equipment	
19	1 x whey pump capacity 3 cubic metre/hour.	Stainless steel centrifugal pump. To be supplied on a trolley and with enough flexible hose to reach whey tank. Pump body and food contact parts should be 316 grade stainless steel. Motor cover and frame can be made of 304 grade stainless steel.
20	1 x 1,500 litres whey tank with outlet tap and nearby hose tap for washing out.	Made of food grade plastic or stainless steel, located outside the factory on a stand so can be emptied daily. A mobile tank is also suitable.
	Laboratory equipment	
21	1 digital hand thermometer 1 x pH meter with calibration liquids 1 glass brine density meter 5 plastic 100ml measuring cups	Use existing equipment and buy extra as needed e.g. "Lactoscan" analyser for fat protein and added water content Acidity titration equipment
	Packing equipment	
22	Vacuum packer	You already have
23	1 x set 0 to 10kg electronic scales	Food grade with hygienic surface
	Auxiliary equipment	
24	1 x 200 litre 7.5KW electric hot water boilerwith necessary piping Or 2 x 100 litre, whatever is available	Drinking quality hot water at55°C to 65°C is used to scald the curd and for cleaning. Typically 10-15% of the batch volume is added to the cheese vat
25	1 x 2,000 litre plastic fresh water	Reserve water supply. This water is used for cooling milk

Equipment for dairy group 5 Gerasim Agri-Production Consumer Cooperative, Vayots Dzor Marz Larger investment		
	tank	after reaches pasteurising temperature and also for cleaning. Maximum cold water demand by the equipment is 500 litres per hour. Size of tank depends on reliability of your water supply.
26	Washing tub	Plastic or stainless steel on stand and with drain plug. For cleaning moulds, stirring blade, cutting blade and general cleaning
27	Hygienic shelving that lets equipment drain dry	Stainless steel to store moulds, blades, Locally made. Size and shape as required.

4 Recommended suppliers for the equipment (initial recommendations)

A comprehensive proposal to make 1,000kg batches of Gouda cheese was received from Van't Riet of the Netherlands. Total cost was EUR154,000 including installation. Given that the project's EUR100,000 budget for cheese is to be split amongst 5 groups, they cannot afford this equipment and cheaper alternatives are needed. Contact details are included as in late November no other alternative had been found for some items of equipment.

C. van't Riet Dairy Technology BV

Energieweg 20

2421 LM Nieuwkoop

The Netherlands

Tel + 31 172 571304

Fax + 31 172 573406

E-m info@rietdairy.nl, rietdairy@cs.com

http://www.rietdairy.nl/

Vladimir Ejikhine, Export manager Central and Eastern Europe and Middle Asia

An Austrian supplier was found and they quoted on some equipment but it was also expensive

BERTSCH Foodtec GmbH

Herrengasse 14 – Postfach 61 6700 Bludenz – AUSTRIA

Büro Schweiz

Business Center

Flughafenstrasse 11

CH-9423 Altenrhein

Tel.: +41 (0) 71 855 23 52

Tel.: +43 5552 6135 329 Fax: +43 5552 6135 77 329 Mobil: +43 664 81 30946 E-Mail: hansueli.etter@bertsch.at Web: www.bertsch.at

Skype: hu_etter

The local supplier CARD is agent for some Turkish cheese making equipment. They were unable to supply specifications despite repeated requests. They are an obvious supplier for a vacuum packer and cheese making ingredients.

CARD (Centre for Agribusiness and Rural Development

Address: Azatutyan 1/21-40 Yerevan 0037, Republic of Armenia

Telephone: (374 60) 440-550 Fax: (374 60) 440-551

http://www.card.am

Naira Mkrtchyan naira.mkrtchyan@card.am

It is highly necessary to continue the equipment search for alternative solutions and cheaper suppliers.

5 Description of the steps in processing and use of equipment (brief version of processing protocol)

The following equipment names, processing steps and descriptions apply to Gouda cheese. Similar cheeses have similar processes.

Individual cheese makers develop their own unique recipes and cheese factories and develop their own procedures and manuals, while applying Good Manufacturing Practice principles and relevant food safety standards.

Note. Cheese making is part science and part art. The following procedures are guidelines. Different cheese makers will vary these depending on the quality of milk, the time of year and how the milk and curd look and feel at the moment.

Weighing milk.

The milk is weighed at the farm for payment purposes. Weighing equipment in the form of a small tank mounted on a set of scales is also at the factory door.

Milk is assessed for quality at the time of purchase. A holding sample of milk may be taken at the farm or at the factory for testing purposes. The milk may be smelled, tasted or put through an electronic analyser such as the commonly used Lactoscan.

Relevant tests are fat content, protein content, total solids (fat + protein+ lactose + ash) and added water.

Two critical quality parameters are milk temperature at collection and time interval between collection and arrival at the factory. Warm milk quickly spoils and high value cheese needs high quality milk.

Milk pump

Milk is pumped from the weighing station or incoming milk tanker to either the cheese vat or a cooling tank. Centrifugal pumps with contact parts made of 316 grade stainless steel are used. Sanitary fittings and milk lines are made of 316 stainless steel or food grade flexible plastic.

Cooling tank

Raw milk is chilled to 4°C if it is not going to be made into cheese immediately. Milk cooling tanks are insulated, made of stainless steel and have a low speed agitator. 500 litre to 1,000 litre tanks, which are suitable for this project generally, have a vertical profile with a lifting lid. They can be mounted horizontally. Some tanks are fitted with CIP (cleaning in place) nozzles. Refrigeration gas circulates in a false bottom of the tank. The refrigeration plant may be located inside the factory or directly outside from the tank.

Fill cheese vat

The vat may be filled by using a pump or manually. If the milk pump mentioned above is mounted on a trolley it may also be used for both filling the cooling tank and the cheese vat. If it is a separate pump it should have the same specification. Milk pH should be not less than 6.6 to make high quality cheese.

Pasteurising heating

Milk is pasteurised by heating to 68°C in the cheese vat then held for one minute. Alternatively it may be heated to 60C and hold for 30minutes. The heating process will take up to one hour in a batch pasteuriser the time depends on the capacity of the heating energy. Heating may be applied by either electrical elements located in the water-filled base of the cheese vat or by an external hot water generator that is powered by gas or electricity.

Milk may also be pasteurised using a separate plate pasteuriser. The Berdashen group, which has a 2,600kg vat also has a 1000kg/hour plate pasteuriser. The remaining 4 groups intend to use the batch pasteurising process.

Some famous varieties of cheese such as Roquefort are made from unpasteurised milk but the makers have been following consistent procedures for generations. This route is discouraged for food safety reasons. High value cheese must be safe to eat.

Pasteurising cooling

The milk is cooled to cheese making temperature of about 34°C by pumping cold water through the jacket. Cheese makers can elect to use ice water instead of tap water is warm in summer and it takes too long in summer. Cooling will take up to one hour in a batch pasteuriser.

The milk is stirred slowly throughout the entire pasteurising process.

Add rennet and bacteria culture

The cheese maker follows his specific recipe for the particular variety of cheese.to the milk then varies it depending on his judgment of the milk in the particular batch.

The bacteria culture is added to the milk and the vat is stirred for 30 minutes, allowing the bacteria to grow, Different cheese makers prefer different strains/suppliers of starter bacteria. As a guideline, add 10g bacteria culture to each 1,000kg batch.

Add annatto colour also if it is to be used.

Add 100g rennet next. There are different types of the coagulant rennet as well.

Stir for 5 minutes at 8RPM. Four of the five groups will have mechanical stirrers that have a variable speed drive.

Let the milk set. At 13 minutes the milk begins to thicken. Let the curd develop for 40-70 minutes from the time of adding rennet until there is a very firm curd. The cheese maker uses his judgment based on the milk and activity of the bacteria used. Acidity after cutting should be about 1.3%. This can be checked by simple titration in the laboratory.

Cut the curd by using the mechanical cutter into 10mm cubes. The cutter automatically increases in speed from 2RPM to 8RPM over 8 minutes. pH of the curd should be about 5.85. If manual cutting is used instead of mechanical then the curd knife must be sharp, clean, in good condition and used precisely to cut the curd into even sized cubes. Even size cubes shrink uniformly and help to produce a consistent texture in the curd.

Drain some whey

If the moulds will be filled in the vat, place a stainless steel screen in front of the drain valve to prevent curd from coming out.

Open the drain valve and quickly drain out some whey, about 1/3 of the volume of the batch. Drain off the same amount in successive batches to maintain consistent results. Run the whey through a metal or cloth screen to avoid losing any curd.

Scalding Gouda and Edam cheese

These are both so called "washed curd" cheeses". Washing the curd with hot water removes some of the lactose (milk sugar) which the bacteria would otherwise covert to acid. Add enough drinking quality water over 15 minutes at 55 ° to 65°C to the vat to bring up the temperature to 36°C to 38°C. The water added is 10%-20% of the original volume of milk and is normally just above the level of the curd. The whey should now have about 0.09% acidity and curd have pH about 5.45

Stir the curd and whey mixture for 20 to 40 minutes at 7RPM.

For making Gouda cheese there are now two processing options.

Option 1

Replace the stainless steel screen in front of the drain valve.

Let the curd settle for about 20 minutes. Again the cheese maker uses his judgment.

Drain all the remaining whey.

Fill curd into the cheese mould liners while they are in the vat. Load each curd liners into its mould base using a table on wheels for a work surface.

Option 2

Drain all curds and whey onto a draining vat. Let the curds settle into a mass. Cut the curd into regular size rectangles then pack the curds into the moulds on the worktable.

Move moulds to the press

The moulds are pushed to the press using the worktable on wheels or carried directly to the press.

Press

There are two kinds of press; mechanical and pneumatic. The pneumatic press is much more expensive, needs a separate air compressor and has electronic components that could fail but gives a consistent pressure-time process and is light to operate. The mechanical press is cheaper, sturdy, has no breakable parts but is heavy to operate, as the weights must be manually lifted up and down.

On a mechanical press, press gently at first then progressively heavily on a mechanical press.

On a pneumatic press use the recommended pressure/time programme.

A typical pressing programme is

1kg of weight per 1kg of cheese for 15 minutes

4kg for 30 minutes

8kg for 30 minutes

11kg for 2-8 hours

The moulds can be left in the press overnight if a drier, longer aging cheese

Take out the new cheese

Release the pressure and take the cheese out of the moulds. Clean and sanitise the moulds. This needs hot water, detergent and then sanitiser. Allow the moulds to drain in a clean dry place ready for the next day’s production.

Brining

Put the new cheese into the brine tank. Use saturated brine or a brine concentration the cheese maker recommends. The brine temperature should be 10 to 15°C. Leave a 500g Gouda in the brine for 2 hours, a 1kg Gouda for 8 hours and a 5kg Gouda for 24 hours. Turn the cheeses regularly to let the whole surface contact the brine.

Take the cheese out. Put on a shelf to drain dry. Some cheese makers take the cheese straight to the storage room but this increases the humidity there.

Ripening

Store the cheese for one month to ripen on shelves made of a wood that does not taint the cheese. Maintain storeroom temperature at 12-14°C so that the cheese ripens at a controlled rate. Maintain humidity at 80-85% so that the cheese neither dries out nor develops mould.

Note. Some cheese makers store the new cheese in a green cheese store for about 10 days at 10-12°C then transfer to a ripening store for 2-12 months at 12-15°C.

Turn Gouda cheese once daily during storage. Gouda can be eaten after 4 weeks storage. Gouda is best stored for 3 to 6 months but may be stored a year or longer.

Vacuum packing

The cheese maybe vacuum packed at three different stages

Before going into the storage room

After a few days in the storage room

Immediately before despatch to the market

Different cheese makers have different views on what is best. It is generally agreed that cheese that is not vacuum packed matures faster but loses some weight while maturing.

A cheese ripening film is used that allows gases to pass through it but not water vapour. This prevents the cheese from losing weight in storage.

Note. Humidity control is less critical once the cheese is already packed.

Whey disposal

Whey is the low nutrient by product form cheese making. While it can be made into ricotta cheese following a boiling process, most small-scale cheese makers get rid of it by supplying a farmer for feeding pigs or cattle.

In this case the whey is pumped outside the factory into a suitable sized fixed or mobile tank. It is important to maintain good hygiene with the whey tank as whey supports the growth of unwanted bacteria that could contaminate future production.

Process steps for Edam cheese

The procedure is identical except that Edam is made from milk with lower fat content. Use 70% whole milk and 30% skim milk.

Process steps for Havarti cheese

The procedure is identical except that instead of pressing the curd is turned in the cheese moulds for 3-4 hours.

Note. Armenian language description of the processing steps may be found in the booklet Guidance on Cheese Production on Farms. It is published by CARD (Centre for Agriculture and Rural Development) and was written by Andrey Araksyants, cheese technologist with that organization.

6 Recommended processing facility design, for each group

Pdfs of these 1:100 scale concept layout plans are all in the Dropbox file for Dairy Groups. Note. While the buildings were measured and drawn to scale, the size of the individual items of equipment is indicative. Positioning of the equipment is also indicative. The cheese vat can be turned to put the platform in the best place. The curd draining vat, cheese moulding table and vacuum packer are all on wheels. The next step is to discuss the concept plans with the groups so that internal walls can be built and the layout refined taking into account the position of drains, electrical power supply, water supply and access for both turcks and pedestrians. Note. The concept layouts do not yet provide space for staff facilities such as toilets and changing rooms.

All the equipment in the layouts uses the same numbering as follows

No	**Item English**
	Raw milk collection
1	Weighing milk
1A	Milk pump
2	Cooling tank (s)
3	Pasteuriser
	Cheese production
4	Cheese vat
6	Curd draining vat
7	Cheese moulding table
10	Press
	Brining
13	Brine tanks
14	Brine room shelving

16 Ice-bank brine cooler

Storage for hard and soft brined cheese

18 Wooden shelves for hard cheese

18A Tanks for soft brined cheese

Whey equipment

20 Whey tank

20A Whey pump

Laboratory equipment

21 Laboratory equipment

Packing equipment

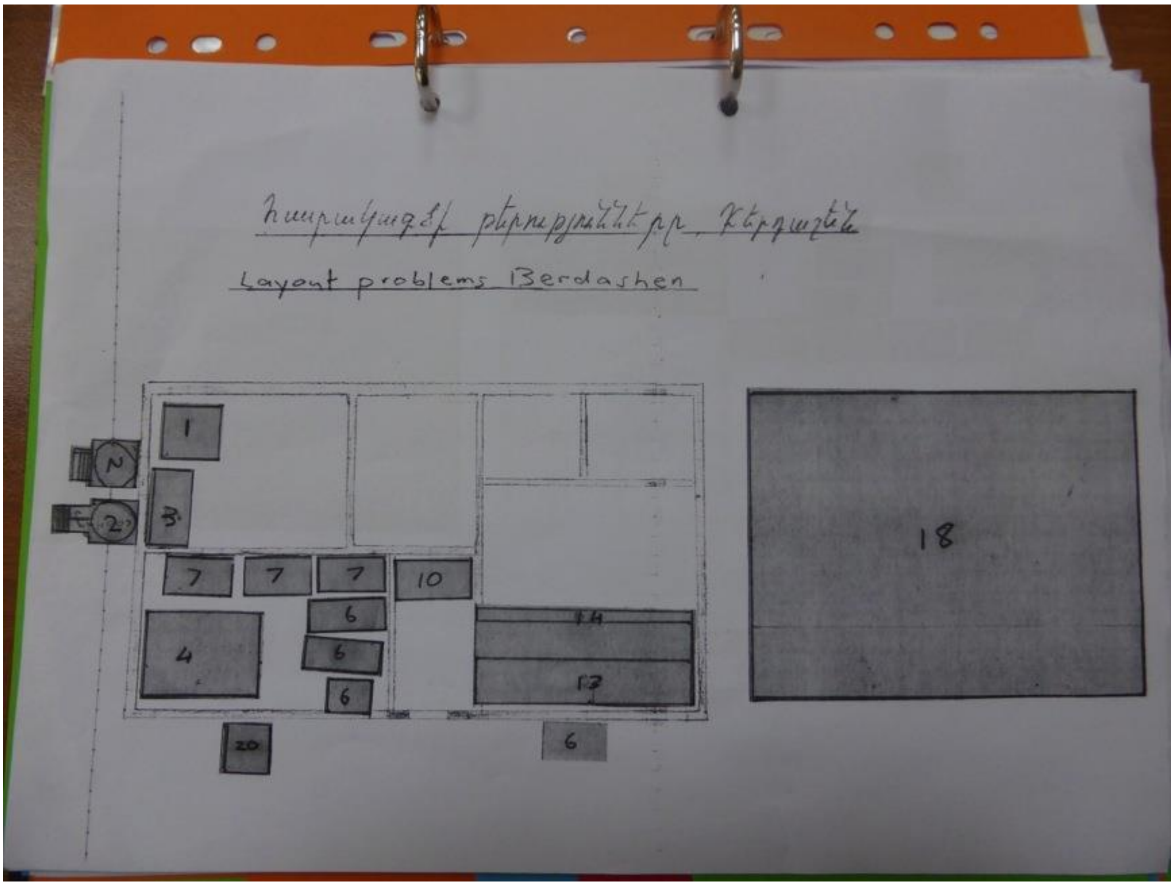
22 Vacuum packer

Auxiliary equipment

24 Hot water tank

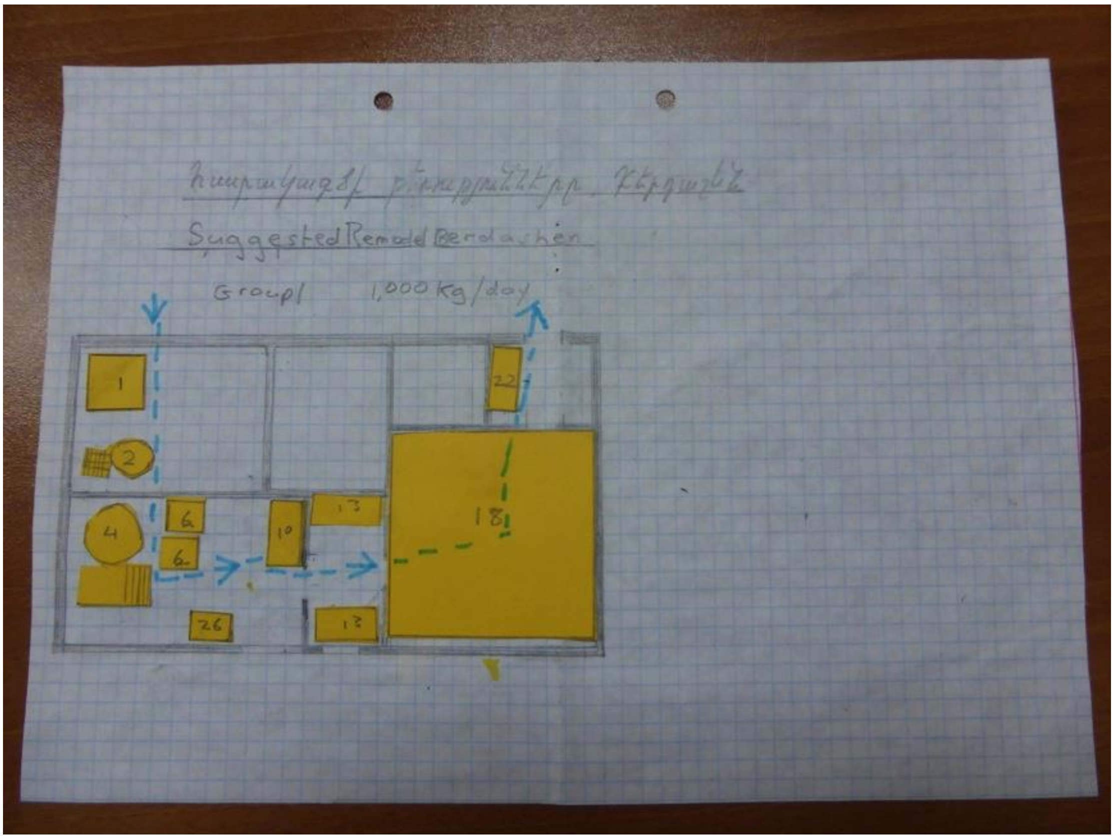
26 Washing up tub

27 Draining shelf



6.1 Original layout for dairy group 1 Berdashen, Shirak Marz

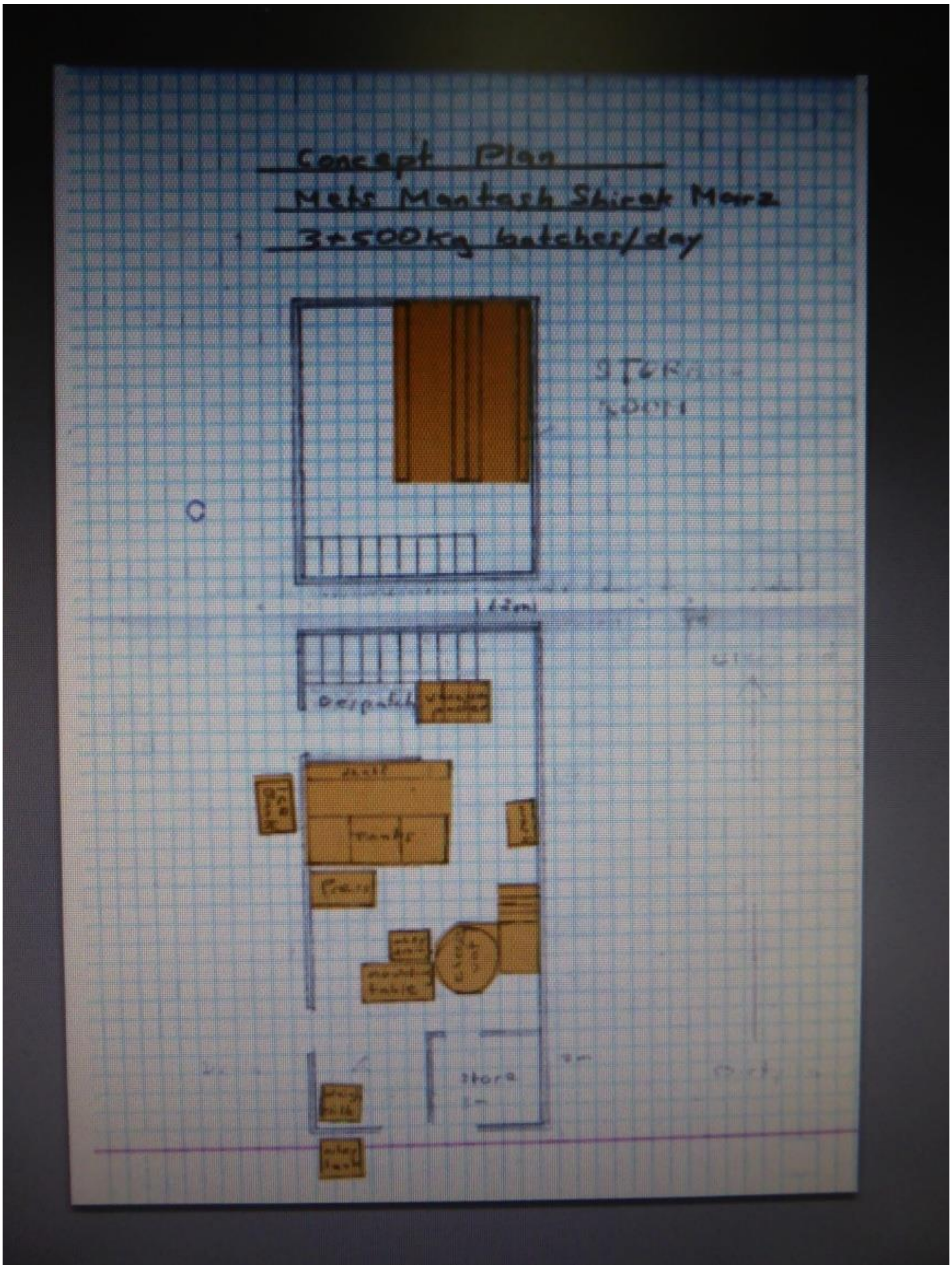
The unworkable congestion and cramped conditions are clear. They need to be resolved before the groupcan consider making high value cheese.



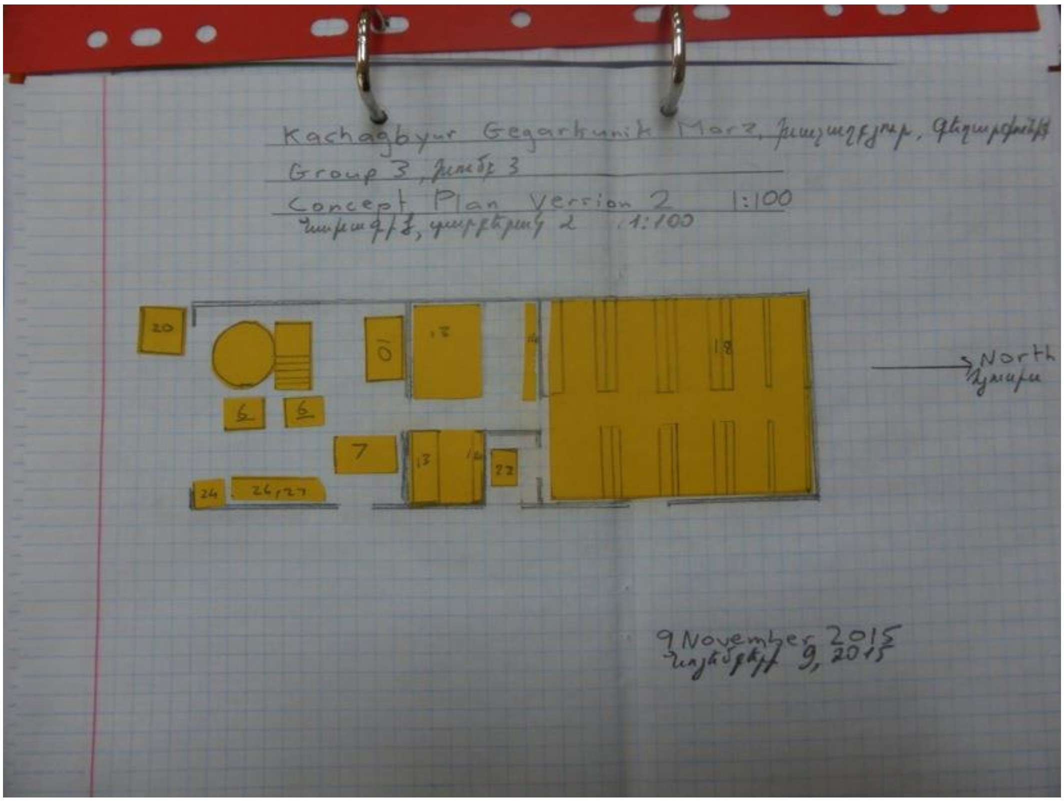
6.2 Modified layout for dairy group 1 Berdashen, Shirak Marz

This quickly drawn layout removes the existing old 2,600kg vat, removes the existing 1,000kg per hour batch pasteuriser and replaces them with a 1,000kg pasteurising cheese vat. Theoretical capacity of the plant has been reduced.

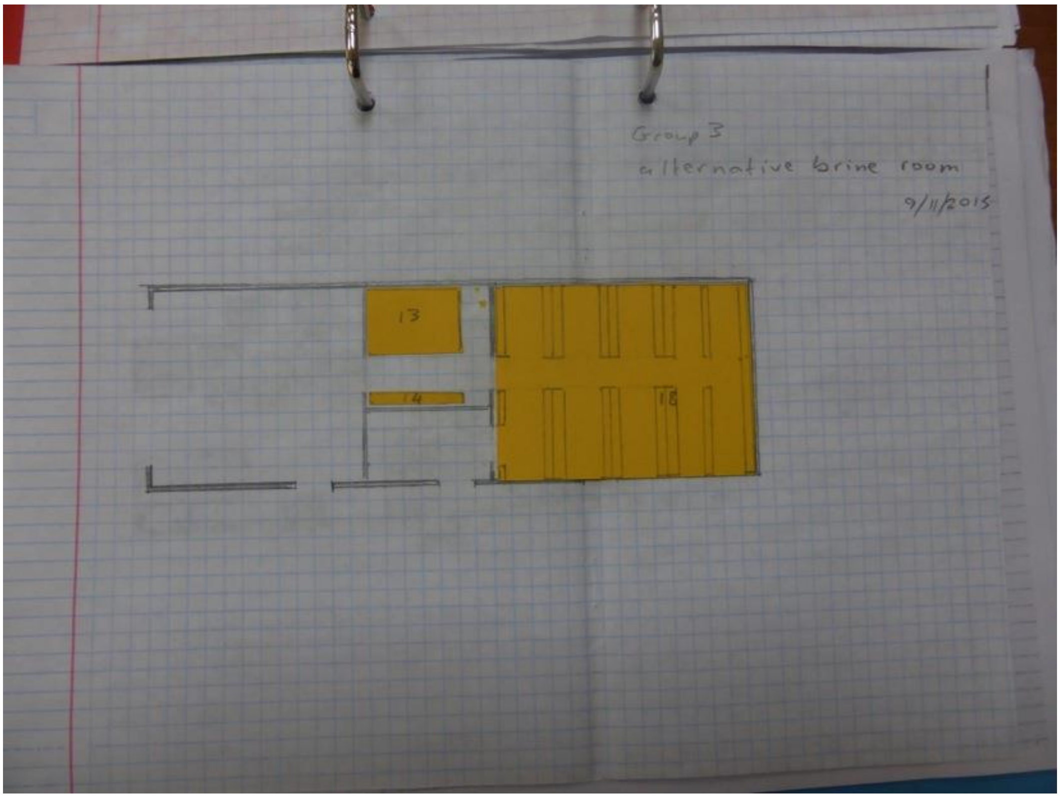
This concept has not yet been presented to the group and may well meet resistance. It is offered as a first up idea to try and resolve their congestion problems.



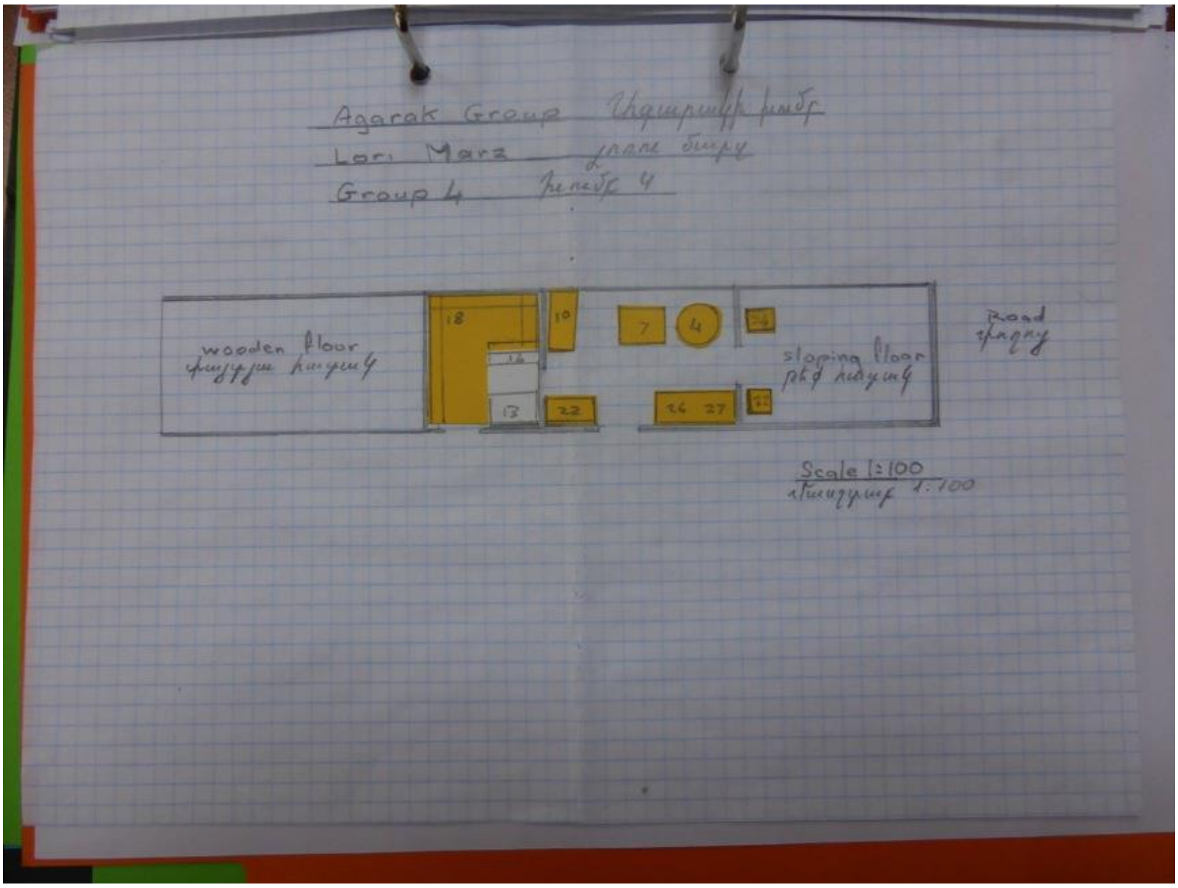
6.3Layout for dairy group 2 Mets Mantash, Shirak Marz



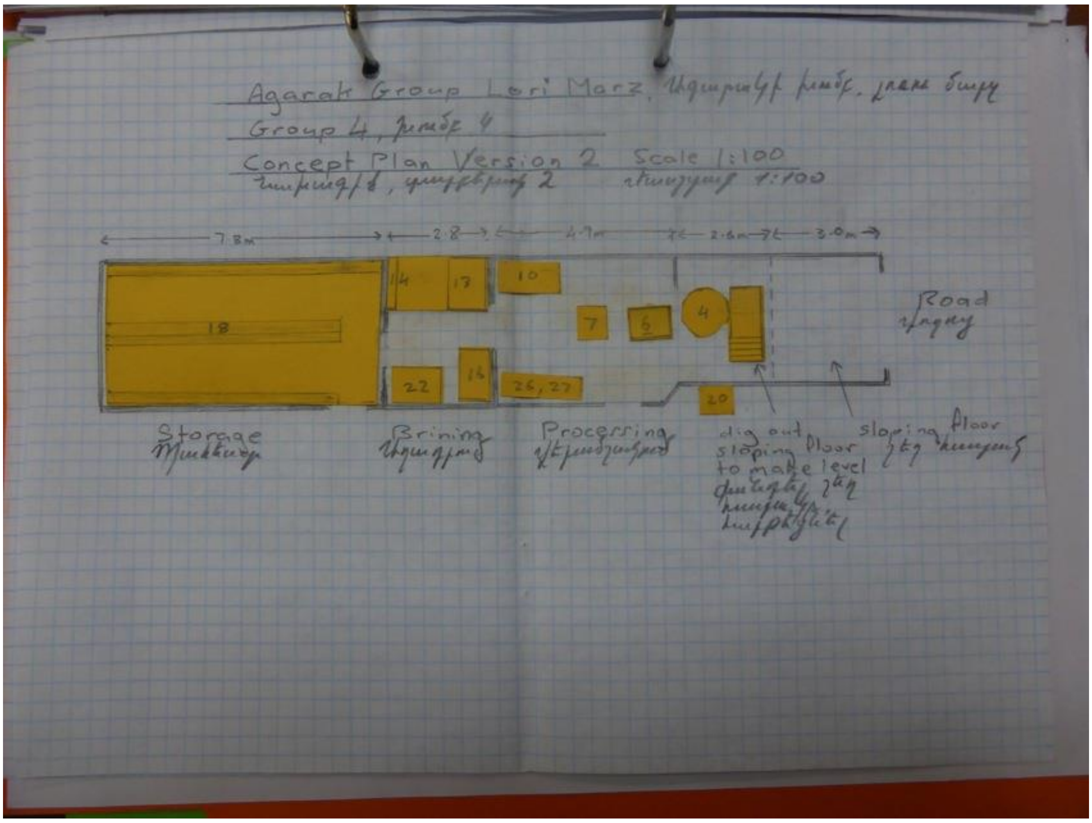
6.4Layout for dairy group 3 Khachaghbyur, Gegarkhunik Marz



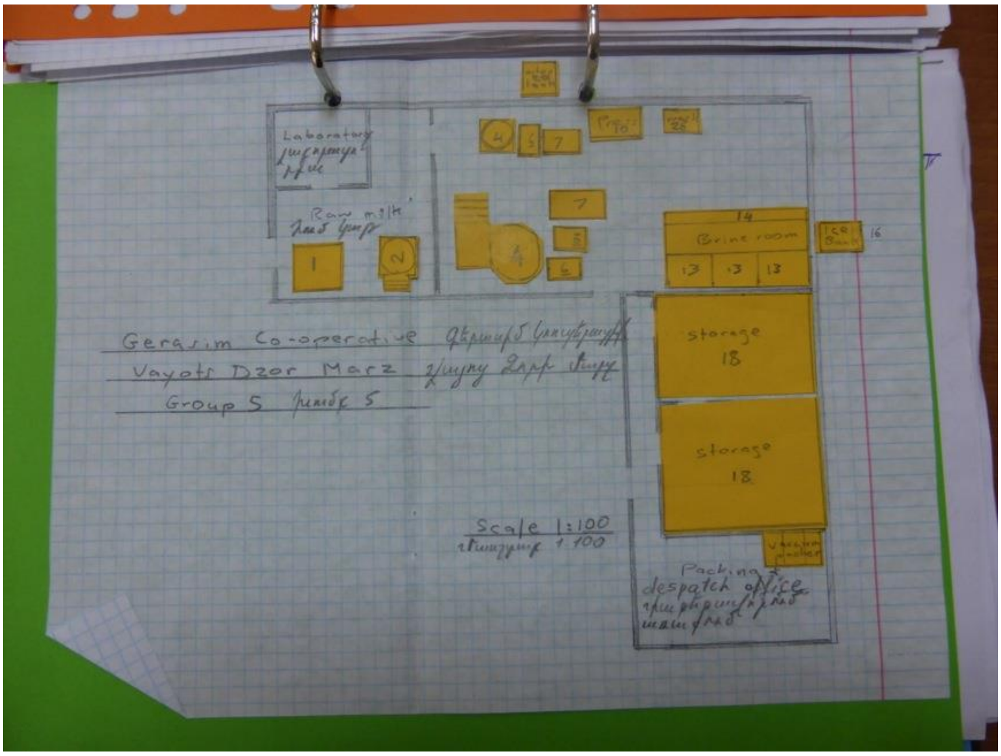
6.5Alternative layout for brine room dairy group 3



6.6Earlier layout for dairy group 4 Agarak Group Lori Marz



6.7Later layout for dairy group 4 Agarak Group Lori Marz



6.8Layout for dairy group 5 Gerasim Agri-Production Consumer Cooperative, Vayots Dzor Marz

7 Description of the adequacy of each of the 5 proposed locations for processing compared to recommended design

	Group 1	**Group 2**	**Group 3**	**Group 4**	**Group 5**
	Berdashen	Mets Mantash	Khachaghbyur	Agarak Group	Gerasim
Marz	Shirak	Shirak	Gegarkhunik	Lori	Vayots Dzor
Location	Adequate	Adequate	Adequate	Adequate	Adequate
Factory					
Overall suitability	Problems	Should be good	Excellent	Marginal	Very good
Status	Newly complete	Under construction	Almost complete	Part exists, part needs interior work	Existing cheese factory
Process area	105 sq m	78 sq m	52 sq m	39	102sq m
Store area	Not built	42	38	30 sq m	63 sq m

Group 1 Berdashen Lori marz

Adequacy of siteThe factory is located in a village. The village roads are narrow and not paved with asphalt.

They have three-phase power and use bottled gas, as there is no gas line nearby

A lot of old dairy equipment stored outside the building but this has no effect on hygiene conditions.

Adequacy of buildingThe 105 building is new with a 2.8m ceiling height but there are some serious issues with it. Firstly it is divided into several small rooms and this restricts layout design. Having said that, raw milk is received and processed in one of the rooms and that is a plus for hygiene control. The floor is draining but is very uneven and problems will develop with pitting and ponding in the future. Further, the 2,600 kg cheese vat is very large for the room it is in and this puts severe constraints on downstream processing. Walls were rough cement in mid November and they will need to be painted and or tiled to make a smooth hygienic surface

Construction of a cheese store has not yet started,

Group 2 Mets Mantash Shirak marz

Adequacy of siteThe factory is located in the middle of the village. Roads in the village are unpaved but passable.

3-phase electricity is available

Whey will be used to feed pigs.

No pollution was noticed.

<u>Adequacy of building</u>The 78 building is under construction and in mid November the external structure was generally complete. The finishing work of lining, doors and windows was still to be done. The building also has a 78 sq basement storage room under construction.

The design and shape of the building is promising for the future.

Dairy group 3 Khachaghbyur Group in Khachaghbyur village Gegarkhunik Marz

<u>Adequacy of site</u>The factory is located in the middle of the large village of Khachaghbyur. Two larger towns, Vardenis and Martuni are a few km away. The village roads are narrow and not paved with asphalt but milk collection trucks do use them daily.

The planned cheese factory is on a level site and next to their milk collection facility and family home.

Both three-phase electricity and piped gas are available. Gas is preferred as the heating medium as it is cheaper than electricity.

Water supply is continuous; water temperature is 8°C in winter and 12°C in summer. The cheese factory is likely to need some extra water storage capacity to cater for peak demand.

The cheese factory will use the village sewage system. There seemed to be no problems with objectionable smells and local pollution.

Skimmed whey will be taken from the whey storage tank and used to feed pigs.

<u>Adequacy of building</u>The 17m by 5.5m building is excellent and is a brand new shell. It has good height and a good quality draining concrete floor. The owner who has had much experience with collecting milk claims the floor will be impervious to milk acids. Internal partition walls are yet to be built. The entire front of the building consists of a large metal door. The owner intends to seal the walls with a combination of tiles and paint.

Dairy group 4 Agarak Group in Lori Marz

<u>Adequacy of site</u>The area has a moderate climate by Armenian standards with winters down tominus 15°C

The factory is located in the middle of Agarak village, some 7 km from the city of Stepanavan. The village roads are narrow and not paved with asphalt but milk collection trucks do use them.

The planned cheese factory is on a sloping site and next to their milk collection facility and family home.

Three-phase electricity is available on site and at a low price as a hydroelectric station is near the village.

The village water supply operatesjust 4-5hours per day in the village, and the group has its own water collection tank. The cheese factory is likely to need extra water storage capacity.

The cheese factory will use the village sewage system, which disposes of waste into a nearby gorge. There seemed to be no problems with objectionable smells and local pollution.

Whey will be used for pig feeding as raising pigs is popular in the community.

The owner of the building (also a member of cooperative) is an electrician and this will be helpful with installations and repairs. Labour supply is readily available from the families of group members.

Adequacy of buildingThe building is marginal. It is long and narrow (17m by 3.9m), divided into 4 'rooms' with a low ceiling height and on sloping ground. The group started their milk collection business in part of this building. That part is already food standard with a sloping floor and drain running along one wall.

The lowest room is 30sqm and has a wooden floor. The owner is keen to develop that into a cheese storage room. It will need a new floor. This is big enough to store Gouda cheese from 2x500kg batches per day for one month.

The next room is small and is suitable as a brine room. It easily accommodates a 1.5sq m brine tank, which is sufficient to brine cheese from a 500kg batch of Gouda. It is big enough to accommodate a second 1.5 brine tank so that two batches could be processed per day.

The next room up is food grade and has a ceiling height of just 2.04m. It is too low to take a 500kg cheese vat on a platform. There are three options.

1. (The owner's preference) extend the room 3.6m towards the road by digging out the sloping floor in the uppermost room.
2. Use a 500kg floor mounted vat but this will mean a very tight layout
3. (The consultant's preference) Make cheese in a manual 300kg second hand vat to minimise investment and learn about cheese making. This was the original concept and is detailed Version 1.

Dairy group 5 Gerasim inVayots Dzor marz

Adequacy of siteThe factory is located in the middle of the village. Roads within it are unpaved but passable.

They have 3-phase electricity and water is generally available 24 hours. They have a storage tank and will install a pump if necessary.

A gas pipeline is expected to come next year and that will make gas more affordable.

Whey is currently fed to pigs

Adequacy of buildingThe 102 sq m processing building is of very good standard. They plan to upgrade the room to ISO food processing standards next year and this will include food grade epoxy flooring. It has a draining floor, good ceiling height and hygienic.

The design allows the raw milk to be received and held in a separate room. This helps reduce cross contamination.

8Evaluation of collection & storage methods/equipment for milk, for all the 5 cooperatives, with recommended improvements as necessary

Conditions of local cow milk production

Pastoral conditions vary between the valleys and mountainous areas. Much pasture is unimproved so nutrition for the animals is restricted.

The five dairy groups all said that variable on-farm milk quality was a problem. This is important, as good quality milk is needed to make good quality cheese. And hard cheese is more demanding on milk quality than Armenian soft salty cheese. Common ways that on-farm milk quality can be compromised are described below. Bacteria cause most of these problems.

Quality problems BEFORE milking

Mastitis in dairy cattle is the persistent, inflammatory reaction of the udder tissue and can cause abnormalities in milk such as a watery appearance, flakes, or clots[92]. Mastitis lowers the casein (protein) content of milk and also makes it less stable, which is harmful for cheese making. Mastitis is treated with antibiotics and this milk must be withheld from processing. If milk containing antibiotics is used for cheese making the antibiotics have a harmful restrictive effect on the special bacterial culture that is added to make the cheese.

Brucellosis is an infectious disease caused by bacteria. People can get the disease when they are in contact with infected animals or animal products contaminated with the bacteria. Animals that are most commonly infected include sheep, cattle, goats, pigs, and dogs, among others.[93] While there is general acceptance that there is brucellosis in Armenia different people had different views about its prevalence ranging from "generally under control" to

"Brucellosis is a big problem and is being transmitted between sheep and some farmers are infectious". A big brucellosis prevention and control programme will start in January 2016. USDA is working on this together with the University of Maryland and the Armenian Ministry of Agriculture.

Seasonality Milk production in Armenia, like other temperate countries is seasonal. Colostrum milk produced at the very beginning of lactation is not suitable for cheese making as is milk produced at the very end of lactation

Feed taints The quality and type of feed can have a major effect on the suitability of the milk for making cheese. For example kale, turnips and wild garlic all taint milk.

[92]https://en.wikipedia.org/wiki/Mastitis_in_dairy_cattle
[93] Centres for Disease Control and Prevention http://www.cdc.gov/brucellosis/index.html

Quality problems DURING milking

ContaminationHygiene risks during milking include contamination from cow faeces, cow urine, dirty or no milking cloths, dirty milker's hands, dirty milker's clothing, dirty milking buckets, contaminated wash water.

Food poisoning organisms in raw milk can include harmful strains of Salmonella, E. coli, and Listeria, which are responsible for causing numerous foodborne illnesses. These also find their way into the milk through contamination with human or cow faeces, contaminated water supply.

Disease. Pathogens in raw milk can include those that causetuberculosis, diphtheria, typhoid, and streptococcal infections. These find their way into the milk through contamination with human or cow faeces, contaminated water supply.

Quality problems AFTER milking

Milk spoilage bacteria are inevitably in milk. They can spoil milk in numerous ways such as producing lactic acid which makes milk go sour, forming chains of bacteria that make milk go ropy or slimy, containing filth.

Lack of on-farm milk cooling is the norm in Armenia where cows are often milked in small herds on open pastures. Milk in the udder is pretty well bacterial free. But the inevitable contamination during and after milking introduces bacteria to the warm milk. Bacteria reproduce very quickly at blood temperature and this leads to quality deterioration and ultimately spoilage. Fresh milk can spoil in just 2 hours.

Unusual quality defects are also possible. Bacteria can cause a change in colour (reddish, greenish, brownish), taste (sour, fishy, oxidized, sharp, bitter).

Added water can be a problem in some dairying countries. The main cause apart from deliberately addition is when water used for flushing milking machines accidentally gets into the milk. Milk with added water is less suitable for all kinds of dairy processing.

Quality of roads and drivinghas an effect on the quality of milk. Liquid milk sloshes backwards and forwards during transport, especially in part filled containers. When milk impacts on solid surfaces, especially rough ones a churning effect takes place. This partly destabilizes the membrane around individual butter fat globules and leads to butterfat loss in the whey. Further, the movement partly aerates the milk. This also gives a mild churning effect and has unfavourable effects on milk proteins.

Temperature of milk received Processing plants commonly receive their supply at 30-34°C and at this temperature spoilage bacteria grow rapidly. Their metabolic waste products are in the milk that will be used to make the cheese and contribute to undesirable outcomes in terms of flavor and texture of the finished product

Recommendations for specific improvements in production and collection practices

On the farm, sealed cans of fresh warm milk can be placed in cool running water to reduce its temperature. This will help to retard quality deterioration.

Conduct training for milkers on how to provide good quality milk

Consider quality incentives for supply of good quality milk

Appendix 1: Field notes from visits to the five selected dairy groups

Following comprehensive procedures the project identified some 20 dairy groups that were worthy of consideration to be involved in the project. Further analysis reduced the number of groups to five. These five groups, in four different marz were all visited during 25 September to 2 October 2015.

It is confirmed that they were all appropriate, well chosen and all worthy of support. While their stage of development, scale of operations and technical skills all varied considerably, all were enthusiastic and motivated to make good quality cheese.

All groups are in remote locations; far from ready markets for high quality cheese. The individual groups' status activities may be summarized as follows

	Group 1 Berdashen Shirak Marz	**Group 2 Mets Mantash, Shirak Marz**	**Group 3 Khachaghbyur, Gegarkhunik Marz**	**Group 4 Agarak Group, Lori Marz**	**Group 5 Gerasim, Vayots Dzor Marz**
Processing room	80% complete	30% complete	80% complete	100% complete	100% complete
Brining room	Not started	30% complete	Not started	Not started	100% complete
Already collect milk	No	No	Yes. Established business	Yes Established business	Yes Established business
Experience with making cheese	Worked in Dutch cheese plant	No	Made local cheese	Brother is a cheese maker	Small scale cheese makers
Already make cheese	No	No	No	No	Yes

Group 1 Berdashen Shirak Marz

The group is strongly entrepreneurial. They developed their plans and started construction of the factory before they heard of the ENPARD project. They also collected a variety of second hand cheese processing equipment; milk weighing scales, two general purpose milk pumps, old Bulgarian 1 tonne per hour plate pasteuriser, old Bulgarian 2,500 litre cheese vat, hot water generator, two work tables and a washing up tub. A further strength is that one member of the co-op worked in a factory that made Dutch cheeses. On the debit side, factory is divided into a number of small rooms. The completed floor is quite uneven. This will make it more difficult to maintain high hygiene standards. Acid in any milk residues on the floor will eat into the cement. Further, the equipment is old and not matched. The cheese vat is missing its mechanical stirring and cutting gear.

The plate pasteurizer is of concern. It is a substantial old machine built prior to digital control technology. It will need commissioning and may well need replacement parts. The control mechanism has the old circular rotating charts. It is by no means clear that it is operational.

The co-operative needs to consider its options if the pasteurizer cannot be made to work there are two options;

i) Make unpasteurised cheese (which is not recommended for foo safety reasons)
ii) Test if the electric heating coils in the cheese vat can be used to batch-pasteurise. Batch pasteurizing involved heating the milk then holding for 30 minutes at 61°C. or 1 minute at 68°C. This can be determined in pre production trials by assessing performance by heating water. There is a risk that it will take too long to heat.
iii) Buy a regular cheese vat that is designed to batch pasteurise as well.

They are worthy of assistance and will benefit from any training provided and in particular training on cheese making and food hygiene.

Group 2 Mets Mantash, Shirak Marz

There are five people involved and it is nominally a women's group. They currently produce 500 litres cow milk and 300 litres sheep milk per day. This group is particularly professional in approach; the spokesman is a qualified practicing veterinarian so is well placed to understand the impact of cow health on milk quality, hygienic procedures and food safety.

The group coordinator was positive that there is no brucellosis in their area as a specialist checks their cattle for it annually.

They had initiative to start the factory building before learning about the ENPARD project. The building, which measures 13m by 6m, has an additional 7m by 6m basement. The design was taken from a cheese textbook and features a basement brining and cheese storage room. Concrete block work was completed in early October and the roof was going on in mid October. They hope to accelerate construction so it is finished by November-January so they can take advantage of the next high season for milk production in April 2016.

This group is interested in and has an opportunity to make added value sheep cheese. One member has completed World Bank training on sheep farming and is also a trainer on sheep farming. The group's sheep milk is currently sold to a processor for AMD130/litre. Sheep milk cheese has a higher yield of cheese (5.5-6.0litres milk per kg cheese compared with traditional cow cheese of 6.5 litres milk per kg cheese). While this project is focused on cheese from cow milk and this group should focus on that too, it does point to some product development work; sheep cheese generally commands a substantial price premium over cow cheese and the cost of milk and cost of production are substantially the same.

Given the group's professionalism, they will be attentive at the training that then project will provide.

Group 3 Khachaghbyur, Gegarkhunik Marz

This is a long established business with 600 suppliers and a good reputation. IN the high season 15 tonnes milk are collected per day on a twice-daily basis from local villages and the furthest collection point is 50km away. Some 2,000 litres milk is collected per day in the low season. Several small modern tankers are used. The ilk is collected, chilled then delivered to processors. Inn other words they already have good raw milk handling facilities.

The co-op itself is newly formed and has 5 members. Their aims and attitude are practical. They have a strong intention to process 1500 litres pasteurised milk 7 days a week into high value cheese such as Gouda but not blue cheese. Realistically they hope to trial several varieties of high value cheese so they can identify one type that suits them and their milk.

Their direct cheese making experience is limited as they earlier tried making local salty cheese but "were too far from the market". Cheesemaking training will be needed.

They have business momentum also. Their factory is under construction and will be ready by Spring 2016. Sheet polystyrene was being put on the walls at the time of visiting. The processing room measures 5.4m by 18m, has a sloping polished concrete floor with under floor drain. They have adequate cold water which runs at 11°C. Three-phase power is available. They are thinking about making a basement curing room as they said they expected to need to hold 15 tonne cheese. This capacity will be sufficient. The layout was\s not yet determined at the time of visiting,

In conclusion the group has the advantage of its existing well-established business systems, infrastructure and dairy knowhow. Adding on a cheese component will be an easier and safer prospect than starting from scratch.

Group 4 Agarak Group, Lori Marz

They have been established for 14 years and have 99 members who all own farms. They collect 13 tonnes cow milk per day in the high season and 2 tonnes in the low season on a daily basis. More milk is available. They own three milk tankers and lease a 1.5 tonne capacity tanker from Marianna, Armenia's biggest dairy company. They do not process any milk themselves.

This situation proves they have sound business and milk handling skills.

They thought they could make cheese in an adjacent building where they originally started their milk collection business. It is on sloping ground. It has concrete floor and walls, is long, narrow and divided into several rooms. It is marginally acceptable, the main difficulty being that it has a 2.0m ceiling height. The floor of the top room slopes steeply so is not suitable for processing but some service facilities such as hot water heater-tank can be located there. The bottom room has a wooden floor that would need to be replaced with a concrete one. A separate basement room with low stud and dirt floor measuring 7m by 4.5 could be developed for ripening.

The facilities would be suitable for starting cheese production as they can obtain chilled raw milk from their existing business. If successful they would build a new factory with an industrial height ceiling.

Making cheese is an idea, a concept for them and possibly they were encouraged by the prospect of some free equipment. However they had the business skills to develop their milk collection business into something substantial and they are likely to have the skills to develop a cheese business also. Interestingly, they are not fixed on producing any particular kind of cheese, hard or soft, they intend to respond to market demand. For example they would consider making yoghurt as well.

They will need comprehensive training.

Group 5 Gerasim, Vayots Dzor Marz

This is the only group that has an established cheese making business. There are 21 members in the co-op and they have been operating 7-8 years. Farmers have 3-15 cows and one has 49 cows. Typically they collect 12-13 litres from each farm, collecting 600-700 litres cow milk per day in the high season and 250-300 litres per day in the low season. Collection is twice per day and the farms are only 10 minutes away. They could potentially collect 1,500 litres in the high season and 500 litres in the low season as the milk is available from nearby villages.

The co-op owns two milk tankers but mechanically, they are not very reliable so spoilage can occur.

Previously they supplied processors but now they process all their milk into soft cheese using totally manual 300 litre cheese vats. They use two in the high season and one in the low season. The factory is operational and good quality. In fact they plan to improve it by bringing it up to ISO standards. This will include the installation of epoxy flooring.

There are large capacity concrete brining tanks in a basement and a further semi-developed basement measuring 12m by 6m that could be developed into a curing room. There is a separate undeveloped basement room measuring 4m by 4,5m that could be developed as an extra ripening room.

Essentially they plan to make more cheese and better quality. They could collect more milk but the difficulty is in selling the products so making hard cheese is an option for them.

Marketing wise, the spokesman has a brother in the retail sector St Petersburg who thought he could sell 10 tonnes cheese of his cheese per month but the spokesman thought his quality and quantity were not up to it yet. “There is a big demand for any cheese in Russia but especially any wrapped Dutch” types of cheese”.

They would also like to sell a specialty high value cheese such as Mozzarella or Sulugani. Their interest innovation was affirmed when they talked about efforts to make commercial drinking yoghurt.

Their approach was practical, conservative but definitely wanting to move forward. The spokesman is a practicing veterinarian and his wife is the cheese maker. They were measured, quietly confident and plan to develop the business by building on their success over the last 7-8 years.

While the cheese maker has had on the job training for making soft cheese, she will need comprehensive training to make high quality hard cheese.

Appendix 2 Technical Specifications Group 1 Berdashan

Appendix 3 Technical Specifications Group 2 Mets Matash

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

DRAFT ONLY

THE TECHNICAL SPECIFICATIONS FOR PURCHASE OF EQUIPMENT

AND SUPPLIES

1. **General Background Information**

    a. UNIDO is implementing the ENPARD project in Armenia on producer groups and value chain development. The overall objective of the project is ensuring an efficient and sustainable agriculture that contributes to better living conditions in rural areas. The project aim to strengthen producer groups, effectively engage producer groups in value addition activities, strengthen value chains that provide improved access to affordable, better quality food, contribute to the development of rural areas, improve access to local and international markets, and ensure the introduction of environmentally-friendly farming and food processing practices. The project is funded by the European Union and Austrian Development Cooperation.

    b. The Project has identified five primary producer cooperatives who wish to make high value cheese in the targeted regions of Armenia. The Project will help them in several ways, including with the purchase of specialised small scale cheese processing equipment. Each group has slightly different equipment requirements as some groups already have or have access to equipment.

    c. The equipmentspecified below is for dairy group 2, Mets Mantash in Shirak Marz that, in the peak plan to make 3 x500kg batches of cheese per day.

2. The Scope of Supply

2.1 The following items should be supplied:

UNIDO REQUIREMENTS			TO BE COMPLETED BY THE INVITEE			
Item	Name and required parameters	Quantity	Unit price	Total item price	Compliance*	Remarks
			Currency	Currency	Yes/no	
0	**GENERAL REQUIREMENTS**					
	ALL ELECTRICAL EQUIPMENT, PLUGS AND CABLES MUST BE COMPLIANT WITH __________________ELECTRICAL NETWORK STANDARDS					
1.	Equipment, parts, supplies					
1.1	500 litre raw milk cooling tank. Stainless steel, insulated with stirrer, drain valve, lid and cooling unit	1				
1.2	1 milk pump with fittings and 8 metres flexible hoses. Stainless steel centrifugal type. Mounted on a trolley. Pump body and food contact parts should be 316 grade of stainless steel. Motor cover and frame can be made of 304 grade of stainless steel.	1				
1.3	1 x 500kgcircular, pasteurising cheese vat. Has stairs, platform to stand on, motorised stirrer and curd cutting blades	1				
1.4	Hot water generator for pasteurising Heating capacity sufficient to heat 500 litres milk to 68°C. e.g. 45KWh. elements Milk is then cooled to 34°C with cold water. Total time less than one hour. NB this is not needed if the cheese vat already has heating capacity built in.	1				
1.5	Curd draining vat, Stainless steel, on wheels capable of taking contents of the 500kg vat	1				

1.6	Worktable to fill moulds and move to press Stainless steel, with one lower shelf and on wheels	1				
1.7	Moulds to make 3kg Gouda cheese Moulds to make 1kg Gouda cheese	20 3				
1.8	stainless steel or hygienic plastic rectangular moulds moulds to make soft cheese such as Chanakh	30				
1.9	Mechanical cheese press suitable for Gouda cheese, Stainless steel, supplied with weights, capable of pressing 55kg curd at a time.	1				
1.10	Brine tank divided into three compartments each with minimum surface area 1.5 sq. m and minimum depth of 30cm and fitted with cooling coils.	1				
1.11	12 linear metres of 316 grade 30cm wide stainless steel shelving plus stainless steel support, for example a shelf 3.0m long x 30cm wide and 4 shelves high	1				
1.12	Air cooling system to keep the room at the desired temperature of 12-14°C.	1				
1.13	Brine cooling system; Insulated ice accumulator to supply ice water to brine tank. Complete with circulation pump. A suitable capacity is 700 litre capacity 0.55 KW motor Total cooling capacity 1083KW Reloading time 8 hours The cheese goes in at about 30°C and should be cooled to 12°C within one hour.	1				
1.14	Hard cheese cooling system to keep 45 sqm room at 12-14°C.Suggested capacity is 3.5KW 230/400V cooling motor	1				
1.15	Stainless steels posts and brackets with 300m wooden shelves 32cm wide by 2.5cm thick. 360 metres shelf. The shelves can be stacked 10 high.	1				

	Lengths of single and double racks to be supplied once the room is designe					
1.16	Whey pump capacity, say 3 cubic metre/hour. Stainless steel centrifugal pump. To be supplied on a stand and with 8m flexible hose to reach whey tank. Pump body and food contact parts should be 316 grade of stainless steel. Motor cover and frame can be made of 304 grade of stainless steel.	1				
1.17	1,500 litres whey tank with outlet tap Made of food grade plastic or stainless steel, located outside the factory on a stand	1				
1.18	Laboratory testing equipment Digital hand thermometer pH meter with calibration liquids Glass brine density meter Plastic 100ml measuring cups Simple titration equipment, supplies to measure acidity in milk	 1 1 1 1 5 1				
1.19	Food grade vacuum packer, cavity big enough to take a 5kg cheese	1				
1.20	Set of 0 to 10kg electronic cheese packing scales	1				
	120 litre 7.5KW electric hot water boilerwith necessary piping. Hot water at55°C to 65°C is used to scald the curd and for cleaning.	1				
1.21	2,000 litre plastic fresh water tank. CAPACITY TO BE CONFIRMED BY DAIRY GROUP BASED ON THEIR WATER SUPPLY	1				
1.22	Washing tub 400 litre, plastic or stainless steel on stand and with drain plug.	1				
1.23	Hygienic shelving that lets equipment such as moulds, cutting blades, scrubbing brushes drain dry	1				
1.24	Protective clothing;					

	Disposable hats, Disposable gloves, Hot water gloves, Plastic aprons, Gumboots	1 box 1 box 10 pairs 5 5 pairs, assorted sizes				
1.25	Cleaning supplies; Scrubbing brushes, detergent, sanitiser, Water spray pistols, Hoses Retractable hose reel	5 20 litres 20 litres 3 20 m cold water cleaning hose 3				

2.	Provision of services			
Item	Name and required parameters	Total item price	Compliance*	Remarks
2.1	Costs of travel			
2.2	Cost of setting up the equipment			
2.3	Cost of test running of the equipment			
2.4	Cost of training of the processing plant staff			
2.5	Other costs			
3.	Total Price			

2.2 Supplier's General Responsibilities

The supplier must provide evidence of being a recognized supplier of metrology equipment to national metrology institutions of other countries.

The supplier shall make its best efforts to ensure that all works will be carried out according to "good quality and adequate accessories". The supplier assumes the overall responsibility for the correct selection and installation of the equipment for the practical implementation of the Project.

The supplier shall take into account all the details presented in these TSs and shall request any further information, which is considered necessary for the correct implementation of the Works.

The supplier should be able to provide support and maintenance within at least five years after installation.

The supplier should be able to supply, install and train personnel where necessary and also to provide all services needed for the technical reception of the equipment at the cites.

2.3 Personnel in the Field

The supplier must appoint/nominate a project manager. This project manager will be the primary contact point for UNIDO and will be responsible for the services of the supplier and especially for the installation. All staff deployed must be suitably qualified and in possession of the necessary valid permits/VISAS to work in Armenia for the duration of the contract.The supplier is responsible for all allowances, accommodation, transportation and such costs related to its personnel in the field. UNIDO will have any responsibility for such staff. The UNIDO Project National Coordinator based in Yerevan, Armenia will be the primary focal point for UNIDO.

2.4 Reporting

A final report (in English) should be submitted to UNIDO no later than 2 weeks after the installation and training has been completed, for approval by UNIDO.

2.5. Language

The Official Project communication language shall be English.The drawings, catalogues, illustrations, printed specifications and other documentation related to the present project shall bepreferably in Russian, or otherwise in English.

3. Guarantee Requirements

At least one year(s) guarantee is required.

4. Delivery Period

Project should be completed by latest June 2016.

5. Award conditions

UNIDO reserves the right to split an award between any suppliers in any combination, as it may deem appropriate. If the quotation is submitted on an "all or none" basis, it should be clearly stated as such in your response to this RFQ

Appendix 4 Technical Specifications Group 3 Khachaghbyur

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

DRAFT ONLY

THE TECHNICAL SPECIFICATIONS FOR PURCHASE OF EQUIPMENT

AND SUPPLIES

1. General Background Information

1.1 UNIDO is implementing the ENPARD project in Armenia on producer groups and value chain development. The overall objective of the project is ensuring an efficient and sustainable agriculture that contributes to better living conditions in rural areas. The project aim to strengthen producer groups, effectively engage producer groups in value addition activities, strengthen value chains that provide improved access to affordable, better quality food, contribute to the development of rural areas, improve access to local and international markets, and ensure the introduction of environmentally-friendly farming and food processing practices. The project is funded by the European Union and Austrian Development Cooperation.

1.2 The Project has identified five primary producer cooperatives who wish to make high value cheese in the targeted regions of Armenia. The Project will help them in several ways, including with the purchase of specialised small-scale cheese processing equipment. Each group has slightly different equipment requirements as some groups already have or have access to equipment.

1.3 The equipmentspecified below is for dairy group 3, Mets Mantash in Shirak Marz that, in the peak plans to make 1 x 1,000kg batch of cheese per day.

2. <u>The Scope of Supply</u>

2.1 The following items should be supplied:

UNIDO REQUIREMENTS			TO BE COMPLETED BY THE INVITEE			
Item	Name and required parameters	Quantity	Unit price	Total item price	Compliance*	Remarks
			Currency	Currency	Yes/no	
0	**GENERAL REQUIREMENTS**					
	ALL ELECTRICAL EQUIPMENT, PLUGS AND CABLES MUST BE COMPLIANT WITH __________________ELECTRICAL NETWORK STANDARDS					
1.	Equipment, parts, supplies					
1.1	1 x 1,00kgcircular, pasteurising cheese vat. Has stairs, platform to stand on, motorised stirrer and curd cutting blades	1				
1.2	Hot water generator for pasteurising Heating capacity sufficient to heat 1,000 litres milk to 68°C. using gas. Milk is then cooled to 34°C with cold water. Total time less than one hour. NB this is not needed if the cheese vat already has heating capacity built in. Note. Cold water pump also needed if flow is less than 1,000 litres/hour	1				
1.3	Curd draining vat, Stainless steel, on wheels each capable of taking half the contents of the 500kg vat. I larger vat is also acceptable.	2				
1.4	Worktable to fill moulds and move to press Stainless steel, with one lower shelf and on wheels. 1600 x 900mm or similar size is suitable	1				

1.5	Moulds to make 3kg Gouda cheese Moulds to make 1kg Gouda cheese	36 3				
1.6	Pneumatic cheese press suitable for Gouda cheese capable of pressing 110kg curd at a time Suitable air compressor, filters, instrumentation and line to supply the press	1 1				
1.7	10 linear metres of 316 grade 30cm wide stainless steel shelving plus stainless steel support, For example a rack 2.5m long x 32cm wide and 4 shelves high gives 10 linear metres	1				
1.8	Air cooling system to keep the room at the desired temperature of 12-14°C.	1				
1.13	Brine cooling system; Insulated ice accumulator to supply ice water to brine tank. Complete with circulation pump. Each batch of about 55kg curd cheese goes into the brine at about 30°C and should be cooled to 12°C within one hour. Note. Cooling pipes that run through the existing brine tank will be supplied and fitted locally.	1				
1.14	Hard cheese cooling system to keep 45 sqm room at 12-14°C.	1				
1.15	Stainless steels posts and brackets with at least 235m wooden shelves 32cm wide by 2.5cm thick. 360 metres shelf. The shelves can be stacked 10 high.Lengths of single and double racks to be supplied once the room is designed	1				
1.16	Whey pump capacity, say 3 cubic metre/hour. Stainless steel centrifugal pump. To be supplied on a stand and with 8m flexible hose to reach whey tank. Pump body and food contact parts should be 316 grade of stainless steel. Motor cover and frame can be made of 304 grade of stainless steel.	1				
1.17	1,000 litres whey tank with outlet tap, made of food grade plastic or stainless steeland on a stand	1				

1.18	Laboratory testing equipment Digital hand thermometer pH meter with calibration liquids Glass brine density meter Plastic 100ml measuring cups Simple titration equipment, supplies to measure acidity in milk	1 1 1 1 5 1				
1.19	Food grade vacuum packer, cavity big enough to take a 5kg cheese	1				
1.20	Set of 0 to 10kg electronic cheese packing scales	1				
	120 litre 7.5KW electric hot water boilerwith necessary piping. Or 2 x 60 litre, whatever is available. Hot water at55°C to 65°C is used to scald the curd and for cleaning.	1				
1.21	2,000 litre plastic fresh water tank. CAPACITY TO BE CONFIRMED BY DAIRY GROUP BASED ON THEIR WATER SUPPLY	1				
1.22	Washing tub 400 litre or similar, plastic or stainless steel on stand and with drain plug.	1				
1.23	Hygienic shelving that lets equipment such as moulds, cutting blades, scrubbing brushes drain dry	1				
1.24	Protective clothing; Disposable hats, Disposable gloves, Hot water gloves, Plastic aprons, Gumboots	1 box 1 box 10 pairs				

		5 5 pairs, assorted sizes				
1.25	Cleaning supplies; Scrubbing brushes, detergent, sanitiser, Water spray pistols, Hoses Retractable hose reel	5 20 litres 20 litres 3 20 m cold water cleaning hose 3				

2.	Provision of services			
Item	Name and required parameters	Total item price	Compliance*	Remarks
2.1	Costs of travel			
2.2	Cost of setting up the equipment			

2.3	Cost of test running of the equipment			
2.4	Cost of training of the processing plant staff			
2.5	Other costs			
3.	Total Price			

2.2 Supplier's General Responsibilities

The supplier must provide evidence of being a recognized supplier of metrology equipment to national metrology institutions of other countries.

The supplier shall make its best efforts to ensure that all works will be carried out according to "good quality and adequate accessories". The supplier assumes the overall responsibility for the correct selection and installation of the equipment for the practical implementation of the Project.

The supplier shall take into account all the details presented in these TSs and shall request any further information, which is considered necessary for the correct implementation of the Works.

The supplier should be able to provide support and maintenance within at least five years after installation.

The supplier should be able to supply, install and train personnel where necessary and also to provide all services needed for the technical reception of the equipment at the cites.

2.3 Personnel in the Field

The supplier must appoint/nominate a project manager. This project manager will be the primary contact point for UNIDO and will be responsible for the services of the supplier and especially for the installation. All staff deployed must be suitably qualified and in possession of the necessary valid permits/VISAS to work in Armenia for the duration of the contract.The supplier is responsible for all allowances, accommodation, transportation and such costs related to its personnel in the field. UNIDO will have any responsibility for such staff. The UNIDO Project National Coordinator based in Yerevan, Armenia will be the primary focal point for UNIDO.

2.4 Reporting

A final report (in English) should be submitted to UNIDO no later than 2 weeks after the installation and training has been completed, for approval by UNIDO.

2.5. Language

The Official Project communication language shall be English.The drawings, catalogues, illustrations, printed specifications and other documentation related to the present project shall bepreferably in Russian, or otherwise in English.

3. Guarantee Requirements

At least one year(s) guarantee is required.

4. Delivery Period

Project should be completed by latest June 2016.

5. Award conditions

UNIDO reserves the right to split an award between any suppliers in any combination, as it may deem appropriate. If the quotation is submitted on an "all or none" basis, it should be clearly stated as such in your response to this RFQ

Appendix 5 Technical Specifications Group 4 Agrak group

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

DRAFT ONLY

THE TECHNICAL SPECIFICATIONS FOR PURCHASE OF EQUIPMENT AND SUPPLIES

2. General Background Information

2.1 UNIDO is implementing the ENPARD project in Armenia on producer groups and value chain development. The overall objective of the project is ensuring an efficient and sustainable agriculture that contributes to better living conditions in rural areas. The project aim to strengthen producer groups, effectively engage producer groups in value addition activities, strengthen value chains that provide improved access to affordable, better quality food, contribute to the development of rural areas, improve access to local and international markets, and ensure the introduction of environmentally-friendly farming and food processing practices. The project is funded by the European Union and Austrian Development Cooperation.

2.2 The Project has identified five primary producer cooperatives who wish to make high value cheese in the targeted regions of Armenia. The Project will help them in several ways, including with the purchase of specialised small-scale cheese processing equipment. Each group has slightly different equipment requirements as some groups already have or have access to equipment.

2.3 The equipmentspecified below is for dairy group 4, Agarak Group in Lori Marz that plans to make 1x500kg batches of cheese per day.

2. The Scope of Supply

2.1 The following items should be supplied:

UNIDO REQUIREMENTS			TO BE COMPLETED BY THE INVITEE			
Item	Name and required parameters	Quantity	Unit price	Total item price	Compliance*	Remarks
			Currency	Currency	Yes/no	
0	**GENERAL REQUIREMENTS**					
	ALL ELECTRICAL EQUIPMENT, PLUGS AND CABLES MUST BE COMPLIANT WITH ________________ELECTRICAL NETWORK STANDARDS					
1.	Equipment, parts, supplies					
1.1	1 x 500kgcircular, pasteurising cheese vat. Has stairs, platform to stand on, motorised stirrer and curd cutting blades	1				
1.2	Hot water generator for pasteurising Heating capacity sufficient to heat 500 litres milk to 68°C. using gas or electricity Milk is then cooled to 34°C with cold water. Total time less than one hour. NB this is not needed if the cheese vat already has heating capacity built in. Note. Cold water pump also needed if flow is less than 1,000 litres/hour	1				
1.3	Curd draining vat, Stainless steel, on wheels capable of taking contents of the 500kg vat.	1				
1.4	Worktable to fill moulds and move to press Stainless steel, with one lower shelf and on wheels. 800 x 900mm or similar size is suitable	1				
1.5	Moulds to make 3kg Gouda cheese Moulds to make 1kg Gouda cheese	20 3				
1.6	Mechanical cheese press suitable for Gouda cheese capable of pressing 550kg curd at a time	1				
1.7	Brine tank with minimum surface area 1.5 sq. m and minimum depth of 30cm. Note. Confirm planned shape with factory to make sure they fit in the	1				

	planned space. Fitted with stainless steel pipe to circulate ice water					
1.8	4 linear metres of 316 grade 30cm wide stainless steel shelving plus stainless steel support, For example a rack 2m long x 32cm wide and 2 shelves high gives 4 linear metres	1				
1.9	Air cooling system to keep the small room at the desired temperature of 12-14°C.	1				
1.10	Brine cooling system; Insulated ice accumulator to supply ice water to brine tank. Complete with circulation pump. Each batch of about 55kg curd cheese goes into the brine at about 30°C and should be cooled to 12°C within one hour.	1				
1.11	Hard cheese cooling system to keep 30 sqm room at 12-14°C.	1				
1.12	Stainless steels posts and brackets with at least 120m wooden shelves 32cm wide by 2.5cm thick. The shelves can be stacked 10 high.Lengths of single and double racks to be supplied once the room is designed	1				
1.13	Whey pump capacity, say 3 cubic metre/hour. Stainless steel centrifugal pump. To be supplied on a stand and with 8m flexible hose to reach whey tank. Pump body and food contact parts should be 316 grade of stainless steel. Motor cover and frame can be made of 304 grade of stainless steel.	1				
1.14	500 litre whey tank with outlet tap, made of food grade plastic or stainless steel and on a stand	1				
1.15	Laboratory testing equipment Digital hand thermometer pH meter with calibration liquids Glass brine density meter Plastic 100ml measuring cups Simple titration equipment, supplies to measure acidity in milk	 1 1 1 1 5 1				
1.16	Food grade vacuum packer, cavity big enough to take a 5kg cheese	1				
1.17	Set of 0 to 10kg electronic cheese packing scales	1				
1.18	60 litre 7.5KW electric hot water boilerwith necessary piping. Hot water at55°C to 65°C is used to scald the curd and for cleaning.	1				
1.19	2,000 litre plastic fresh water tank. CAPACITY TO BE CONFIRMED BY DAIRY GROUP BASED ON THEIR WATER SUPPLY	1				

1.20	Washing tub 400 litre or similar, plastic or stainless steel on stand and with drain plug.	1				
1.21	Hygienic shelving that lets equipment such as moulds, cutting blades, scrubbing brushes drain dry	1				
1.22	Protective clothing; Disposable hats, Disposable gloves, Hot water gloves, Plastic aprons, Gumboots	1 box 1 box 10 pairs 5 5 pairs, assorted sizes				
1.23	Cleaning supplies; Scrubbing brushes, detergent, sanitiser, Water spray pistols, Hoses Retractable hose reel	5 20 litres 20 litres 3 20 m cold water cleaning				

		hose 3				

2.	Provision of services			
Item	Name and required parameters	Total item price	Compliance*	Remarks
2.1	Costs of travel			
2.2	Cost of setting up the equipment			
2.3	Cost of test running of the equipment			
2.4	Cost of training of the processing plant staff			
2.5	Other costs			
3.	Total Price			

2.2 Supplier’s General Responsibilities

The supplier must provide evidence of being a recognized supplier of metrology equipment to national metrology institutions of other countries.

The supplier shall make its best efforts to ensure that all works will be carried out according to "good quality and adequate accessories". The supplier assumes the overall responsibility for the correct selection and installation of the equipment for the practical implementation of the Project.

The supplier shall take into account all the details presented in these TSs and shall request any further information, which is considered necessary for the correct implementation of the Works.

The supplier should be able to provide support and maintenance within at least five years after installation.

The supplier should be able to supply, install and train personnel where necessary and also to provide all services needed for the technical reception of the equipment at the cites.

2.3 Personnel in the Field

The supplier must appoint/nominate a project manager. This project manager will be the primary contact point for UNIDO and will be responsible for the services of the supplier and especially for the installation. All staff deployed must be suitably qualified and in possession of the necessary valid permits/VISAS to work in Armenia for the duration of the contract.The supplier is responsible for all allowances, accommodation, transportation and such costs related to its personnel in the field. UNIDO will have any responsibility for such staff. The UNIDO Project National Coordinator based in Yerevan, Armenia will be the primary focal point for UNIDO.

2.4 Reporting

A final report (in English) should be submitted to UNIDO no later than 2 weeks after the installation and training has been completed, for approval by UNIDO.

2.5. Language

The Official Project communication language shall be English.The drawings, catalogues, illustrations, printed specifications and other documentation related to the present project shall bepreferably in Russian, or otherwise in English.

3. <u>Guarantee Requirements</u>

At least one year(s) guarantee is required.

4. <u>Delivery Period</u>

Project should be completed by latest June 2016.

5. **Award conditions**

UNIDO reserves the right to split an award between any suppliers in any combination, as it may deem appropriate. If the quotation is submitted on an "all or none" basis, it should be clearly stated as such in your response to this RFQ

Appendix 6 Technical Specifications Group 5 Gerasim Co-op

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

DRAFT ONLY

THE TECHNICAL SPECIFICATIONS FOR PURCHASE OF EQUIPMENT AND SUPPLIES

4. **General Background Information**

4.1 UNIDO is implementing the ENPARD project in Armenia on producer groups and value chain development. The overall objective of the project is ensuring an efficient and sustainable agriculture that contributes to better living conditions in rural areas. The project aim to strengthen producer groups, effectively engage producer groups in value addition activities, strengthen value chains that provide improved access to affordable, better quality food, contribute to the development of rural areas, improve access to local and international markets, and ensure the introduction of environmentally-friendly farming and food processing practices. The project is funded by the European Union and Austrian Development Cooperation.

4.2The Project has identified five primary producer cooperatives that wish to make high value cheese in the targeted regions of Armenia. The Project will help them in several ways, including with the purchase of specialised small-scale cheese processing equipment. Each group has slightly different equipment requirements as some groups already have or have access to equipment. The equipment specified below is for dairy group 5, Gerasim Agri-Production Consumer Cooperative in Vayots Dzor Marz They plan to make 1x1000kg batch of cheese per day using cow milk in a new vat and 1x300kg batch of cheese using sheep milk in an existing vat.

2. The Scope of Supply

2.1 The following items should be supplied:

UNIDO REQUIREMENTS			TO BE COMPLETED BY THE INVITEE			
Item	Name and required parameters	Quantity	Unit price	Total item price	Compliance*	Remarks
			Currency	Currency	Yes/no	
0	**GENERAL REQUIREMENTS**					
	ALL ELECTRICAL EQUIPMENT, PLUGS AND CABLES MUST BE COMPLIANT WITH _________________ELECTRICAL NETWORK STANDARDS					
1.	Equipment, parts, supplies					
1.1	1x 500 litre and 1x1,000 raw milk cooling tank. Stainless steel, insulated with stirrer, drain valve, lid and cooling unit	1				
1.2	1 milk pump with fittings and 8 metres flexible hoses. Stainless steel centrifugal type. Mounted on a trolley. Pump body and food contact parts should be 316 grade of stainless steel. Motor cover and frame can be made of 304 grade of stainless steel.	1				
1.3	1 x 1000kgcircular, pasteurising cheese vat. Has stairs, platform to stand on, motorised stirrer and curd cutting blades	1				
1.4	Hot water generator for pasteurising Heating capacity sufficient to heat 1000 kg milk to 68°C then cooled to 34°C with cold water in less than one hour. NB this is not needed if the cheese vat already has heating capacity built in.	1				
1.5	Curd draining vats, Stainless steel, on wheels capable of taking contents of half the 1,000kg vat	3				
1.6	Worktable to fill moulds and move to press Stainless steel, with one lower shelf and on wheels. One larger for cow milk e.g. 1800 x 1000mm and one smaller for sheep milk e.g. 1100x 1000 mm	2				
1.7	Moulds to make 3kg Gouda cheese Moulds to make 1kg Gouda cheese	50 4				
1.8	stainless steel or hygienic plastic rectangular moulds moulds to	30				

	make soft cheese such as Chanakh Dairy group needs to confirm this						
1.9	pneumatic cheese presses to press cow and sheep cheese, , Stainless steel, supplied with weights, Capable of pressing 150kg curd at a time.	1					
1.10	Brine tank divided into three compartments each with minimum surface area 1.5 sq. m and minimum depth of 30cm and fitted with cooling coils for ice water to run through	1					
1.11	15 linear metres of 316 grade 30cm wide stainless steel shelving plus stainless steel support, for example a shelf 3.0m long x 30cm wide and 5 shelves high. Dairy group to confirm measurement	1					
1.12	Air cooling system to keep the brine room at the desired temperature of 12-14°C.	1					
1.13	Brine cooling system; Insulated ice accumulator to supply ice water to brine tank. Complete with circulation pump. The cheese goes in at about 30°C and should be cooled to 12°C within one hour.	1					
1.14	Hard cheese cooling system to keep 41 sqm room at 12-14°C.	1					
1.15	Stainless steels posts and brackets with 360m wooden shelves 32cm wide by 2.5cm thick. 360 metres shelf. The shelves can be stacked 10 high. Lengths of single and double racks to be supplied once the room is designed	1					
1.16	Whey pump capacity, say 3 cubic metre/hour. Stainless steel centrifugal pump. To be supplied on a stand and with 8m flexible hose to reach whey tank. Pump body and food contact parts should be 316 grade of stainless steel. Motor cover and frame can be made of 304 grade of stainless steel.	1					
1.17	1,500 litres whey tank with outlet tap Made of food grade plastic or stainless steel, on a stand	1					

1.18	Laboratory testing equipment Digital hand thermometer pH meter with calibration liquids Glass brine density meter Plastic 100ml measuring cups Simple titration equipment, supplies to measure acidity in milk	1 1 1 1 5 1				
1.19	Food grade vacuum packer, cavity big enough to take a 5kg cheese	1				
1.20	Set of 0 to 10kg electronic cheese packing scales	1				
	180 litre 7.5KW electric hot water boilerwith necessary piping. Hot water at55°C to 65°C is used to scald the curd and for cleaning. Can supply two smaller units depending on what is available	1				
1.21	2,000 litre plastic fresh water tank. CAPACITY TO BE CONFIRMED BY DAIRY GROUP BASED ON THEIR WATER SUPPLY	1				
1.22	Washing tub 400 litre, plastic or stainless steel on stand and with drain plug.	1				
1.23	Hygienic shelving that lets equipment such as moulds, cutting blades, scrubbing brushes drain dry	1				
1.24	Protective clothing; Disposable hats, Disposable gloves, Hot water gloves, Plastic aprons, Gumboots	1 box 1 box 10 pairs 5				

		5 pairs, assorted sizes				
1.25	Cleaning supplies; Scrubbing brushes, detergent, sanitiser, Water spray pistols, Hoses Retractable hose reel	5 20 litres 20 litres 3 20 m cold water cleaning hose 3				

2.	Provision of services			
Item	Name and required parameters	Total item price	Compliance*	Remarks
2.1	Costs of travel			
2.2	Cost of setting up the equipment			
2.3	Cost of test running of the equipment			
2.4	Cost of training of the processing plant staff			
2.5	Other costs			
3.	Total Price			

2.2 Supplier's General Responsibilities

The supplier must provide evidence of being a recognized supplier of metrology equipment to national metrology institutions of other countries.

The supplier shall make its best efforts to ensure that all works will be carried out according to "good quality and adequate accessories". The supplier assumes the overall responsibility for the correct selection and installation of the equipment for the practical implementation of the Project.

The supplier shall take into account all the details presented in these TSs and shall request any further information, which is considered necessary for the correct implementation of the Works.

The supplier should be able to provide support and maintenance within at least five years after installation.

The supplier should be able to supply, install and train personnel where necessary and also to provide all services needed for the technical reception of the equipment at the cites.

2.3 Personnel in the Field

The supplier must appoint/nominate a project manager. This project manager will be the primary contact point for UNIDO and will be responsible for the services of the supplier and especially for the installation. All staff deployed must be suitably qualified and in possession of the necessary valid permits/VISAS to work in Armenia for the duration of the contract.The supplier is responsible for all allowances, accommodation, transportation and such costs related to its personnel in the field. UNIDO will have any responsibility for such staff. The UNIDO Project National Coordinator based in Yerevan, Armenia will be the primary focal point for UNIDO.

2.4 Reporting

A final report (in English) should be submitted to UNIDO no later than 2 weeks after the installation and training has been completed, for approval by UNIDO.

2.5. Language

The Official Project communication language shall be English.The drawings, catalogues, illustrations, printed specifications and other documentation related to the present project shall bepreferably in Russian, or otherwise in English.

3. <u>Guarantee Requirements</u>

At least one year(s) guarantee is required.

4. Delivery Period

Project should be completed by latest June 2016.

5. Award conditions

UNIDO reserves the right to split an award between any suppliers in any combination, as it may deem appropriate. If the quotation is submitted on an "all or none" basis, it should be clearly stated as such in your response to this RFQ

Comparative cheese production costs for 800kg batches				DRAFT ONLY			
BATCH COSTS								
Materials			**120kg cheese**	**88kg cheese**				
		Cost	**Soft cheese**	**Hard cheese**				
800	kg milk	110	88,000	88,000				
8	gram bacteria culture		2,400	2,400				
80	ml Annatto colour AMD8,000/litre	8		640				
80	gram CHY-MAX rennet @55800/kg	56		4,480				
80	gram Hansen L3000 rennet @31800/kg	32	2,560					
2	kg salt at 2.3% in cheese	guess	300	600				
3	kg salt at 3.5% salt in cheese	guess	300	900				
25	ripening bags for 5kg packs	150		175				
	sanitiser detergent		1,000	1,000				
	Sub total of batch materials		94,560	98,195				
Electricity								
60	KWH Pasteurising	48	2,880	2,880				
10	KWH Hot water wash	48	0	480				
5	KWH General	48	240	240				
Labour								
1	Cheesemaker AMD 150,000pm		5,000	5,000				
1	Helper AMD 100,000pm		3,000	3,000				
1	Packer/turner AMD 100,000pm		0	3,000				
Water								

800	litre wash water	1	800	800			
200	litre curd wash water	1		200			
ANNUAL STATEMENT ASSUMPTIONS							
1. Make 1 x 800 kg batch per day for 250 days							
2. Makes 120kg soft cheese per batch at yield of 6.5 litre milk per kg cheese							
3. Or makes 88kg hard cheese per batch at yield of 9 litre milk per kg cheese							
			Chanakh	Gouda type			
REVENUE		Price/kg	Soft cheese	Hard cheese			
22,000	kg. 88kg.batch x 250 batches	3,100		68,200,000			
30,000	kg. 120kg x 250 batches	1,800	54,000,000				
COST OF GOODS SOLD							
Materials							
		Cost	Soft cheese	Hard cheese			
250	Batches	94,560	23,640,000				
250	Batches	98,195		24,548,750			
Electricity							
15,000	KWH Pasteurising	48	720,000	720,000			
2,500	KWH Hot water wash	48	0	120,000			
1,250	KWH General	48	60,000	60,000			
Water							
200,000	litre wash water	1	200,000	200,000			
50,000	litre curd hot wash water	1		50,000			

Labour							
1	Cheesemaker 150,000pm		1,800,000	1,800,000			
1	Helper 100,000pm		1,200,000	1,200,000			
1	Packer/turner 100,000pm		0	1,200,000			
Other costs	Miscellaneous		1,000,000	1,000,000			
Total cost of goods sold			28,620,000	30,898,750			
Gross profit			**25,380,000**	**37,301,250**			
Investing							
	Construction costs; factory, brining & ripening rooms admin			0			
1	Raw milk collection; milk cans, milk tanker vehicles, scales			0			
2	1000 litre refrigerated cooling tank EUR 5,000			2,600,000	Turkey		
3	1 Milk pump, hoses to fill cheese vat@1870			980,000	Netherlands		
4	1,000 litre Cheese vat/pasteuriser @ EUR 16,200 ex CARD			8,500,000	Turkey		
5	1 x 2 level worktable on wheels to move filled moulds to press EUR 2,240. 1200000			1,200,000	Netherlands		
6	24 x 5kg Gouda moulds @EUR 158 is EUR 3792 Netherlands			1,500,000	Netherlands		
7	25 ss soft Cheese moulds ex CARD @ EUR40. ex CARD			525,000	Turkey		
7A	1 x Work table for Chankh cheese ex CARD @ EUR4,600			2,400,000	Turkey		
8	I x 4 stamp mechanical cheese press @EUR5850			3,100,000	Netherlands		
9	1 whey pump and hoses @EUR 1,410			740,000	Netherlands		
10	1 x 1000 litres local plastic whey tank EUR 500			260,000	Local		
11	1 x 1,000 litre local plastic fresh water tank EUR 500			260,000	Local		
12	2 x 120 litre hot water tank; cleaning moulds, making Gouda			800,000	Local		
12A	1 x 200 litre Wash tank plastic or stainless steel say EUR 400			210,000	Local		
13	1 x vacuum packer EUR3,500 ex CARD.			1,800,000	Turkey		

14	1 x Brine tank local construction say EUR 1,000			525,000	Local		
15	1 x Brine room temperature control say EUR 1,000			525,000	Local		
16	1 x Ripening room ss posts, wooden shelves EUR 5520. Netherlands			2,900,000	get local price		
17	1 x Ripening room 6.75KW cooling machine EUR 13,600 Netherlands			7,140,000	get local price		
18	Miscellaneous laboratory equipment			900,000	Netherlands		
	Subtotal of construction and equipment			36,865,000			
	Installation at 10% of equipment costs			3,686,500			
	Total construction and equipment			40,551,500			
	Contribution from project say EUR 20,000			10,000,000			
	Dairy groups need to find			30,551,500			
NB if buy all items from Dutch supplier, total cost is EUR 150,000 or AMD 80 million							
Depreciation (10%) of all processing equipment & installation			4,055,150				
Gross profit			**25,380,000**	**37,301,250**			
Depreciation of equipment			4,055,150	4,055,150			
Interest expense on loans			0	0			
Net income before tax			21,324,850	33,246,100			
Income/member if 5 members in cooperative			4,264,970	6,649,220			
Income/member if 20 members in cooperative			1,066,243	1,662,305			
Income/member if 100 members in cooperative			213,249	332,461			

Dairy groups also need to find:			Working capital	Working capital			
Hard cheese storage for Gouda 1 month				2,574,896			
Hard cheese storage for Gouda 3 months				7,724,688			
Soft cheese storage for Chanakh 2 months			4,770,000				
Breakeven hard cheese, years				1.1			
Breakeven soft cheese, years			1.6				

Annex 12: Equipment needs and processing details for production of Buckwheat honey in Armenia

DRAFT ONLY

UNIDO Project No 120603

Producer Group and Value Chain Development

Project Manager Mr Frank HARTWICH

November 2015

David POOCH

Short term food processing consultant

1 Recommendations

The project staff discuss a workable and affordable incentive scheme to encourage beekeepers to keep their hives in the buckwheat fields. For example the project could i) supply free of charge, ii) pay most of the cost of one beehive if a beekeeper keeps at least one beehive in the buckwheat fields for the duration of the buckwheat flowering season.

The project staff discuss a workable and affordable incentive scheme to encourage beekeepers to join the scheme. For example a budget can be allocated for some honey extraction equipment for each buckwheat growing community. The decision as to what equipment e.g. motorised extractor or semi automatic filling machine and the basis for sharing it can be discussed with the groups.

At least one set of branding iron and stencils are bought so that new hives can be permanently marked and identified. This will reduce the risk of theft of the hives.

2 Introduction

<u>Required scale of beekeeping and honey extracting equipment</u>

The project's planned 600 ha buckwheat will need 1,800 beehives to pollinate the buckwheat and these will produce 60 tonnes honey. Armenia has some 250,000 hives in total.

A typical Armenian beekeeper has 20-50 beehives and each one yields 10 -15kg honey (hives on buckwheat produceup to 35kg honey per year). He extracts 200kg to 750kg honey per year. Some hobbyist beekeepers have just one or two hives and some have many more.

<u>Location of honey extraction equipment</u>

The planned location of honey processing activities has changed since the TOR was initially drawn up. The original idea was for the honey frames to be extracted in the buckwheat hulling factories. This was later revised to the individual beekeepers doing it as they already extract their own honey on a small-scale basis. This is a more sustainable model as it distributes the honey extraction process more widely and directly benefits more people.

The project's consulting apiarist is currently assessing capacity of village beekeepers to extract the extra honey. It is highly likely that the capacity does exist as i) honey is long lasting and can be stored for some time before processing, ii) small scale honey extraction equipment is generally highly under utilised; just once a year when the honey flow comes in and iii) extra capacity can be more readily absorbed by the many existing small scale beekeepers.

<u>Location of honey blending/packing equipment</u>

Homey blending/packing will now likely take place at the premises of existing larger scale honey packers and the buckwheat processing factories.

The apiary consultant is also gathering an inventory of Armenia's honey packing and blending resources. Gaps in those resources will determine what honey packing equipment the project needs to buy. If it is learned that regional honey processors have no interest or spare capacity the project will need to set up facilities at the buckwheat hulling factories.

3 Description of honeys blended for product testing

Evaluation of buckwheat honey obtained by the project

Buckwheat honey is typically dark in colour and with a strong flavour. Internet research indicated that North American buckwheat honey was the darkest of all honeys and with the flavourof molasses. The project office ordered some buckwheat honey for testing. The first sample was mid amber in colour and had a strong taste but not at all like molasses. The consultant opined that either this was either not buckwheat honey or buckwheat honey had a wide colour range or that it was a multi-floral honey derived from buckwheat and other lighter coloured honeys.

The Russian buckwheat agronomy consultant brought a further sample and it resembled the first. This new sample was given to the marketing consultants to carry out their consumer research.

The case against blending honey

This consultant recommended that the consumer research be carried out on buckwheat honey only and not a blend of buckwheat and other honeys. The reasoning was i) the buckwheat honey looked and tasted acceptable on its own, ii) the research findings could be analysed more accurately on a single honey and iii) a blend of buckwheat and other honey(s) was not necessarily repeatable in the future; the blend might taste better or worse and that information would be difficult to take advantage of commercially as the honeys used for blending with buckwheat may not be able to be identified in the future.

Village produced buckwheat honey blend

Armenian beekeepers typically have 5-10 hives and extract multi-flora rather than mono-florahoney. Given that a village beekeeper will put some, but not all of his hives on buckwheat, he will actually extract what his own personal blend of buckwheat honey.

4 Recommended complete honey extraction, processing and packaging equipment (to be housed at the buckwheat hulling factories)

Note that village beekeepers will now extract the buckwheat honey as well as their other honey. A summary of all the required equipment is below. Most, possibly all of the beekeeping equipment already exists and is in current use. Centralised equipment needed for blending and repacking buckwheat honey is new, needs to be bought and is included in the list.

<u>Beehives</u>

Operating beehives; 1800 are needed in total

<u>Beehive components</u>

Lid

Hive mats

Supers

Floor

Excluder

Bee frames

Plastic foundation

Bee escapes

<u>Beekeeping tools and accessories</u>

Smoker with manual set of bellows

Frame gripping tool

Hammer/pry bar

Horsehair brush

Electric or gas branding iron with stencils

Protective clothing

Long gloves

<u>Small-scale honey extraction equipment</u>

Uncapping scraper or electric/hot water uncapping knife

Stainless steel uncapping tray or plastic tub

Motorised 4 frame honey extractor

Stainless steel uncapping tray or plastic tub

Stainless steel tank with baffles to receive honey from extractor

Stainless steel honey screen size not finer than 0.2mm

Small stainless steel filling tank

Plastic honey tap

Small stainless steel filling table

20 litre food grade plastic buckets with secure lids

<u>Honey blending/packing equipment</u>

Warm room

Honey strainer

Honey pump

Honey filter/strainer

Bulk honey holding tank(s) e.g. 1,000 litre

Creaming tank

Honey tap for each tank

Volumetric filling machine

Air compressor

Bulk honey containers

Drum handling equipment

4.1 Beehives

Numbers of hives neededThere are two broadly agreeing ways of calculating the number of beehives required i) a widely recommended density is 2-3 beehives per ha and ii) buckwheat should yield 90-100kg honey per ha and each hive can produce 30 -35 kg of honey. On balance, 3 beehives per ha are recommended. This equates to 1,800 hives for the planned initial 600ha.

There are three scenarios for providing thispollination capacity.

1. All these hives needed are already in existence and beekeepers will move their hives to take advantage of this new floral source and use their existing facilities to extract the honey.
2. Beekeepers will obtain new hives to collect buckwheat honey as they see buckwheat honey as an opportunity to expand their beekeeping interests and are satisfied with the productivity of their bees collecting nectar from local floral sources.
3. Beekeepers will usesomenew and some existing hives.

Incentives for beekeepers; Buckwheat pollinationis completely dependent on bees and the project is investing heavily in buckwheat processing equipment.It is recommended that the project discuss a workableand affordable incentive scheme to encourage beekeepers to keep their hives in the buckwheat fields. For example the project could i) supply free of charge, ii) pay most of the costofone beehive if a beekeeper keeps at least one beehive in the buckwheat fields for the duration of the buckwheat flowering season. Note. While the project could supply kitset or even fully assembled beehives, they are productive only when bees are in residence. Procedures for population of the hives are best left to the individual beekeepers.

Kitset hivesBigger numbers of beehives are best supplied in kitset form then assembled on site. Before assembling it is recommended that the wooden components are all branded with a suitable identity code inside and outside with a branding iron. Past experience in New Zealand has shown that thieves are less likely to steal a beehive when identification is permanently burnt into every side of the wooden components. Armenian beekeepers use Langstroth hives with typically one full sixed super (honey box) mounted above the brood box.

4.2 Beehive components

Note. Componentsbought must be coordinated in size so they all fit together and allow the right distance for bees to move around the hive.

The componentsare

Galvanised lid, slightly different designs and sizes are available

Hive mats also known as crown board, inner cover and ceiling

Supers also known as honey boxes come in several sizes; full depth, ¾ depth and half depth

Floor this is also called base or bottom boards. These bottom boards sit on runners or bearers that are directly on the ground. They are generally made of wood but can also be made of plastic.

Excluder keeps the queen in the lower 'brood box' and prevents her from going to the upper 'honey box'.

Bee frames these are the wooden or plastic frame that hang vertically inside the supers, 9 or 10 frames to each super.

Plastic foundation is what is attached to the fames and the bees use to build their honeycomb. Internationally, beekeepers are progressively turning away from beeswax foundation to plastic foundation because it is more durable and needs less maintenance. In Armenia, wax foundation is still the norm.

Bee escapes let bees in and out but not other predatory insects. There are many designs; circular, conical, flat and corner designs and are made of both metal and plastic.

4.3 Beekeeping tools andaccessories

Every beekeeper needs a set of equipment to manage his hives. The items are

Smoker with manual set of bellows

Frame gripping tool

Hammer/pry bar; these multi function tools have several different designs

Horsehair brush to brush away bees when inspecting hives

Electric or gas branding iron with stencils to mark identification on new hives

Protective clothing (hat and veil when hot and full body suit when cold),

Long gloves for handling bees

All existing beekeepers have all these needs orhave ready access to them with the possible exception of a branding iron.

4.4 Small scale honey extraction equipment

The project can choose to supply some of the items described below; as a ‘sweetener’ to drive beekeeper interest in the project. Individually they are not high cost items. The decision on how which items to supply, how many, which would have the most benefit, and under what conditions awaits analysis of data currently being collected by the project’s beekeeping consultant.

<u>Stainless steel uncapping tray or plastic tub</u>

<u>Electric or hot water uncapping knife</u>The electrical knife looks like a hair drier; it is simpler as the hot water knife also needs a circulating pump and reservoir of hot water.

<u>Motorised 4 frame honey extractor</u> Motorised rotary honey extractors are sized to take 3, 4, 5, 6, 9 12, 16,24 frames at a time. The principle is the same; the more frames, the bigger the diameter. Hobbyist beekeepers throughout the world still commonly use hand-powered extractors as do many Armenian beekeepers.

<u>Honey strainer stainless steel</u> size not finer than 0.2mm

<u>Stainless steel uncapping tray or plastic tub</u> to collect honey and wax

<u>Stainless steel tank with baffles</u> to receive honey from extractor

<u>Honey strainer stainless steel</u> size not finer than 0.2mm

<u>Small stainless steel filling tank</u> the size depends on how much honey the beekeeper will extract at once. A 200 litre tank that is on legs, has a lid and drains to the exit tap is suitable for small scale beekeepers. (A 200 litre tank will hold 280kg honey, enough for 8 hives on buckwheat or some 20 hives on other flowers).

<u>Plastic honey tap</u> The honey tap has a special sliding opening to cut off honey securely and avoid drips.

<u>Small stainless steel filling table</u> This fits under the honey outlet tap.

<u>20 litre food grade plastic buckets</u>A suitable container is 20 litre (25kg) food grade plastic buckets with secure snap on lids are suitable containers to hold and freight the honey. A 20 litre carboy or jerry-can may also be used but these are more difficult to clean.

4.5 Honey blending/packing equipment

It is likely and hoped that the village beekeepers who already sell all of their honey will be able to sell the extra that will be produced when they start collecting buckwheat honey. This is not certain however so equipment is listed for two honey repacking facilities, each located in the buckwheat hulling plants and each capable of processing 30 tonnes per year.

Throughput of each of these plants is modest. They are <u>each</u> capable of handling 60 tonnes of honey i.e. only plant is actually needed. Having two plants has the modest advantages of saving freight, creating two local businesses instead of one and giving a sense of community.

Warm room insulated and bee-proof room with either electric resistance heating wire attached to the walls or a heat pump type of air conditioning unit. A 3m by 3m room will take 80x 20 litre buckets or 3 tonnes honey on the floor.

Honey strainer stainless steel size not finer than 0.2mm

Honey pump A honey pump is a food grade pump with internal contact parts and connecting hoses made of sanitary food grade material. Warm honey can be pumped but it is viscous so a positive displacement pump is needed. Lobe pumps, pumps with flexible impellers and Archimedes screw pumps are all suitable. A typical specification is

Pressure 8 bars

Flow rate 20 litres per minute

Power 2.5HP (1.9KW)

With variable speed control

Forward/reverse function

Honey filter/strainer In line sock filter or fine stainless steel mesh filter depending on market requirements

Bulk honey holding tank(s) Say 2,000 litre or 2 x1,000 litresstainless steel tank(s) with a close fitting lid, slow speed stirrer and a no-drip honey tap exit. The tank is on legs high enough to be able fit a 200 litre drum or filling machine under the exit tap.. Tank capacity depends on i) scale of operation, ii) numbers of different kinds of honey to be blended/stored.

Creaming tank This is fitted with electrical heating elements, water cooling jacket and slow speed stirrer. Volume depends on how many retail jars would like to be filled in one batch but 1,000 litres is typical.

Honey taps one for each tank. The honey tap has a special sliding opening to cut off honey securely and avoid drips.

Volumetric filling machine; a pneumatic semi automatic type is suitable. A suitable specification for the filling machine is

Able to handle viscous liquid foods

Sanitary easy clean design

Weight range 50g to 1,000g

Accuracy +- 0.25% based on 500g

Speed up to 18per minute (the limiting factor is the operators)

Construction materials 304 stainless steel and other food grade materials

Non-drip nozzle suitable for wide or narrow necked jars

Air compressor to supply volumetric filler, typical air requirement is 200 litres per minute at 6 bars

Bulk honey containers Suitable packaging includes food grade 20 litre buckets and 200 litre food grade (epoxy lined) steel drums, either open top or closed top design.

5 Recommended suppliers for the equipment (initial recommendations)

The following on-line suppliers are recommended.

Carl Fritz of Germany is a well known provider of beekeeping equipment and has an on-line shop with a very wide range of products.

Carl Fritz Imkertechnik GmbH & Co. KG Immenweg 1 D-97638

E-Mail: info@carl-fritz.de

http://shop.carl-fritz.de/index.php

Ceracell of New Zealand has an excellent on line shop with a wide range and very clear images of the products offered

PO Box 204184, Highbrook, Manukau 2161, Auckland New Zealand

Email info@ceracell.co.nz

http://www.ceracell.co.nz

Swienty of Denmark has an online beekeeping shop

http://www.swienty.com/uk/home.asp

The project's consulting apiarist suggested the following companies,

Agrbioprom is a Russian online beekeeping supplies shop

http://agrobioprom.ru/

Dadant is an American supplier.

http://www.dadant.com/

6 Recommended processing facility (room) design, to be housed in a separate room in the hulling factory

It is likely and hoped that the village beekeepers who already sell all of their honey will be able to sell the extra that will be produced when they start collecting buckwheat honey. This is not certain however so a design is provided for two honey repacking facilities, each located in the buckwheat hulling plants and each capable of processing 30 tonnes per year.

Throughput of each of these plants is modest. They are each capable of handling 60 tonnes of honey i.e. only plant is actually needed. Having two plants has the modest advantages of saving freight, creating two local businesses instead of one and giving a sense of community.

7 Description of adequacy of each of the 4 proposed locations for processing compared to recommended design

There will now be two locations of the hulling plants not four. The sites were not seen but in any case if the site is suitable for making food grade buckwheat then it is almost certain to be suitable for handling honey.

8 Description of the steps in processing and use of equipment

8.1 Small scale village honey extraction and packing

Village beekeepers will either extract their own honey or make arrangements with a local beekeeper to do it for them. They will also sell their own honey and have the option of selling bulk honey to regional honey processors who will refine/blend/pack/sell it.

Beekeepers with around 15 hives use this process and equipment. It is simpler than larger scale honey extraction as some capital-intensive processing steps are not necessary.

<u>Transport from field</u>Filled honey boxes are brought in from the field at the end of the flowering season or when the frames are full and the honey cells are capped. Honey is extracted immediately while the frames are still warm and the honey is runny. There is no need for a specially made warming room.

<u>Uncapping scraper or electric/hot water uncapping knife</u>In the simplest case a scraping tool or knife is used to uncap the frames. The long bladed knife may be dipped in hot water then dried to help cut through the wax. For faster uncapping an uncapping knife is used that is heated by electricity or hot water pumped through it. Mechanical wax uncappers are available for some USD3,000 but these are for larger scale businesses.

<u>Stainless steel uncapping tray</u> or <u>plastic tub</u> Uncapping is done over a tray or tub to catch the wax and any honey spillage.

<u>Rotary honey extractor</u>The uncapped frames are put into a small rotary honey extractor powered by hand or motor. Each cycle takes about 5 minutes.

<u>Stainless steel tank with baffles</u>the honey and cappings drain into a stainless steel tank with screens in it to separate out the wax and major impurities. This tank can have a water jacket to keep the honey warm.

<u>Stainless steel screen</u> the honey is poured though a finer screen into a small tank. The screen is not finer than 0.2mm. It strains out fine impurities and the honey retains the pollen. There is no need for a honey pump and honey filter. Depending on the layout, the screen can be hung on the side of or across the filling tank

Small stainless steel filling tank Honey in this tank is ready to be packed. Honey is poured down the side of the tank to avoid trapping air in the honey.

Plastic honey tap is fitted to the bottom of the tank

Small stainless steel filling table Empty jars are placed ready for filling on a small stainless steel table. Honey flows from a small stainless steel tank, through a simple manual honey tap into the jars. There is no need for a filling machine. It is important to fill the honey while it is still flows. Suitable filling temperature depends on the variety but 18°C is a common minimum.

20 litre plastic buckets Bulk honey can also be packed. Small scale beekeepers who find it difficult to barter or sell the extra honey can pack their honey into suitable food grade containers and sell to a larger scale honey blender/packer.

8.2 Larger scale honey blending/packing process

This process is described because i) community beekeepers may not be able to sell all their extra honey, ii) existing regional honey blenders/packers will buy this honey at an acceptable price.

Ifexisting honey blenders/packers do not have the capacity or interest to buy the villagers' honey, the project may need to set up centralised facilities at either or both of the planned buckwheat hulling plants.

The degree of the project's necessary involvement in honey blending will clarify after the project beekeeping consultant's report has been completed and analysed.

Honey blending/packing flow chart

Store

I

Warm

I

Tip through screen

I

Tip into small tank

I

Pump

I

Creaming tank or Blending tank

I I

Filling machine Filling machine 200 litre drums

I I I

Retail glass jars Retail glass jars I

I I I

Store Store Store

<u>Freight honey</u>Community beekeepers will freight their honey packed in 25kg (20 litre) food grade plastic buckets or other suitable containers to regional honey packer(s). Honey will arrive during the course of the year when beekeepers need money and/or decide that they are unlikely to be able to sell the honey locally for a better price. Caution. If the project sets up its own blending/packing facility for buckwheat honey it is important that the price is set low enough that beekeepers do not sell all their honey as buckwheat honey. The caution is not relevant when, as expected, private sector honey blenders buy the honey.

<u>Store honey</u>The honey blenders/packers will store the honey then repack according to market demand. Accordingly a storage area is required. The honey will be packed in sealed food grade containers so normal storage conditions are acceptable. However if the weather is warm and honey has been spilt on the containers insects are likely to invade the store and cause problems. Ideally the honey is stored in an insect-proof area.

<u>Warm honey</u>The honey will be cold and not runny enough to process by the time the honey blenders are ready to process it. This is a normal situation for a honey packer. The buckets of honey are placed in an electrically heated and insulated warm room and kept at 37°C for several days or until the honey is runny enough to process. Honey at 34°C flows readily. Cold honey is too difficult to pump and filter. Honey must be heated carefully and slowly as it can burn easily Avoid heating honey over 40°C as it harms the quality. A small room is sufficient as honey keeps very well and can be warmed, blended and packed throughout the year.

<u>Strain the honey</u>The tops of the buckets are removed then the honey is poured through a honey strainer into a small stainless steel tank. Straining is recommended in case the honey was not strained properly during extraction by the beekeeper. Residual honey is scraped out with a plastic scraper. The bucket lids are put back on and the buckets are stored. Alternatively the buckets are washed, thoroughly dried then stored.

<u>Pump honey to filter</u>Honey flows from a drain tap in the small stainless steel tank to a honey pump.

Honey filterHoney is pumped through an in–line sock filter for very fine results. The fineness of the filter depends on market requirements. For many markets it is sufficient to let the honey filter naturally through a fine metal screen or cloth filter. Honey is pumped to the filter or flows through the fine strainer to one of three destinations discussed below.

Blending tankThe honey is discharged into a stainless steel tank theoutlet tap is high enough to be able fill an export size closed head or open top food grade 200 litre drums underneath it. Honey can be filled from here also into 20 litre plastic containers for industrial buyers. Honey should be run down the side of a container to avoid entraining air. The tank is big enough so that different honeys can be blended in it as necessary. The tanlo also has aslow speed stirrer eg 1-2RPM so that honetys ay be slowly blended. Size of the tank depends on the volume of business. Some honey blenders have several tanks to keep different honeys separate e.g. 3x1,000 litre tanks

Creaming tankThe honey can also be discharged into a creaming or honey mixing tank. First the honey is slowly warmed if necessary to 18°C or similar temperature that is suitable for the filling machine. Cooler honey is more viscous and will slow down the filling machine.10 parts of already creamed honey are added to 90 parts of liquid honey in the tank. The mixture is slow stirred at 1-2 revolutions per minute at 13-14°C for 1-2 days or until the honey is granulated enough. Honey can be creamed up to 17°C but it takes to granulate at the higher temperature.

Honey taps are needed, one for each tank

Volumetric filling machineThe filling machine hopper can be located directly under the creaming tank outlet tap. Creamed or liquid honey is run into its header tank.

Packing tablea stainless steel is needed to stand empty jars on, support the jar being filled and lid the filled jars.

Handling equipmentHoney is heavy. A standard 200 litre drum of honey contains 280kg of honey so handling equipment is essential. A variety of manual, mechanical and electrical drum handling equipment as well as forklift trucks are available. Safe loading of trucks is necessary. The most suitable type depends on the quantity of honey to be moved and design of the facilities, for example whether there is a truck loading dock.

9 Contribution of financial elements to dairy business model, for each group (costing for investment, detailed operational costs, income estimation)

A spreadsheet was prepared that covered annual production costs and the necessary equipment for repacking 30 tonnes of honey that had been extracted and bulk packed in the villages. This will be a useful starting point for the business plans.

10 Other honey or wax based products that could be produced, with sketch of potential markets, product formulations, equipment, and suppliers for any/all of the recommended products

Potential honey added value products and by products include beeswax and beeswax products such as candles, propolis (a kind of bee glue), pollen, royal jelly and bee venom, cosmetics and honey intensive health products and remedies. Of all these, only beeswax recovery is recommended. The others add undue complications.

Wax recoveryBees produce 7kg beeswax per 1,000kg honey. A typical beekeeper with all 5-10 hives on buckwheat will produce say 300kg honey and just 2.1 kg of wax. Bees spend a lot of energy producing the wax so many beekeepers put some wax near the hives and let the bees recover it easily. That way the bees can spend more time searching for nectar.

Village beekeepers are already recovering some beeswax as part of their honey extraction activities. Recovery of the extra beeswax from the buckwheat honey is a very modest addition and should not result in the need for any additional equipment. Raw beeswax has a low value so will be melted and purified in the village rather than sold and freighted to a centralised processor.

Beeswax is readily recovered in simple equipment by melting the crude wax in a hot water boiler. The melted wax floats in a layer above the water and is poured off into moulds then allowed to set.

Wax melters of many different capacities are readily bought from the same online providers of other beekeeping equipment. It is highly unlikely the project will need one. They are not specified further.

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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THE TECHNICAL SPECIFICATIONS FOR PURCHASE OF EQUIPMENT AND SUPPLIES

1. General Background Information

a. UNIDO is implementing the ENPARD project in Armenia on producer groups and value chain development. The overall objective of the project is ensuring an efficient and sustainable agriculture that contributes to better living conditions in rural areas. The project aim to strengthen producer groups, effectively engage producer groups in value addition activities, strengthen value chains that provide improved access to affordable, better quality food, contribute to the development of rural areas, improve access to local and international markets, and ensure the introduction of environmentally-friendly farming and food processing practices. The project is funded by the European Union and Austrian Development Cooperation.

b. The Project will support producers groups to cultivate and process buckwheat in the targeted regions of Armenia. A number of primary producer cooperatives would be clustered around each of the cleaning, hulling and packaging operations.

c. Buckwheat must be pollinated by bees and the Project will support village beekeepers with the supply of beekeeping and honey extracting equipment. In addition the Project will set up two honey blending and repacking plants which will be located in the buckwheat processing plants.

d. The below specified equipment is therefore needed for fulfilling the ENPARD mandate.

2. The Scope of Supply

2.1 The following items should be supplied:

UNIDO REQUIREMENTS			TO BE COMPLETED BY THE INVITEE			
Item	Name and required parameters	Quantity	Unit price	Total item price	Compliance*	Remarks
			Currency	Currency	Yes/no	
0	**GENERAL REQUIREMENTS**					
	ALL ELECTRICAL EQUIPMENT, PLUGS AND CABLES MUST BE COMPLIANT WITH _________________ELECTRICAL NETWORK STANDARDS					
1.	Equipment, parts, supplies					
1.1	Beekeeping equipment Kitset Langstroth hives with full size brood box and one fullsize super and all other regular components for use including wooden frames, bee escapes, queen excluders, plastic foundation, winter feeders Bee-suits, Adult size with veils and long beekeeping gloves Motorised 4 frame honey extractors	100 units 100 units 20 units				
1.2	Honey packing and blending equipment 20 litre food grade plastic buckets with secure lids for freighting and holding honey, enough for 60 tonnes, one year's production 3kw heat pump which will be located in a locally provided warming room Honey strainer to catch coarse particles mounted on the tank described below Small stainless steel tank to receive warm honey poured from buckets Honey pump Suitable cloth filter to remove finer particles Stainless steel bulk honey holding/blending tanks with secure insect proof lid and slow speed stirrer e.g. each 1,000litres Honey creaming tank with warming and water-cooling facility, stirrer and	2,400 2 2 2				

	insert proof lid, 1,000 litres is suitable Honey tap for each tank provided Stainless steel honey packing table say 1800 x800. Measurement is not critical Volumetric filling machine range say 50ml to 1,000ml mounted on a support high enough to let packing table underneath Suitable air compressor to supply filling machine capacity say 200 litres per minute at 6 bars 200 litre food grade epoxy lined 200 litre drums, enough to export the first 14 tonnes of production	2 2 4 2 8 2 2 50				

2.	Provision of services			
Item	Name and required parameters	Total item price	Compliance*	Remarks
2.1	Costs of travel			
2.2	Cost of setting up the equipment			
2.3	Cost of test running of the equipment			
2.4	Cost of training of the processing plant staff			
2.5	Other costs			
3.	Total Price			

Supplier's General Responsibilities

The supplier must provide evidence of being a recognized supplier of metrology equipment to national metrology institutions of other countries.

The supplier shall make its best efforts to ensure that all works will be carried out according to "good quality and adequate accessories". The supplier assumes the overall responsibility for the correct selection and installation of the equipment for the practical implementation of the Project.

The supplier shall take into account all the details presented in these TSs and shall request any further information, which is considered necessary for the correct implementation of the Works.

The supplier should be able to provide support and maintenance within at least five years after installation.

The supplier should be able to supply, install and train personnel where necessary and also to provide all services needed for the technical reception of the equipment at the cites.

2.3 Personnel in the Field

The supplier must appoint/nominate a project manager. This project manager will be the primary contact point for UNIDO and will be responsible for the services of the supplier and especially for the installation. All staff deployed must be suitably qualified and in possession of the necessary valid permits/VISAS to work in Armenia for the duration of the contract.The supplier is responsible for all allowances, accommodation, transportation and such costs related to its personnel in the field. UNIDO will have any responsibility for such staff. The UNIDO Project National Coordinator based in Yerevan, Armenia will be the primary focal point for UNIDO.

2.4 Reporting

A final report (in English) should be submitted to UNIDO no later than 2 weeks after the installation and training has been completed, for approval by UNIDO.

2.5. Language

The Official Project communication language shall be English.The drawings, catalogues, illustrations, printed specifications and other documentation related to the present project shall bepreferably in Russian, or otherwise in English.

3. <u>Guarantee Requirements</u>

At least one year(s) guarantee is required.

4. <u>Delivery Period</u>

Project should be completed by latest June 2016.

5. **Award conditions**

UNIDO reserves the right to split an award between any suppliers in any combination, as it may deem appropriate. If the quotation is submitted on an "all or none" basis, it should be clearly stated as such in your response to this RFQ

Honey packing spreadsheet to repack 30 tonne honey per annum				**DRAFT ONLY**
Two sets of this equipment are neeed, one for each factory				AMD
Income				
16,800	kg honey packed in 200 litre drum @	1500	per kg	25,200,000
13,200	kg honey packed in 1kg jars @	3500	each	46,200,000
30,000	kg honey in total			**71,400,000**
	Production rate: 60 drums per year is 1 per week			
	Production rate: 13,200 jars per year is 55 jars/day at 240 days/year			
Expenses				
30,000	kg honey @	2,000	per kg	60,000,000
60	200 litre food grade drums@	30,000	each	1,800,000
13,200	glass jar, lid, label, corrugated carton	500	each	6,600,000
1	manager	150,000	per year	150,000
1	part time helper	50,000	per year	50,000
1	year of electricity for warming honey etc	250,000		250,000
	Other overheads			200,000
				69,050,000
	Profit			**2,350,000**
Equipent needed		USD		USD
1200	20 litre plastic buckets with lids	12		14,400
1	Heat pump warmer			3000
1	Small stainless steel tank			1000
1	Honey pump			3000
1	Coarse honey strainer			1,000
1	Honey creaming tank			5,000
4	Honey taps	20		80
1	Volumetric filler			4,000
1	Stainless steel packing table			1,000
2	1,000 iitre stainless steel honey blending tanks	2500		5,000
1	Drum lifter			3,000
	Total equipment			**40,480**
Possible equipment to encourage beekeepers				
100	Adult bee suits with veil and gloves	100		10,000
100	Kitset beehives	70		7,000
20	Motorised 4 frame honey exractors	1600		32,000

Annex 13: Equipment needs and processing details for production of Dried fruit in Armenia

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Mission report

Equipment needs and processing details for production of

Dried fruit in Armenia

1 Recommendations

The two technologies recommended are cabinet drying and solar tunnel drying,

The project does not get involved in supplying ancillary equipment such as refrigeration. This keeps purchasing simpler, allows more driers to be bought and allows groups to make their own storage solutions.

Cabinet drying

The project buys several CARD cabinet driers because there are already 100 operating successfully in the country. CARD's model EQ-05SW,which they claim has a 300 kg load and costs 5,200 Euro plus inflation plus freight is the most likely model but this should be discussed with the groups.

Choice of electric or gas for the cabinet driers is for the groups to make.

Solar drying

The project buys 2 x Innotech solar tunnel driers.

The two solar tunnel driers are supplied to the groups under more favourable financial conditions than the cabinet driers, as the design is well proven but new to Armenia.

The two solar driers both include the emergency heating system that can be used when conditions are unfavourable

The two solar driers are located in the most effective place for solar drying.

Engage the supplier to come to Armenia to install the driers, provide training and work with local engineers so they can i) assemble the driers without assistance in future and ii) develop capacity to build solar tunnel drier components in the future.

2 Introduction

Armenian apricot, peaches & pears are sold as dried halves as per international norms. They are mostly treated with sulphur to prevent them from going brown.

Plums and cherries sold as whole dried fruit with the stone left in. They are not treated with sulphur.

Apples are sold as dried rings. They are invariably treated with sulphur.

Grapes are dried whole. They may or may not be treated with sulphur depending on the variety.

Climatic conditions in Yerevan

The following climatic data was obtained from weather websites. Drying conditions in Shirak are not as good as Yerevan.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High °C	2	5	12	19	24	29	34	33	29	20	12	5
Low °C	-7	-4	0	7	11	15	19	18	13	7	2	-3

Annual high and low temperatures in Yerevan

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High °C	2	5	12	19	24	29	34	33	29	20	12	5
Low °C	-7	-4	0	7	11	15	19	18	13	7	2	-3

Annual rainfall in Yerevan

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
mm	20	20	30	30	20	20	20	10	10	30	40	10
Days	2	2	8	11	11	6	4	3	3	8	6	6

Annual sunshine hours in Yerevan

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hrs	7	7	9	10	12	13	13	12	11	10	8	7

3 Description of the dried fruit (7 groups) and herbs (2 groups) to be produced by the farmer groups, with attention to quality criteria

According to information the groups submitted on their application form they produce or wish to produce the following dried products. The table will be able to be completed after further discussions with the groups.

Group	Already produce	Wish to produce
Dried fruit groups		
Aragatsavan group in Aragatsavan, Aragatsotn	2.5 tonne dried apricot	Dried fruits
Verba group in Ujan, Aragatsotn		Increased production of dried fruits
Haykani group in Katnaghbyur,	0.56 tonne dried apricot	Production of dried fruits

Aragatsotn	and cherry	
Agro Shen-Hogh in Shnogh, Lori		Dried fruit production
Fruit Producers' Union of Mets Ayrum, Mets Ayrum Lori	? 40 tonne dried grape	Asking for a dryer
Arevaham group in Vayots Dzor, Rind		Dried fruit production
Arayi Women Farmer Group in Arayi, Aragatsotn		?
Dried herb groups		

Quality of dried fruitGift packs of assorted dried fruit are made up beautifully and popular with locals and tourists alike.

There are two types of Armenian dried fruit; fully dried and “soft dried”. Fully dried fruit keeps at room temperature and is generally made for home use. “Soft dried” must be stored under refrigeration and generally at 8°C. The market prefers this softer, easier to eat product and pays a higher price for it. Mould will grow on this product if left at room temperature for too long.

Dried herbs

Need info

4 Description of the different technologies/methods possible to dry fruit, and the recommended appropriate technology, per selected group (9 groups)

Different technologies for drying fruit

These are briefly described below. There are some variations and cross overs within each group.

Direct solar drying; fruit is placed on trays or a mat on the ground directly under the sun. It is necessary to cover the fruit or bring it inside when it rains.

Protected direct solar drying; glass or plastic panels or a tent covers the trays to protect the fruit from bad weather

Indirect solar drying; air passes under glass panels so is warmed by the sun. The warm air is then blown over a layer of fruit on trays that are housed under a glass or plastic roof e.g. Hohenheim drier

Cabinet and tunnel drying; air is heated by gas or electricity then blown over the surface of the fruit in an enclosed stack of trays

Belt drier; hot air blows through a mesh belt that holds the food. This drier is continuous; the food goes in wet and comes out dry

Heat pump drying; This is a cabinet drier that has what is essentially an air-conditioning unit attached to it. Warm dry air is blown over the fruit. Water from the fruit evaporates into the air and condenses outside the drier on the air conditioning unit. This system has a higher capital cost and lower operating cost

Osmotic drying; This involves soaking the fruit in a concentrated sugar solution for a few minutes. Osmosis causes sugar to move into the fruit tissue, displacing water. Warm air is then blown over the drained fruit. The final product is heavily sweetened. The process is used for cranberries and papaya pieces

Vacuum drying; This is a refinement of a cabinet drier. The system is placed under vacuum. The reduced air pressure causes water in the food to be released more easily. Vacuum driers can operate at lower temperatures than conventional cabinet driers so this is a useful but expensive technique for heat sensitive raw materials. Microwave energy can be used as an alternative to electrical energy in vacuum driers. This has the advantage of quicker drying times and the disadvantage of additional capital costs.

Freeze-drying; Higher capital and operating costs restrict this to high value and sensitive products such as strawberries that will be used for making chocolates. The fruit is first frozen then warmed under a very high vacuum. Ice crystals in the food evaporate without first turning to water.

Recommended technology for each group

Of the above possibilities, the two favoured technologies are solar drying and cabinet drying. Solar is not suitable for groups where the weather can be unfavourable at harvest time. The table below shows that the locations of x groups are suitable for solar drying and x groups are not.

Group	Suitable for solar
Dried fruit groups	
Aragatsavan group in Aragatsavan, Aragatsotn	Yes
Verba group in Ujan , Aragatsotn	Yes
Haykani group in Katnaghbyur, Aragatsotn	Yes
Agro Shen-Hogh in Shnogh, Lori	No
Fruit Producers' Union of Mets Ayrum, Mets Ayrum Lori	No
Arevaham group in Vayots Dzor, Rind	To be determined
Arayi Women Farmer Group in Arayi, Aragatsotn	Yes
Dried herb groups	
Women council of Akhtala in Akhtala, Lori	No

One of the solar drier beneficiaries of the UNDP project claimed that his solar drier was not designed well. There was insufficient airflow and there were too many drying trays. He is a qualified engineer and designed and built two improved solar driers for drying fruit in 2015. He believed that solar drying gave a better quality product as the fruit dried slowly whereas cabinet drying dried the fruit on the outside but left half dried fruit in the centre.

Groups' technology preferences

All the groups that asked for a drier asked for a cabinet drier. None asked for a solar drier. This is in part due to the successful introduction of cabinet driers in Armenia. A recent UNDP project Trade for Aid introduced 17 cabinet driers and two solar driers. The project's Paruyr Asatryan was involved in that

In this project the groups are required to part pay for the equipment they will receive under a yet to be finalised formula. Given i) their stated preference for a cabinet (also called electric) drier, ii) the project's interest in supplying improved or hybrid solar driers and iii) the group's required contribution to equipment cost some careful discussions are needed with the groups.

The very first step is to determine with the groups what production capacity they wish to achieve and what combinations of equipment will meet that.

Recommendations on drying technology

1. Cabinet drying technology is supplied. This is based on the groups' requests and successful track record of the technology in Armenia for drying fruit.
2. Some solar drying capacity is provided under a financial arrangement that is more favourable to the groups. The drier(s) should be equipped with the back up heating system that can be added to the Innotech Hohenheim type tunnel drier.
3. If German Innotech solar drier is bought, use it as a model for building some more driers locally. The frame can be easily made locally, the plastic covers and stainless steel trays will still need to be imported.

Energy source General consensus is that the cost of drying with an electrically powered drier is 150 to 200AMD per kg of dry product and the cost of gas is "about half that".

5 Recommended suppliers for the equipment (initial recommendation)

Recommended cabinet drier suppliers

Prices of driers are compared on drying area and indicative prices below. Drying area is used as for comparison as different manufacturers make different claims for drying different products

Supplier	**Model**	**Drying area in sq m**	**Cost**
CARD	EQ-03SW single door	6.4	EUR 2,800
CARD	EQ-05SW double door	12.8	EUR 5,200
CARD	AD-10SW	30	EUR 12,800
CARD	AD20	45	EUR 24,000
Sure Intl	SR-ADM2	10	USD 5,850
Sure Intl	SR-ADM4	20	USD 8,650

Sure Intl	SR-ADM6	30	USD 11,350
Innotech	Cabinet	8	EUR 18,200
Innotech	Cabinet	15.7	EUR 26,454
Innotech	Solar tunnel	20	EUR 9,567

CARD, who supplied cabinet driers to the UNDP Trade for Aid project have imported a total of 100 cabinet driers over the last 6 years from South Korea. They typically sell say 20 driers per year, 10 to projects and 10 directly to processors. They receive regular enquiries and customers are satisfied with their performance.

CARD is highly recommended based on proven performance of their product

Model AD-10SW 30 sq m drying area is EUR 12,800

Model EQ 05SW 12.8 sq m drying area is EUR 5,200

Innotech supply cabinet driers but their prices are much higher as shown below

HT8 8 sq m drying area EUR 18,200

HT15 15.7 sq m drying area EUR 26,454

Alibaba.com display many Chinese makers of cabinet driers. Several were contacted and one replied.

Sure International

tom@tj-sure.com

A three door 30 sq m drying area costs USD11,350

A two door 20 sq m drying area costs USD 8,650

Contact person Tom Qin

Marketing Department

Sure International

Mobile Phone: 0086-13821239473

Telephone: 0086-22-84841831

Fax: 0086-22-84841832

Skype:tom.qin555

Recommended solar drier suppliers

Innotech who are better known for making solar tunnel driers also make cabinet driers. Contact details are

Albert EsperInnotech.ing@t-online.de

Website http://www.innotech-ing.de/Innotech/english/Products.html

Installation of solar tunnel drier.

The maker Innotech states that

"The installment of the basement (please refer to the attached picture) is the only preparation necessary. The solar tunnel dryer can be installed by skilled local craftsmen within 2 days. The installation manual, which is also attached, gives all necessary information. Innotech will give assistance - if needed by phone or email - free of charge.If desired the installation, putting into operation can be done by our team. The time necessary for the installation is depending whether all dryers will be installed at the same location or at different. If all are installed at the same place one day per unit can be calculated. If the distance between the locations is not too far 1 1/2 days per unit have to be calculated. If only one unit has to be installed in average 2 days are required. A training period of 2 up to 5 days can be included - duration is depending on the knowledge of the people involved. Besides that 2 or 3 travel days have to be considered. Honorarium per day is 800,-- €. Not included travel cost, accommodation and daily allowance. If local transport, accommodation and food can be provided by your side only travel cost for flight and expenses for visa, etc. will be accounted."

Turkish supplier

It is known that Turkey makes solar tunnel driers but a manufacturer could not be found during the consultancy. If one can be found, the price is likely to be about 50% of a German solar drier.

Armenian manufacturer

A local engineer could be made a solar tunnel drying frame by copying an imported German Hohenheim drier. The cover and drying trays would still need to be imported though.

Cool storage

As mentioned above, the market preference is for dried fruit to contain some residual moisture so that it needs to be stored under refrigeration. Equipment needed for a cool store is as follows. Prices were supplied by Shav Refrigeration of Yerevan.

Refrigeration unit A 50 sq m by 2.3m or 3m high room needs a 6HP or 5KW refrigeration unit. This would typically be 3 phase 400V, use refrigeration gas R404, has three evaporator fans inside the room and 2 condenser fans outside it. The refrigeration equipment would cost about USD 4,000 to buy and USD600 to install plus travel if outside Yerevan. Installation includes supply of refrigeration gas and a temperature gauge.

Given that 2 tonne of dried fruit can be tight packed in a 17.5 sq m cool room, a smaller room is acceptable unless of course the fruit driers also use the cool rooms for keeping harvested fruit for delayed release to the market.

Insulation Top quality 50mm polystyrene panel with prepainted metal both sides costs about USD36 per square metre. This is excellent for walls but expensive. Panels are readily cuttable and measure12m by 1 m

50mm floor insulation has polystyrene one side and aluminium foil on the other. Costs USD15/sqm.

Insulated door and frame A 190 cm high by 90 cm wide door that is 10cm thick is suitable. It costs USD 390.

6 Complete technical specifications for the equipment

Cabinet drier specifications

Standard sized South Korean cabinet driers imported by CARD have the following specifications and prices.

The wet load figures are based on the FAO recommendation of 10kg/sq m for apricot halves on the drying tray. NB CARD claims these drying loads, which are significantly higher loads than the FAO norms.

EQ-03SW - 150 kg - 2,800 Euro

EQ-05SW - 300 kg - 5,200 Euro

AD-10SW - 700 kg - 12,800 Euro

AD-20SW - 1,400 kg - 24,000 Euro

Model	Wet Load	EUR	No of trays	Size of tray	Heating	Drying area	Size of drier L x W x D
EQ-03SW single door	64kg	2,800	12	885 x 605 x 50	Electric	6.4 sq m	1000 x 740 x 1850
EQ-04SW	81kg		20	885 x 460 x 50	Electric	8.1 sq m	1035 x 1020 x 1850
EQ-05SW double door	128kg	5,200	24	885 x 605 x 50	Electric	12.8 sq m	1000 x 1440 x 1850
AD-05SW	150kg		28	885 x 605	Gas	15 sq m	2195 x 970 x 2040
AD-10SW	300kg	12,800	56	885 x 605	Gas	30 sq m	3560 x 970 x 2040
AD-20SW	600kg		112	885 x 605	Gas	60 sq m	3590 x 1980 x 2040
AD10	320kg		42	885 x 605	Gas	22 sq m	2750 x 1945 x 2040
AD20	450kg	24,000	84	885 x 605	Gas	45 sq m	4630 x 1945 x 2040

All are 240V and include 1 year warranty.

A gas burner system costs about an extra EUR 500

Solar drier specifications

Innotech offer the following as a standard product

Modified Hohenheim solar tunnel drier

Drying area 20 sq m (say 200kg wet fruit load)

Drying time 2-4 days

Width 2m

Length of heat collector 8.0mm

Length of drying area 10.0m

Construction Galvanised steel

Cover for collector UV stabilised PE film

Cover for drier UV stabilised PE film

Fan photo voltaic drive & one solar module EUR 5,800

2 spare covers for drier and 1 spare cover for collector	EUR 265
Packaging for export	EUR 332
22 stainless steel trays stringed with plastic net 950 x 950mm	EUR 2,495
Extra heating system for emergency use	EUR 675
Total cost	EUR 9,567

It will cost an extra EUR 9,000 for a German engineer to come and instal both driers and provide training. This is recommended, as these will be the first of their type in the country. If they are set up 100% they will be easier to replicate in the future.

7 Recommended drying facility or area design, for all groups

The groups were not visited and so a generic design only is given. It is based on loading a cabinet drier with 300kg of prepared fruit.

8 Description of adequacy of each of the 9 proposed location for processing compared to recommended design

The sites were not visited

9 Description of the steps in processing and use of equipment

The generalised individual process steps are given for apples, cherries, grapes, peaches, pears, and plums

Fruit inspection/acceptanceAt reception, fruit is inspected to make sure that it meets quality standards and weighed for payment purposes.

Fruit washing The fruit must be washed, as it will have come straight from the orchard. Ideally the fruit is washed in a sequence of three steps; clean water washing/scrubbing/spraying depending on the individual fruit then a dip in a bath of water that contains chlorine to kill any harmful bacteria on the surface and then a final rinse to wash off the chlorine. Robust fruit like apples can be scrubbed while soft fruit can only be gently sprayed.

Fruit preparation The whole fruit is prepared for drying. Apples are peeled and sliced, apricots and peaches are halved and the stone removed, grapes cherries and plums have the stalk removed.

Sulphuring This step is optional and depends on market preferences. The fruit is treated in an enclosed room with gaseous sulphur dioxide obtained by burning sulphur or from a cylinder of compressed gas. Alternatively and preferably the fruit is dipped into a solution of potassium metabisulphite. Either way the sulphur reacts with the fruit and lessens the development of brown colour during drying. Concentrated sulphur dioxide gas is harmful to human health and safety precautions must be taken. Dark fruit such as cherries, plums and red grapes are not treated with sulphur. Organic dried fruit must not be treated with sulphur.

Loading trays Drying trays are loaded with prepared fruit. Pieces are positioned to favour drying; apricot halves are placed hollow side down, pieces are separated so they do not touch each other and slow down drying.

Drying The following table of temperatures and times is taken from http://www.fao.org/docrep/V5030E/V5030E0j.htm

FRUITS	Drying Conditions			Finished Product	
	Load kg/m²	Temperature °C	Time	Moisture %	Yield %
Plums	15	I. 40-50	6 H	18-20	25-35
		II. 75-80	14 H		
Apples (Rings)	10	75-55	5-6 H	20	10-12
Apricots (Halves)	10	70-60	10- 15	15-20	10-15
Cherries (w. stones)	10	55-70	6-8	12-15	25
Pears (Halves and quarters)	15	70-65	15-22	18-20	10-15
	15	70-60	10-15	15-20	10-15

For cabinet drying, If air temperature is too high the fruit surface dries but traps moisture inside the fruit. Generally, drying temperature starts lower and is raised a little during the second half of the drying process.

For solar drying, the riskiest day is the first day when the cut surface of the fruit is wet and most prone to microbial growth and spoilage. It is important to get the fruit into a solar drier as early as possible in the day to take advantage of the maximum solar energy. The fruit must therefore be ready to be prepared first thing in the morning.

Cooling The dried fruit must be allowed to cool before packing

Grading The dried fruit is graded as required. Workers must wear gloves to avoid transferring any harmful bacteria from their hands on to the surface of the fruit

Packing Packing is done as per market requirements

Storage Fully dried fruit may be stored at room temperature. The ‘soft dried’ fruit preferred in Armenia is stored in a cool room, typically at 8°C.

10 Financial elements contributed to dried fruit business model, for each group (costing for investment, detailed operational costs, income estimation)

The following data may be useful reference material for preparation of the business plan.

Fruit	Typical purchase cost in AMD/kg	Dried yield	Harvest months
Apples	100	11%	Sep Oct
Apricots	150	20%	Jul Aug
Peaches	250	9%	Aug Sep
Pears	200	13%	Sep Oct
Plums	150	30%	Aug Sep

Item	No
No of days to dry in solar drier	4
No days to dry in cabinet drier	2
Drying loads per year in cabinet drier	40
Drying loads per year in solar drier	20
Energy cost for drying with electricity	150-200 AMD/kg product
Energy cost for drying with gas	75-100 AMD/kg product
Energy cost for solar drying	0 AMD/kg
Typical annual fruit purchase for 40 x 300kg loads	15 tonnes fresh fruit
Typical annual production at average yield of 17%	2040kg dried fruit
Typical storage area required	Bare minimum 20 sq m, preferable is 50 sq m to allow for storing fresh fruit to allow planned delivery to market.

11 Other fruit based products that could be produced, with sketch of potential markets, product formulations, equipment, and suppliers for any/all of the recommended products

Armenia is already making fruit juices, fruit drinks, fruit vinegar, alcoholic fruit beverages, compote, jam and fruits preserved in both cans and jars. In other words, Armenia already has a comprehensive fruit processing industry.

12 Factory layout and technical specifications for a medium-sized fruit processing plant, based on discussions with beneficiaries

This topic is addressed only in passing; these points were not discussed with beneficiaries.

The key points to be decided before addressing layout and equipment specifications are i) what product is to be made, ii) the planned rate of production and iii) type of packaging. The ideas that follow may lead to a discussion on those points.

A medium sized fruit processing plant requires a lot of raw material. The most widely grown fruits in Armenia are apple, apricot, pear and peach. Of these, apples appear to be the most plentiful and are available at low prices. In the harvest season a common sight in villages was small apples being left on trees.

Apples Concentrated apple juice is an internationally traded commodity, although not a very high value one. The key indicators for a successful concentrated apple juice industry are i) availability of low priced fruit, ii) availability of low priced energy to concentrate the juice and iii) a market for the product. Metrication of those parameters was not researched during the assignment. Both Iran and Georgia produce substantial quantities of apples so an assessment of market prospects is critical before spending time on a feasibility study.

Grapes. It is understood that grape farmers are currently having problems with selling their crop. Armenian brandy is justifiably famous but a lot is sold in Russia and devaluation of the Russian rouble has made Armenian brandy more expensive and restricted sales. While this is a problem for growers, it seems to be more a marketing problem and is by no means certain that a medium scale grape processing plant is a workable solution.

Appendix 1 Technical specifications

Appendix 2 Annual production costs spreadsheet

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

DRAFT ONLY

THE TECHNICAL SPECIFICATIONS FOR PURCHASE OF EQUIPMENT AND SUPPLIES FRUIT DRIERS

1 General Background Information

e. UNIDO is implementing the ENPARD project in Armenia on producer groups and value chain development. The overall objective of the project is ensuring an efficient and sustainable agriculture that contributes to better living conditions in rural areas. The project aim to strengthen producer groups, effectively engage producer groups in value addition activities, strengthen value chains that provide improved access to affordable, better quality food, contribute to the development of rural areas, improve access to local and international markets, and ensure the introduction of environmentally-friendly farming and food processing practices. The project is funded by the European Union and Austrian Development Cooperation.

f. The Project will support producers groups to dry fruit and herbs in the targeted regions of Armenia. A number of primary producer cooperatives would be clustered around each of the preparation, drying and packing operations, with further expansion of processing volumes and members of cooperatives. Based on the business model developed by the project team two groups will use with solar tunnel driers to dry a combination of apples, apricots, peaches, pears and plums. Seven groups will use cabinet driers powered by gas to dry the same fruit as well as herbs,

g. Producer groups expect to use the driers to dry their fruit in the 2016 harvest season. The below specified equipment is therefore needed for fulfilling the ENPARD mandate.

2. The Scope of Supply

2.1 The following items should be supplied:

	UNIDO REQUIREMENTS		TO BE COMPLETED BY THE INVITEE			
Item	Name and required parameters	Quantity	Unit price	Total item price	Compliance*	Remarks
			Currency	Currency	Yes/no	
0	**GENERAL REQUIREMENTS**					
	ALL ELECTRICAL EQUIPMENT, PLUGS AND CABLES MUST BE COMPLIANT WITH ________________ELECTRICAL NETWORK STANDARDS					
1.	Equipment, parts, supplies					
1.1	Solar tunnel drier suitable for drying fruit, equipped with photovoltaic fan, alternative means of heating for use in an emergency, one set of stainless steel drying trays, UV resistant covers for heating area and drying areas, two spare covers for drying area and one spare cover for heating area, instruction manual, heat heating area 16 sq m and drying area 20 sq m Cost is needed for travel, setting up the equipment, test running of the equipment and training,	2 units				
1.2	Cabinet driers suitable for drying fruit, stainless steel construction of all food contact parts, one set of stainless steel drying trays, and rack to hold trays, complete with gas burner as the energy source. Area of drying trays No allowance is needed for setting up the equipment	7 units				

2.	Provision of services			
Item	Name and required parameters	Total item price	Compliance*	Remarks
2.1	Costs of travel			
2.2	Cost of setting up the equipment			
2.3	Cost of test running of the equipment			
2.4	Cost of training of the processing plant staff			
2.5	Other costs			
3.	Total Price			

2.2 Supplier's General Responsibilities

The supplier must provide evidence of being a recognized supplier of metrology equipment to national metrology institutions of other countries.

The supplier shall make its best efforts to ensure that all works will be carried out according to "good quality and adequate accessories". The supplier assumes the overall responsibility for the correct selection and installation of the equipment for the practical implementation of the Project.

The supplier shall take into account all the details presented in these TSs and shall request any further information, which is considered necessary for the correct implementation of the Works.

The supplier should be able to provide support and maintenance within at least five years after installation.

The supplier should be able to supply, install and train personnel where necessary and also to provide all services needed for the technical reception of the equipment at the cites.

2.3 Personnel in the Field

The supplier must appoint/nominate a project manager. This project manager will be the primary contact point for UNIDO and will be responsible for the services of the supplier and especially for the installation. All staff deployed must be suitably qualified and in possession of the necessary valid permits/VISAS to work in Armenia for the duration of the contract. The supplier is responsible for all allowances, accommodation, transportation and such costs related to its personnel in the field. UNIDO will have any responsibility for such staff. The UNIDO Project National Coordinator based in Yerevan, Armenia will be the primary focal point for UNIDO.

2.4 Reporting

A final report (in English) should be submitted to UNIDO no later than 2 weeks after the installation and training has been completed, for approval by UNIDO.

2.5. Language

The Official Project communication language shall be English. The drawings, catalogues, illustrations, printed specifications and other documentation related to the present project shall be preferably in Russian, or otherwise in English.

3. Guarantee Requirements

At least one year(s) guarantee is required.

4. Delivery Period

Project should be completed by latest June 2016.

5. <u>Award conditions</u>

UNIDO reserves the right to split an award between any suppliers in any combination, as it may deem appropriate. If the quotation is submitted on an "all or none" basis, it should be clearly stated as such in your response to this RFQ

Dried fruit annual production on 300kg/load electric drier, 40 loads per year					**DRAFT ONLY**
Income				AMD	AMD
2040	Kg mixed dried fruit @			2800	5,712,000
Expenses					
Fruit	15000	kg fresh fruit, avg price/kg		170	2,550,000
Electricity to dry	200	AMD/kg dried fruit		2040	408,000
Manager	1	full time		1,000,000	1,000,000
Labour	9	3 people each for 3 months		100,000	900,000
Electricity for cool store, lights etc					300,000
Packaging	retail, gift pack, bulk, not specified				0
Total expenses					5,158,000
Profit using electricity					**554,000**
Gas	100	Cost/kg dried fruit		2040	204,000
Less cost of using electricity					408,000
Savings of					204,000
Profit using gas					**758,000**
Profit using solar (assuming same annual throughput)					**962,000**
Equipment costs			**EUR**		
CARD electric 300kg/load drier			5,100		
Gas burner			500		
Preparation, packing tables			1000		
Cool storage room door			400		
Cool storage refrigeration unit			4600	(is for 50 sqm storage)	
Total			11,600		
Basis of calculations					
weight	**Kg fresh fruit**	**at AMD/kg**	**Fruit cost AMD**	**Yield**	**Kg dry fruit**
100	Apples	100	10000	11%	11
100	Apricots	150	15000	20%	20
100	Peaches	250	25000	9%	9
100	Pears	200	20000	13%	13

100	Plums	150	15000	30%	30
Average	All fruit	170	17000	17%	17
Cost of driers			**EUR**		
CARD electric	150	kg load	2,800		
CARD electric	300	kg load	5,100		
CARD electric	700	kg load	12,000		
CARD electric	1400	kg load	27,000		
CARD	extra for gas		500		
Innotech solar	200	kg load	9,567		
Harvest days/yr	100				
Days to dry	2	in electric drier			
Loads/year	40	in electric drier			
Harvesting					
Apple	Sep Oct				
Apricot	July Aug				
Peach	Aug Sep				
Pear	Sep Oct				
Plum	Aug Sep				
Assumed no of harvest days in year		80			
No days in electric drier		2			
No of drying loads/year		40			
		kg dry fruit	**kg dry fruit**	**kg wet fruit**	
Yrly prodn at avg 17% yield		**per load**	**per year**	**into drier/yr**	
150	kg load	25.5	1020	7500	
300	kg load	51	2040	15000	Using this
700	kg load	119	4760	35000	
1400	kg load	238	9520	70000	
Cool storage					
Paruyr Asatryan stores 2 tonne dried fruit in 3.5 x 2 x 2.5 is 17.5 cubic m					
And is tightly packed					
A 5x3x2.5m cool store leaves room to store fresh fruit as well					
Ex drier sales value					
Apple	2500				
Apricot	2500				
Peach	3500				
Pear	3000				
Plum	2500				
Average	2800				

Annex 14: Monitoring and Evaluation Strategy

Introduction

With funding from the European Union, the European Neighborhood Programme for Agriculture and Rural Development (ENPARD) project supports the Government of Armenia in ensuring an efficient and sustainable agriculture that contributes to better living conditions in rural areas. Within ENPARD Armenia a technical assistance component focuses on producer group and value chain development. This component is implemented by UNIDO and UNDP with funding from the EU (2.4 million euro) and co-funding from the Austrian Government (1 million euro). In particular the project aims to strengthen producer groups, effectively engage these groups in value addition activities, and strengthen value chains that provide improved access to affordable, better quality food, contribute to the development of rural areas and improve access to local and international markets. Theproject will ensure the introduction of environmentally-friendly farming and processing practices. Direct beneficiaries of the ENPARD project will be agricultural producers, members of producer groups and their employees, their families and SMEs along the value chains as well as Armenian consumers. The project also will focus on women, youth and vulnerable groups.

In order to ensure effective implementation of the UNIDO/UNDP component of ENPARD, a results management system has been designed to monitor that the implementation of the project is proceeding as planned, and to evaluate whether the impact on the beneficiaries meets expectations. The project team uses a Results-Based M&E (RBM&E)system over the three-years of the project in order to: help monitor progress of ENPARD project on an ongoing basisagainst the goals of producer group and value chain development,as well asto demonstrate its added value at countrylevel, finally, incorporating the lessons learned for continuous improvements.

In short, the project's methodology for results management uses a combination of the results based approach and the classic M&E approach, with a focus on results chain progress monitoringto assess the impactof the project intervention. Elements of this methodology include participatory monitoring and evaluation, the selection of key performance indicators, the methods of baseline survey, data collection, analysis and reporting.

Image 1: What is M&E about?

Source: http://www.fidafrique.net/article3353.html

Purpose of the strategy

Overall purpose of the RB M&E strategyis to help the UNIDO, UNDP, Ministry of Agriculture, the donors-EU and ADA during the project implementation to get knowledge about which activities worked and which did not work, and why (lessons learned). As a transparent and accountable tool the strategy will serve the project management to take timely and corrective action and help future planning and effective resource allocation. The Results Based M&E Strategy consists of the results measurement to support good project management and decision making at all levels.

Specifically, the purpose of the results management and the M&E strategy is twofold:

Firstly, the data collected on project output indicators will guide the ENPARD project team to ensure that project activities are implemented in a timely manner and in order, with the purpose to obtain outcome and impact objectives. Regular monitoring in the marzes will verify whether the activities undertaken by the ENPARD project team are having their intended results and generating the expected outcomes.

Secondly, the effects which the project outputs have on the target population will also be measured, in order to ensure that the achievement of project outputs generates positive changes in the rural areas and in the lives of beneficiaries. Such indicators will be measured using the accounting/financial results of the producer enterprises, as well as by evaluating changes in income and assets accruing to households and producer groups and cooperatives.

As noted above, the M&E system willmeasure the qualitative and quantitative indicators of the project outputs and outcomes, as well asevaluate the impact of the project intervention. The data collected falls into two primary categories:**output/outcome monitoring** of project activities, **and evaluation of specific results indicators** showing the impact on the producer groups and target populations.

- **Output monitoring of project activities:** These indicators measure the logical implementation of project activities, including developing business plans, training groups in business related skills, installing processing equipment, supporting groups to sign sales contracts, and many other activities which the project team will undertake in support of the selected producer groups. Monitoring of these activities will show the degree to which the project team is on target to achieve its implementation objectives. The basis for this approach will be the logic model of the results chain highlighting the relationship among the inputs, activities, outputs and outcomes.

- **Monitoring and evaluation of indicators of beneficiary progress:**The impact on the target beneficiaries is closely linked to the project output monitoring. However, instead of measuring the activities of the project team, it measures the degree to which these activities, together with the producer's efforts, have translated into tangible results for the producers. The primary outcomes which will be measured include increases in income resulting from the activities of the cooperatives and the creation of new jobs in the targeted value chains. However, data will also be collected on the producer's assets, and the relative importance of the change in their earnings from project activities compared to other household income.

Main users

The main user of the M&E strategy is the ENPARD project team, which will use the data collected to adjust its activity plan in real time. Information collected will be analyzed on a continuous basis.

Other users of this strategy include the donors (the European Union Delegation to Armenia and the Austrian Development Agency), the Ministry of Agriculture, and other key stakeholders who will benefit by learning which approaches prove to be the most successful. In this aim, data will also be used to provide timely and useful information to relevant decision-makers and stakeholders.

Additionally, the farmer beneficiaries will be received updates on the progress of the implementation of their business plans and their income results. Such M&E based reports, discussed with the farmers, will assist in building their understanding of their own enterprises and business objectives, as well as to gauge the impact on their own lives resulting from their participation in the cooperative development.

By using M&E data to informthe communication strategy and approaches, it will bemutually beneficial to discuss M&E findings with implementing partners and stakeholders in order to get feedback and reach joint conclusions and agree on next steps. Findings in the progress reports, mid-term reviews,as well asstories and photographs or videos, will support the development of a robust communication strategy.

The stakeholders will learn about the ENPARD project progress through RB M&E, and remain accountable for their actions in the project implementation as well. It is very important for the ENPARD project team to present the impact of the project on rural agricultural producers' lives as felt by the producers themselves.

Chapter 1: Approach

The overall approach is to apply the Results measurement insynergy withthe M&E strategy, involvingresults chain design, activity planning, defining key indicators and questions, gathering and managing the field data on outputs, outcomes and impact, as well as reflecting critically on implementation progress in order to improve further project actions, and finally communicating and reporting onENPARD project results (Appendix 1).This system will measure the effects of project actions, and internal monitoring will be carried out considering the results chain, results indicators at the level of output and outcome.

Within the framework of the results chain, the approach will focus how outputs are transformed into different levels of outcomes, to achieve the project's goalswithin the three components. Within the framework of M&E, abaseline study will be conducted to collect baseline data about the beneficiary and non-beneficiary groups and households with the help of questionnaires. The collected data will be compiled in Excel databases, updated at mid-term and end-term, and analyzed for measurement of the progress of the project results, as well as to measure the impact of the project.

The project will be monitored during the implementation cycle on a regular basis internally by the project staff for us as implementers, with reporting undertaken according to the M&E activity plan (Appendix 2). This approach will consider also the DCED Standards practical framework to monitor progress towards objectives, according to good practice.

1.1 The aim of the project (outcomes outputs) and its logic

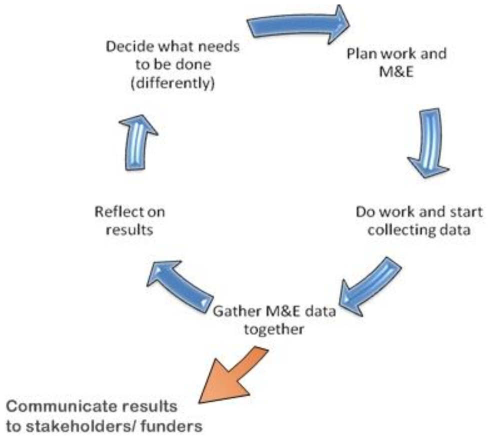
The primary outcome of ENPARD project is to increase income of the households as a result of improved production and developed value chains in the target regions. The project will accomplish its goal through implementation of three components. Component 1 will help to identify and strengthen primary producer groups, support them in business plan development and operation, While some of the activities of component 1 will be carried in parallel to component two, the project will link the primary producer groups to value adding processor groups, train them, provide them with equipment and infrastructure, link them to financial sources, so that they co finance the business activities and become linked to markets. The main focus of Component 3 is to diagnose and find the gaps, develop a value chain upgrading strategy,improvement of the post- harvest handling, storage, trading, marketing which will lead to provision of improved access to better quality food. Specific outputs and their intended results will be discussed in more detail in Section 4.2.

1.2 The approach as a combination of survey data, results measurement (RM), and project M&E

The frameworkof projectM&E, various monitoring systems will be used to evaluate and provide information which will help in adjusting project implementation. The primary elements of this system include the Baseline survey of the shortlisted primary producer groups;the mid-term and final evaluations, also monitoring the results on producer groups; and the evaluation through "Results measurement" of the value chains, using the results chains.Thus the overall monitoring of the project will focus on whether the project has accomplished its objectives having the intended impact on the beneficiaries; and identify the necessary corrections needed to keep progress on track and support decision making at all levels.

Specifically, the baseline survey will help to measure the situation of the beneficiary groups and control groups before the project activities. Likewise, the results measurement of project activitieswill concentrate mainly on the changes at output level analysing how one change causes another change andhow the project progresses to the set outcomes. This monitoring of the project will help to measure key indicators of outcomeor impact of the project activities: increase in income and employment of the producer and value adding groups. Finally, the data collected will be used as part of assessment of Project achievements including the lessons learned.

Diagram 1: RB M&E Cycle



Source: http://www.fidafrique.net/article3353.html

1.3 Results measurement in value chain development context

The main focus of the ENPARD project results measurement will be on outcomes of the project components and overall impact, considering cause and effect relationship of the project intervention, assumptions about the linkages of outputs, outcomes and impact, which has been specified at the value chains diagnostic phase on the case of the buckwheat and legumes.

Results measurement will help to measure the changes of the project components and effects of changes taking place during the whole development process of the value chain.One change or several changes will occur as a result of improved production, processing, storage, transportation and marketing.

A set of indicators for each project component, for the main and intermediary results, has been developed for data collection on the results of the project, which will be analyzed and reported accordingly and shared among the key stakeholders. The results measurement of the project have considered the key outcome indicators regarding the created employment considering participation of women and youth, increased income, value addition, enterprise development, which will be reached through the chain of output results.

In order to evaluate progress toward these targets, a baseline questionnaire has been prepared with a list of indicators and corresponding questions to measure the situation before the project. Developmental impacts will be updated and evaluated as the project progresses.

A detailed results chain has been developed for the value chains of buckwheat, berries/fruits and non-traditional and high value vegetables, providing clear understanding of the specific value chain development logic, which will be used to monitor implementation activities and measure the results progressing.

Chapter 2: Methodology

The methodology includes the following key points:

- The results chain developed for the selected value chains will be used to track outputs, eventually leading to target outcomes.
- Key indicators for needed information collection have been defined according to the outputs in the results chains, which when achieved will lead to the desired results of increased incomes and job creation.
- Questionnaires,as M&E data collection tools have been designed for the baseline survey of the target and control groups, as well as for gathering the qualitative and quantitative data on a regular basis.
- Monitoring visits will be conducted to gather information considering 3 methods:
- Household/producer group survey, (2) a participatory assessment process where beneficiaries do their own monitoring and record and discuss their findings, or (3) focus-group meetings to discuss changes that groups have reached. Participatory assessment involves face to face discussions with farmers, heads of cooperatives, mayors, trainers, and other stakeholders to receive feedback on project implementation activities. This will assist the ENPARD project team to adjust future activities to increase effectiveness.
- Data input and analysis will be done after the results are compiled and analyzed, based on the baseline survey, interviews with the value chain farmer groups, individual households, producer groups' records, and financial institution's or credit providers' records, etc.The gender segregated data will be separately managed for each value chain.
- The results of the monitoring will be shared after each monitoring visits through formal and informal meetings, regular ENPARD team meetings to review the observations from the monitoring visits, meetings and feedback.
- Reporting will includeproviding success stories about the best cases of farmer groups or households tohighlight the project results in terms of improved agricultural production, capacity,and the economic improvement of women, youth and vulnerable groups.
- For additional data collection or clarification, apart or in addition to the field visits and interviews, phone calls will be made.

2.1 Household and group survey

The M&E system of the ENPARD project will keep track of and measure the project intermediary and ultimate results to the expected changes in achieving the producer groups increased income and employment living standards by conducting the baseline survey, mid-term and final evaluation. For each intermediary and main results' specific indicators have been identified and prepared in the database.

In order to measure the results at output and outcome level, surveys will be undertaken on the household and producer group level, including a baseline survey, a mini-survey at midterm, and a final evaluation. For the household surveys, treatment and control groups will be interviewed.

After analyzing the applications submitted as a result of theopen call of interestin the targeted marzes, the baseline survey will be implemented. The baseline survey of households and groups in the identified value chainswill provide the social and economic status of the beneficiaries before the intervention of the project. Baseline data will be collected on most to all of the shortlisted groups. Since not all of the shortlisted groups will be eventually selected for participation in the project, those groups not selected will be used as control groups, while those selected will be the target/treatment groups (which have not yet, but will, benefited from the project intervention).[94] The mid-term and final evaluation surveys will show the impact of the project's activities by measuring the change in income, employment, assets and other factors.

In order to ensure correct methods of data collection, the following elements will be considered to ensure that there is sameness between the two groups (treatment and control) of the value chain and to compare a before and after picture.

M&E methodology used for the above-mentioned activities will include the main key methods:

- The Experimental design method will be used for the baseline survey selecting one "treatment" group from the value chain producer groups (to benefit from the ENPARD project intervention) and one "control" group (not benefiting from the project intervention). These two groups would be similar in terms of being from the similar value chain. For the buckwheat producer groups survey wheat producers groups will be selected as a control group.
- The result of the survey will be the "treatment effect" comparing the situation of the producer groups with and without the project intervention. Quasi-experimental design methods will be used, which means that we will estimate the difference in parameters (as mentioned in the survey questionnaire) for both "treatment" and "control" groups.
- Case studies, as a form of a non-experimental design method, will be prepared to highlight the process, situation, opinion, positive changes as the results' effect on the lives of beneficiary households and the producer groups. The stories will be shared.
- The non-random Sampling method will be applied when the ENPARD project follows a specific purpose: for example, when the project team wantsto measure the results of the intervention of the specific value chain producer groups for any*ad hoc* or a regular monitoring survey.
- The collected baseline and monitoring information will be recorded in an Excel database and the ENPARD team will have access to the updated files and results information.
- Photos and short videos shot during the field visits will add value to the presentation of the project accomplishments for communication with stakeholders and wider publicity.

2.2 Results measurement

The results measurement will focus on the results chains during the whole process of project implementation,monitoring a number of outputs and outcomes under the three components. By

[94]The ongoing open call is scheduled to conclude on July 15. This, the short list of groups should be available at the beginning of August. As noted, the baseline survey will be implemented on those groups likely to be selected for intensive project support, as well as groups receiving less or no support. However, before the final shortlisting, the baseline survey will be tested on groups likely to be included in the project, with possible adjustments made prior to final deployment.

accomplishing the outputs the project intervention will deliver the results to be measured by the M&E system.

Diagram 2: Hierarchy of results/results chain

Source:http://www.fidafrique.net/article3353.html

2.2.1 Steps of results chain development, participation of stakeholders

The Results chains of ENPARD project have been developed with the input of the entire project team, by comparing the activities described in the project document to the intended outcomes of the project. The activities to be undertaken were ordered based on timeline which means that certain activities need to be undertaken before others. There are certain steps in three components of the project that may take place simultaneously or in parallel to one another. The arrows on the results chain graphic model show these linkages.

Additionally, certain activities depend on the results of previous activities. For example, business models need to be designed to ensure the profitability of producing a certain product, before the equipment necessary to produce the product can be purchased and installed. Likewise, producers need to produce before selling their crop, and before attaining increased incomes.

These logical steps will be discussed with the producers, as key stakeholders of the project. The producers will have the opportunity to recommend changes to the results chains, and the project will prioritize their understanding of the activities to be implemented according to the results chain. These discussions will take place during the early phases of business plan development with the producer groups.

The results chains will also be presented to the donors, Ministry of Agriculture, and other key partners. The chain structure is flexible for amendments during the project implementation, and feedback from the donors, other stakeholders and various actors.

2.2.2 Setting up of database

Each value chain has its own results chain developed by the project team. Based on these chains an Exceldatabase has been set up which will be the data store for analysis and reporting starting from the baselinethrough completion of the project and will be updated accordingly on regular basis.

Two databases will be maintained and managed by the results manager. One will be for the baseline,mid-term and final evaluation surveys and the second will be for the results chains with quantitative and qualitative data.The first database will be populated with data after each survey with the household and groups using the questionnaire, and the second database will be updated based on regular field visits and monitoring with the farmers, processing groups, extension and business service providers, MFI relevant representatives and others. The second database undertakes the tracking of results chain implementation and will be updated at least on a six month basis.

2.2.3 Training people in data collection for the RM system

Data collection relating to both M&E on producer group changes/impact, as well as on the implementation of the results chain will be the responsibility of the results manager. Additionally, the entire project team will be involved in data collection and internal reporting.

- **Output monitoring of project activities:** The output monitoring of the results management system requires the full participation of the entire team. Therefore, the project staff will be trained in data collection as well.[95]The team will agree on responsibilities for data collection, analysis, and the timing. The record of the status of the indicators will be made at the baseline phase in the results chain database. The trained programme staff will use the results chain to guide their activities and will be able to explain the logic of project interventions to key partners. The results chain will be regularly reviewed to reflect changes at least once a year. At least one relevant indicator associated with each change will be described in the results chain (quantitative and/or qualitative indicators).
- **Monitoring and evaluation of indicators of beneficiary progress:** Since the collection of baseline and other M&E data will occur in parallel with the trainings and other group development activities, it is expected that sufficient time will be available for the results manager, assisted by project assistants, to collect this data. However, if time becomes a constraint, temporary staff or interns will be used.

2.2.4 Data analysis and reporting

The data collected in the results chain format per value chain will be analyzed to show the degree to which the project is on track in implementing its planned activities and achieving the desired outputs. Internal documents with quantitative and qualitative analysis of survey results will be prepared to report on the findings of the bi-annual review of progress based on the results chains, as well as following the completed baseline, mid-term, and final evaluation. These documents will be integrated into documents prepared for the required official project reporting, such as the annual

[95]For the team training, the results manger will develop a brief training program, primarily to inform team members of results chain and implementation activities on which they need to report,

reports. Mini-reportswill also be incorporated into regular reviews of interventions and project progress. During the regular meetings the team will discuss findings on results and project progress. Findings will be communicated to other stakeholders via the official documents and documents/presentations on an as needed basis.

2.3 End of project evaluation

The evaluation of the ENPARD project will help to measure whether the anticipated project objectives were completed and whether the accomplished results are actually attributable to project activities, as well as documenting the lessons learned and good practices. The evaluation will be internal, and undertaken by the project team.. Externally the project will also be evaluated by an expert or a company outside commissioned by the European Union. The project team, and specifically the results manager, will assist the external evaluators with any necessary joint monitoring and will share findings to assess project effectiveness and complement efforts.

Chapter 3: Design of household and group survey

The survey questionnaire is designed separately for the household survey and for the producer group interview.The data collected through this questionnaire will be gender segregated and collected on the main parameters for both household and the group before and after the project (Appendix 5 Questionnaire).

3.1 Main parameters for household/groupquestionnaire include

The household questionnaire and the group/cooperative questionnaire are similar in that they monitor virtually the same indicators, however tracked at two different levels—that of the household or that of the enterprise/cooperative. The categories of indicators are described below.

1. **General information about the interviewee, including name, age, gender, household and group composition:** Such demographic information will allow the project to analyze the general status of the selected beneficiaries, as well as later to track the impacts on the demographic categories. For example, the project maybe more successful in creating impact with one category or another (men/women, or age groups). Such information will be useful in continued project implementation and in the design of future projects. In the group questionnaire, this category focuses on the institutional status of the group.
2. **Geographical location:**Community and marz, where the household and the producergroup are located run their business and production. This information will showwhere the household is located, where he or she runs business.Additionally, this information will help to analyze the overall impact on the particular household, group and geographical area.
3. **Assets, including agricultural lands, machinery, technical equipment, livestock, etc.:**The data collected under this section is very important to evaluate what the economic situation of the interviewee was before and will be after the project intervention. It will help to have the picture about the project impact when we juxtapose and analyze the before and after data.
4. **Financial data includingrevenue and expenses:**
    a. Business/production/markets/sales,annual turnover,
    b. Employment (labor division; women and youth involvement) and salary;

c. Co-financing, contribution of the beneficiary to the business plan implementation.
d. Credits extended through the MFIs: the purpose for which the loan has been taken and impact of the loan, in terms of how it improved the production,promoted new opportunities and achievements.

5. **Training and other needs:**The data on this section will help to identify the knowledge gaps and training needs, as well as later assessing the impact of the knowledge received.
6. **Level of vulnerability (low, medium, high):**Comparing the data before and after the intervention will give a clear understanding the improvements due to the projectintervention.
7. **Status of women:**This data will describe the women's status before and after the project in terms of access to finance/credits, participation in the production/business, income generation and decision making.
8. **Other observations:**Other observationswill include additionalqualitative impact data to add value to the collected information, such as how the collective action as a group helped the farmers to overcome challenges and prosper in terms of their production and business, raised their trust towards each other, provided joint learning and business initiatives/opportunities, how has the quality of extension and business services ameliorated, and will showindicators of success for men/women andaccess to resources for men/women, etc.

3.2 Organization of data collection, analysis and reporting

Data collection

For monitoring purpose both quantitative and qualitative data collection method will be used with the help of data collection tools –like the producers as focus group discussions, interviews, surveys, phone calls, questionnaires, and in form of photosdiagrams, tables, will be highlighting the documented accomplishments of the projects. During the meetings and interviews of monitoring visits the records of the producer groups, cooperatives, processing plants will be considered, necessary information will be recorded and analyzed. All the data will be gender segregated. Such information seeking visits will occur on a regular basis, with surveys filled out at baseline, mid-term, and end-term.

The project will put focus and encourage participation of women, youth and vulnerable groups in the ENPARD project. Interviews with individual households and the producer groups will provide data and feedback from the field. Face-to-face meetings with women and youth involved in the value chain development, and will give a full understanding about their contribution and status within the community.

The collection of quantitative data in numbers, will be answering questions such as "How much has the farmer household increased the production?", "How many trainings have they received?", and "How frequent do they apply the new knowledge and new technology?" etc. Quantitative data will require formal measurements of variables such as income, employment, production, trainings, etc.

The qualitative data will help to produce data answering the "how" and "why" through, meetings, interviews or general observations. Qualitative data will help to understand the households and producer groups' attitudes or behaviors, beliefs, opinions, experiences and priorities about the changes in their lives. The beneficiaries and non-beneficiaries will be asked also the following questions like “Why do they think that particular change happened?” and “How do they think that what happened is due to the project and how it will effect on their well -being?[96]

The project team will also look for data collection interviewing other actors of the value chain, including MFIs linked to the producer and value-added producer groups, extension and business service providers, consumers.

Data analysis

All the data on the results will be filled in the database from the questionnaires, and reports will be presented and shared/discussed for further decision-making. All the collected data will be indicating women, youth and vulnerable group engagement in the producer groups.Among other data collected, the baseline study will include a gender disaggregated basic information and highlight differences between men and women in terms of, for example, the working day, time dedicated to rural production and differences in income and employment.

Once the data has been collected and entered into the database, the impact of the project on the growth in incomes and assets will be calculated to provide analysis on individual progress from before the project, in absolutes and percentages. The results will be compared between the producer groups and value chains. Other learnings will be generated using statistical methods and logical deduction.

Reporting

The results of the analysis and statistical deductions will be presented in internal reports as well as annual reports. Further, the project team will to create a video of beneficiaries about their local livelihoods. After three years, videos will be made of the same communities to show what has improved as a result of the project intervention. Additionally, “before” and “after” photographs taken during the monitoring visits will help to assess the overall impact of the ENPARD project.

3.3 Data analysis and reporting

The data gathered and compiled in the results chain format per value chain will be analysed forillustrationof the degree to which the project is on track in implementing its planned activities and achieving the desired outputs. The monitoring of impacts on the livelihoods and assets of the producers (collected through the household and groups surveys) provides a second data set for analysis. The degree to which the outcomes are realized (the change in income over the three years of the project), and the additional earnings from newly created jobs, will be measured in the baseline surveys, ongoing monitoring, mini-midterm, and the final evaluation. This data will be collected and analysed on at baseline, mid-term and end-term to show the degree to which the project outputs are achieving the intended outcomes and impacts. Reporting on findings will be included in the annual reports.

[96]A Guide for project M&E, Managing impact for rural development, International Fund for agricultural Development

Chapter 4: Results chains and points of measurement

4.1 The graphic presentation of the chains is attached (Appendix 4).

For a graphical representation of the results chain, see Appendix 4.

4.2 Explanation of results chain logic

The results chain demonstrates how one change creates another change or changes to display the program effect, and why, illuminating the 'logic' of the program: showing how activities get to outputs, then to outcomes, and ultimately to the project impact.The results chain shows all key changes and linkages arranged in logical order, demonstrating how project results lead to achievement of development goals[97]. For each output/outcome boxintermediate results will occur and they have their specific indicators set.

The results chain is sufficiently detailed so that changes at all levels can be assessed quantitatively and/or qualitatively. The results chains are closely linked to the business models, also being developed for the value chains. In fact, the implementation of the business plans almost parallels the steps described in the results chains. The income and employment results of implementing the business models will lead to the higher level outputs and outcomes described in the results chains.

The Excel file database with the results chain is the basis for further data input, analysis and reporting. The outcomes and activities will be measured regularly and data will be updated, reported and shared accordingly.

The results chain discussed and definedwith the project team helped tounderstandthe expectedchanges, and how one change may cause another change or a range of changes in the course of the value chain development starting from the value chain diagnostic's stage through the final outcome.

4.3 Presentation of indicators and points of measurement

Indicators set in the results chain of the value chains will measure the activities and outputs completed, and the changes reached from improved services or interventions—to evaluate the impact and highlight the changes that the project accomplished. Although achieving impact depends on the successful implementation of related and linked activities, the output indicators are organized within the three project components. The primary flow of the indicators within each of the components is described below.

Component 1

Implementation of the component 1 will generate the following range of results. For the Primary producer groups,they will first be shortlisted following the open call announcementThe project team will develop business models based on the value chain analysis, withengagement of women, youth and vulnerable groups.

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In the next step,Business plans will be adapted to the selected producer groups, including identifying the co-financing needs. Under this component, the Producer Groups will be trained in production, business operation/management, accounting and GAP.

These Producer groups will be registered as legal entities (cooperatives) in the State Registry (with women-leadership at40% & youth employment at 30%). Groups will be provided with necessary equipment/machines and supported to access financing/investment (if necessary), and will receivesupport inestablishing storage facilities/warehouses. The Producer Groups will effectively manage business and group developmentas a result of receiving a consulting and coaching.

The outcome indicators of component 1 include the increase in earnings per farmer householdand total total increase in earnings of farmers.

Component 2

The results chain of component 2focuses on the value adding groups being effectively engaged in value addition. In order to obtain the expected results,the Business model of the value adding processor group will be developed after theVC diagnostics/analysis with engagement of women, youth and vulnerable groups. Cleaner production and energy saving technologies, as well as the properfinancing scheme (working capital & capital investment) will be incorporated in the business model. The groups will be supported in business plan development and trained on organizational development and business planning.

Thevalue adding Groups registered with the State Registry will be linked to investors and/or financial institutions to get affordable credits for construction and/or operational costs of processing.Co-financing for proper business operation will be arranged, buildings refurbished/constructed,processing and packaging technologies/equipment installed and tested, promotional and marketing strategies will be developed and tested. Value adding groups will be trained on new technology, packaging, storage, marketing, including food safety state standards and linked with the market.

As a result, the annual turnover of groups is expected to get increasedwith improved and increased sale of products and services, received coaching on effective marketing strategy implementation, as well as profitably management of production and expanding of processing volumes.

The outcome indicators for component 2 are the total annual earnings by employees of the group (cooperative) and the number of jobs created (gendered for coopertaive and non-cooperative members).

Component 3

The Project activities under component 3 are mainly supporting activities to the components 1 and 2 and will be organized specific to the respective value chain.

The component 3 resultschain invloves the identification and analysis of the value chain gaps/priorities, based on which the value chain upgrading strategy will be developed, involving the Ministry of Agriculture, private sector service providers, NGOs and financial institutions. Trainedextension services and innovative financing facilities will be developed and presented to partners.Value chain actors, including primary producers and processor groups will have access to financial capital for operation (with at least 0.5mln € secured).

After training, the groups will apply GAP and disaster risk management to minimize risks of new crops. Improved knowledge of the primary producers on agronomy, market prices, etc. will help applying new techniques, improved harvesting techniques, post-harvest handling and storage. Among the results under the component 3 are improved primary producer extension services and provision of quality products, processing groups with improved capacities in sourcing products and developing supplier networks and international sourcing.The value chain upgrading strategy will include the trading and marketing segments of the value chain by supportingwholesalers/traders to improve trader access to finance, transport capacity, pricing and dispute resolution.

The mentioned chain of results will generatean increase in householdincome,and employmentfor men and women in the value chain as a result of project interventions.

(Appendix 4 illustrates the Graphic presentations of chains with indicators).

Chapter5: End of project evaluation

The M&E system will help the evaluation of the ENPARD project near the end of project implementation with the following purpose: toassess the achievements of results and effectiveness, to measure how well the project has accomplished its objectives, and the level to which changes in results are attributed to the project. This information will enableevaluators to provide a final evaluation of impact, as well as to formulate recommendations for adjustment in the case of a second phase for ENPARD.

5.1 Main focus on continued support to groups and leverage

Overall project assistance to leverage private and public sectors will contribute to the sustainability of the project interventions after the project completion. The gained new knowledge will be applied to continue the provision of the quality agricultural business service. As part of the ENPARD project activities the beneficiary groups will be technically supported and linked to new financing schemes, enhanced governmental and local extension services to ensure their sustainable growth and business management.

The ENPARD project will demonstrate the well-established and functioning value chains for better quality and reasonably priced food. The successful value chain business models can be replicated in other marzes as well.During the final year of project implementation the RB M&E data collected will be used as part of assessment of the project achievements and sharing of lessons learned among the key stakeholders. The dissemination of this results based M&E analysis and reporting will assist the government or other development actors to replicate successful ENPARD pilot projects.

For the ENPARD impact assessment/project evaluation the reported changes in universal impact indicators disaggregated by gender will be considered: # of groups established, jobs created (employment), increased income (additional net income).

5.2 Reference to EU evaluation

As per the project document, the overall M&E of ENPARD activities will be the responsibility of the EU, and given the UNIDO's mandatory evaluation Division for the final evaluation (the project impact) the EU may consult with the UNIDO Evaluation Division.

The evaluation can be conducted on mid-term project implementation and after the end of the project.

ANNEXES

- Appendix 1: Output and Outcome Indicators from the project log frame
- Appendix 2: M&E plan
- Appendix 3: Model of the Results chain for buckwheat
- Appendix 4: Graphic presentation of result chain
- Appendix 5: Questionnaires for household and group survey

Appendix 1: Output and Outcome Indicators from the project logical frame

Outcome indicators:	Increase in rural household incomes -	20%
	Increase in employment -	5%

<u>Output 3 indicators</u>:

a. new financing secured for targeted value chains in the selected marzes- 0.5mln €

b. Good Agricultural Practices/Risk assessment protocols for MOA, training of staff- in target marzes

c. Target value chain actors employ more workers - 5%

<u>Output 2 indicators:</u>

a. producer groups with value addition - 10

b. products of modernized groups have -10% premium price and 20% increase in annual turnover

c. products of target producers' groups comply food quality standards - 90%

<u>Output 1 indicators:</u>

a. new business-oriented producers' groups established - 20

b. staff of producer groups trained in business planning, admin., budgeting and financial, marketing, food safety, policy advice, new technology, clean and safe production, disaster risk management.

c . farmers trained in marzes - 1000

d. preparation of manuals for producer groups- for target marzes

Appendix 2: M&E plan

Type of M&E activity	Responsible Parties	Time frame
Inception workshop	UNIDO Project Manager; UNDP Component Leader, UNIDO Project Coordinator, Steering Committee	Within 2 months of project start up
Inception report		3 months after project start to be submitted within 2 months
Preparation of the Detailed Work Plan		Within first 6 months of project start up (to be completed after the value chain analyses are finished)
Annual progress reports	UNIDO Project Manager, UNIDO Project Coordinator, UNDP Component Leader, Results Manager	31st of December 2015 and 2016, to be submitted within 2 months after reporting period
Participatory monitoring workshop		Within target marzes with key stakeholders
Project completion/consolidated report		31st of December 2017, to be submitted within 2 months after project completion. Draft submission 3 months before end of project implementation
M&E design and tools to collect and record data (performance indicators)		Start of project and feed into database throughout the project life
Baseline study	UNIDO Project Manager, UNIDO Project Coordinator, Results Manager	Start after the selection of the groups is finalized/shortlisted, use the Baseline questionnaire developed
Regular monitoring and analysis of performance indicators	Results Manager, PIU	Regularly to feed into project management and Annual Project Review
Visits to field sites	Results Manager, PIU	Every 6 months
Preparation and sharing of monitoring report	UNIDO Project Coordinator, UNDP Component Leader, Results Manager	After each monitoring visits
Terminal Project Evaluation	UNIDO Project Coordinator, UNDP Component Leader, Results Manager	Evaluation at least one month before the end of the project; report at the end of project implementation
	PM, UNIDO HQ, Project Steering Committee, independent external evaluators	

Appendix 3: Model of the Results chain for buckwheat

component 1:	results indicators
A. Producer Groups effectively manage business and group development/growth	Outcome: total increase in earnings of farmers
	Outcome: average increase in earnings per farmer HH
	1. Number of groups receiving Coaching on group development, business administration .
	2. ha under cultivation by groups
	3. amount of buckwheat sold to processors/buyers

component 2:	results indicators
J. Value adding producer groups profitably manage production and expand processing volumes	Outcome: Total annual earnings by employees of the group (cooperative)
	Outcome: Number of job created (for co-op and non-co-op members)
	1. Number of Groups received Coaching on group development, business administration.
	2.Amount of buckwheat sold in total
	3. Number of groups that sold buckwheat

component 3:	results indicators
R. Value chain upgrading strategies impact value chains constraints are resolved; and, the flow of goods, services and capital within the buckwheat and lentil value chains improve	Outcome: increased HH income and employment
	1. Increase in HH income
	2. Number of jobs created in the buckwheat value chain as a result of project intervention
S. Value chain upgrading strategy implemented in the *trading and marketing* segments of the value chain	1. Number of supported Wholesalers/traders who buy/transport buckwheat and/or lentils to perform better (including addressing transport capacity, pricing, dispute resolution, and other issues) (Act. 3.8)
	2. Improve trader access to finance (if this is a constraint in

						the value chain (Act. 3.9)
B. Producer groups acquire/establish storage & develop post-harvest handling practices	1. Number of constructed storage facility/warehouses supported by project(UNDP budget, Act. 3.6)		K. Annual turnover of groups has increased	1. Number of Groups improved and increased sale of products and services.	T. Value chain upgrading strategy implemented in the *processing* segment of the value chain	1. Number of Processing groups have improved access to better quality production inputs and related services (through training and developing linkages with primary groups and others) (Act. 3.5)
	2. Number of Producers trained on post-harvest handling & storage, seed selection			2. Number of Groups received coaching on effective marketing strategy implementation. (Act. 2.6)		2. Number of Processing Groups have experienced international sourcing (Act. 3.7)
	3. Number of Producers delivered production to warehouses	Link to L		3. Short and long term strategy is developed.		3. Improved provision of quality products
C. Producer groups produce	1. Number of Groups efficiently linked to input supplies (seeds, fertilizers, machinery) and trained on sourcing and developing supplier networks		L. VA groups pilot value added products	1. Number of VA groups trained on new technology, packaging, storage, and marketing. (Act. 2.2, 2.4, 2.5)		4. Number of Processing groups capacities improved in developing sourcing products and developing supplier networks (sourcing buckwheat & lentils, and other factory inputs) (Act. 3.7)

	2. Number of Trained producer groups
	3. Groups apply GAP in production (most groups trialed buckwheat production in previous season)
D. Funding (for seeds, tractor attachments, and/or warehousing) provided (as previously agreed with co-ops in business planning)	1. 2016: Number of Groups provided with high quality buckwheat and lentil seeds (farmers self-finance other inputs) (UNDP budget, Act. 3.4)
	2. 2016: Number of Groups provided with necessary equipment/machines (likely to include a tractor attachment for seeding) (UNDP budget, Act 3.4)
	3. 2017: Number of Primary producer

	2. Number of Groups business operation which meets market requirement including food safety state standards.
	3. Number of Groups supported to marketing for processed products
	4. Number of Groups is Linked with buyers (market), number of contracts.
	5. amount of processed buckwheat tons total per group
M. Branding and packaging is developed	1. Number of Groups produce with branding

U. Value chain upgrading strategy implemented in the *post-harvest and storage* segments of the value chain	1. Appropriate storage methods/technologies identified and installed for harvested buckwheat & legumes at the primary cooperative level (Act. 3.6)
	2. Number of Groups trained in harvesting, post-harvest handling, sorting, and storage (Act. 3.6)
	3. Number of Groups applying new techniques, improved harvesting techniques, post-harvest handling and storage (Act. 3.6)
V. Value chain upgrading strategy implemented in the *production* segment of the value chain	1. Improved knowledge of the primary producers (on agronomy, market prices, etc.) (Act. 3.3)
	2. Improved primary producer extension

	groups have access to financing/investment (if necessary)		(for use across all project products) (Act. 3.3)			services (all relevant materials/protocols posted on GAMK or MoA websites. (Act. 3.3)
E. Producer groups registered as legal entities (cooperatives) (Act 1.4)	1. Number of Groups educated on organizational types (Act 1.3).	Link to W		2. Packaging is developed and tested		3. Number of Groups apply (received/piloted systems of DRR, production protocols to minimize risks of new crops (buckwheat & legumes) (Act. 3.4)
	2. Number of Buckwheat and lentil producer groups registered in State Registry (with women-leadership @40% & youth employment @ 30%).			3. Promotional and marketing strategies developed and tested with possible product trialing, free samples, focus groups, etc.		4. Number of Groups are informed/trained and apply GAP and disaster risk management for buckwheat & legumes (Act. 3.4)
F. Producer Groups are trained in production, business operation/management, and accounting (gendered) (Act. 1.5)	1. Number of Farmers trained in GAP		N. Co-financing for business operation is ensured and processing equipment is installed (Act. 2.2)	1. Co-financing for proper business operation is arranged	W. Supporting/cross-cutting actors/institutions collaborate to implement their components of the value chain upgrading strategy (including the MoA, private sector service providers,	1. Number of Trained extension services support development of the value chain actors (TOT in GAP for buckwheat & lentils, business, finance, branding, marketing) (Act. 3.2)

	2. Number of Women, youth and vulnerable groups engaged in group operations
	3. Number of Producer groups trained in organizational development, business operation/management
G. Primary groups develop business plans (and improved understanding of planned business) (Act. 1.5)	1. Number of Business plans adapted to selected groups/locations
	2. Number of Primary groups supported in developing/adapting their own business plans (different groups with different goals)
	3. Groups' needs assessment conducted

Link to P

	2. Number of locations and buildings refurbished/constructed
	3. Processing and packaging technologies/equipment installed, tested. (UNIDO budget, Act 2.2)
O. VA Groups are linked to finance schemes, investors, financers	1. Number of Groups are in negotiation with investors and/or financial institutions
	2. Number of VA groups get affordable credits for construction and/or operational costs of processing
P. VA Group is registered	1. Number of Representative members nominated

Link to W

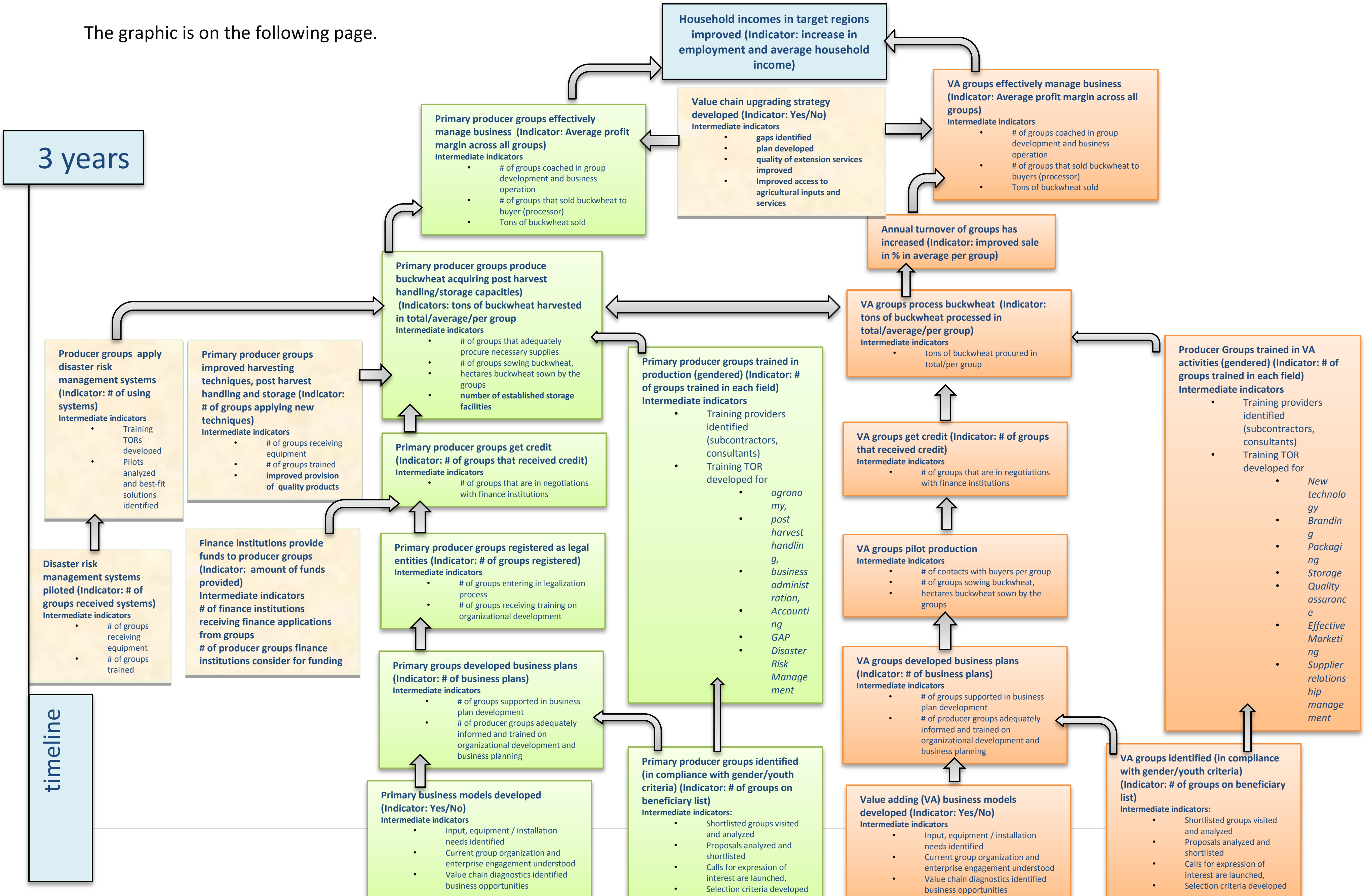
NGOs and financial institutions)	2. FINANCE: Innovative financing facilities for buckwheat and lentils developed and presented to partners (Act. 3.9)
	3. FINANCE: Value chain actors, including primary producers and processors groups' have access to financial capital for operation (with at least 0.5mln € secured) (Act. 3.9)
X. Value chain upgrading/intervention strategy and implementation plan developed to bridge gaps	1. Value chain upgrading strategy developed based on results of value chain analysis
Y. Value chain analysis completed for buckwheat and legumes, showing gaps and constraints	1. Value chain gaps/priorities are identified and analyzed (Act. 3.1)

	4. Co-financing needs discussed with groups, included in business plans			2.Number of VA Groups registered with the State Registry
H. Business models are developed based on VC analysis (gendered), needs are identified (Act 1.8)	1. VC diagnostics/analysis completed, business opportunities identified		Q. Business model of the VA processor group is developed (Act. 1.8, 2.10)	1. VC diagnostics/analysis carried out and business models developed (engagement of women, youth and vulnerable groups)
	2. number of Business models developed (business model enables the engagement of women, youth and vulnerable groups)			2. Input, equipment and construction needs are identified, included in the business model.
	3. Input, equipment and construction needs are identified and included in the business model			3. Cleaner production and energy saving technologies incorporated in the business model.
I. Primary Producer Groups are identified (in compliance with gender and youth criteria) (Act. 1.2, 1.7)	1. Calls for expression of interest are launched introductory community visits organized.	Link to Q		4. Financing scheme included in business plan (working capital& capital investment)
	2. Selection criteria are developed, and agreed with the MoA			5. Number of groups supported in business plan development

	and donors (EU, ADA)			and informed trained on organizational dvlp. and business planning
	3. Proposals are analyzed and shortlisted			
	4. Number of Shortlisted groups visited and evaluated	same with processing groups		

Appendix 4: Graphic presentation of result chain

The graphic is on the following page.



Appendix 5: Questionnaires for household and group survey

QUESTIONNAIRE FOR INTERVIEW - HOUSEHOLD's BASELINE SURVEY

Date/ամսաթիվ
Marz, Community/մարզ, համայնք
Name, Last name of interviewee/հարցվողիանուն, ազգանուն
Interviewee's sex/հարցվողիսեռը՝ 1-տղամարդ, 2-կին
Interviewee's age/հարցվողիտարիքը
number of HH members/ տնայինտնտեսությանանդամներիթիվը
Family/household structure/տնայինտնտեսությանկազմը
Education/կրթությունը՝ *միջնակարգ* *բարձրագույն* *ութամյա*
Status and role of women in the household/ *Կանանցկարգավիճակնուդերը*
տնայինտնտեսուհի *ղեկավար*
Total land area of the household in hectares/տնայինտնտեսությանտարածքը՝ հա
backyard plot/տնամերձ *rented lands/Վարձակալվածհողեր* *farmlands/Ցանքատարածքը*
Crop structure/մշակաբույսերիտեսակները
Grain/հացահատիկ և հատիկաընդեղեն *Vegetables/բանջարեղեն* *Fruit orchards/մրգատու այգի* *Vineyard/խաղողիայգի* *Berries/հատապտուղներ* *Fodder crops/կերայինկուլտուրաներ* *Potato/կարտոֆիլ* *Other/այլ*
Agri.Machinery and equipment units/գյուղ.տեխնիկաևսարքավորումներ, հատ
Wheel Tractor /անիվավորտրակտոր *caterpillar tractor/թրթուրավորտրակտոր* *autotruck/բեռնատարավտոմեքենա* *combines/հացահատիկայինկոմբայն* *forage harvesting machine/կերահավաքկոմբայն* *plow/գութան* *drill/շարքացան* *mower/խոտհնձիչ*

Other /այլ
Availability of infrastructures /Ենթակառուցվածքներիառկայությունը
Շենքեր, շինություններ/արտադրական տարածքներ *cooling storage sq m/Սառնարան, $մ^2$* *greenhouse sq m/Ջերմոց, ջերմատուն, $մ^2$* *Sun-drying facility sq m/Արևային չորանոց, $մ^2$* *drying facility sq m/Արհեստական չորանոց, տարողությունը, կգ* *Processing capacity kg/hour/Վերամշակող հզորություններ, կգ/ժամ* *hail protection system/հակակարկտային համակարգ* *irrigation network/ոռոգման ցանց* *barn, cow-house/գոմ* *other/այլ*
Livestock number/անասնագլխաքանակ
Ընդամենըխոշորեղջերավոր *որից՝Cows/կովեր* *Sheep/Goat/ոչխարնայծ* *Pigs/խոզեր* *Chicken/թռչուններ* *Beehives/մեղվաընտանիք* *Other/այլ*
Employment/աշխատողներիթիվը
Men/տղամարդիկ *Women/կանայք*
Number of young people/երիտասարդներիթիվը(մինչև 35 տարեկան)
working hours/աշխատանքիտևողությունը(ժամ)
Labor division between women and men/ *աշխատանքիբաժանումըտղամարդկանցևկանանցմիջև*
cultivation/հողագործություն *horticulture/այգեգործություն* *livestock care/անասուններիխնամք* *milking/կիթ* *milk processing/կաթիվերամշակում* *sales/վաճառք*
Total Yield, produce of the HH/տնտեսությանընդհանուրբերք/արտադրանք
Cereals/հացահատիկ և հատիկաընդեղեն *Vegetables/բանջարեղեն* *Berries/հատապտուղ* *Fruits /պտուղ* *Grapes/ խաղող* *Meat/poultry/մսամթերք* *Milk/ Կաթ*

Diary/կաթնամթերք
Herbs and plants/դեղա(բույսեր)
New product due to the project/նորարտադրատեսակծրագրիարդյունքում
Other/այլ

Sales channels/Share of products to different markets/մթերքիարտադրանքիբաժինըտարբերշուկաներում (%)
farm-gate/տեղում
local or regional market/տեղականշուկայում
to processors/վերամշակողներին
to intermediaries/միջնորդներին
to supermarkets/խանութ, սուպերմարկետներին
export /արտահանում`երկիր
other (specify) այլ

Number of Suppliers/մատակարարներիթիվը
including women /այդթվումկանայք
including youth /այդթվումերիտասարդներ

Financial data /Ֆինանսականտվյալներ (AMD/ՀՀդրամ)

Average monthly salary in AMD/միջինամսականաշխատավարձը`ՀՀդրամ
men's salary/տղամարդկանցաշխատավարձը
women's salaray/կանանցաշխատավարձը

Annual Household Income Variability (by season or by year) տնայինտնտեսությանեկամտիփոփոխականությունըսեզոնայինկամտարեկանկտրվածքով

Remittances/transfert received/ստացվածդրամայինփոխանցումներ

Annual turnover/տարեկանշրջանառություն

Income from the sales of the agriproduct in AMD/Գյուղմթերքիվաճառքիցստացվածհասույթ, հազ. դրամ

Income from the target crop produce in AMD/Թիրախայինմշակաբույսիցստացվածհասույթըհազ. դրամ

Annual Expenses in AMD/տարեկանծախսեր ՀՀդրամ

Annual production expenses for agri.products in AMD (incl. donor funding)/Տարվաընթացքումգյուղմթերքիարտադրությանվրակատարվածծախսերը (ներառյալդոնորների), դրամ
Annual production expenses for target agri. Product in AMD/Տարվաընթացքումտվյալգյուղմթերքիարտադրությանվրակատարվածծախսերը (ներառյալդոնորների), դրամ

Earnings/income from the product produced compared to other HH /եկամուտըհամեմատածայլտնտեսությանեկամտիհետ

Total net income from agriculture in AMD/Ընդամենըզուտեկամուտգյուղատնտեսությունից ՝ՀՀդրամ *Total net income from the target product in AMD/Ընդամենըզուտեկամուտտվյալմթերքից ՝ՀՀդրամ*
Type of co-financing/Համաֆինանսավորմանտեսակը *monetary/փողիտեսքով* *equipment, machinery/սարքավորումներ,տեխնիկա*
Loan amount (if taken)/վարկիգումարը
Purpose of the loan/վարկինպատակը
Needs for Training/Ուսուցմանկարիքները
Organizational/ Կազմակերպչական
Business /Ձեռներեցության
Accounting/Հաշվապահական
Greenhouse management/ջերմոցայինտնտեսության
Agricultural production/գյուղմթերքիարտադրության
Food safety/Սննդիանվտանգության
Technical (packaging, equipment use, etc.)/Տեխնիկական ՝փաթեթավորում, սարքավորումներիշահագործումևայլն
Marketing/Շուկայավարման
Vulnerability level of the household/տնայինտնտեսությանխոցելիությանմակարդակը *High/Բարձր* *Average/Միջին* *Low/Ցածր*

Observations, Notes/Դիտարկումներ, նշումներ
indicators of success for men/women/հաջողությանցրավականըտղամարդկանց/կանանցհամար *access to resources for men/women/ ռեսուրսներիմատչելիությունըտղամարդկանց/կանանցհամար* *role in decision-making of men/women/որոշումներիկայացմանգործումտղամարդկանց/կանանց դերը*

QUESTIONNAIRE FOR INTERVIEW - GROUP's Baseline Survey

Date /ամսաթիվ

Marz/Community/մարզ/համայնք
Name, Last name of the group leader/խմբիղեկավարիանուն, ազգանուն
Status of the group/խմբիկարգավիճակը՝
Cooperative/կոոպերատիվ *Association/ասոցիացիա* *Economic association-LLC, CJSC,OJSC/Տնտեսականընկերակցություն՝ՍՊԸ, ՓԲԸ, ԲԲԸ* *NGO/ՀԿ* *unregistered/չգրանցված* *other /այլ*
Interviewee's sex/հարցվողիսեռը՝ 1-տղամարդ, 2-կին
Interviewee's age/հարցվողիտարիքը
number of the group members/(# of youth)/խմբիանդամներիթիվը
Status/role of women in the group/ *Կանանցկարգավիճակնուդերըխմբում*
ղեկավար *հաշվապահ* *աշխատող* *այլ*
Total land area in hectares/հողատարածքը՝ հա
backyard plot/տնամերձ
rented lands/Վարձակալվածհողեր
farmlands/Ցանքատարածքը
Crop structure/մշակաբույսերիտեսակները՝ *Grain/հացահատիկ և հատիկաընդեղեն* *Vegetables/բանջարեղեն* *Fruit orchards/մրգատու այգի* *Vineyard/խաղողիայգի* *Berries/հատապտուղներ* *Fodder crops/կերայինկուլտուրաներ* *Potato/կարտոֆիլ* *Other/այլ*

Agri.Machinery and equipment units/գյուղ.տեխնիկաևսարքավորումներ, հատ
Wheel Tractor /անիվավորտրակտոր *caterpillar tractor/թրթուրավորտրակտոր* *auto truck/բեռնատարավտոմեքենա* *combines/հացահատիկայինկոմբայն* *forage harvesting machine/կերահավաքկոմբայն* *plow/գութան* *drill/շարքացան* *mower/խոտհնձիչ* *Other /այլ*

Availability of infrastructures /Ենթակառուցվածքներիառկայությունը
Շենքեր, շինություններ, արտադրականտարածքներ, մ²

cooling storage sq m/ Սառնարան, մ^2
greenhouse sq m/Ջերմոց, ջերմատուն, մ^2
Sun-drying facility sq m/ Արևայինչորանոց, մ^2
drying facility sq m/ Արհեստականչորանոց, տարողությունը, կգ
Processing capacity kg/hour/ Վերամշակողհզորություններ, կգ/ժամ
hail protection system/ հակակարկտայինհամակարգ
irrigation network/ ոռոգմանցանց
barn, cow house/ գոմ
other/ այլ

Livestock number/ անասնագլխաքանակ `
Ընդամենըխոշորեղջերավոր
որից `Cows/ կովեր
Sheep/Goat/ ոչխարևայծ
Pigs/ խոզեր
Chicken/ թռչուններ
Beehives/ մեղվաընտանիք
Other/ այլ

Employment/ աշխատողներիթիվը `

Men/ տղամարդիկ
Women/ կանայք

number of young people (under age 35/ երիտասարդներիթիվը(մինչև 35 տարեկան)

working hours/ աշխատանքիտևողությունը (ժամ)

Labor division in the group between women and men/
աշխատանքիբաժանումըխմբումտղամարդկանցևկանանցմիջև `

cultivation/ հողագործություն
horticulture/ այգեգործություն
livestock care/ անասուններիխնամք
milking/ կիթ
milk processing/ կաթիվերամշակում
sales/ վաճառք

Time dedicated to rural
production/ Գյուղմթերքիարտադրությանվրածախսածժամանակը

by men/ տղամարդկանցկողմից
by women/ կանանցկողմից

Total Yield, produce of the
group/ խմբիգործունեությանարդյունքումստացվածընդհանուրբերքը/արտադրանքը `

Cereals/ հացահատիկ և հատիկաընդեղեն
Vegetables/ բանջարեղեն
Berries/ հատապտուղ
Fruits / պտուղ

Grapes/ խաղող *Meat/poultry/մսամթերք* *Milk/ Կաթ* *Diary/կաթնամթերք* *Herbs and plants/դեղա(բույսեր)* *New product due to the project/նորարտադրատեսակծրագրիարդյունքում* *Other/այլ*
Sales channels/Share of products of the group to different markets/խմբայինգործունեությանմթերքիարտադրանքիբաժինըտարբերշուկաներում (%) *farm-gate/տեղում* *local or regional market/տեղականշուկայում* *to processors/վերամշակողներին* *to intermediaries/միջնորդներին* *to supermarkets/խանութ, սուպերմարկետներին* *export /արտահանում՝երկիր* *other (specify) այլ*

Number of Suppliers/մատակարարներիթիվը *including women /այդթվումկանայք* *including youth /այդթվումերիտասարդներ*

Financial data of the group production/Ֆինանսականտվյալներ (AMD/ՀՀդրամ) խմբայինգործունեությանարտադրանքիհամար
Average monthly salary within the group in AMD/միջինամսականաշխատավարձըխմբում ՀՀդրամ *men's salary/տղամարդկանց* *women's salaray/կանանց*
Annual Income Variability (by season or by year)/եկամտիփոփոխականությունըսեզոնայինկամտարեկանկտրվածքով *Annual turnover/տարեկանշրջանառություն*
Income from the sales of the agriproduct in AMD/Գյուղմթերքիվաճառքիցստացվածհասույթ, հազ. դրամ
Income from the target crop produce in AMD/Թիրախայինմշակաբույսիցստացվածհասույթըհազ. դրամ
Annual Expenses in AMD/տարեկանծախսեր՝ՀՀդրամ
Annual production expenses for agriproducts in AMD (incl. donor funding)/Տարվաընթացքումգյուղմթերքիարտադրությանվրակատարվածծախսերը (ներառյալդոնորների), դրամ *Annual production expenses for target agri. Product in AMD/Տարվաընթացքումտվյալգյուղմթերքիարտադրությանվրակատարվածծախսերը (ներառյալդոնորների), դրամ*

Earnings from the product produced the group compared to other group / income/խմբիեկամուտըհամեմատածայլխմբիեկամտիհետ
Total net income from agriculture in AMD/Ընդամենըզուտեկամուտգյուղատնտեսությունից՝ՀՀդրամ *Total net income from the target product in AMD/Ընդամենըզուտեկամուտտվյալմթերքից՝ՀՀդրամ*
Type of co-financing/Համաֆինանսավորմանտեսակը
monetary/փողիտեսքով *equipment, machinery/սարքավորումներ,տեխնիկա*
Loan amount (if taken)/վարկիգումարը *Purpose/նպատակը*
Needs for Training/Ուսուցմանկարիքները
Organizational/Կազմակերպչական
Business /Ձեռներեցության
Accounting/Հաշվապահական
Greenhouse management/ջերմոցայինտնտեսության
Agricultural production/գյուղմթերքիարտադրության
Food safety/Սննդիանվտանգության
Technical (packaging, equipment use, etc.)/Տեխնիկական՝փաթեթավորում, սարքավորումներիշահագործումևայլն
Marketing/Շուկայավարման
Vulnerability level of the households in the group/ խմբումտնայինտնտեսություններիխոցելիությանմակարդակը
High/Բարձր *Average/Միջին* *Low/Ցածր*

Observations, Notes/Դիտարկումներ, նշումներ
indicators of success for men/women/հաջողությանցուցանիշներըտղամարդկանց/կանանցհամար *access to resources for men/women/ ռեսուրսներիմատչելիությունըտղամարդկանց/կանանցհամար* *role in decision-making of men/women/որոշումներիկայացմանգործումտղամարդկանց/կանանցդերը*

Appendix 6: Bibliography

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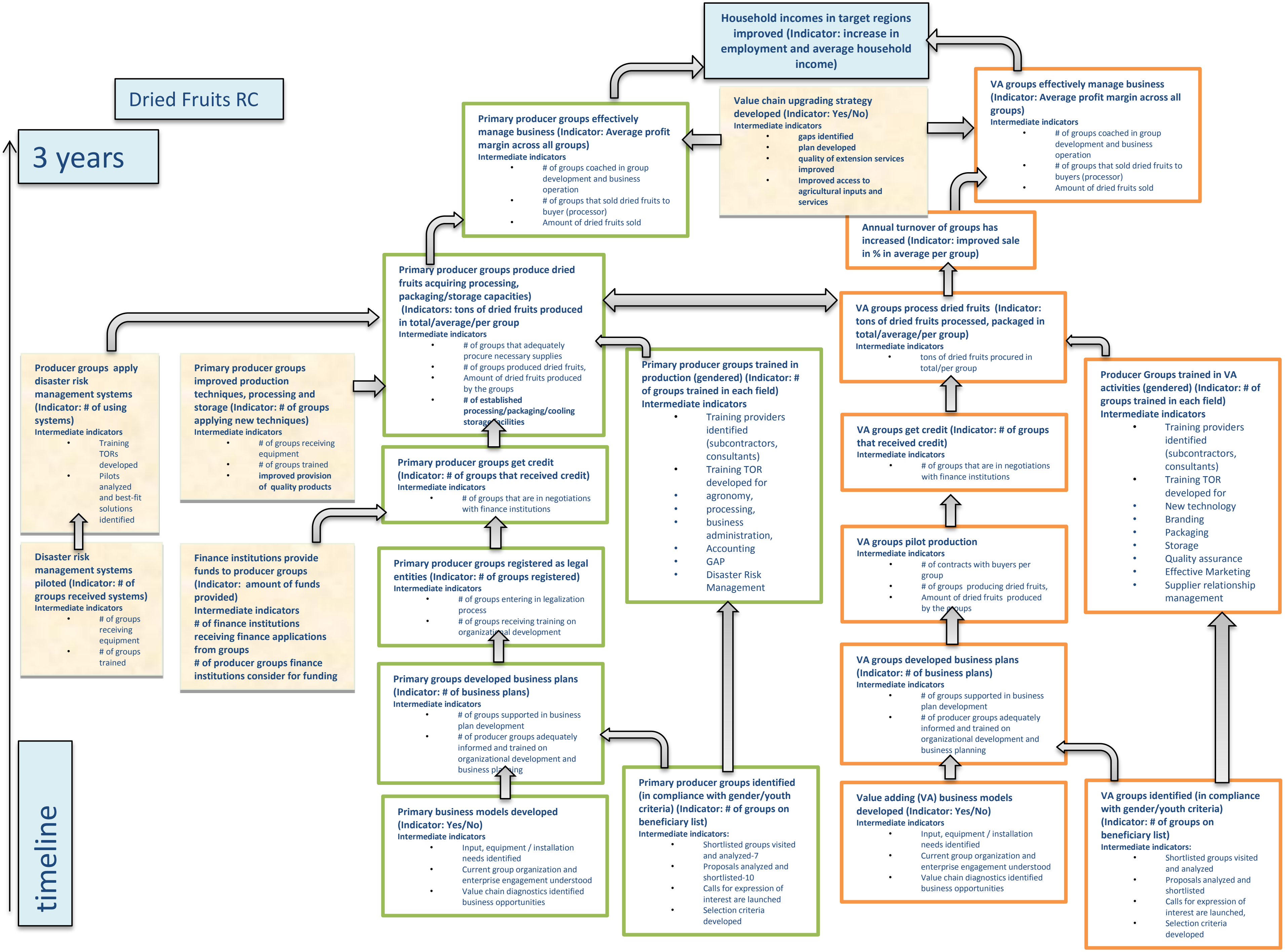
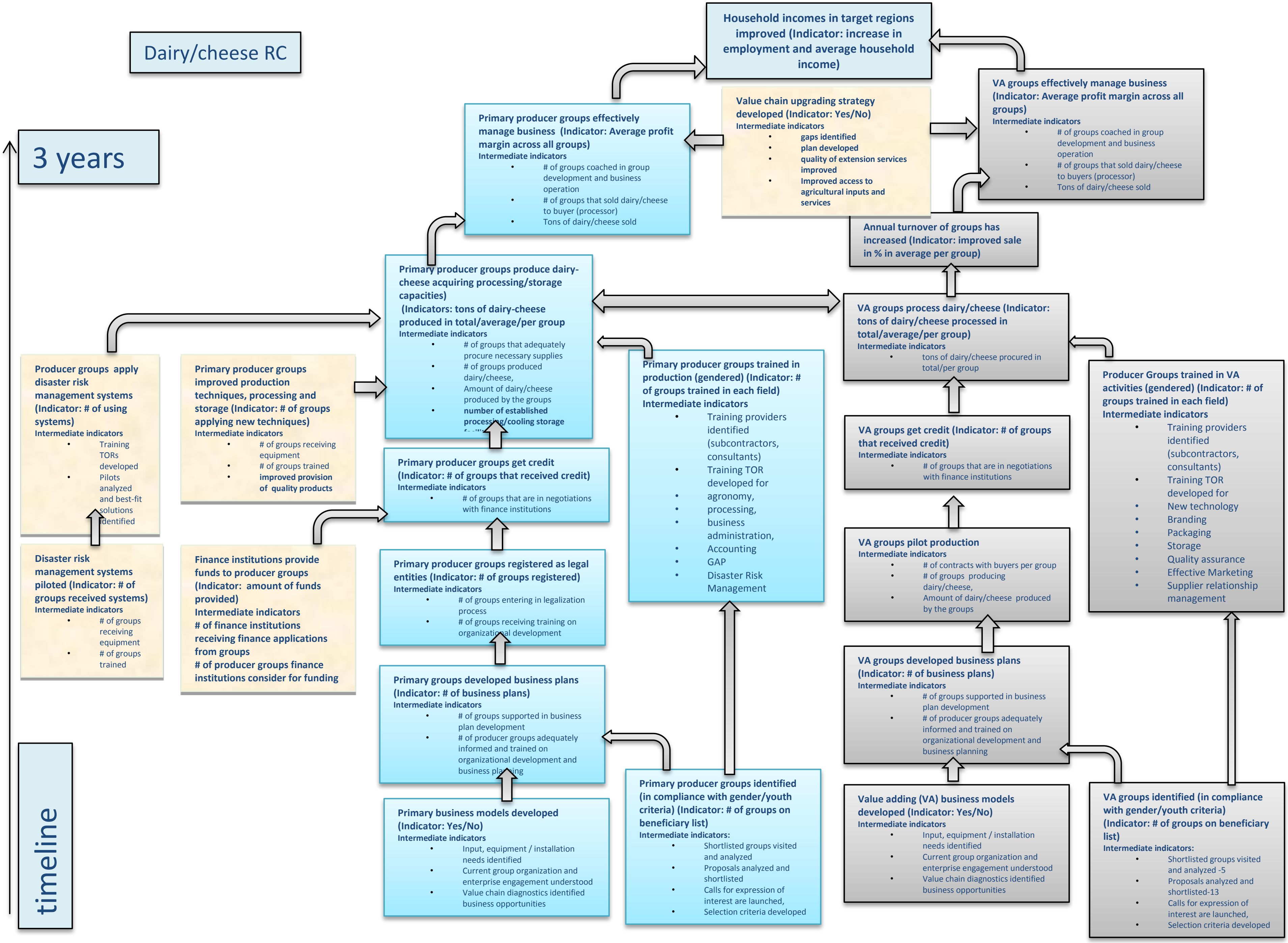
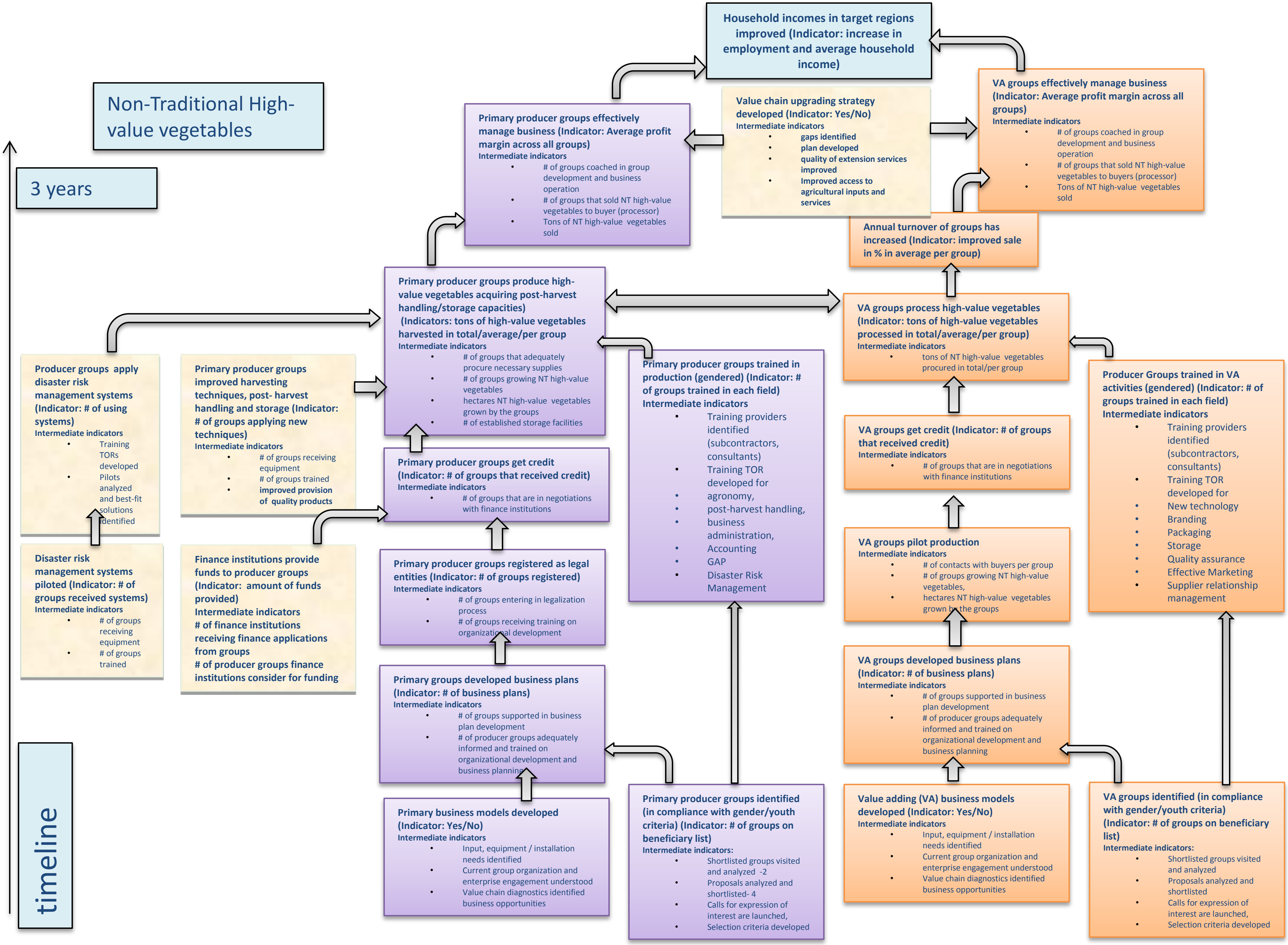
Annex 15: Examples of results chains for dried fruits, dairy/cheese, non-traditional high- value vegetables and buckwheat

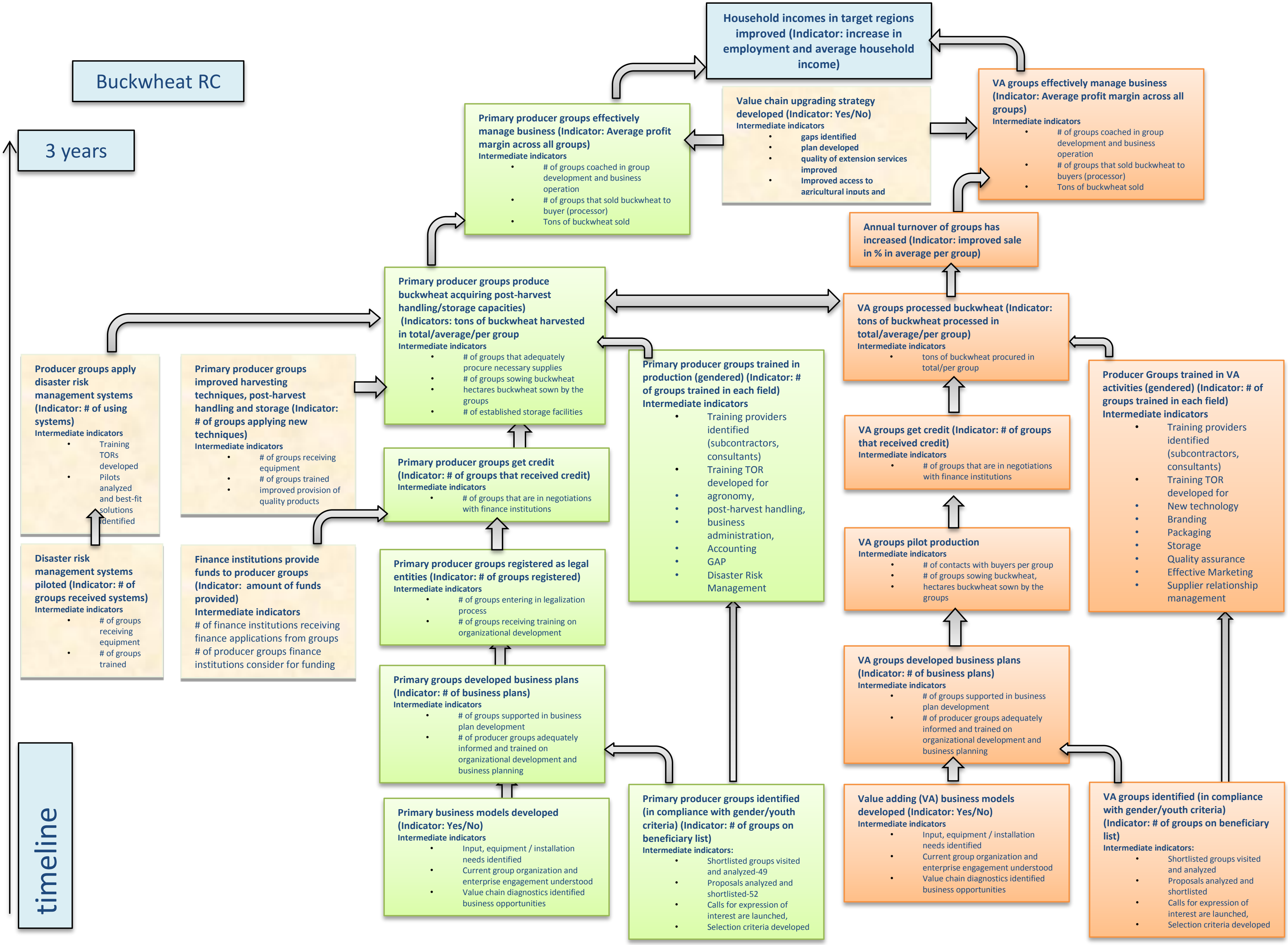
The diagrams below shows conceptually how the different implementation activities in the dried fruits, dairy/cheese, non- traditional high value vegetables and buckwheat value chains will lead to the various indicators, including creating rural jobs and increasing the income of farmers.


Dried Fruits RC
3 years
timeline
Household incomes in target regions improved (Indicator: increase in employment and average household income)
VA groups effectively manage business (Indicator: Average profit margin across all groups)
Intermediate indicators
• # of groups coached in group development and business operation
• # of groups that sold dried fruits to buyers (processor)
• Amount of dried fruits sold
Value chain upgrading strategy developed (Indicator: Yes/No)
Intermediate indicators
• gaps identified
• plan developed
• quality of extension services improved
• Improved access to agricultural inputs and services
Primary producer groups effectively manage business (Indicator: Average profit margin across all groups)
Intermediate indicators
• # of groups coached in group development and business operation
• # of groups that sold dried fruits to buyer (processor)
• Amount of dried fruits sold
Annual turnover of groups has increased (Indicator: improved sale in % in average per group)
Primary producer groups produce dried fruits acquiring processing, packaging/storage capacities)
(Indicators: tons of dried fruits produced in total/average/per group
Intermediate indicators
• # of groups that adequately procure necessary supplies
• # of groups produced dried fruits,
• Amount of dried fruits produced by the groups
• # of established processing/packaging/cooling storage facilities
VA groups process dried fruits (Indicator: tons of dried fruits processed, packaged in total/average/per group)
Intermediate indicators
• tons of dried fruits procured in total/per group
Producer groups apply disaster risk management systems (Indicator: # of using systems)
Intermediate indicators
• Training TORs developed
• Pilots analyzed and best-fit solutions identified
Primary producer groups improved production techniques, processing and storage (Indicator: # of groups applying new techniques)
Intermediate indicators
• # of groups receiving equipment
• # of groups trained
• improved provision of quality products
Primary producer groups trained in production (gendered) (Indicator: # of groups trained in each field)
Intermediate indicators
• Training providers identified (subcontractors, consultants)
• Training TOR developed for
• agronomy,
• processing,
• business administration,
• Accounting
• GAP
• Disaster Risk Management
Producer Groups trained in VA activities (gendered) (Indicator: # of groups trained in each field)
Intermediate indicators
• Training providers identified (subcontractors, consultants)
• Training TOR developed for
• New technology
• Branding
• Packaging
• Storage
• Quality assurance
• Effective Marketing
• Supplier relationship management
Primary producer groups get credit (Indicator: # of groups that received credit)
Intermediate indicators
• # of groups that are in negotiations with finance institutions
VA groups get credit (Indicator: # of groups that received credit)
Intermediate indicators
• # of groups that are in negotiations with finance institutions
Disaster risk management systems piloted (Indicator: # of groups received systems)
Intermediate indicators
• # of groups receiving equipment
• # of groups trained
Finance institutions provide funds to producer groups (Indicator: amount of funds provided)
Intermediate indicators
# of finance institutions receiving finance applications from groups
# of producer groups finance institutions consider for funding
Primary producer groups registered as legal entities (Indicator: # of groups registered)
Intermediate indicators
• # of groups entering in legalization process
• # of groups receiving training on organizational development
VA groups pilot production
Intermediate indicators
• # of contracts with buyers per group
• # of groups producing dried fruits,
• Amount of dried fruits produced by the groups
Primary groups developed business plans (Indicator: # of business plans)
Intermediate indicators
• # of groups supported in business plan development
• # of producer groups adequately informed and trained on organizational development and business planning
VA groups developed business plans (Indicator: # of business plans)
Intermediate indicators
• # of groups supported in business plan development
• # of producer groups adequately informed and trained on organizational development and business planning
Primary business models developed (Indicator: Yes/No)
Intermediate indicators
• Input, equipment / installation needs identified
• Current group organization and enterprise engagement understood
• Value chain diagnostics identified business opportunities
Primary producer groups identified (in compliance with gender/youth criteria) (Indicator: # of groups on beneficiary list)
Intermediate indicators:
• Shortlisted groups visited and analyzed-7
• Proposals analyzed and shortlisted-10
• Calls for expression of interest are launched
• Selection criteria developed
Value adding (VA) business models developed (Indicator: Yes/No)
Intermediate indicators
• Input, equipment / installation needs identified
• Current group organization and enterprise engagement understood
• Value chain diagnostics identified business opportunities
VA groups identified (in compliance with gender/youth criteria) (Indicator: # of groups on beneficiary list)
Intermediate indicators:
• Shortlisted groups visited and analyzed
• Proposals analyzed and shortlisted
• Calls for expression of interest are launched,
• Selection criteria developed



Dairy/cheese RC
3 years
timeline
Household incomes in target regions improved (Indicator: increase in employment and average household income)
VA groups effectively manage business (Indicator: Average profit margin across all groups)
Intermediate indicators
• # of groups coached in group development and business operation
• # of groups that sold dairy/cheese to buyers (processor)
• Tons of dairy/cheese sold
Value chain upgrading strategy developed (Indicator: Yes/No)
Intermediate indicators
• gaps identified
• plan developed
• quality of extension services improved
• Improved access to agricultural inputs and services
Primary producer groups effectively manage business (Indicator: Average profit margin across all groups)
Intermediate indicators
• # of groups coached in group development and business operation
• # of groups that sold dairy/cheese to buyer (processor)
• Tons of dairy/cheese sold
Annual turnover of groups has increased (Indicator: improved sale in % in average per group)
Primary producer groups produce dairy-cheese acquiring processing/storage capacities)
(Indicators: tons of dairy-cheese produced in total/average/per group
Intermediate indicators
• # of groups that adequately procure necessary supplies
• # of groups produced dairy/cheese,
• Amount of dairy/cheese produced by the groups
• number of established processing/cooling storage
VA groups process dairy/cheese (Indicator: tons of dairy/cheese processed in total/average/per group)
Intermediate indicators
• tons of dairy/cheese procured in total/per group
Producer groups apply disaster risk management systems (Indicator: # of using systems)
Intermediate indicators
• Training TORs developed
• Pilots analyzed and best-fit solutions identified
Primary producer groups improved production techniques, processing and storage (Indicator: # of groups applying new techniques)
Intermediate indicators
• # of groups receiving equipment
• # of groups trained
• improved provision of quality products
Primary producer groups trained in production (gendered) (Indicator: # of groups trained in each field)
Intermediate indicators
• Training providers identified (subcontractors, consultants)
• Training TOR developed for
• agronomy,
• processing,
• business administration,
• Accounting
• GAP
• Disaster Risk Management
Producer Groups trained in VA activities (gendered) (Indicator: # of groups trained in each field)
Intermediate indicators
• Training providers identified (subcontractors, consultants)
• Training TOR developed for
• New technology
• Branding
• Packaging
• Storage
• Quality assurance
• Effective Marketing
• Supplier relationship management
Primary producer groups get credit (Indicator: # of groups that received credit)
Intermediate indicators
• # of groups that are in negotiations with finance institutions
VA groups get credit (Indicator: # of groups that received credit)
Intermediate indicators
• # of groups that are in negotiations with finance institutions
Disaster risk management systems piloted (Indicator: # of groups received systems)
Intermediate indicators
• # of groups receiving equipment
• # of groups trained
Finance institutions provide funds to producer groups (Indicator: amount of funds provided)
Intermediate indicators
# of finance institutions receiving finance applications from groups
# of producer groups finance institutions consider for funding
Primary producer groups registered as legal entities (Indicator: # of groups registered)
Intermediate indicators
• # of groups entering in legalization process
• # of groups receiving training on organizational development
VA groups pilot production
Intermediate indicators
• # of contracts with buyers per group
• # of groups producing dairy/cheese,
• Amount of dairy/cheese produced by the groups
Primary groups developed business plans (Indicator: # of business plans)
Intermediate indicators
• # of groups supported in business plan development
• # of producer groups adequately informed and trained on organizational development and business planning
VA groups developed business plans (Indicator: # of business plans)
Intermediate indicators
• # of groups supported in business plan development
• # of producer groups adequately informed and trained on organizational development and business planning
Primary business models developed (Indicator: Yes/No)
Intermediate indicators
• Input, equipment / installation needs identified
• Current group organization and enterprise engagement understood
• Value chain diagnostics identified business opportunities
Primary producer groups identified (in compliance with gender/youth criteria) (Indicator: # of groups on beneficiary list)
Intermediate indicators:
• Shortlisted groups visited and analyzed
• Proposals analyzed and shortlisted
• Calls for expression of interest are launched,
• Selection criteria developed
Value adding (VA) business models developed (Indicator: Yes/No)
Intermediate indicators
• Input, equipment / installation needs identified
• Current group organization and enterprise engagement understood
• Value chain diagnostics identified business opportunities
VA groups identified (in compliance with gender/youth criteria) (Indicator: # of groups on beneficiary list)
Intermediate indicators:
• Shortlisted groups visited and analyzed -5
• Proposals analyzed and shortlisted-13
• Calls for expression of interest are launched,
• Selection criteria developed


Non-Traditional High-value vegetables
3 years
timeline
Household incomes in target regions improved (Indicator: increase in employment and average household income)
VA groups effectively manage business (Indicator: Average profit margin across all groups)
Intermediate indicators
• # of groups coached in group development and business operation
• # of groups that sold NT high-value vegetables to buyers (processor)
• Tons of NT high-value vegetables sold
Value chain upgrading strategy developed (Indicator: Yes/No)
Intermediate indicators
• gaps identified
• plan developed
• quality of extension services improved
• Improved access to agricultural inputs and services
Primary producer groups effectively manage business (Indicator: Average profit margin across all groups)
Intermediate indicators
• # of groups coached in group development and business operation
• # of groups that sold NT high-value vegetables to buyer (processor)
• Tons of NT high-value vegetables sold
Annual turnover of groups has increased (Indicator: improved sale in % in average per group)
Primary producer groups produce high-value vegetables acquiring post-harvest handling/storage capacities)
(Indicators: tons of high-value vegetables harvested in total/average/per group
Intermediate indicators
• # of groups that adequately procure necessary supplies
• # of groups growing NT high-value vegetables
• hectares NT high-value vegetables grown by the groups
• # of established storage facilities
VA groups process high-value vegetables (Indicator: tons of high-value vegetables processed in total/average/per group)
Intermediate indicators
• tons of NT high-value vegetables procured in total/per group
Producer groups apply disaster risk management systems (Indicator: # of using systems)
Intermediate indicators
• Training TORs developed
• Pilots analyzed and best-fit solutions identified
Primary producer groups improved harvesting techniques, post- harvest handling and storage (Indicator: # of groups applying new techniques)
Intermediate indicators
• # of groups receiving equipment
• # of groups trained
• improved provision of quality products
Primary producer groups trained in production (gendered) (Indicator: # of groups trained in each field)
Intermediate indicators
• Training providers identified (subcontractors, consultants)
• Training TOR developed for
• agronomy,
• post-harvest handling,
• business administration,
• Accounting
• GAP
• Disaster Risk Management
Producer Groups trained in VA activities (gendered) (Indicator: # of groups trained in each field)
Intermediate indicators
• Training providers identified (subcontractors, consultants)
• Training TOR developed for
• New technology
• Branding
• Packaging
• Storage
• Quality assurance
• Effective Marketing
• Supplier relationship management
Primary producer groups get credit (Indicator: # of groups that received credit)
Intermediate indicators
• # of groups that are in negotiations with finance institutions
VA groups get credit (Indicator: # of groups that received credit)
Intermediate indicators
• # of groups that are in negotiations with finance institutions
Disaster risk management systems piloted (Indicator: # of groups received systems)
Intermediate indicators
• # of groups receiving equipment
• # of groups trained
Finance institutions provide funds to producer groups (Indicator: amount of funds provided)
Intermediate indicators
# of finance institutions receiving finance applications from groups
# of producer groups finance institutions consider for funding
Primary producer groups registered as legal entities (Indicator: # of groups registered)
Intermediate indicators
• # of groups entering in legalization process
• # of groups receiving training on organizational development
VA groups pilot production
Intermediate indicators
• # of contacts with buyers per group
• # of groups growing NT high-value vegetables,
• hectares NT high-value vegetables grown by the groups
Primary groups developed business plans (Indicator: # of business plans)
Intermediate indicators
• # of groups supported in business plan development
• # of producer groups adequately informed and trained on organizational development and business planning
VA groups developed business plans (Indicator: # of business plans)
Intermediate indicators
• # of groups supported in business plan development
• # of producer groups adequately informed and trained on organizational development and business planning
Primary business models developed (Indicator: Yes/No)
Intermediate indicators
• Input, equipment / installation needs identified
• Current group organization and enterprise engagement understood
• Value chain diagnostics identified business opportunities
Primary producer groups identified (in compliance with gender/youth criteria) (Indicator: # of groups on beneficiary list)
Intermediate indicators:
• Shortlisted groups visited and analyzed -2
• Proposals analyzed and shortlisted- 4
• Calls for expression of interest are launched,
• Selection criteria developed
Value adding (VA) business models developed (Indicator: Yes/No)
Intermediate indicators
• Input, equipment / installation needs identified
• Current group organization and enterprise engagement understood
• Value chain diagnostics identified business opportunities
VA groups identified (in compliance with gender/youth criteria) (Indicator: # of groups on beneficiary list)
Intermediate indicators:
• Shortlisted groups visited and analyzed
• Proposals analyzed and shortlisted
• Calls for expression of interest are launched,
• Selection criteria developed


Buckwheat RC
3 years
timeline
Household incomes in target regions improved (Indicator: increase in employment and average household income)
VA groups effectively manage business (Indicator: Average profit margin across all groups)
Intermediate indicators
# of groups coached in group development and business operation
# of groups that sold buckwheat to buyers (processor)
Tons of buckwheat sold
Value chain upgrading strategy developed (Indicator: Yes/No)
Intermediate indicators
gaps identified
plan developed
quality of extension services improved
Improved access to agricultural inputs and
Primary producer groups effectively manage business (Indicator: Average profit margin across all groups)
Intermediate indicators
# of groups coached in group development and business operation
# of groups that sold buckwheat to buyer (processor)
Tons of buckwheat sold
Annual turnover of groups has increased (Indicator: improved sale in % in average per group)
Primary producer groups produce buckwheat acquiring post-harvest handling/storage capacities) (Indicators: tons of buckwheat harvested in total/average/per group
Intermediate indicators
# of groups that adequately procure necessary supplies
# of groups sowing buckwheat
hectares buckwheat sown by the groups
# of established storage facilities
VA groups processed buckwheat (Indicator: tons of buckwheat processed in total/average/per group)
Intermediate indicators
tons of buckwheat procured in total/per group
Producer groups apply disaster risk management systems (Indicator: # of using systems)
Intermediate indicators
Training TORs developed
Pilots analyzed and best-fit solutions identified
Primary producer groups improved harvesting techniques, post-harvest handling and storage (Indicator: # of groups applying new techniques)
Intermediate indicators
# of groups receiving equipment
# of groups trained
improved provision of quality products
Primary producer groups trained in production (gendered) (Indicator: # of groups trained in each field)
Intermediate indicators
Training providers identified (subcontractors, consultants)
Training TOR developed for
agronomy,
post-harvest handling,
business administration,
Accounting
GAP
Disaster Risk Management
Producer Groups trained in VA activities (gendered) (Indicator: # of groups trained in each field)
Intermediate indicators
Training providers identified (subcontractors, consultants)
Training TOR developed for
New technology
Branding
Packaging
Storage
Quality assurance
Effective Marketing
Supplier relationship management
Primary producer groups get credit (Indicator: # of groups that received credit)
Intermediate indicators
# of groups that are in negotiations with finance institutions
VA groups get credit (Indicator: # of groups that received credit)
Intermediate indicators
# of groups that are in negotiations with finance institutions
Disaster risk management systems piloted (Indicator: # of groups received systems)
Intermediate indicators
# of groups receiving equipment
# of groups trained
Finance institutions provide funds to producer groups (Indicator: amount of funds provided)
Intermediate indicators
# of finance institutions receiving finance applications from groups
# of producer groups finance institutions consider for funding
Primary producer groups registered as legal entities (Indicator: # of groups registered)
Intermediate indicators
# of groups entering in legalization process
# of groups receiving training on organizational development
VA groups pilot production
Intermediate indicators
# of contacts with buyers per group
# of groups sowing buckwheat,
hectares buckwheat sown by the groups
Primary groups developed business plans (Indicator: # of business plans)
Intermediate indicators
# of groups supported in business plan development
# of producer groups adequately informed and trained on organizational development and business planning
VA groups developed business plans (Indicator: # of business plans)
Intermediate indicators
# of groups supported in business plan development
# of producer groups adequately informed and trained on organizational development and business planning
Primary business models developed (Indicator: Yes/No)
Intermediate indicators
Input, equipment / installation needs identified
Current group organization and enterprise engagement understood
Value chain diagnostics identified business opportunities
Primary producer groups identified (in compliance with gender/youth criteria) (Indicator: # of groups on beneficiary list)
Intermediate indicators:
Shortlisted groups visited and analyzed-49
Proposals analyzed and shortlisted-52
Calls for expression of interest are launched,
Selection criteria developed
Value adding (VA) business models developed (Indicator: Yes/No)
Intermediate indicators
Input, equipment / installation needs identified
Current group organization and enterprise engagement understood
Value chain diagnostics identified business opportunities
VA groups identified (in compliance with gender/youth criteria) (Indicator: # of groups on beneficiary list)
Intermediate indicators:
Shortlisted groups visited and analyzed
Proposals analyzed and shortlisted
Calls for expression of interest are launched,
Selection criteria developed