## OCCASION

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

## 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
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

D00135

ID

Distr.
LIMITED

ID/WG.17/4
12 September 1968

ORIGINAL: ENGLISH

United Nations Industrial Development Organization

Expert Group Meeting on the Development of Small-scale Industries in Arab Countries of the Middle East
Beirut, Lebanon, 11 - 16 November 1968

Agenda item 4

# THE FUTURE OF RURAL INDUSTRIES IN A MODERNIZING ECONOMY

Presented by the

Food and Agriculture Organisation of the United Nations

id.68-3140

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche.

## Contents

| | Page |
|---|---|
| A. INTRODUCTION | 5-6 |
| Industrial Development | 5 |
| Interdependence of Agriculture and Industry | 5 |
| Agriculture as Supplier of Food and Raw Materials | 5 |
| Food and Agricultural Processing Industries in Rural Development | 6 |
| Further References | 6 |
| B. SELECTED RURAL PROCESSING INDUSTRIES | 7-30 |
| 1. Cereals Industries | 7-10 |
| Production, Exports and Imports of Major Cereal Crops in a Number of Near East Countries | 7 |
| Need for Development of Efficient Cereals Processing Industries and the Introduction of Improved Technologies for Milling and Baking | 8 |
| Technological Development in the Field of "Composite Flours" | 9 |
| Summary | 10 |
| Further References | 10 |
| 2. Processing of Fruits and Vegetables | 11-21 |
| Introduction | 11 |
| (a) Fruits | 12 |
| Sun-drying | 12 |
| Artificial Dehydration | 12 |
| Preparation for Drying | 12 |
| Packaging | 13 |
| Sanitation | 13 |
| Annual Production and Exports: Raisins and Figs | 13 |
| Further References | 14 |
| Handling, Processing and Packing of Dates | 14 |
| Export and Production of Dates | 15 |
| Date Syrup Processing | 17 |
| Summary | 17 |
| Further References | 17 |
| (b) Vegetables | 17 |
| Review of Problems | 17 |
| Banana Processing | 19 |
| Okra Dehydration | 20 |
| Summary | 20 |
| Further References | 21 |
| 3. Processing of Vegetable Oils | 21-27 |
| Olive Production and Oil Processing | 21 |
| Revenues | 21 |
| The Present Situation in Near East Countries | 22 |

| | | Page |
|---|---|---|
| | The Future of the Olive Oil Industry in a Modernising Economy | 23 |
| | Pilot Operations | 23 |
| | The Industrial Development Programme | 24 |
| | Conclusion | 25 |
| | Further References | 25 |
| | The Processing of Oil Seeds | 25 |
| | Particulars of Some Promising Oil Bearing Crops | 26 |
| | Animal Feeds Industries | 26 |
| | The Vegetable Oil Industry | 27 |
| | Conclusion | 27 |
| 4. | Hides, Skins and Leather Industries | 28-30 |
| | FAO's Past Activities | 28 |
| | FAO's Present Activities | 30 |
| | FAO's Future Activities | 30 |
| | Further References | 30 |

## A. INTRODUCTION

### Industrial Development

Industrial development is one of the chief objectives of every developing country. In developing countries, agriculture generally accounts for the major proportion of national income, employment and exports, and manufacturing and other industries as yet play only a small part in the economy. In the industrialised countries, the position is reversed and the non-agricultural sectors predominate.

Industries based on raw materials derived from agriculture, animal husbandry, forestry and fisheries played a major part in the early stages of industrialisation of the developed countries, and they are no less important in the industrial development process now under way in the not yet fully industrialised countries.

Such industries are estimated to account for about half of the total value added and almost two-thirds of the employment in manufacturing industry in the developing countries at the present time, and their share in the developed countries, although smaller, is still substantial. The development of these industries also has many beneficial feedback effects on agricultural production itself.

The industries serving agriculture may also make a notable contribution to a country's industrial development, and their role in raising the low levels of agricultural production and productivity in developing countries is even more crucial.

### Interdependence of Agriculture and Industry

The interrelationships between agriculture and industry are complex. Agriculture's basic role as supplier of food for the industrial labour force and of many of the raw materials for industry is only one element, although perhaps the most essential. In most of the developing countries, agricultural exports must provide the bulk of the foreign exchange earnings for the import of the capital goods required for industrial development. Agriculture releases labour and often finance to industry. The agricultural population provides a market for industrial products, not only for consumer goods but also for a wide range of equipment and materials used in agricultural production.

### Agriculture as Supplier of Food and Raw Materials

The expansion of industrial and other non-agricultural employment increases the size of the population dependent on purchased food, of which an increasing part will be in the form of a processed product. It is, therefore, necessary that parallel with the development of industry, there should be a sufficiently rapid increase in marketed supplies of food. This implies a substantial transformation of the primarily subsistence-oriented agricultures of the developing countries. In particular, incentives must be provided, institutional and social barriers removed, and an adequate processing and marketing system developed, so as to ensure that agricultural producers feel the full force of the growing demand of the population employed in industry.

Thus, food and agricultural industries are of basic importance to rural development; by bringing the industrial development process within the environmental conditions of agricultural producers, a better understanding of the complementary role they have to play will result. In this paper, only a few selected food and agricultural processing industries are the subject of discussion.

## Food and Agricultural Processing Industries in Rural Development

Many agricultural raw materials are perishable; many, particularly grains, fruits and vegetables, are seasonal. Consequently, a large proportion of all agricultural raw materials undergo some transformation between harvesting and final use. In many developing countries, between 50 and 60 percent of all agricultural production is processed to some degree.

Processing serves to preserve and protect perishable materials and to permit them to be safely distributed from regions and seasons of abundance to those of scarcity. Processing frequently enhances the acceptability, uniformity and utility of foods and other agricultural materials.

The efficient processing, preservation, protection and distribution of food and agricultural products requires competent and efficient industries. Such industries are frequently best placed in rural locations, close to the source of the raw materials. Rural processing industries may be small, designed to satisfy local demands, or large, to process products for wide distribution including export.

The appropriate size, design, structure and operation of food and agricultural processing industries, the production and control of adequate raw materials to feed them, and the economical distribution and marketing of their finished products must be totally integrated. FAO has had many years of experience in the development and integration of food and agricultural processing industries. Some of the industries of interest to Near Eastern Countries are described in the following text.

FAO officers and experts are available to advise and assist all Member Governments in the development of rural industries which can benefit their overall economic development.

## Further References

- FAO Basic Study No. 17: Agriculture and Industrialisation.

- FAO's Activities in the Field of Industrial Development.
  1967 Annual Report for the Second Session of the Industrial Development Board of the United Nations Organisation for Industrial Development.

## B. SELECTED RURAL PROCESSING INDUSTRIES

### 1. Cereals Industries

**Production, Exports and Imports of Major Cereal Crops in a Number of Near East Countries**

In the countries of the Near East, cereals provide between 50 and 80 percent of the total calories and between 45 and 72 percent of the total proteins consumed. Except in two or three countries of the region, the potential demand for cereal intake per person is not yet satisfied. Demand per caput is therefore expected to rise during the next twenty years. With population projected to rise at 2.7 percent p.a., the overall demand for cereals will undoubtedly grow rapidly. The shortage of cereals is also a limit to the production of livestock.

Imports of cereals are a growing burden on foreign exchange resources. Between 1954 and 1964, imports of wheat increased eightfold. The total value of cereal imports in 1962 was $264, but by 1985 it is expected to reach $550 million (6.9 million tons), even if present production targets are fully attained.

The table below shows the production, exports and imports of the major cereal crops in a number of Near East countries:

(Thousand metric tons)

| | WHEAT | | | MAIZE | | | MILLET and SORGHUM | RICE | | | BARLEY | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Prod. | Exp. | Imp. | Prod. | Exp. | Imp. | Prod. | Prod. | Exp. | Imp. | Prod. | Exp. | Imp. |
| IRAQ | 1500 | 1.3 | 170 | 3 | - | - | 5 | 308 | - | 1 | 807 | 128 | - |
| JORDAN | 248 | 1 | - | - | 9 | - | 9 | - | - | 26 | 96 | 3 | - |
| LEBANON | 70 | 0.5 | 240 | 9 | 37 | - | 2 | - | - | 19 | 13 | 6 | 71 |
| KUWAIT | - | - | - | - | - | - | - | - | - | - | - | - | - |
| SAUDI ARABIA | 120 | - | 71 | - | - | - | 25 | 3 | - | - | 3 | - | 41 |
| SYRIAN ARAB REPUBLIC | 1068 | 24 | 23 | 6 | 6 | 2 | 84 | 2 | - | 29 | 690 | - | 245 |
| U.A.R. | 1500 | 6 | 1400 | 1739 | | | 860 | 2300 | 346 | | 110 | | |

The FAO Indicative World Plan has proposed an increase in total cereal production in the Near East from approximately 21 million tons (1962) to 42 million tons in 1985. While every effort must be made to achieve this goal it is equally important that all cereals produced be utilised most efficiently and that losses through infestation and spoilage be reduced to the lowest possible level.

The latter will require the universal adoption of reliable methods of harvesting and storage, and the prevention and control of rodent and insect infestation.

## Need for Development of Efficient Cereals Processing Industries and the Introduction of Improved Technologies for Milling and Baking.

Most effective utilisation requires the establishment of efficient cereals processing industries. The size and scale of milling, baking and other cereals industries must be decided according to local circumstances. Wherever new industries are being planned or existing industries expanded, due consideration must be given to new industrial technologies which can improve efficiency and the economy of operations and, particularly in the Near East, those which can help to reduce imports.

Two new industrial developments in which FAO has collaborated deserve mention.

Traditionally, in many countries of the world sorghum and millet are pulverised by hand. The resulting flour, being high in natural oil and lipolytic enzymes, becomes rancid in a very short time. Millet and sorghum flours of greatly improved quality and significantly longer shelf life, are now being produced under an FAO project in a pilot mill located in Zinder in Eastern Niger.

The grain is cleaned, graded and dehusked by abrasive millstones. The bran is separated for cattle feed, and the decorticated grain passes to a turbo-grinder. This Ultrafine Cyclomat turbo-grinder is of two components: (1) a hot air generator (2) a grinding unit. The grinder consists of a vertical axis fitted with a series of alveolar rotors and discs which rotate horizontally at high speed. As the grain passes upward it is gradually pulverised.

The resulting mixture of flour and semolina is being conveyed to storage by a stream of hot air. The hot air reduces the moisture content of the flour to about 5 percent and probably destroys some of the fat splitting enzymes. In consequence, the flour is more stable and can be satisfactorily stored for several months under local conditions.

In an additional alternative process, the grain, after decortication, is fermented in its own weight of water for 24 hours before being dried and turbo-milled as before. Fermentation improves the colour and flavour and permits sorghum and millet flours to be mixed in the proportions in which they grow.

The flour and semolina produced in the mill at Zinder are being well accepted by the local consumers and several other countries in the region propose to establish similar mills.

For more than 6,000 years, bread has been made traditionally by allowing a mixture of flour, salt, yeast and water to ferment for several hours before dividing, moulding and baking the resultant dough. Very recently an important technological discovery has provided bakers with a new breadmaking process. The basic essentials of this process include the total replacement of bulk fermentation by rapid mechanical dough development in a high speed mixer. Small, comparatively inexpensive mixers suitable for this purpose are now commercially available.

Technological Development in the Field of "Composite Flours"

In addition to the obvious advantages which accrue from the elimination of bulk fermentation, i.e. reduced processing time; savings in manpower, space and services; simplification of the technology; less reliance upon operator's judgement; greater uniformity of bread weight - the mechanical development process permits bakers to use significantly weaker flour blends than is possible with conventional fermentation systems.

An industrial development study sponsored by FAO demonstrated that using the mechanical dough development process, a significant proportion of the wheat flour customarily used could be replaced by corn (maize) flour, cassava starch or millet and sorghum flours, the protein content being supplemented by oil seed protein flours. The following table shows the percentage composition of some of the "composite flours" from which a wide range of satisfactory breads have been produced:

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Wheat flour (Canadian) | 67 | 64 | 60 | 64 | 67 | 64 | 64 | 64 |
| Cassava starch | 33 | 30 | 30 | - | - | - | 30 | - |
| Corn starch | - | - | - | 30 | - | - | - | 30 |
| Soya flour (1) | - | 6 | 10 | 6 | - | 6 | 3.5 | 3.5 |
| Millet and sorghum (2) | - | - | - | - | 33 | 30 | - | - |
| Fish protein concentrate (3) | - | - | - | - | - | - | 2.5 | 2.5 |

(1) Full fat heat-treated to nil urease; defatted heat-treated (50% protein) and full fat made by the Wenger process were all successfully used.

(2) A mixture of 70% millet, 30% sorghum flours produced in an ultrafine turbo mill in Niger.

(3) A pilot plant sample from the U.S.A. (82% protein).

By making it possible to replace imported wheat with local grains and starches, this process could lead to substantial savings in foreign currency in countries which are major wheat importers and which cannot produce sufficient wheat to meet their present needs but which can produce substantial quantities of other grains and starch sources. Furthermore, the proportion of the non-wheat components of the composite flour can be raised according to local taste or increased gradually over a period of time.

In collaboration with FAO, the Institute for Cereals, Flour and Bread, TNO, Wageningen, Netherlands, has made considerable progress in the development of a breadmaking process using cassava starch and defatted soyabean or peanut flour. Its applicability will be studied in a number of countries.

<u>Summary</u>

In summary, it can be said that recent advances in technology, together with existing knowledge of cereals production, storage and processing, can be widely applied in rural industries to the economic benefit of the countries in which they are adopted.

<u>Further References</u>


- FAO Commodity Policy Studies Series, FAO Commodity Series and other Reports
- FAO Agricultural Development Paper No. 64: "Equipment for Rice Production" (1966)
- Informal Working Bulletins in the Agricultural Engineering Series:
  - No. 15 "Methods and Equipment for Rice Testing" (1962)
  - No. 21 "Portable Equipment for Sampling and Temperature Measurement of Bulk Grains" (1965)
  - No. 23 "Rice Drying - Principles and Techniques"
  - No. 24 "Some Essential Considerations on the Storage of Food Grains (Cereals, Legumes and Oilseeds) in Tropical Africa" (1965)
  - No. 30 "Rice By-products Utilisation" (1967)

## 2. Processing of Fruits and Vegetables

### Introduction

Sun-drying of fruits is a very ancient rural industry in all the Near East countries. The main fruits which are dried are: apricots, grapes, figs, peaches, plums, pears, dates, in halves, in slices, or in paste like kamaradeen (apricots).

Dehydration as a technique for the preservation of fruits and vegetables has a number of advantages over the alternative methods of canning and freezing.

(1) The equipment required is usually simpler and less expensive.

(2) The technology is less complex.

(3) Packaging, transport and storage costs are usually lower.

These advantages have particular significance for developing countries where, more often than not, the technology, services and supporting industries necessary to sustain a canning or quick freezing venture are either non-existent or inadequate. In countries such as the UAR, Sudan, Syria, Jordan and Iran, it is likely that better opportunities exist in the short term for the establishment of soundly based fruit and vegetable dehydration ventures than for parallel industries using canning or freezing as a means of preservation. In the case of canning, bitter experience has often shown that the high price of imported tinplate and the variable quality of locally manufactured cans not only prevent entry into the very competitive export market, but also result in locally produced canned goods being more expensive and of lower quality than those imported from reliable manufacturers.

In the case of freezing, we are faced with one of the most capital-intensive segments of the food industry. Only highly industrialised countries such as Sweden, the U.S.A., the U.K., West Germany, and some others, have been able to develop successful frozen food industries. But this success has only come about with the setting up of highly automated plants, massive cold storage depots, expensive fleets of refrigerated transports, refrigerated cabinets in every retail shop and, most important, frozen storage facilities in the majority of homes.

By comparison then, dehydration as a technique for the preservation of fruits and vegetables presents some really worthwhile opportunities for the developing countries. And to illustrate that these opportunities can be exploited to the benefit of a country we can cite the example of the industry of dehydrated onions as has been developed in the U.A.R. From an initial production of 650 tons in 1950, the U.A.R. has built this industry to the point where to-day eight plants produce an annual total of around 6,000 tons. Most of this production is exported and, each year, earns for the U.A.R. around US$ 2.5 million export income.

(a) <u>Fruits</u>

<u>Sun-drying</u>

For developing countries in the Near East, sun-drying is probably the most attractive preservation technique available. Many fruits if properly prepared can be sun-dried quite successfully and the dehydrated product reconstitutes well. The equipment required is quite inexpensive compared with other dehydration methods and consist of little more than trays, dipping tanks and rooms for fumigation or sulphur dioxide treatment. Favourable climatic conditions are required and existing, but careful consideration needs to be given to meteorological data concerning the season of crop maturity. Humidity below [illegible]% and a dry bulb temperature between [illegible] and [illegible]° are essential for a satisfactory rate of drying. Under these conditions, apricots can be dried in two to three days while other fruits require longer periods. Pears and large peaches, for example, require up to 14 days. When long drying periods are necessary fruit trays should be stacked for much of the latter part to minimise bleaching of the dried surfaces.

<u>Artificial Dehydration</u>

Dehydration controlled by hot air with or without reduced pressure does have a number of advantages over sun-drying. Firstly, climatic conditions are not a factor; secondly, the product is cleaner because it is free of dust and insects which can gather on the sticky surfaces of sun-drying fruit; and thirdly, the time required for dehydration is much shorter than for sun-drying, ranging from eight to twelve hours for apricots, 12 to [illegible] hours for peaches, 16 to 24 hours for apples (sliced), 20 to 30 hours for pears (sliced), prunes and figs.

To ensure against heat damage - particularly in the final stages of dehydration - temperatures in the dehydrator should never exceed 65°C (150°F). Various types of dehydrators of natural or forced draft design for fruit and vegetables are available. Most of the small and medium sized driers are of the counter-flow tunnel type in which the trolleys progress in the opposite direction to the air flow, entering at the cool end and emerging at the hot end. Produce is dried to a moisture content of 15 to 16% being the normal level at which microbial growth normally is inhibited.

In the FAO/UNDP projects in Syria and the Sudan, excellent results were obtained with simple and cheap cabinet dryers using air ventilation, and with rotary dryers made with bicycle wheels and screens.

<u>Preparation for Drying</u>

Drying requires several pre-treatment conditions. Fruit should be well-matured and should be separated by size and processed accordingly. Most fruit should be washed first to remove sand, dust and insects and should be sorted to eliminate damaged and impure produce. Dipping - to shrivel and toughen the skin and to facilitate drying - is recommended in a hot, dilute sodium hydroxide solution (about 0.25 to 1%) for 10 to 60 seconds with dark prunes and raisins and in a cold solution with figs. Treatment by sulphur dioxide is desirable with all fruits except dark coloured prunes and bananas. The use of sulphur dioxide is permitted in most countries of the world and its purpose is to retain the natural colour of the fruit and to retard the browning reaction between amino-acids and reducing sugars. The cheap and easy practice of sulphur dioxide treatment is to place a plastic tent over stacked, loaded trays and to diffuse the gas through them by burning sulphur in a small pit connected by an underground channel to the plastic tent in the top of which there are small holes to ensure diffusion of the gas. About 2.5 to 4 kilograms are generally used for each ton of fruit. The length of the sulphuring treatment is important and varies according to the fruit (for example, 3 to 7 hours are required for apricots and 15 to 18 hours for sun-dried pears).

## Packaging

Increasingly, the trend in retailing dried fruits is by using sealed, plastic bags. This method has the advantage of avoiding the possibility of insect infestation which is present when packaging is in paper-lined wooden crates.

## Sanitation

Regular control and supervision of hygienic conditions during the preparation period for drying, further processing and during packaging is of utmost importance, both when simple sun-drying techniques or more elaborate artificial dehydration methods are applied. Introduction of improved fumigation practices is in this respect also very desirable.

## Annual Production and Exports: Raisins and Figs

The following table shows the annual production and export of fruit in Syria, Lebanon, Libya and the U.A.R.:

- Hundred Metric Tons -

| Country | Production 1961 | 1962 | 1964 | 1965 | Export 1961 | 1962 | 1964 | 1965 |
|---|---|---|---|---|---|---|---|---|
| | Raisins | | | | | | | |
| Iran | 677 | 499 | 350 | 500 | 379 | 305 | 235 | 238 |
| Jordan | 5 | 8 | 4 | 28 | - | - | - | - |
| Lebanon | 4 | 4 | 3 | 3 | - | 0.2 | 0.1 | 0.2 |
| Syria | 114 | 104 | 136 | 100 | 1.5 | 1 | 1.6 | 1.2 |
| | Dried Figs | | | | | | | |
| Jordan | 20 | 20 | 30 | 30 | - | - | - | - |
| Syria | 50 | 60 | 50 | 50 | - | - | - | - |

Further References

- Informal Working Bulletin No. 16 in the Agricultural Engineering Series: "Possibilities for the Utilization of Solar Energy in Underdeveloped Rural Areas" (1960) (Drying of Fruit and Vegetables)

- FAO Agricultural Study No. 55: "Agricultural and Horticultural Seeds" (1961)

Handling, Processing and Packing of Dates

The main date producing countries in the world are located in the Near East and North Africa: Iraq, Iran, Saudi Arabia, U.A.R., Algeria and Pakistan. More than one million persons are supported entirely by date cultivation which is their single revenue and their main food. Dates play the same role as the coconut in Polynesia, but on the world market dates are much less important since they do not contain a valuable vegetable oil.

From the nutritive point of view, dates provide practically only sugar. The fat and the protein content are extremely low (less than 2%) and only a slight amount of vitamin A is present.

But for the producing areas ("desert ecology") dates are of vital importance and the excess production represents valuable income to these areas which are in general very poor and have no other source of income. The developed countries could absorb significant quantities at profitable prices. Unfortunately, until the last years the quality of the dates coming from the producing countries has generally been poor. Therefore dates have been exported at comparatively low prices.

In the developed countries only one variety is generally considered acceptable; it is the Deglet Nour, but this variety grows only in Algeria, Tunisia and in the United States of America.

If the growers could adopt improved and hygienic practices and reliable methods of separating and packaging sound ripe clean dates, free from infestation, sand, dirt, under-ripe and damaged fruits, very little processing normally would be required and a premium price could be demanded in world markets.

The inferior practices of the growers necessitate a number of expensive operations: sorting, washing, drying, cleaning, maturation, curing, grading, fumigation and packing. Even though the equipment used is comparatively simple, only physical operations are involved and, since labour is generally cheap, many steps are still done by hand (wrapping, labelling, sorting, grading), the additional processing is inevitably reflected in the final price.

During the past ten years, and partly with FAO assistance, a number of modern packing plants have been erected in Iraq (Baghdad and Basrah), in Saudi Arabia (Medina, Hofuf), in Algeria, Tunisia and Libya, from which products of high quality are exported. The world trade is estimated at 350,000 tons which is probably not more than one-fourth of the total production. Another fourth is probably lost through damage and infestation and the remainder are eaten by animals or by the producers and their families.

There are no date-palms in Lebanon, only a few in Syria. Jordan begun some planting in the south, but the quantity is still too small to start any industry. In Kuwait there are only a few date-palms and no labour available. Petrol is much more attractive and gives a much higher income than date cultivation and processing.

## Export and Production of Dates

The following two tables are listing the export and production of dates.

### Export of Dates

(Hundred Metric Tons)

| Country | 1961 | 1962 | 1964 | 1965 |
|---|---|---|---|---|
| Iran | 296 | 296 | 232 | 275 |
| Iraq | [illegible] | 230 | [illegible] | 269 |
| Jordan | - | - | 0.4 | 0.2 |
| Lebanon | 0.7 | 3 | 3 | 6.5 |
| Saudi Arabia | 33 | 27 | 64 | 26 |
| Syria | 0.5 | - | - | - |

U.A.R. : No export. All consumed in the country (386,000 tons)

---

Reference Book: Trade Yearbook, 1966 (FAO)

## Production of Dates

(1000 Metric Tons)

| Country | 1948-1952 | 1952-1956 | 1961 | 1962 | 1963 | 1964 | 1965 |
|---|---|---|---|---|---|---|---|
| Iran | 230F | 303* | 300* | 310* | 328* | 285* | 285* |
| Iraq | 313 | 330 | 350 | 460 | 330 | 350 | 280* |
| Jordan | - | - | 1 | 1 | 1 | 1 | 1 |
| Pakistan | 80 | 80F | 60F | 43 | 53 | 55F | 75 |
| S. Arabia | 183 | 182 | 200F | 250F | 260F | 284 | 354 |
| S. Arabia Fed. | 6 | 14 | 8 | 8 | 8 | 8 | 8 |
| Yemen | 50F | 52F | 60F | 60F | 60F | 60F | 60F |
| Total | 848 | 960 | 980 | 1133 | 1041 | 1044 | 1064 |
| **AFRICA** | | | | | | | |
| Algeria | 98 | 89 | 95F | 100F | 113 | 110 | 110F |
| Libya | 34 | 33 | 33F | 24F | 22F | 56 | 40 |
| Morocco | 43 | 72 | 56 | 57 | 80 | 85 | 85 |
| Sudan | 31 | 28 | 38* | 40* | 40* | 42* | 45* |
| Tunisia | 34 | 34 | 36 | 15 | 30 | 42 | 54 |
| U.A.R. | 185 | 323 | 479 | 401 | 440 | 327 | 386 |
| Total | 425 | 579 | 737 | 637 | 725 | 662 | 720 |

Reference Book: Production Yearbook, Vol. 20 - FAO, 1966

F = FAO Estimates

* = Unofficial figures

The value of Iraqi date exports was more than 7 million Iraqi dinars in 1965 which represents more than 50% of the total exports of the country (with the exception of petrol).

Date Syrup Processing

As already stated, dates as a food provide practically only sugars. These sugars, although not of the same structure as the sugar derived from cane or beet, have nevertheless the same nutritional value. These sugars can best be used in the form of syrup, as crystallisation of the sugars present in dates is difficult and not economic. Date syrup has been made in Near East countries since ancient times, following simple techniques, but increasing interest is shown in the application of modern technologies (extraction, concentration, etc.) and a pilot processing plant has for some years been in operation in Tripoli, Libya.

Iraq, Saudi Arabia, Pakistan and other countries also are interested in this new development, and several ways and means for the use and further application of date syrup in food mixes, soft drinks, baking, etc. are now under consideration. The presscake that remains in this process as a further by-product mostly containing fibres and some sugar is valuable for use in animal food compounds.

Summary

Date processing is a rural industry which can unquestionably be expanded. In this respect, the recommendations contained in the second FAO Technical Conference on the Improvement of Date Production and Processing (held in Baghdad 16-25 October 1965) should be reviewed and implemented by all of the countries concerned.

Further References

- FAO Agricultural Development Paper No. 72: "Dates: Handling, Processing and Packing" (1962)
- FAO Agricultural Study No. 56: "Manual of Fumigation for Insect Control" (1964)
- "Date Palm Improvement" (In preparation).

(b) Vegetables

Review of Problems

Although we made the claim earlier that the technology of vegetable dehydration is relatively simple, there are a number of basic rules which must be followed if a technically and economically successful operation is to result. To spell out the way in which these rules operate, it may be useful to draw examples from the Sudan where FAO/UNDP and the Sudanese government are jointly operating a Food Processing Research Centre at Khartoum.

A major part of the activities of this centre is concerned with the development of the vegetable dehydration industry in the Sudan. At present, this industry is centred at Kassala where a pilot processing plant was established in March 1967 for the dehydration of onions.

In general, in planning the location of such processing industries, attention should be given to a certain number of rules to ensure effective processing and marketing operations. Some of the essential points to be given consideration are listed below under (a), (b), (c) and (d).

(a) <u>The plant should be located close to an adequate source of raw material.</u>

While the Kassala plant is located in an onion growing district, in fact most of the varieties grown there are of a type suited only for the fresh market. Red skins, low solids content (8%) and a short storage life (3-4 weeks) after harvesting make them unsuitable for dehydration. The type of onion required by the Kassala plant should have a white or yellow skin, a solids content of up to 14% and should be capable of being held in store for up to 4 months, this latter requirement being necessary to enable the plant to operate 7 months of the year from a 3 month harvesting season.

At Kassala, only one variety, "Excel", has met with limited success. Over the 1967 season, this variety averaged 12.6% solids, but during 1968 the figure was down to 8.7%. The reasons for this have not been established, but it is suspected that a different strain of seed was used in 1968. The effect on the economics of production of such a drop in solids content are quite dramatic:

At 12.6% solids it requires 10 tons of fresh onions to produce 1 ton of dried onions; at 8.7% solids it requires <u>13 tons</u> of fresh onions to produce 1 ton of dried onions.

An intensive programme of variety trials is under way to develop strains with properties suitable for dehydration, but at present it seems that at least two more seasons will elapse before these will be available in sufficient quantity. The economics of the plant are based on a minimum 7 months production season using raw material of 14% solids content, and it is now clear that the Kassala plant will not be brought to an economic break-even position until an adequate supply of suitable raw material is secured.

(b) <u>If possible, the operation of a plant should be based on a broad variety of raw materials.</u>

Few and fortunate are the industries that can make an economic success from the use of one raw material or the sale of one end product. This is particularly so in the vegetable processing industry where a wide spread of crops for processing is almost always undertaken for two very good reasons:

(1) Different varieties of vegetables harvested at different times throughout the year mean that a plant can spread its processing season over more months. A dehydration plant, like any other, earns income only while it is operating. The ideal, of course, is to operate a plant on 3 shifts for 52 weeks of the year and, generally, the nearer that one can come to this ideal through diversification of varieties of vegetables processed, the better the chance of economic success.

(8) A wide range of vegetables helps to spread the risk. Where a plant relies on only one vegetable variety for processing, there is always a danger that a crop failure through adverse weather or disease will put it out of business.

The vulnerability of the Kassala operation was recognised at an early stage and an active programme of diversification started. One of the most promising crops appeared to be sweet peppers and earlier this year an area of about 6 feddans near the factory was laid down for variety trials. The most promising varieties appear at present to be Yolo Wonder and California Wonder. A paprika type variety known as "Pepperocini" is also being assessed for the production of paprika powder. The processing procedure that has been established by FAO and Sudanese Government workers for sweet peppers is as follows:

(1) Grading the green from the red fruit.
(2) Hand coring.
(3) Washing in a converted onion washer.
(4) Slicing by machine to 6x6 mm or 10x10 mm.
(5) Sulphiting by a 1 minute dip in a solution containing 4000 ppm of sulphur dioxide.
(6) Drying in a conveyor dryer to a final moisture content of 5%.
(7) Sieving over a 16 mesh sieve to remove fines.
(8) Hand inspection and packing.

With the knowledge that conveyor dryers are most efficient in the early stages of moisture removal and become less efficient for final drying to 5% moisture, FAO workers have completed the design of a bin dryer for finish drying of sweet pepper and other products. When installed, this inexpensive unit will enable the throughput of the main conveyor dryers to be increased considerably. Initial trials with sweet peppers look extremely promising and it is planned to enter commercial production in 1969.

Banana Processing

The dehydration of bananas using the novel preliminary step of partial osmotic dehydration in a sugar syrup has also reached the pilot production stage. Laboratory samples sent to the U.K. for evaluation have resulted in a 2 ton trial order being placed with the Kassala plant. The process uses Cavendish bananas at the "eating ripe" stage. The bananas are peeled and sliced, then immediately dipped in a sugar brine containing sulphite. After draining, the slices are loaded on drying trays at the rate of 1.25 lbs per square foot, then dried in a cabinet dryer to a final moisture content of between 15 and 20%. The relatively high final moisture content is acceptable because the high concentration of sugar absorbed by the slices from the brine reduces the water activity to the equivalent of a 5 - 7% moisture level in a low sugar product dried by conventional means. After drying, the material is packed loosely in large polythene bags and allowed to stand for 5 days to come to equilibrium. It is then press-packed into 4 oz. blocks, cellophane wrapped and finally placed into shipping cartons.

## Okra Dehydration

Okra is a third variety which is felt to have potential for Kassala. Here although it is possible that export opportunities may exist, the main objective is to produce a superior grade of dehydrated Okra for the local market. In the Sudan, fresh Okra is available for a large part of the year, but there is also a considerable demand for the dehydrated product. This demand is at present supplied by a low grade of sun-dried Okra. Workers at the FAO project in Khartoum have prepared excellent samples of machine-dried Okra by slicing, blanching, then sulphite dipping for 1 minute in a solution containing 5000 ppm of sulphur dioxide. Slices dried for 3 hours at 65-70°C had a final moisture content of 6% and reconstituted well after 6 months storage at ambient conditions. At present, a blancher is being designed for installation at the Kassala plant.

(c) <u>Pre-process storage facilities should be designed to suit the specific requirements of the vegetable variety being stored</u>

Initially, white onions were stored at Kassala on racks in open sided sheds. The excessive exposure to sunlight resulted in the rapid development of green pigment, making the onions unsuitable for dehydration. It has been recommended by FAO workers that walls be provided for the sheds with adequate, vermin proof, top and bottom ventilation. The onions should be stored on slatted wooden floors with a 15 cm air space between the wood and concrete floor to permit easy air circulation. It has also been found that some onions are being delivered green from the field. Project officers recommended the simple device of covering piles of green onions with empty sacks. After 5 days the green pigmentation disappears.

(d) <u>Machine capacities in a processing operation should be matched.</u>

It was found in practice at Kassala that the capacities of the four preparation lines were greatly in excess of that of the dryers which they feed. It has been found possible to close down two of the lines and by altering the layout, arrange for each of the other lines to feed two dryers. The result has been a marked increase in factory efficiency. One of the spare preparation lines is now being used for pilot plant studies and the other is on stand-by. As the rate-controlling factor on throughput was found to be dryer capacity, steps have now been taken to increase this by speeding up the fans. The bin drier mentioned above will also increase factory output by about 20% when it is installed.

## Summary

In summary then we have 4 rules:

(1) Ensure an adequate supply of suitable raw material.
(2) If possible, plan a wide range of products.
(3) Know the requirements of the vegetable when planning a raw material store.
(4) As nearly as possible, match the capacities of successive processing steps.

This list is, of course, by no means exhaustive. It is, for instance, just as vital to know your market, to package properly and to predict and control your costs with accuracy. The above 4 were chosen, however, because they have proved to be key factors in determining the success of the Kassala operation. The examples quoted also illustrate the way in which technology applied "at the factory floor" level can be of real use in aiding the development of rural industries.

Further References

- FAO Marketing Guide No.2: "Marketing Fruit and Vegetables" (1957)
- Freedom from Hunger Campaign Basic Study No. 4: "Marketing: Its Role in Increasing Productivity".
- FAO Agricultural Study No. 21: "Legumes in Agriculture" (1966)

3. Processing of Vegetable Oils

Olive Production and Oil Processing

The yearly production of olives in the Near East Region fluctuates considerably due to climatic conditions and varying cultural practices. Over the 1961/65 period, the Region, as recorded in Vol. 20 of the FAO Yearbook, produced an average of 852,000 metric tons of olives. During this period, the maximum production of 1,088,000 tons was reached in 1964 and the minimum production of 478,000 tons was experienced in 1962. However, in recent years, as a result of improved agricultural practices, certain areas have shown reduced annual fluctuations. Crop increases have resulted from young trees recently entered into production and further increases are expected from new plantings.

The crop volume and the present trends justify a serious study of future development.

Revenues

The olives produced in the region are mostly destined for oil extraction and the revenues are directly related to:

(a) Quality of the final product
(b) Rate of extraction (processing yield)
(c) Cost of processing.

In the Syrian Arab Republic, the normal wholesale prices recorded in 1966 were as follows:

| | | | |
|---|---|---|---|
| Up to 1 degree of acidity: | Syria pounds | 2.25/2.35 | per kilo |
| Good tasting oils from 1-2 degrees | " " | 1.95/2.10 | " " |
| From 2 - 4 degrees | " " | 1.70/1.90 | " " |
| From 4 - 6 degrees | " " | 1.60/1.70 | " " |
| Over and above 7 degrees | " " | 1.60 | |

This indicates that the good oils command a 20-30 percent higher price than the others.

The wide price differentials are attributable to several factors: the fruit, as it comes from the tree, can be pressed by mechanical means and, if handled hygienically, it provides a most valuable oil rich in flavour, vitamins and other nutritive substances which encounters extensive demand, both for domestic and foreign markets. On the other hand, low grade oils of high acidity, poor flavour and unpleasant odour, must be refined. The necessary chemical treatment flattens the taste, destroys the vitamins and places the oil in an inferior class, where it is commercially non-competitive with cheap seed oils. In Syria, the price of refined cotton seed oil used for human consumption averages 1.10 Syrian pounds per kilo and it is highly competitive when compared with the low quality olive oil.

Low grade olive oil is due to improper post-harvesting methods, disorganised deliveries to the mill, prolonged and bad storage of olives prior to milling, inadequate processing operations, and lack of sanitation in the processing plant. Thus the production of superior quality oil mainly requires careful handling and strict co-ordination between production and processing.

Rate of extraction (processing yield) is mainly related to machinery performance and milling technique. Modern equipment may permit from 4% to 8% increases of extraction yields over the normal yields obtained from primitive equipment. Processing costs are mainly linked to machinery performance, management organisation and working capacity. Hence economic processing involves rather high milling capacities and modern equipment.

The Present Situation in Near East Countries

The South-Western coast of the Mediterranean Basin, as a whole, presents a uniform picture and fairly standard problems with the only possible exception of a few pilot areas which have been equipped with modern installations. Within the Region, most of the mills are small capacity units of the artisan type where processing operations are carried out under poor hygienic conditions. The olives, upon delivery to the mill, are mostly stored in the open air, headed up in piles on the ground, usually on paved earth and olive washing machines are extremely scarce. The crushing of olives is badly done, the subsequent pressing of the paste is most unsatisfactory because of the low pressing force, short pressing time and frequently unhygienic conditions of the filtering discs; centrifugal separators are very rare and the separation of oleaginous liquors is normally done by natural decanting; hence oil qualities, extraction yields and daily outputs are very poor.

This situation is also caused by the fact that many of such artisan mills press to order for third parties and are paid in oil (a given percentage of the oil extracted) including sometimes the press-cakes. The mill owner, therefore, is not interested in high pressure and prolonged pressing. On the contrary, he gains if the press-cakes are rich in oil. In addition, he tends to keep capital investments to the minimum and, therefore, he does not take into consideration the machines and expenses which improve the quality of the oil, such as washing machines, centrifugal separators, the washing of the filtering discs, good storage and hygienic conditions. Hence, even when the millers have installed modern equipment, there has been insignificant improvement in oil qualities due to the little attention paid to sanitation and rational processing.

## The Future of the Olive Oil Industry in a Modernising Economy

The olive oil sector offers excellent opportunities for wide industrial development projects which, by necessity, must be confined to the rural areas, close to existing plantations, since the olives must be processed with minimum delay and minimum handling after they have been harvested.

A comprehensive development programme should aim at quality improvement, increase in the rate of extraction and reduction of processing costs and the systematic implementation of such a programme involves three basic steps:

(1) Reconnaissance, identification of pilot project areas and general planning;

(2) Establishment and operation of pilot mills;

(3) Planning and implementation of the investment programme.

## Pilot Operations

Pilot operations must be carried out at commercial level and are mainly required to:

(a) demonstrate the advantages of improved methods to local farmers and millers;

(b) identify and develop the most appropriate processing techniques;

(c) assess the basic data required for subsequent industrial development programmes.

A pilot, medium capacity olive oil mill might involve an approximate investment of US$ 40,000 (25,000 for the equipment and 15,000 for the building). The unit, even if working for applied research and demonstration purposes, should produce a profit but requires the provision of a specialised expert for a period of 3 - 5 years. One expert, if provided with adequate transport facilities, should be able to supervise three pilot plants. A pilot project conducted in the Syrian Arab Republic with FAO assistance, in addition to other results, produced:

- a 5% increase in extraction yields over the normal yields obtained in the prevailing local mills;
- an improvement in quality between oil from modern and primitive mills with an increased value estimated at 250 Syrian pounds per ton.

The Industrial Development Programme

The second phase, i.e. the industrial development programme, requires:

assessment of production figures; inventory of existing mills; plans for the consolidation and modernisation of existing mills; similar plans for the new installations which are envisaged; cost estimates for equipment and spare parts; drawings and cost estimates for the buildings; plans and cost estimates for maintenance and service facilities; an accurate programme of staff requirements and training requirements; a time schedule.

In addition, such a development programme requires extensive services of fully qualified experts to assist in the planning, installation, initial operation, organisation, and training.

The costs of industrial development may vary considerably from country to country. A preliminary study which was prepared for the Syrian Arab Republic and envisaged the installation of standardised milling units, suggested the following estimated costs:

Two Press Plant

Working capacity: 13.5 tons of olives per 24 hours
Cost of buildings: S.P. 31,000
Cost of equipment: S.P. 78,000
Running expenses (depreciation, maintenance, personnel, interest on revolving funds, fuel, lubricants, etc.) S.P. 7.10 per ton

Milling cost: S.P. 48.30 per ton of olives
Total milling revenue: S.P. 62.35 per ton of olives.

Four Press Plant

Working capacity: 26 tons of olives per 24 hours
Cost of buildings: S.P. 44,000
Cost of equipment: S.P. 147,000
Running expenses: S.P. 7.10 per ton
(depreciation, maintenance, personnel, interest on revolving funds, fuel, lubricants, etc.)

Running cost: S.P. 44.12 per ton of olives
Total milling revenue: S.P. 62.35 per ton of olives.

## Conclusion

The olive oil sector offers excellent opportunities for industrial developments in the rural areas but requires:

(a) full co-ordination of agricultural and industrial activities;
(b) systematic planning, and
(c) extensive technical assistance.

## Further References

- FAO Agricultural Study No. 50: "Improvement in Olive Cultivation" (1961)
- FAO Agricultural Development Paper No.58: "Olive Oil Processing in Rural Mills" (1956)
- Commodity Policy Study No.9: "The Stabilization of the Olive Oil Market" (1955)
- Commodity Report: "Fats and Oils No. 8. Olive Oil "

## The Processing of Oil Seeds

The production of oil bearing seeds in Iran, Jordan, Kuwait, Lebanon and Saudi Arabia is limited compared with the significant production in the Syrian Arab Republic. The FAO Yearbook (Vol. 20) quotes the following production statistics for the year 1965:-

| | tons |
|---|---|
| **Groundnuts** | |
| Syria | 6,000 |
| Lebanon | 5,000 |
| **Cottonseed** | |
| Lebanon | 1,000 |
| S. Arab Federation | 13,000 |
| Syria | 292,000 |
| **Linseed** | |
| Iraq | 12,000 |
| **Sesame** | |
| Iraq | 95,000 |
| Jordan | 14,000 |
| Lebanon | 2,000 |
| Syria | 48,000 |
| S. Arab Federation | 9,000 |
| S. Arabia | 4,000 |

In the Near East Region, consumers generally prefer olive oil but the domestic production does not cover the consumption requirements; in addition, olive oil commands a high price for export and therefore other seed oils are important substitutes. A significant increase in production is required throughout the region; those countries which already produce substantial quantities should endeavour to increase their output, countries with a limited production might consider a "pioneering" approach and with competent assistance determine what measures are required to establish olive production on a significant scale.

Studies have revealed the possibility of cultivating several oil yielding plants and recent experiments, still on the way, would indicate that, in addition to cotton, the most suitable oil seeds for the oil mills are groundnuts, safflower, sesame and sunflower.

Particulars of Some Promising Oil Bearing Crops

Groundnuts which can be planted in sandy soil, are one of the best sources of edible oils (average oil content approx. 45 percent). In addition to the possibility of using the shells to make artificial cork, the press cake containing about 45 percent protein and 6 percent residual oil, can be used in animal feedstuff. If harvested and processed under satisfactory conditions the extracted cake represents a valuable source of protein for human consumption.

Safflower seeds (oil content ca. 30 percent) are also important oil seeds, the cultivation of which has proved successful in a number of areas.

Sesame seed also is high in oil (46 - 50 percent) and the extracted cake contains roughly 45 percent protein. Like groundnuts, sesame, planted in sandy and light soil, does not encroach upon other crops (and requires from 100 to 120 days to mature). Sesame seed oil is high in unsaturated fatty acids and in consequence is used in certain dietary foods and margarine.

Sunflower is also one of the summer crops that can be cultivated in sandy and generally poor and neglected soils. It contains between 30 and 36 percent of oil and is used in the margarine industry.

Animal Feeds Industries

In addition to production and extraction, country programmes should also include studies on the possible utilization of extracted oil seed cakes as animal feeds to stimulate meat and milk production. At present, substantial quantities of press cakes are exported to developed countries to be used in feedstuffs. Since the transport of cake is expensive and difficult, domestic processing of animal feeds offers excellent opportunities for industrial development in rural areas.

On the other hand, in view of the advanced technology involved, the hydrogenation of vegetable oils to produce hard fats and margarine, would appear to be a second priority activity. Furthermore, consumers in a number of Near Eastern countries are accustomed to liquid oils for cooking.

## The Vegetable Oil Industry

In general, detailed information on existing oil seed processing factories is not readily available. There is a need for data on type of installation and processing capacities on factory performances, i.e. rates of utilization of existing processing capacities, processing yields, running costs, profits, upkeep of machines, modernization requirements, requirements in terms of trained personnel, and other essential operating data.

It is known that in the Syrian Arab Republic seven oil factories are in operation: three in Aleppo with a total capacity of [illegible] tons per day and one each in Damascus, Homs, Hama and Latakia with a total capacity of [illegible] tons per day, i.e. a total of some [illegible] tons per day for the seven factories. These data would indicate that there is adequate processing capacity for the cottonseed crop, but insufficient residual capacity for the other oil seeds. Nevertheless, in the light of the limited performance data available of existing factories, it is difficult to assess adequately the present status of the oil extraction industry. Jordan possesses one factory which reportedly imports some [illegible] tons of palm oil per annum from Indonesia and Malaysia plus small quantities of hydrogenated oil from Europe for further processing.

### Conclusion

Thus, under the present circumstances, it would seem that the countries with significant levels of production require accurate inventories of existing factories as a preliminary to any further industrial development programme.

On the other hand, any processing venture envisaged for the areas where there is a limited production of oil seed imposes, as a prerequisite, (a) identification of production districts, (b) precise assessment of production levels, and (c) accurate techno-economic studies on small or medium capacity factories for the purpose of ascertaining the economic viability of any proposed project.

The Near East Region requires increased oil seed production to meet domestic market demands and also to provide industrial development opportunities in the rural areas. However, the Region includes countries which have reached significant levels of production and other countries where production is negligible. Thus, there is a need for a selective approach in studying and recommending appropriate future action. Those countries which already achieved substantial levels of production should concentrate upon improving their technical and economic performance. Other countries may need to consider what amounts to a "pioneering approach" in both agricultural and industrial sectors.

FAO can assist member governments with economic and technical studies designed to expand and improve existing vegetable oil processing and to create new industries where they can be beneficial. FAO can provide complete guidance on integrated projects including the production, protection, harvesting, storage, primary and secondary processing of oilseeds and the marketing and utilization of both oils and by-products.

4. Hides, Skins and Leather Industries

FAO has been active for many years in the development and improvement of hides, skins and leather processing industries in the Near East.

The following are some typical examples of FAO's past, present and future activities.

FAO's Past Activities

Turkey

(a) From September 1958 to November 1960, an EPTA expert assisted the Government's Meat and Fish Organisation in the improvement of flaying methods, of salt curing and pickling, particularly of sheepskins. The expert also studied the possibilities of engaging in full tannage of sheepskins within the country and advised the Government on the grading of hides, skins and pre-processed products.

(b) Under the pre-investment study of the Antalya Region, a Hides and Skins Improvement Adviser was appointed to make two surveys and was in the country from September 1964 until January 1965; the surveys were as follows:-

(i) A specific study of Antalya, Burdur and Isparta provinces, resulting in recommendations for the improvement of tanning in these provinces.

(ii) A general overall survey of Turkey, from which has developed the Special Fund project now under preliminary operations.

(c) Once again, the Government's Meat and Fish Organisation have requested assistance in sheepskin pickling in view of the large combinates which they have opened. An expert has assisted them since February 1966 until mid 1968.

Egypt (U.A.R.)

At the request of the Government, an expert was appointed in December 1954 on a year's assignment to appraise the conditions of the hides and skins industry; to organise an improvement scheme; to train workers in flaying, curing and grading; and to advise on legislation affecting the above activities.

Libya

Assistance to the Government of Libya has been carried out in a number of assignments leading up to the erection and running of a small pilot production tannery. The early assignments were funded under EPTA and later assignments under Trust Fund agreements.

(a) From October 1951 to October 1953 an EPTA expert was assigned to develop and assist in operating a programme for improved treatment of animal hides and skins; to introduce techniques which would improve the quality of raw materials; and to introduce improved tanning techniques.

(b) From May 1954 until October 1955 another expert was appointed to continue the work of the former expert and to find methods of the better utilisation of locally available tanning materials in leather manufacture.

(c) From February 1956 until 20 August 1958 an expert predominantly concerned with tanning was appointed. He surveyed the industry thoroughly and gave technical assistance to the existing tanners.

(d) It was found desirable in 1962 to establish a small pilot tannery. An expert was duly assigned to install and manage the tannery from October 1962 through May 1964.

(e) A funds-in-trust was established in 1964 to provide funds for the recruitment of an expert to continue to run the pilot tannery. An expert was assigned from April 1964 until April 1966 and has trained local personnel and shown a steady profit on the operations by diversifying the production. Particular attention being given to camel hides in which Libya has a strong economic advantage over many other countries.

<u>Iraq</u>

Two technical assignments have been filled to assist the Government of Iraq in the field of hides and skins improvement.

(a) In November 1954 an expert was assigned to make a preliminary survey and to organise and operate a programme of flaying, curing and grading of hides and skins.

(b) From November 1955 until December 1956, a second expert was assigned once the Government's policy towards the introduction of modern slaughterhouses had been put into operation and the expert concentrated on training staff in these slaughterhouses.

<u>Kuwait</u>

At the Government's request, an expert was assigned for 5 weeks in September/October 1963 to study the slaughtering facilities for the preparation of hides and skins; to survey the requirements for leather manufacture; and to study the complex of ancillary industries.

FAO's Present Activities

A large Special Fund project is presently in operation in Iran, under which an Institute, for applied research, demonstration and training; and three sub-centres are under construction. Training programmes in hides and skins improvement have taught, to-date, over 1,500 foremen and workers how to handle hides and skins properly. The project has also put two main tanneries back into economic running and given assistance to the Bureau of Standards and the Ministry of the Interior in their programmes related to the fields of competence of this project.

FAO's Future Activities

A Special Fund programme is under advanced preparation for assistance to the Turkish Leather Industry.

Further References

- Agricultural Development Papers:
  - No. 49: "Flaying and Curing of Hides and Skins as a Rural Industry" (1966)
  - No. 68: "Rural Tanning Techniques" (1966)
  - No. 75: "Processing and Utilization of Animal By-products" (1962)

- Informal Working Bulletin No. 29 in the Agricultural Engineering Series: "Training Leather Utilization Workers in Developing Countries".

31. I. 72