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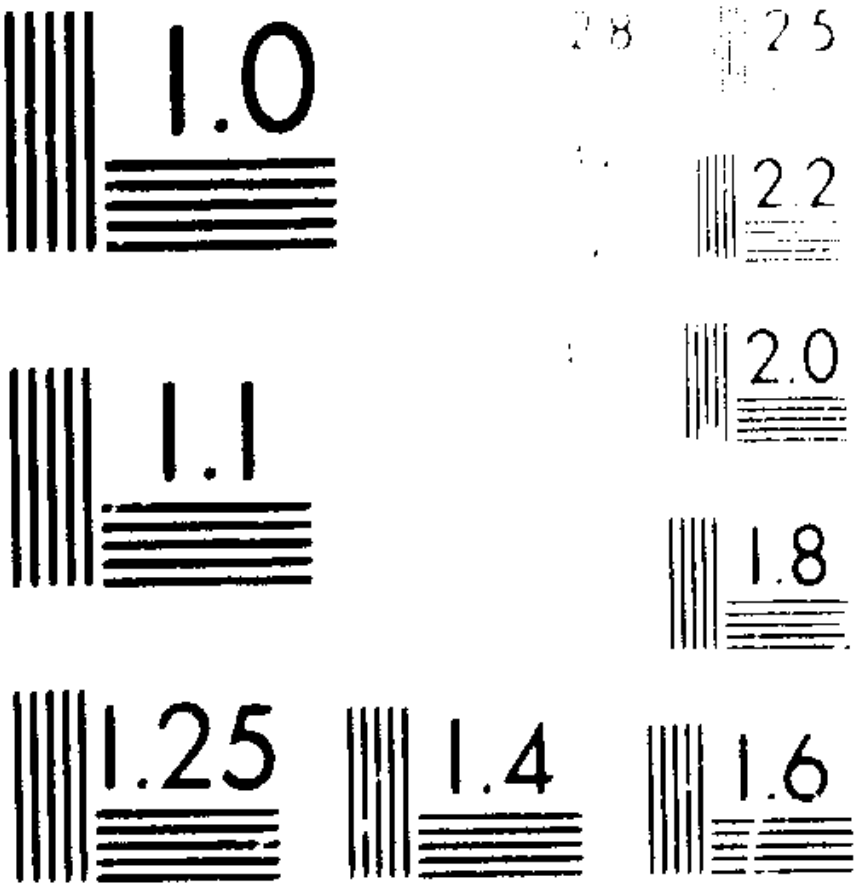
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org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PROMOTION OF TCDC BETWEEN AFGHANISTAN AND YUGOSLAVIA - ASSISTANCE OF DTD COMBINAT YUGOSLAVIA TO NW COMPANY, KABUL, IN THE FIELD OF FRUIT PROCESSING

RP/AFG/79/001
AFGHANISTAN

Terminal report

Prepared for the Government of Afghanistan
by the United Nations Industrial Development Organization

Based on the work of P. Vajagić, N. Radonić and V. Milinski,
food processing technologists

Explanatory notes

A comma (,) is used to distinguish thousands and millions.

A full stop (.) is used to indicate decimals.

References to dollars ($) are to United States dollars, unless otherwise stated.

The monetary units in Afghanistan is the afghani (Af). During the period covered by the report, the value of the afghani in relation to the United States dollar was US$ 1 = 42,5.

Mention of firm names and commercial products does not imply the endorsement of the United Nations Industrial Development Organization (UNIDO).

ABSTRACT

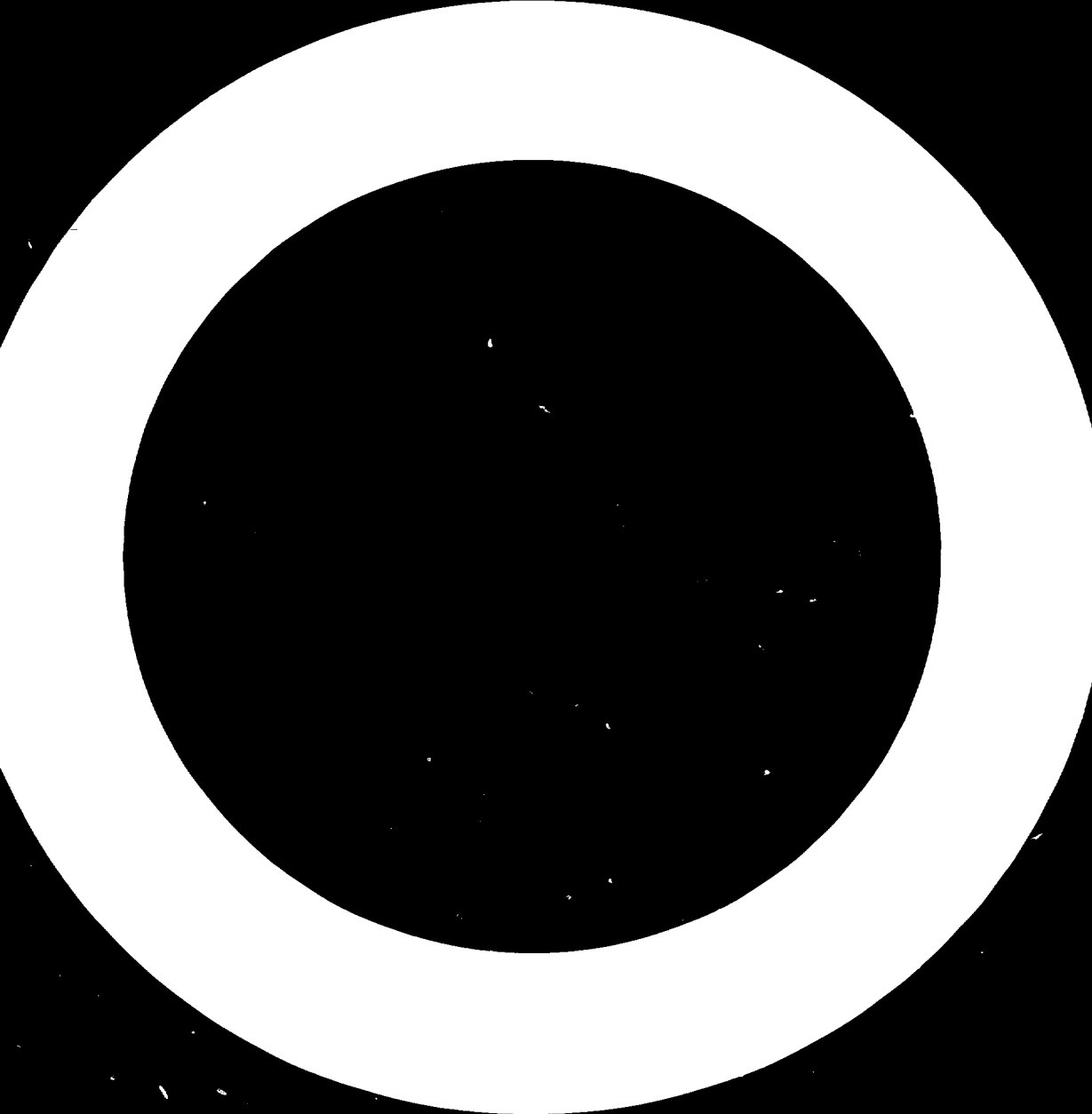
The project entitled "Promotion of TCDC Between Afghanistan and Yugoslavia - Assistance of DTD Combinat Yugoslavia to N.W. Company, Kabul, in the Field of Fruit Processing" (RP/AFG/79/001) arose from a request submitted by the Government of Afghanistan in August 1979 and approved by the United Nations Industrial Development Organization (UNIDO) in October 1979. The mission, which took place from 10 December 1979 to 2 January 1980, had the following main tasks:

(a) Investigation of marketing possibilities of dried fruits and vegetables;

(b) Improvement of raisin-processing equipment;

(c) Study of the possibility of installing new equipment for raisin packaging, nuts processing, dehydration of fruit and vegetables and cold storage.

The experts recommended, in particular, the establishment of a small modern processing plant and a food testing and quality control laboratory.



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INTRODUCTION

Food production is lagging compared with population growth throughout the world. Without international co-operation it cannot be rapidly developed to a level that would satisfy the increasing market demand. To ensure the regular supply of food to consumers all over the world, especially in developing countries, international and financial aid would be necessary during both the preparation of the food production programme and the actual production of food.

The programmes of economic development and food production of Afghanistan are based on natural resources and production possibilities where traditionally successful fruits and vegetables, especially grapes, are concerned. The industrial processing of fruits and vegetables and the production of canned food and sweet grape juice fit into the economic development programme, which together with the laboratory for the testing and control of food quality, should help to change the nutrition structure and improve living conditions in the country.

The mission had only a limited choice of vegetables for industrial processing to meet market demand in Europe, Asia and other areas where the results of the application of up-to-date technol gy could be seen. However, a trend towards products such as peppers and cucumbers as raw materials makes it possible to diversify production, which can be adapted according to the demands of the market. With regard to high-quality fruits, the situation is quite different, since there is a variety of well-known fruits available for industrial processing and highly rated on the market.

Taking into account nutrition tastes and traditions in Afghanistan, the production of sweet grape juice is the most interesting and economically feasible project. Grapes are produced over large areas to meet both domestic and export needs for either fresh or dried products. Since

consumption of grapes as food is limited to seasonal use, industrial production of sweet juice will improve and change the nutrition habits of the country. In the food industry, sweet grape juice is regarded as a supplementary dietetic meal.

The technical solutions envisaged in the three projects are outlined in this report. However, the expertsconsider that detailed estimates and the economic justification of each project should be presented in the pre-feasibility or feasibility studies, which should confirm the need for international co-operation to help Afghanistan increase and improve its food production.

The proposed technology for the industrial processing of fruits and vegetables lends itself to small adaptations for the processing of a greater variety of raw materials, depending on market demand. The proposed technological processing line has the additional advantage of being labour-intensive, which would help to alleviate the problem of unemployment in Afghanistan.

The President of the Afghan Fruit Processing Co., Kabul, took part in promotional activities organized in co-operation with UNIDO as part of the International Agricultural Fair held in May 1979. With the co-operation of the organization "Dunav-Tisa-Dunav", Novi Sad, the following investment projects were supported:

1. Fruit and vegetable processing plant
2. Modernization and improvement of raisins-processing plant
3. Establishment of new and modernization of existing dehydration plant
4. Establishment of alcohol distillery using low-grade raisins; capacity, 3.000 t/a
5. Setting up refrigeration plant and stores
6. Establishment of plant for liquorice root extraction.

On the occasion of the International Agricultural Fair the representatives of the Afghan Fruit Processing Co. and Dunav-Tisa-Dunav agreed that a mission of three experts from Yugoslavia should be sent to Afghanistan to study the situation and draw up a programme of co-operation.

The official request submitted by the Government of Afghanistan to UNIDO was approved by the Programming Committee and the mission of three experts from Yugoslavia visited Afghanistan from 9 December 1979 to 2 January 1980.

The Ministry of Mines and Industries informed the mission upon its arrival that the industrial processing of fruits and vegetables was included in the priority list of activities under the government programme. The development programme of the Afghan Fruit Processing Co. had therefore been considerably changed to include the following priority projects: large-scale production of up to 170,000 of sweet grape juice; modernization of the existing raisins processing plant; improvement of the existing dehydration plant; establishment of refrigeration plant and stores for nut and almond kernels. The project for the establishment of an alcohol distillery based on low-grade raisins was postponed.

Although the fruit and vegetable processing plant was not included in the government priority programme and is therefore no longer part of the development programme of the Afghan Fruit Processing Co., the Ministry of Mines and Industries also requested the opinion of the experts on that project. In addition to the fruit and vegetables processing programme, the Ministry of Mines and Industries attaches particular importance to the food testing and quality control laboratory and to the programme for the production and processing of medical herbs. The experts were also asked to give their opinion and make recommendations on those programmes.

I. FINDINGS

Some parts of Afghanistan, particularly the regions of Nanganhar, Kandahar, Kabul and Mazar-i-Sharif, have favourable conditions for the production of subtropical and other fruits and vegetables. The production of the following fruits is well developed: grapes, almonds, citrus fruits, apples, apricots, walnuts, pistachios, water-melons, etc. The production of vegetables is less developed, due to the limited local market demand. However, the production of fruits has a long tradition and is of great importance for the national economy, especially as an export item.

Fruit is the most important export item of Afghanistan. In 1979 the value of exported dried and fresh fruits amounted to $ 121 million, which accounts for up to 1/3 of total export value. The fruits and vegetables processing industry is not developed. The mission findings on the production of fruits and vegetables in the three provinces visited are outlined below.

Fruits and vegetables produced in the province of Kandahar are of good quality. The two processing plants for fruits and vegetables are the Afghan Fruits Industry, which processes fruits and vegetables into jams and juices, and the Nazzar Fruit Factory, which produces jams, compotes, juices and other fruit and vegetable products. Both factories are of small capacity and have obsolete equipment. A programme for the establishment of a factory with a larger capacity in the province of Kandahar was considered, because there exist good conditions for the supply of quality fruits and vegetables.

In the province of Naganhar, the growing of fruits and vegetables over large irrigated areas has a long tradition. The province is an important supplier of fruits and vegetables for the other consuming centres, and quantities are exported to various countries in Asia and elsewhere. The characteristics of the soil in the province are suitable for the further expansion of fruit and vegetables production if the technical conditions are met and storage facilities provided. At present in Jalalabad, the centre of the province, there is a technical facility for selecting, calibrating and packing citrus fruits, and a plant for processing olives and oilseeds is being established. There is also a small unit for canning olives for export.

Export statistics on fresh and dried fruits and vegetables
(March 1977-March 1978)

Product	Quantity (kg)	Value ($US)
Almonds (hard-shell)	6 796 420	7 443 969
Almonds (shelled)	893 170	3 278 242
Almonds (thin-shell)	2 748 449	5 041 482
Apples	7,883 774	1 303 299
Apricot kernels	628 436	1 154 486
Fruits (dried)	8 583 907	8 790 960
Fruits (fresh)	14 367 386	4 327 274
Grapes (fresh)	41 250 984	14 455 902
Liquorice roots	10 489 619	4 876 085
Melons (fresh)	29 616 931	4 830 387
Pistachios Khandan (open, shelled)	255 709	1 294 131
Pistachios (shelled)	1 141 582	9 906 782
Raisins (black)	2 481 002	2 259 980
Raisins (green)	13 292 669	17 769 230
Raisins (red)	43 885 264	39 853 684
Vegetables (fresh)	207 500	31 132
Walnuts (unshelled)	800 643	3 015 525

Source: Ministry of Mines and Industry, Kabul.

Statistical data on the production of fresh fruits and vegetables were not available. However, the data on the export of fruits and vegetables, which makes up only a part of the total production, could indicate the scope of production of certain fruits.

In the province of Kabul, good quality fruits, in particular grapes, are traditionally grown on larger areas. Vegetables, some of them typical for the region, are also grown. According to the information obtained at the Ministry of Agriculture, organized production of fruits and vegetables in the province is planned. It should be organized on larger plots, mainly for industrial processing. A share of the processed fruits and vegetables was earmarked for export, and the remainder would be for local consumption.

The following conclusions may therefore be drawn from the above-mentioned points:

(a) Processing of fruits and vegetables on an industrial scale in Afghanistan is undeveloped;

(b) Existing capacities are small and plants require reconstruction and modernization;

(c) Most of the plants are based on the processing of primary fruits, and especially on the drying, selecting and packing of raisins.

The Ministry of Mines and Industries expressed particular interest in the establishment of a fruits and vegetables processing plant with modern industrial production. Co-operating officials also expressed the desire that the new plant should ensure processing of fruits and vegetables at prices which could compete on local and especially foreign markets.

The economic development programme of Afghanistan envisages the establishment of fruits and vegetables processing plant in the industrial zone of Kabul where most of the required infrastructure (electricity, roads, etc.) already exists.

The factory for the production of sweet grape juice, with a capacity of about 170,000 t, is a new and important project ranking first on the priority list of the Afghan Fruits Processing Co. The inclusion of the project in the priority list of the company is a consequence of growing demand, in particular on the local market. The large production of best quality grapes, along with the experience of the company in the marketing of fruits, especially grapes, also help to justify the project.

In the programme of economic development of Afghanistan, the project has priority over other projects (modernization and reconstruction) of the Afghan Fruit Processing Co.

The food testing and quality control laboratory could be well incorporated into the programme of development and modernization of fruits and vegetables processing. The Afghanistan authorities attach particular importance to that project, because it should contribute to the improvement of quality and standardization in that field, and also in the production of other foodstuffs. The experts were informed that the laboratory was under construction, and it was requested that a list should be drawn up of laboratory equipment, glassware, chemicals and furniture required for normal operation of the small food testing and control laboratory.

In talks with representatives of the Afghan Plant Medical Herbs Company the experts were informed that great importance was attached to the programme of processing medical herbs. The company is convinced that economically viable production could be organized with technical and financial assistance from abroad.

According to the information received, several dozens of different medical herbs grow wild throughout the country. Only small quantities of herbs are picked up, collected and dried in a traditional way. Medical herbs are mostly used for local consumption, while significant quantities are exported without processing.

There have been several attempts by different organizations within the United Nations system, including that of the UNIDO/Romania mission in 1977/78, to undertake programmes to improve the use of medical herbs in Afghanistan. However, because of the lack of skilled staff and financial support, the efforts proved unsuccessful.

The experts were unable to devote the required attention to the medical herbs programme because of their involvement in other projects and the need to cut short their stay in Afghanistan as a result of the internal political situation. However, the general feeling of the experts is that good results could be obtained with only limited financial and expert assistance.

II. RECOMMENDATIONS

The views and recommendations of the experts on the proposed revised list of projects of the Afghan Fruit Processing Co. and projects envisaged by the Government of Afghanistan are outlined below.

Fruits and vegetables processing plant

The experts consider that tradition in the production of fruits and vegetables, existing and potential availability of raw materials and the previously insignificant level of industrial processing of fruits and vegetables justify the establishment of a small modern processing plant.

The proposed small-capacity plant processing fruits and vegetables is based on modern technology and methods applied in the industry. The larger part of the production would be devoted to export. Production costs, productivity and the quality of products must therefore be competitive and acceptable on the foreign market. Consequently, particular attention was paid to reducing the investment costs to a minimum and to better utilization of capacities. To achieve such results the plant would have to work 8-10 months per year (see figure).

The recommended equipment makes possible an output of 2 t/h of final products. Annual production would be in the range of 6000-7000 t, depending on the supply and structure of raw materials and final products. Given the limited availability of financial resources, the equipment should be of smaller capacities involving continual production on a three-shift daily basis during the period of ripening and disposal of raw materials.

The plant is designed for the processing of both fruits and vegetables. The processing of vegetables should account for most (about 70 per cent) installed capacity, and the processing of fruits (peaches, plums, apricots and pears) for the rest. The project should also deal with refrigeration facilities, which are required for the most important phase in the industrial processing and preservation of fruits and vegetables.

Time chart for the industrial processing of fruits and vegetables

Item	Quantity (tonnes)	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tomatoes													
Peppers	2597						XXXX	XXXXXXXX	XXXXXXX	XXXXXXXX			
Long peppers	136							XXXXXXX	XXXXXXX	XXXXXXXX			
Cucumbers	1288					XXXXXX	XXXXXXXX	XXXXXXXX		XXXXXXXX	XXXXXX		
Cauliflower	354	XXXXXXXX	XXXXXXXX									XXXX	XXXXXXXXX
Cabbage	52	XXXXXXXX									XXXXXX	XXXXXXXX	XXXXXXXXX
Carrots	32										XXXXXX	XXXXXXX	
Onions	207								XXXXXX	XXXXXXX			
Garlic	2	XXXXXXXX											XXXXXXXX
Apples													
Pears	183									XXXXXXX	XXXXXX		
Peaches	180						XXXXXXX	XXXXXXXX	XXXXXX				
Apricots	180					XXXXXX	XXXXXXX						
Cherries	144					XXXX	XXXXXXX	XXXXXXX					
Plums	144								XXXXXX	XXXXXXX			

The plant would employ 124 permanent and about 145 seasonal workers, not including those working in the fields and on the supply of raw materials. Out of 124 workers employed in a factory, 74 should be qualified and highly qualified. The training of personnel is usually carried out by the equipment supplier.

The most suitable location for the plant seems to be the industrial zone of Kabul, which is also the choice of the Government of Afghanistan. However, the experts consider that the plant could also be established at some other site visited (Jalalabad, Kandahar), or possibly in the province of Mozari-Sharif, with some adaptation of the plant, taking into account available quantities and varieties of fruits and vegetables and other factors.

Industrial production of 170,000 t/a of sweet grape juice

In view of the well-developed production of high-quality grapes, increasing local consumption of fruit juices, and the experience of the Afghan Fruit Processing Co. in handling and trading fresh and processed fruits, the experts consider that the introduction of the project into the priority programme of the company is justified.

In order to obtain better insight into the technology and equipment required, a short description of both is given in annexes I and II. Its capacity of 170,000 t of juice per year and the suggested equipment makes possible the production of different types of grape juice, depending on demand and prices on both local and foreign markets.

An opportunity study carried out suggests that the project is economically viable. However, only a feasibility study, with a detailed examination of all relevant factors, from the availability and condition of fresh fruits and vegetables to marketing and exports would provide a more definite reply with regard to the economic efficiency and viability of the establishment of the processing capacity. The experts recommend the preparation of such a feasibility study.

Few juice preservation techniques and methods of juice concentration are recommended. The techniques employed and the type of juice selected would influence the economics and utilization of the storehouse and the means of transport. The transport of juice from the factory to the consumer and over long distances was envisaged. Since the experts had to curtail their stay, they were unable to obtain deeper insight into present and

expected local consumption of grapes and different types of fruit juices in Afghanistan. Nor were they able to give a more definite opinion on the suggested capacity (170,000 t/a) and on the assortment of grape juices.

Modernization of machinery and technological processes for the preparation, preservation and packing of raisins

The existing plant of the Afghan Fruit Processing Co., Kabul, (with a capacity of 50 t/a for an eight-hour working day) operates with out-of-date equipment. The available technology is used in the selection, washing, preservation and manual reselection of grapes. The machinery and conveyors were imported from the United States of America in 1961 and have been in operation since that time. Most of the machinery is obsolete and requires considerable labour, thus increasing production costs.

In an effort to ensure better efficiency and more rational utilization of capacities, the company is interested in the modernization of machinery and technology and in the introduction of smaller packs of 250 g, 400 g, 500 g and 1,000 g of raisins. The smaller packs make possible higher market prices.

Since raisins are the most important export item of Afghanistan, and since the investment could give a considerable export trade, the experts consider it to be economically justified.

Reconstruction and modernization of fruits drying plant

The existing drying plant in the industrial complex of the Afghan Fruits Processing Co. in Kabul is based on diesel fuel. It uses moving trays for the drying of fruits and a ventilater with a servo-engine for warm air circulation.

Reconstruction and modernization of the plant would require the installation of a conveyor. In addition to grapes, pears, plums, cherries and apricots are to be dried.

In planning for the reconstruction and modernization of the drying plant, consideration should also be given to the possible use of other energy sources such as electricity and gas, instead of diesel fuel.

The Afghan Fruit Processing Co. would welcome, and the experts recommend, international co-operation in the reconstruction and modernization of the plant, including the possible switch from diesel fuel to electricity or gas. Such an undertaking could increase plant capacity and improve product quality. Since its production is devoted mainly to export, it would also help to increase foreign exchange earnings.

Establishment of refrigeration plant and stores for nut kernels

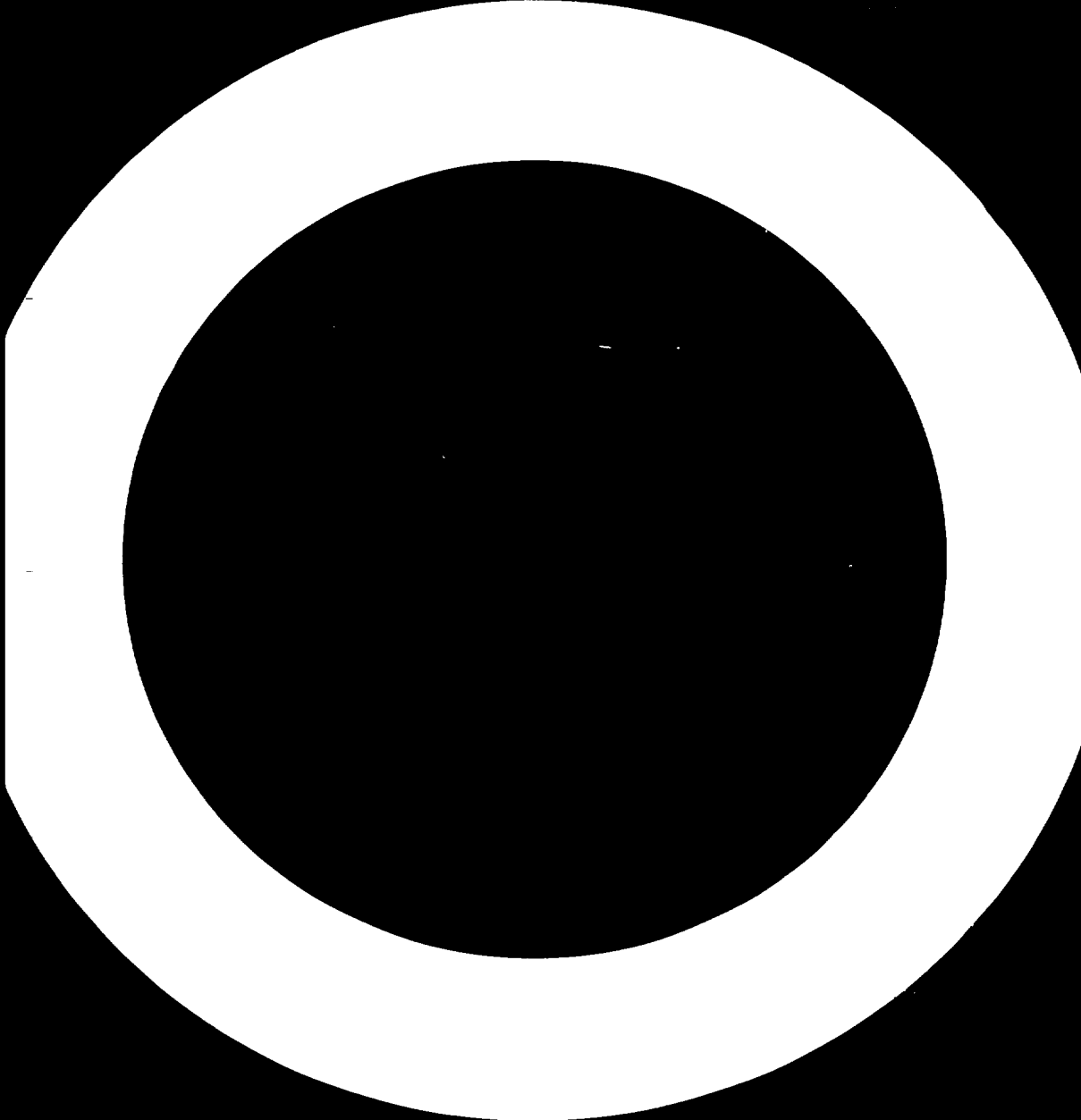
Within the industrial complex of the Afghan Fruit Processing Co., Kabul, consideration has been given to the establishment of a storehouse with a capacity of 300-500 t/a of nut kernels, and of a refrigeration plant for that perishable product Machines with a capacity of 3-5 t/h should also be provided for the mechanical crushing of walnuts and almonds. The machine selected should provide at least 35-45 per cent of the whole nut kernel, in accordance with foreign market requirements.

Since the storehouse will be of rather small capacity and involve specific storage methods, the experts consider that such a project should be dealt with within the framework of the project for the production of grape juice.

Food testing and quality control laboratory

The establishment of a food testing and quality control laboratory is, in the view of the experts, well incorporated into the programme of expansion, improvement and modernization of fruits and vegetables production. It could contribute to the improvement of the quality and phytopathological conditions of processed and fresh fruits and vegetables, and help the Government of Afghanistan in its efforts to improve human nutrition and to standardize foodstuffs.

In view of the limited financial resources available, the experts recommend the establishment of a small well-equipped laboratory, which would be able to determine the protein, moisture, oil, fat and carbohydrate content of different products, in addition to acidity, specific weight, quality, microscopic values, alcohol and dry matter content, impurities etc. The laboratory would require qualified local personnel and the assistance of an expert for a period of about six months. One of the tasks of the expert would be to provide intensive training to local personnel.



Annex I

TECHNOLOGICAL PROCESS FOR THE PRODUCTION OF APPROXIMATELY 170,000 T/A OF SWEET GRAPE JUICE [1]

Grape juice, by virtue of its quality, nutrition value and dietetic features, is an excellent supplementary source of nutrition in the modern diet. The age-old production technology of the juice is based on a process that keeps the liquid component unchanged and preserves it as long as possible.

Chemical analysis shows that the sweet grape juice contains approximately 77 per cent of water, 20–22 per cent of sugar, 1–3 per cent of materials of organic and mineral origin as free organic acids, salts of organic acids, albumens, pectins, oil, vitamins, mucous materials, dyed materials and micro-elements.

To satisfy daily demand for the juice, which is highly appreciated by consumers, reliable large-scale production is possible with the help of modern technologies of canning, preserving and transport to the consumers. Modern technology, good labour organization, and favourable natural and climatic conditions for wine growing and grape production will ensure the success of the product on the market.

Grape-picking has an important influence on the whole process of producing sweet grape juice. The transport of the picked grapes to the processing place has to be well organized and brief.

If the grapes are dirty with soil, dust or sand, washing is performed by flotation. Pressing is done by machine, to achieve faster and better separation of juice from the grapes and stalks. The latter operation is done by devices that separate stalks from grapes and press them mildly to prevent crushing the seeds and the crumbling of the grape skin.

The purpose of blanching technology is to inhibit the grape ferments and to inactivate the surface microflora (yeasts etc.). The influence of increased temperatures and brief exposure of the mass-crushed grapes increase the hydrolysis of the protopectin, which makes easier the separation and improves juice extraction.

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[1] Prepared by an expert of the Afghan Fruit Processing Co., Kabul.

Pressing of the prepared grape mass is done by machines of several types in order to separate the juice under high pressure.

Juice sedimentation is performed in basins by the separator in order to settle or separate remains of the hard part of fruits. After sedimentation, the pure juice thus produced is preserved by pasteurization at a slightly higher temperature, by adding chemicals, or by other means. The processed juice is then put into storage and serves as raw material for juices and non-alcoholic drinks.

Annex II

PROGRAMME

OF PRODUCTION, PRESERVATION, STORING AND

TRANSPORT OF SWEET GRAPE JUICE

For the primary processing of grapes and the production of approximately 170,000 t of sweet juice in a season of about three months, 200,000 t of grapes and the following equipment are needed:

4 grapes receiving stations with machines having a capacity of 50 t/h

4 lines for continuous crushing with a capacity of 50 t/h

4 blanching stations (8 blanchers), each with a capacity of 30 t/h

8 continuous presses, each with a capacity of approximately 30 t/h

10 reception pots with mixers for enzyme treatment, capacity of 50 tonnes per piece

1 separating station with a capacity of 200 t/h

The secondary, higher phase of processing requires the following:

Pasteurizers for pasteurization of sweet grape juice

Additives dosing device

Refrigerated storage facilities for about 100 cisterns of preserved juice at 1,000 m^3/cistern and a temperature of 0°-2°C

10 filters with a capacity of 200 hl/h

2 sulphuric dioxide separation devices

4 plate sterilizers

1 bottle-filling line with a capacity of about 6,000 pieces per hour

1 vacuum evaporator

1 concentrate filling line

10 cisterns for storage of the concentrate with air-conditioning at 10°C and a capacity of 1,000 tonnes per cistern

Internal transport system

1 vaporax for steam production

1 electric generator unit

1 compressor station for ammonia

4 vacuum pumps

1 chemistry and microbiologic laboratory

1 pump water system

1 waste water purification system

To avoid the need for large and expensive storage space, the volume of the juice from one grape picking should be reduced by one of the following means: evaporation under vacuum, low-temperature evaporation, spray draining and freeze drying. When using one of those techniques, the optimum relationship between preserved and concentrated juice will be determined on the basis of techno-economic and ecological factors.

Large-scale grape processing and sweet-juice production yield secondary raw materials, i.e. stalks, grape skins and seeds, for further processing. The technology has already been developed for processing and further using such waste material as fodder, manure for heating or in the industrial production of tannin, oil or dyed materials.

From the sweet juice it is possible to produce clear, turbid, carbonated, concentrated and instant juice. The choice of the final product and market supply conditions will determine the choice of the equipment and technology used in grape processing and production.

It has been shown that large-scale processing and production of various products from the same raw material is possible. A feasibility study with details on all technical and economic aspects of the project should therefore be prepared.