



TOGETHER
for a sustainable future

OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

AA070716

Rural sustainable development Through the development of the horticulture sector in Iran

SITUATION ANALYSIS

Rural unemployment

Rural unemployment is a foremost social and economic problem, it differentiates from urban unemployment because, rural population migration to metropolitan areas trigger a cascade of consequences that exacerbate existing problems in both the rural area of origin as well as in the metropolitan area of destination.

Rural population migration to metropolitan areas tends to worsen already critical conditions in urban areas, and particularly in a mega-city such as Tehran. Massive migration to urban areas cause marginalization, social segregation, housing problems, traffic, pollution, poverty, micro-criminality, lack of social services such as sanitation, education, health, etc.

Problems does not affect only metropolitan areas, rural areas are affected as well, in terms of environmental degradation, desertification, soil erosion, aging population, provision of social services, marginalization, poverty, desegregated families, loos of production, culture and traditions, etc.

Past experiences have demonstrated that wrong industrial development plans, aiming to keep rural population in rural areas, have gained modest results, if not on strict financial terms, surely on social and sustainable development terms.

We won't discuss in this paper the dynamics of rural/urban migration however, it is worth mentioning that when "industrial ventures" does not fit into the local environment and community, they often create more problems than opportunities. Problems such as social segregation, detachment from traditional culture and behaviours, raising costs of living, exploitation of natural resources, pollution, losses of skills, etc. are only an example.

A feasible income generation strategy in rural areas

Iran export is highly dependent to oil & gas and their downstream industry, for various reasons the exploitation of non-oil products and services has always lacked behind. In a long term development plan, as reflected in the 6th Five Years Plan, Iran is, to some extent, trying to decouple its economy from the oil & gas industry. The concept of resistance economy set the guideline to distance the Iranian economy from the sole exploitation of natural resources however, is yet to be seen which strategies will be able to deliver cost effective impacts.

The protected agriculture sector, and the manufacturing and servicing sectors linked to it, are unexploited opportunities for the development of Iran.

What is protected agriculture? These are various forms of agriculture for which we employ means that mitigate the impact of climatic conditions on the agriculture activity. Generally speaking, we talk about crops, such as tomato, cucumber, strawberry, flower, etc., produced in greenhouses.

Protected agriculture allows to obtain high added value crops, also known as cash crops, targeting high value markets. The production of this "cash" crops require substantial inputs in terms of labour, capital and knowledge, but also generate substantial incomes along the value chain. From previous experiences in the Mediterranean region and Central America we estimate that one hectare greenhouse create from 12 to 15 jobs and a cash flow of 300,000 US\$/Ha/year.

Water, Land and Human resources management

We have to acknowledge that Iran, as for its geographical conditions cannot be self-sufficient in terms of cereal production therefore, Iran has to rely on countries such as Brazil, Argentina, Canada or Indonesia for part of its supply of wheat, barley, corn, soya beans, palm oil, etc.

Iran covers an area of 1.65 Million Km² of which: 35% are deserts, 7% are cities, industrial areas, roads, and other non-agriculture land, 35% is grassland, 11% is woodland and finally 12% is proper arable land, of which only one third is irrigated. Grassland and woodland allow some marginal productions however, the proper agriculture land remain only 12% of the total area.

As land, and water, are limited production means, there are not many options to increase rural employment and income through traditional extensive agriculture of cereals, fruits and nuts. The ecological disaster at Orumieh Lake is largely caused by wrong policies aiming to boost fruits production in the Orumieh basin. A viable option is to invest on protected agriculture to produce high added value crops by minimizing natural resources exploitation.

The table below show a comparison of inputs/outputs of a typical extensive crop, such as corn, and a cash crop, such as tomato in greenhouse.

| Item | Corn | Tomato greenhouse |
|--|----------------|--------------------------|
| Water consumption m ³ /year | 10,000 | *5,000 to 2,000 |
| Production Ton/Year | 6 to 10 | 150 to 250 |
| Value US\$/ton | 200 | 1,000 |
| Total value crop US\$/Ha/Year | 1,200 to 2,000 | 150,000 to 250,000 |
| Total value inputs** US\$/Ha/Year | 500 | 70,000 to 100,000 |
| Labour hour/Ha/Year*** | 100 | 11,000 to 15,000 |
| Capital investment US\$/Ha | 1,000 | 150,000 to 250,000 |

*Water consumption: depending on the technology implemented, with/without water recycling and recovery

**Inputs: seeds, fertilizers, machineries, labour, handling, etc.

***Labour: direct and indirect labour along the value chain.

From the table above it is clear that extensive crops, such as corn, requires a considerable amount of limited resources, such as water and good arable land, and relatively fewer of abundant resources, such as labour, technical inputs, infrastructure, etc. Extensive crops also generate a modest added value per unit of resource employed however, they requires a limited capital investment.

Cash crops, such as tomato in greenhouse, require fewer of the limited resources, such as water and good arable land, and a lot of the abundant resources, such as labour, technical inputs, infrastructure, etc. Cash crops also generate a high added value per unit of resource employed however, they requires a high capital investment.

In conclusion, cash crops can be an effective mean to address a number of the problems mentioned above, such as water scarcity and water effectiveness, unemployment, migration, effective and efficient utilization of existing infrastructure such as roads, water distribution systems, electricity grids, gas pipes, education, R&D, etc.

The three major means to promote cash crops are: capital, knowledge and management. We will address these later in this document.

Opportunities

An effective way to utilize limited resources, such as water and land, is to assess their return for investment and to promote processes that are both technically feasible, financially profitable and sustainable.

Agriculture is indeed the activity that traditionally links human being to the land however, because of the globalized economy in which we are living, traditional agriculture is unable to provide the economic and social opportunities that people in rural area need, and aim for.

This does not mean a shift to intensive agriculture however, we have to make cost effectiveness assessments of resources before making strategic decisions.

Within the agriculture sector, there are segments of the market, such as horticulture crops, flowers and ornamental plants, which have become extremely globalized and technically and financially extremely complex, crops produced and packed in South America are traded in Rotterdam and sold in Berlin or Tokyo, all in the same day.

Countries such as The Netherlands, Spain, Turkey, Morocco, Colombia, Kenya, relies substantially on agriculture value chains for their economies and employment. Note that this goes beyond the bare value of crops harvested at farms and sold in the market, because an almost equal amount of GDP is generated through the value chain, this includes technical assistance and auxiliary services, equipment, machineries, seeds and fertilizers, infrastructure, and knowledge. Countries such as Spain and The Netherland have developed a considerable market of technical assistance services and equipment related to their hi-tech agriculture sectors.

PROJECT GOALS

The objective of this project is to develop the cash crops sector and its downstream and upstream components.

This includes infrastructures manufacturing and services providers to support the production of crops (downstream), and crops processing, marketing and trading (upstream).

The final goal of this project is to create jobs and generate income in rural areas.

As mentioned earlier, we estimate that 1 Ha greenhouse creates from 12 to 15 jobs and a cash flow of 250,000 US\$/Ha/year.

At its full deployment, the project will generate about 50,000 jobs and a turnover of about US \$1 billion/Year.

PROGRAMME STRATEGY

Specialized agriculture, and so cash crops production, is no longer the traditional form agriculture we knew, where a mixture of traditions and knowledge were passed on from one generation to another, together with a bit of God's will.

Specialized agriculture has become an industrial activity that follow the same rules as any other industrial activity. It is built around long term planning, R&D, product development, system optimization, marketing, financial tools and so on. This project proposal has to be seen in this prospective.

To optimize the use of production means and maximize the profitability along the value chains, the programme will be implemented in four geographical/climatic areas as follow:

1. Dry and hot,
2. Mild and humid,
3. Cool (summer), and
4. Proximity of major metropolitan areas.

The aim is to boost the profitability along the value chains through the optimization of the processes and economies of scale.

Nowadays, consumption patterns of fruit and vegetables are detached from season because consumers got used to find the all range of fruit and vegetable twelve months a year. Globalized supermarket chains have become providers of services rather than goods.

These services are sold to customers in the form of high quality food products available on the shelf. Supermarkets' profitability is measured on US\$/m² therefore, supermarkets need services suppliers rather than suppliers of tomato or strawberry or flowers. These services are built indeed around the specific food item however, they also incorporate a complex mix of other services such as a timely delivery of the product directly on the supermarket's shelf, certification and traceability of the product, a strict quality control and marketing tools such as branding, corporate social responsibility issues, low environmental impact, etc. The more complete is the service the higher is the value added throughout the value chain.

Cash crops production, despite the technological aids provided by greenhouses and other equipment is still seasonal. Overcoming seasonal constrains is possible through technology and other inputs, such as high tech greenhouses, energy for heating and cooling, artificial light, water and fertilizers, etc. All these technologies and inputs are available but they all come at a cost, the worst are the climatic conditions the higher is the production costs.

By operating in four geographical areas this programme will take full advantage of distinct climatic conditions and will be able to optimize the production process. The strategy is to optimize and integrate processes throughout the value chain, also through economies of scale, so to increase profitability at each stage.

Location

Climatically speaking, Iran has been blessed with diversified climatic conditions, from north to south to west it range from hot and dry, to mild and humid, to cool in summer.

Marketing speaking, Iran is the gate between east and west and the heart of the Middle East, with a number of very profitable markets at close reach. Iran has also a very good internal market, with major metropolis such Tehran, Esfahan and Mashhad with millions of consumers and very dynamic and diversified markets.

The objective of this programme is to develop, for each climatic and economic zone, the most cost effective "package" and, by integrating the different "packages", to create efficient and sustainable value chains.

Key topics to assess to select the locations are: climatic conditions, water, energy, human and financial resources, infrastructures, target markets and their access.

- Climatic conditions: cash crops production is seasonal, but market demand is continuous therefore, we have to identify areas with opposite climatic conditions, either a mild winter or a cool summer. This will allow to fetch top quality and premium prices all around the year, ensure a constant supply, and minimize energy costs.
- Water: protected agriculture need a minimum amount of water per unit of production because, evapotranspiration is minimized, drain water is recovered and recycled, and water flow is optimized. Water quality, if not optimal, can be rectified through inverted osmosis or other technologies. Water management can be optimized because the water requirement is forecasted throughout the year allowing the best use of existing water infrastructures, such as dams and channels as well as various form of water supply and auxiliary storage infrastructure.
- Energy: the aim is to minimize energy costs for heating and cooling during the pick of the production season. This is achieved by selecting wisely the location, synchronizing the crop cycles and implementing the best available technologies.
- Human resources: the availability of skilled labour force is essential to minimize the cost for training and cutting down the lead time to enter into operation. Areas with an existent tradition on protected agriculture are preferable, this does not include only "agriculture skills" but also support services, such as metal carpentry; water, electric, heating and cooling systems manufacturing and servicing; extension services; transportation and logistics services; agriculture machineries manufacturing and servicing; etc.
- Financial resources: as we have seen earlier, protected agriculture requires high capital investment, 150,000 to 250,000 US\$/Ha as an average. Because of the financial market in Iran, and the very high interest rate, despite the return for investment in protected agriculture is very good, individual farmers cannot afford to borrow money from the market to finance the project. Our proposal has to include alternative forms of financing that will introduce later.
- Infrastructure: existing infrastructure for water, electricity, gas, and roads are essential to minimize the initial investment costs and cut down the lead time to enter into operation.
- Target markets: different markets have different requirements and, products have to be tailor made accordingly.
- Market access: transportation and logistics have reached a very high level of sophistication however, been close to the market is still a comparative advantage. A niche market in a big city like Tehran or Dubai represent an important market volumes therefore, been geographically close to those markets is indeed a comparable advantage. In addition to geographical vicinity to facilitate market access, we have to consider trade agreements and compliance with standard and certification protocols to facilitate a quick and free movement of products.

Crops selection

Based on the four climatic areas identified earlier, the programme will promote the following crops:

1. Dry and hot: the pick production season will be winter, and will focus on tomato, pepper, cucumber, eggplant, and strawberry;
2. Mild and humid: the pick production season will be autumn, winter and spring, and will focus on flowers, ornamental plants, green ornamental foliage, and green edible leaves (lettuce, *sabsi*, etc.);
3. Cool: the pick production season will be summer, and will focus on high quality vegetable crops such as cucumber, tomato and green edible leaves (lettuce, *sabsi*, etc.), flowers, ornamental plants, strawberry fruit and strawberry runners (nursery), berries, and herbs;
4. Proximity of major metropolitan areas: this is a very specific business that cover most of the year and specific crops for which the freshness and punctual supply is a key added value. These include *sabsi*, lettuce, baby spinach, and other type of edible green leaves and herbs.

In order to optimize the value chain and ensure constant supply of high quality products, the production will be shifted from hot to cool areas, backing up each other.

Supply chain

Cash crops production, for as much as it has advanced in recent years, relies on conventional technologies and production means, sun, soil, and water. Cash crops supply chains are a combination of technologies, goods and services that allow to produce goods tailor made to the target markets.

These technologies, goods and services are available in Iran; we are referring to metal carpentry, water pipes, polyethylene films, irrigation, heating, cooling and electric systems, IT components, fertilizers, pesticides, machineries, packaging materials, laboratory analysis, R&D, transportation and logistics, etc.; all items available in Iran.

This project will source technologies, goods and services in Iran so to keep the entire value chain, and added value, in Iran. Technologies and services will be based on technical specification defined through this programme and with the joint contribution of national and international experts.

Technology transfer

This is the single most important items required to implement this programme and consist of two components, (a) design and (b) management.

- a. The design regards all technological components required for the implementation of the project, ranging from: greenhouses, heating, cooling and climatic control systems, irrigation systems, substrates, machineries, packaging, tracking systems, etc. All these items have to be designed based on the specific conditions of the production area. Particularly with regard to R&D, the project will source from the vast R&D pool present at Iranian universities and technology parks. Once technical specifications and blue print are defined, the manufacturing process will be done in Iran relying on existing manufacturing capacities.
- b. Management, this is possibly the most difficult component to transfer. International experts on crop management, pest management, packaging, logistics, quality control, etc. will work hand in hand with local entrepreneurs to build progressively the capacity to stir this rather complex and challenging component of the project.

Technology transfer does not mean transferring objects, neither is a static process, but is the action of transferring knowledge, including the capacity to constantly develop and optimize technologies and processes.

Marketing

Marketing is the beginning and the end of the entire programme. The specification of the goods to produce are defined by the market. Cash crop is by large a demand driven market, despite the globalization we are still dealing with basic and unprocessed food products, such as fresh tomatoes, cucumbers, strawberry, flower, etc. The market define the specifications; the players along the value chains have to deliver services; the way these players are managed along the value chain make the business successful and profitable.

The cash crops market is globalized, well developed and extremely complex in the management of inputs therefore, there is limited space available for new players to step in. Therefore, Iran has to maximize its comparative advantages, such as climatic conditions, geographical position, existing industrial and services infrastructures, human resources, etc. to successfully compete in the global market.

PROGRAMME OUTLOOK

As described earlier, the programme foreseen the establishment of four production hub in four different climatic zones. Each production hub consist of:

- A technology transfer centre, about 3 Ha of greenhouses;
- Phase I expansion, about 100 Ha of greenhouses;
- Phase II expansion, about 1,000 Ha of greenhouses; and
- A network of auxiliary services.

Technology transfer centre

The technology transfer centre is the catalyst for the development of the entire programme.

It consist of about 3 Ha of greenhouses with different design and auxiliary equipment and crop management.

The technology transfer centre aims to:

- Define the optimal design for the greenhouses and auxiliary equipment to build in the specific climatic zone.
- Define the crop management for the specific crops in the specific climatic zone.
- Show case the effectiveness and performance of greenhouses and cash crop production in the area.
- Build the capacity of local entrepreneurs to supply equipment, goods and services required, this range from greenhouses construction, heating/cooling, water plant construction and management, packaging, fertilizers, pesticides, laboratory analysis, etc.
- Train farmers on crop management.
- Provide long term technical assistance.

Phase I expansion

The Phase I expansion aims to build about 100 Ha of greenhouses, this represent a critical mass of greenhouses to ensure the effective and sustainable supply of goods and services required to the production hub.

The technology transfer centre will provide technical assistance for farmers and suppliers of equipment, goods and services.

Phase II expansion

The Phase II expansion aims to build 1,000 Ha of greenhouses, this will generate economy of scale that will boost benefits along the value chain. It will also promote investment and R&D to further fine tune the programme and generate further added value along the value chain.

Network of auxiliary services

The management of a production hub need the supply of a number of auxiliary services, these range from design and construction of greenhouses, maintenance of heating/cooling of water plants, analysis for pest management, analysis for crop certification and quality control, transportation, packaging, technical assistance etc.

The programme will build the capacity of local enterprises to provide these services.

IMPLEMENTATION STRATEGY

The overall programme consist of:

- A pilot programme, to physically build the production infrastructure and technical capacity, and
- A support programme, to provide support services;

As follow:

1. Pilot programme: four pilot programme, one in each geographical area, each consisting of three independent projects as follow:
 - Project #1: Technology transfer centre;
 - Project #2: Training local entrepreneurs and labour force; and
 - Project #3: Replicate and expand the production capacity (Phase I and Phase II).
2. Support programme: this programme consist of six independent projects as follows:
 - Project #4: Network of technology and auxiliary services providers;
 - Project #5: Packaging;
 - Project #6: Market access;
 - Project #7: Inter-governments trade agreements; and
 - Project #8: Enabling environment.

These eight projects are linked to each other, each project deliver and receive specific inputs from the other in an integrated manner therefore, the coordinated implementation of all eight projects is the precondition to create jobs and income.

The synergies generated between these eight projects will maximize the benefits of the overall programme and will make it effective, sustainable, profitable and resilient in the long terms.

Missing one or more components, in terms of deliverables and timing, would reduce the profitability however, the programme would be still sustainable implementing only component from #1, 2 and 3.

Project #1: Technology transfer centre.

The objectives of this project are: (a) to develop the technical specification for greenhouses and auxiliary equipment manufacturing, (b) to develop the specific crop management protocols.

This project will be implemented in four geographical areas, (1) dry and hot, (2) mild and humid, (3) cool, and (4) in the proximity of major metropolitan areas.

The project will be operation at the end of Year 1, and will take two more years to deliver it final results.

The Project #1 consist of two activities:

1. Technology transfer centre of about 3 Ha of greenhouses.

The technology transfer centre consists of about 3 Ha of greenhouses, including auxiliary equipment, specifically designed to fit the specific local environment and the specific crops requirement.

The centre will test and fine-tune a limited number of greenhouses models and auxiliary equipment.

2. Develop and fine-tune the crop management protocol.

Based on the input coming from the market, the crop management protocols will be developed for each crop and geographical area.

Project #2: Training local entrepreneurs and labour force.

The technology transfer centre established through the Project #1 act also as training centre for all stakeholders involved along the value chain, farmers, manufactory companies for greenhouses and auxiliary equipment, service providers, labour force, etc.

The training centre will also provide technical assistance to farmers, manufacturing companies, services providers and the local extension service.

The training will initiate during Year 2 and will continue indefinitely as a permanent training and technology development centre.

The training centre will rely on international and national experts.

Project #3: Replicate and expand the production capacity (Phase I and Phase II).

The technology transfer centre established through the Project #1 act as a catalyst for the entire area. Farmers, as well as entrepreneurs in the manufacturing and servicing sectors can see first-hand how the project operate and asses cost and benefits.

Phase I, the objective is to establish, in about three years, a hub of about 100 Ha of greenhouses, built following the parameters set by the technology transfer centre. The hub

represents the critical mass needed to trigger the development of a full flagged value chain and to attract further private investment.

Phase I will initiate during Year 2, will be operation from Year 3, it will completed, 100 Ha of greenhouses built, in Year 5.

Phase II, the aim is to expand the area to about 1,000 Ha of greenhouses.

Project #4: Network of technology and auxiliary services providers.

This is the most challenging and most private sector driven component of the project. Most of these service providers are available in Iran but, they need to acquire proper technologies and develop skills aiming at providing equipment and services of high quality to meet international standards.

Building the network of technology and auxiliary services providers will commence from Year 1, while building the technology transfer centre.

This project will address seven component as follows:

1. Develop the equipment and goods supply chains: based on existing industrial capacity, develop the capacity to supply high quality equipment, services and goods. This includes: greenhouses and auxiliary equipment, building materials, irrigation equipment, agriculture machinery, plastic films for greenhouse covering and mulching, fertilizers and pesticides, energy, packaging equipment, and packaging materials.
2. Develop the services sector: building on existing capacity, develop technical assistance enterprises able to provide high quality services as follows: crop management and maintenance services for irrigation, heating/cooling, and agriculture machinery.
3. Labour force: the implementation of this programme require a considerable amount of labour force, mostly medium to high qualified staffs. The establishment of workers cooperative, or similar, will ensure the constant supply of well qualified and trained labour force.
4. Standards and certification: to target export markets, products must meet international standards. Laboratories and technical staffs are needed to certify products and means of production.
5. Construction: the implementation of this programme involves the construction of various and extensive infrastructure, such as greenhouses, warehouses, roads, irrigation systems (piping, water reservoirs, filtration systems, etc.), skilled labour force and qualified suppliers are required.
6. Logistic: the implementation of this programme involves the hauling of considerable volumes of products. This requires the support of reliable logistic companies to provide transportation services, handling and administrative services, certification, custom clearance, distribution, quality control, etc.
7. Research & Development: the programme need to bridge between existing institutions doing R&D and production hubs. Iran own a sizable R&D infrastructure, the implementation of this programme is an opportunity to link existing solution to concrete market opportunities and furthermore create demand for tailor made solutions to fill the technology gap and to match a continuous evolving markets.

Project #5: Packaging.

The packaging sector is the link between the field and the market. There will be a packaging centre for each geographical area. This is the single major item for direct investment, and two component have to be addressed:

1. Establish a pilot packaging centre: each centre will consist of calibration and packaging machineries, cold storage, basic analytical and testing equipment for compliance to export standards and certification.
2. Develop packaging materials and logistic services supply chain: this is an essential and complementary activity to support the packaging centre, the scope is to supply the packaging centre with proper packaging materials and logistic services.

The packaging centre will be operation at Year 4.

Project #6: Market access.

The cash crops markets already exist and is in constant expansion, both in developed and developing countries. These markets can be exploited only if the offer matches the demand in terms of customers' taste and local legislations.

Since this markets fluctuate significantly following consumers demand, seasons, trends, etc. the programme focuses on building the capacity to develop marketing strategies and tools to follow, or drive, the demand side of the market and so to allow Iranian products to access and stay in the market.

The marketing programme will commence from Year 1.

The final goal is to build long term sustainability rather than exploit spot entry points. The objective is achieved through the implementation of the following activities:

1. Market analysis: identify what products are required, both for niche and large markets, most profitable, where and when.
2. Branding: create a segment of products clearly identifiable by the market. This allows the product to be less replaceable and less susceptible to market stress.
3. Market lobbying and partnerships: link suppliers to the market by promoting partnerships with international supermarket chains and consortium as to facilitate the entry point of products and guarantee direct feedbacks from the market.
4. Marketing: combining the three activities above pave the way for the private sector to exploit the new market opportunities.
5. Feedback between the market and production: this is a fundamental element that provides a constant feedback from the market to the production hub, and vice versa, so to ensure that products always meets market requirement and target the most profitable markets and niches.

Project #7: Inter-governments trade agreements.

As for the same nature of export market, inter-governments trade agreements are essential to ensure that the trade mechanism works in a smooth and reliable manner. The programme aims at creating the conditions for the government of Iran to sign trade agreement with other countries so to facilitate the trade of Iranian products.

Building Inter-governments trade agreements will commence from Year 1

Project #8: Enabling environment.

The activities listed above are rather technical and address specific technical objectives. A number of other crosscutting activities are essential to develop an enabling environment and make the programme functioning. Those are:

1. **Policy:** develop national policies to create the enabling environment for the sectors to develop and grow in a private sector driven manner. These policies have to address land and water availability and price, provision of basic infrastructure, such as communication and energy, financial mechanisms, establishment of standards and certification bodies, etc.
2. **Financial mechanisms:** a key policy measure is to establish financial mechanisms to create incentive for the private sector to invest on the various segments of the value chains. Despite the fact the return for investment is quite attractive, without targeted financial mechanisms, the programme might start too slow and won't be able to gain the momentum necessary to build up the critical mass necessary to carry on the entire process.
3. **Establish standards and strengthen certification bodies:** in Iran there are national standards available however, to target the export market we need to comply with international standards and to establish international recognized certification bodies, such as reference laboratories.
4. **Training and capacity building:** training and capacity building are required at all levels, the programme has to create the capacity of institution and partners to deliver proper training to the large number of workers, technicians and managerial staff that are required throughout the value chain.
5. **Replication:** this programme, initially developed in four geographical areas, aims to develop a format that can be replicated in different setting and targeting different crops. Therefore, through this project we will promote further replications as to create economies of scale that would benefit from the enabling environment (policy) and reduce overall management costs, and so increase efficiency.
6. **Externality:** a key element of this programme is that the hardware required is fundamentally based on existing capacities in Iran. The agriculture sector at large, the carpentry and machinery industry, the polymer industry, R&D, etc. already exist and are well developed in Iran but, are focusing on other sectors. The implementation of this project will fill the technology gaps that will allow Iranian enterprises to supply the domestic market and to compete in the international market for products such as greenhouses, special polyethylene films for greenhouses and mulching, polymers for water pipes and irrigation systems, packaging materials and equipment, agriculture machinery, etc.
7. **Situation analysis:** this proposal has been developed based on UNIDO's experience in various countries therefore; it needs to be fine-tuned to the local conditions particularly with regard to receptiveness by local communities, specific environmental circumstances that have to be defined, identification of competitive advantages, etc. The objective of this analysis is to share idea and get feedback from various stakeholders before proceeding to the formulation of the final project proposal.

Building the enabling environment will commence from Year 1

Timeline Implementation Strategy (this indicate when the project will be operation, deliverable will continue indefinitely)

| Project | Year | | | | | | | | |
|--|------|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Technology transfer centre | ■ | | | | | | | | |
| Training local entrepreneurs and labour force | | ■ | | | | | | | |
| Phase I Replicate and expand the production capacity | | | ■ | ■ | ■ | | | | |
| Phase II Replicate and expand the production capacity | | | | | ■ | ■ | ■ | ■ | ■ |
| Network of technology and auxiliary services providers | ■ | | | | | | | | |
| Packaging | | | | ■ | | | | | |
| Market access | ■ | | | | | | | | |
| Inter-governments trade agreements | | | ■ | | | | | | |
| Enabling environment | ■ | | | | | | | | |

FINANCIAL PLAN

As described earlier, the programme foreseen the establishment of four production hubs, one for each climatic area.

Each production hub consist of:

1. A technology transfer centre, consisting of about 3 Ha of greenhouses;
2. Phase I, about 100 Ha of greenhouses;
3. Phase II, about 1,000 Ha of greenhouses; and
4. A network of auxiliary services.

The investment required for each component is as follows:

1. Technology transfer centre: US \$700,000
2. Phase I: 15,000,000
3. Phase II: 150,000,000; and
4. Network of auxiliary services: 10,000,000.

It is obvious that the programme cannot be fully financed through public or international funding therefore, the financial mechanism will consist of three interventions as follows:

Step 1: Technology transfer centre, has to be fully funded through a grant.

Step 2: Phase I, is funded by the private sector, supported by a three years soft loan, at 4% interest rate.

Step 3: Phase II + network of auxiliary services, this is fully funded by the private sector.

INDICATIVE BUDGET

TABLE #1: cost for one technology transfer centre, one location, including technical assistance for three years.

| Item | Unit | # units | Unit cost US\$ | Total US\$ |
|--|----------------|---------|----------------|----------------|
| Flat roof greenhouse Canarienne type Model A | m ² | 10,000 | 8 | 80,000 |
| Multi-tunnel greenhouse Model B | m ² | 10,000 | 12 | 120,000 |
| Multi-tunnel greenhouse Model C | m ² | 10,000 | 20 | 200,000 |
| Nursery | m ² | 2000 | 25 | 50,000 |
| Warehouse | m ² | 500 | 35 | 17,500 |
| Irrigation system | m ² | 30,000 | 3 | 90,000 |
| Heating system Model A | m ² | 10,000 | 5 | 50,000 |
| Heating system Model B | m ² | 10,000 | 8 | 80,000 |
| Heating system Model C | m ² | 10,000 | 3 | 30,000 |
| Civil works | m ² | 32,500 | 1 | 32,500 |
| Total cost investment | | | | 750,000 |
| Consultancy & Training (8 visits/year plus weekly remote assistance) | years | 3 | 80,000 | 240,000 |
| Total project cost | | | | 990,000 |

TABLE #2: investment cost for a standard greenhouse of 1 Ha

| Item | Unit | # units | Unit cost US\$ | Total US\$ |
|------------------------------|----------------|---------|----------------|----------------|
| Greenhouse | m ² | 10,000 | 8 | 80,000 |
| Irrigation system | m ² | 10,000 | 3 | 30,000 |
| Heating system | m ² | 10,000 | 5 | 50,000 |
| Civil works | m ² | 10,000 | 1 | 10,000 |
| Total cost investment | | | | 170,000 |

TABLE #3: payback time for the investment for a standard greenhouse of 1 Ha

| PAY BACK TIME | | |
|------------------------------|----------|------------|
| Years | # | 3 |
| Rate | % | 4% |
| Investment | US\$ | 170,000 |
| Yearly payment | US\$ | 61,259 |
| Total payment | US\$ | 183,778 |
| EBIDTA/year | US\$ | 83,925 |
| PAY BACK TIME (years) | # | 2.2 |

TABLE #4: business plan for 1 year, 1 Ha of cucumber, 2 cycles per year, total 8 months.

| CROP | CUCUMBER | | | |
|---|---|-----------------------|------------------|----------------|
| TECHNOLOGY | CUCUMBER - SOILLESS - 2 CROPS/YEAR | | | |
| VARIABLE COSTS | | | | |
| Costs | Unit | Units/ha | US\$/unit | US\$/ha |
| Plants (2 cycles) | n° | 80,000 | 0.10 | 8,000 |
| Substrate | n° | 6,100 | 2.00 | 12,200 |
| Fertilizers | kg | 3,000 | 3.00 | 9,000 |
| Crop management | h | 17,067 | 2.00 | 34,133 |
| De-leafing | h | 8,533 | 2.00 | 17,067 |
| Harvesting | h | 8,000 | 2.00 | 16,000 |
| Pest Management | | | | 8,000 |
| Electricity | kWh | 100,000 | 0.05 | 5,000 |
| Heating | m3 | 80 | 0.02 | 16,000 |
| Total variable costs | | | | 125,400 |
| FIXED COSTS | | | | |
| Maintenance | | | | 10,000 |
| Bank Costs on variable cost (interest rate 25%) | | | | 15,675 |
| General Costs | | | | 5,000 |
| Total fixed costs | | | | 30,675 |
| TOTAL COSTS | | | | |
| Total Variable Cost | | | | 125,400 |
| Total Fixed Costs | | | | 30,675 |
| TOTAL COSTS | | | | 156,075 |
| MARGIN | | | | |
| Year 4 and following (no loan) | | | | |
| Income | Harvest Kg/m ² /Year = 40 Kg | Cucumber US\$/Kg 0.60 | 240,000 | |
| Cost | | | 156,075 | |
| Margin/Year | | | | 83,925 |

*No interest rate on the capital investment has been calculated, as for the table above, the yearly payment for a soft loan of 170,000 US\$ for a period of 3 year at the interest rate of 4% is 61,259 US\$.

TABLE #5: cash flow for 1 Ha cucumber, years 1, 2 and 3, including a 3 years loan of 170,000 US\$ at interest rate 4%

| Month | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Total 1 year |
|-------------------------|----------|----------|--------|--------|--------|----------|--------|--------|--------|----------|---------|---------|----------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| Substrate | 12,200 | | | | | | | | | | | | 12,200 |
| Plants | | 4,000 | | | | 4,000 | | | | | | | 8,000 |
| Fertilizer | | | 1,500 | 1,500 | 1,500 | | 1,500 | 1,500 | 1,500 | | | | 9,000 |
| Crop management | | 4,267 | 4,267 | 4,267 | 4,267 | 4,267 | 4,267 | 4,267 | 4,267 | | | | 34,133 |
| Harvesting | | | 2,667 | 2,667 | 2,667 | | 2,667 | 2,667 | 2,667 | | | | 16,000 |
| De-leafing | | | 2,844 | 2,844 | 2,844 | | 2,844 | 2,844 | 2,844 | | | | 17,067 |
| Pest Management | | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | | | | 8,000 |
| Electricity | | | 714 | 714 | 714 | 714 | 714 | 714 | 714 | | | | 5,000 |
| Heating | | | 3,200 | 3,200 | 3,200 | 3,200 | 3,200 | | | | | | 16,000 |
| Maintenance | 3,333 | | | | | 3,333 | | | | 3,333 | | | 10,000 |
| General costs | 417 | 417 | 417 | 417 | 417 | 417 | 417 | 417 | 417 | 417 | 417 | 417 | 5,000 |
| Interest variable costs | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 15,675 |
| Loan on investment | 5,105 | 5,105 | 5,105 | 5,105 | 5,105 | 5,105 | 5,105 | 5,105 | 5,105 | 5,105 | 5,105 | 5,105 | 61,259 |
| Total costs | 22,361 | 16,095 | 23,020 | 23,020 | 23,020 | 23,342 | 23,020 | 19,820 | 19,820 | 10,161 | 6,828 | 6,828 | 217,334 |
| Income | | | 40,000 | 40,000 | 40,000 | | 40,000 | 40,000 | 40,000 | | | | 240,000 |
| Profit | - 22,361 | - 16,095 | 16,980 | 16,980 | 16,980 | - 23,342 | 16,980 | 20,180 | 20,180 | - 10,161 | - 6,828 | - 6,828 | 22,666 |

TABLE #6: cash flow for 1 Ha of cucumber for the years 4, and following.

| Month | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Total 1 year |
|-------------------------|----------|----------|--------|--------|--------|----------|--------|--------|--------|---------|---------|---------|----------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| Substrate | 12,200 | | | | | | | | | | | | 12,200 |
| Plants | | 4,000 | | | | 4,000 | | | | | | | 8,000 |
| Fertilizer | | | 1,500 | 1,500 | 1,500 | | 1,500 | 1,500 | 1,500 | | | | 9,000 |
| Crop management | | 4,267 | 4,267 | 4,267 | 4,267 | 4,267 | 4,267 | 4,267 | 4,267 | | | | 34,133 |
| Harvesting | | | 2,667 | 2,667 | 2,667 | | 2,667 | 2,667 | 2,667 | | | | 16,000 |
| De-leafing | | | 2,844 | 2,844 | 2,844 | | 2,844 | 2,844 | 2,844 | | | | 17,067 |
| Pest Management | | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | | | | 8,000 |
| Electricity | | | 714 | 714 | 714 | 714 | 714 | 714 | 714 | | | | 5,000 |
| Heating | | | 3,200 | 3,200 | 3,200 | 3,200 | 3,200 | | | | | | 16,000 |
| Maintenance | 3,333 | | | | | 3,333 | | | | 3,333 | | | 10,000 |
| General costs | 417 | 417 | 417 | 417 | 417 | 417 | 417 | 417 | 417 | 417 | 417 | 417 | 5,000 |
| Interest variable costs | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 1,306 | 15,675 |
| Total costs | 17,256 | 10,990 | 17,915 | 17,915 | 17,915 | 18,237 | 17,915 | 14,715 | 14,715 | 5,056 | 1,723 | 1,723 | 156,075 |
| Income | | | 40,000 | 40,000 | 40,000 | | 40,000 | 40,000 | 40,000 | | | | 240,000 |
| Profit | - 17,256 | - 10,990 | 22,085 | 22,085 | 22,085 | - 18,237 | 22,085 | 25,285 | 25,285 | - 5,056 | - 1,723 | - 1,723 | 83,925 |