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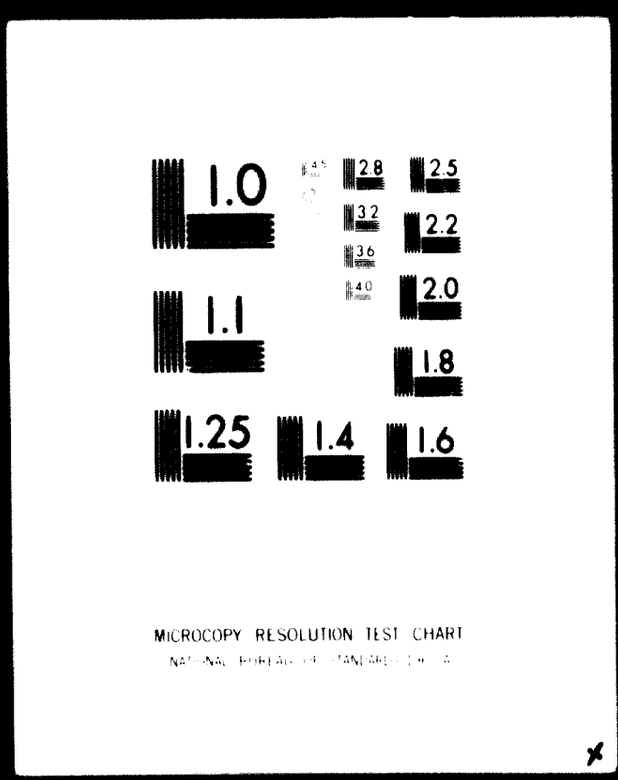

INTRODUCTION

Increasing agricultural and food production is a top priority objective of development plans in most developing countries. With supply unable to catch up with demand for food, the increasing food gap is becoming a major problem. Agricultural production is dependent to a large extent on the proper management and use of inputs. Agricultural inputs are many and varied, but amongst the most important of these is power and its skilful use. Power not only makes it possible to meet the need for timelines of farming operations, but can also help to increase yields by doing the job more effectively than is possible by hand or with the use of animals. Machine power makes for a better job of land clearance and preparation, ploughing and seed-bed preparation, threshing, transport, water pumping, crop spraying.

The returns on investments in agricultural mechanisation can be quite high provided that suitable equipment is selected and that the necessary supporting infrastructure exists. To facilitate the introduction and use of machinery [1/] by farmers, and to obtain the maximum benefits from mechanisation, some basic conditions need to be fulfilled.

Farm holdings should be compact and sufficiently large and the fields should be of a reasonable size with adequate means of water control. The average desirable area per tractor varies considerably according to working

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1/ For the purposes of this report, the term "agricultural machinery and implements" covers hand tools, animal drawn equipment, power machinery (tractors, self-propelled combines, pumps, sprinklers, engines, etc.) and tractor drawn agricultural implements and equipment.

conditions and type of equipment. The range can be from 15 to 25 hectares for a 40 hp. four-wheel tractor under intensive irrigated conditions and up to 40 to 100 hectares, not including fallow, for larger wheel type tractors in rain-fed areas.

In the UNESOB countries, very little use seems to be made of two-wheel tractors or motor cultivators which may be particularly well suited for market garden and terrace cultivation. This type of tractor seems to be widely used today only in some Asian countries where some special socio-economic reasons, unparalleled in other countries, prevail. Although it was in use in some developed countries in the early days of mechanization, the four-wheel tractor has now replaced it for most uses.

The medium to large size four-wheel tractors have the lowest capital and operating costs per horsepower and per hectare. Satisfactory operating conditions should give 600 - 800 hours minimum work per annum for a medium size four-wheel tractor. Cooperative ownership and other forms of multi-farm use of such tractors in the Middle East countries can help in achieving lower costs provided that misuse and poor maintenance of equipment can be avoided. In most cases, government hire schemes proved to be expensive because of excessive overheads and generally poor maintenance of equipment. Private contractors seem to have been the most successful system of multi-farm use of agricultural machinery.

The FAO Indicative World Plan (IWP) [2/] for agricultural development has forecast that by 1985 the Lebanon would have about 64 hectares per tractor,

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2/ FAO, Indicative World Plan for agricultural development, Near East 1965-1985, Vol I, 1966, FAO

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the Peoples' Democratic Republic of Yemen and Saudi Arabia between 100 to 200 hectares per tractor, and Iraq, Jordan and Syria 250 to 500 hectares per tractor. The Indicative World Plan used the following ratios to produce table (1) which gives an indication of the target number of tractors for 1985 based on the agricultural area targets for the same year:

(a) one tractor for every 150 hectares of good rainfall areas;
(b) one tractor for every 450 hectares of lower rainfall areas; and,
(c) one tractor for every 100 hectares of irrigated areas.

The successful introduction and use of farm mechanization is also governed by the need for governments to ensure that equipment is adequately tested and proven suitable for local conditions before allowing its free import and use by farmers. False impressions have been known to cause bad habits to be acquired by farmers and have hindered the introduction of some suitable practices. It is often necessary to modify the design of equipment manufactured for use in more advanced countries before it becomes suitable for use under the ecological and human conditions prevailing in developing countries. National research and development institutions need to be established and encouraged to test equipment and provide the guidance needed for the modification and adaptation of imported equipment by the foreign manufacturers or by local workshops.

The provision of adequate servicing and spare parts facilities is also essential to achieving effective farm mechanization. Because of the heavy capital cost of agricultural machinery and its distribution over a wide area, especially in the early stages of mechanization, the cost of servicing is often quite high. Government policies, such as the restriction of imports to a small number of suitable makes, could help in reducing these costs. Many countries in the Middle East are facing serious difficulties in providing adequate servicing and spare parts facilities. These difficulties are further complicated by the inadequate training of farm machinery operators in both proper use and

Table 1. Potential for growth in tractor numbers on basis of 1985 area targets in selected countries

	No. in 1964	Area targets in 1985			Tractor potential				Index 1964 = 100
		Good rainfall	Lower rainfall	Irrigated	Good rainfall [a]	Lower rainfall [b]	Irrigated [c]	Total	
	(..... '000 ha .....)				(..... number .....)				per cent
Afghanistan	na	3225	-	1985	21480	-	20000	41480	..
Fed. of South Arabia	470 [d]	-	-	170	-	-	1700	1700	362
Iran	6000	2892	3133	3529	19260	6960	35000	61220	1020
Iraq	2400	-	1215	2057	-	2700	20000	22700	946
Jordan	1430	-	649	71	-	1440	700	2140	150
Lebanon	2560	197	-	116	1310		1200	2510	98
Saudi Arabia	360	-	58	360	-	130	3600	3730	1036
Sudan	1760	3996	-	1478	26610	-	14800	41410	2353
Syria	7270	1937	1186	705	12900	2630	700	16230	223
U.A.R.	11000	-	-	5813	-	-	58000	58000	527
Regional total	34250	12247	6241	16278	81560	13860	155700	251120	733

Source: FAO, Indicative World Plan for Agricultural Development, Near East, 1965-1985, Vol. I., 1966, FAO.

a/ Tractor/hectare ratio 1:150

b/ Tractor/hectare ratio 1:450

c/ Tractor/hectare ratio 1:100

d/ Includes tractors for all purposes and is not comparable with figures for other countries.

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basic routine servicing needs such as oil changes, greasing, checking the tightness of belts, battery maintenance etc. It is estimated that every 1,000 tractor units in operation require a fully trained and skilled service and parts staff of at least 25 including supervisory and specialized personnel. Most countries in the Middle East region need to provide additional training facilities and programmes designed to meet local needs. Multi-national cooperation in this field can produce significant results.

The Industrial Development Board, the governing body of UNIDO, had recommended at its second and third sessions in 1967 and 1968, that UNIDO gives priority to problems of agricultural machinery and implements in developing countries, mainly as regards the establishment of industries and the question of design, engineering, research and development and adaptation.

An ECAFE*/AIDO[3]/UNIDO fact-finding team on industries manufacturing agricultural machinery surveyed, for the first time ever, the farm machinery sector in 12 countries in the ECAFE region and finalized its report in 1969. Following the completion of this survey, UNIDO convened an Expert Group Meeting on Agricultural Machinery Industry in Developing Countries. The Meeting was held in Vienna, Austria in August 1969. Forty six participants representing international organizations as well as government agencies, private industry and research institutions in 31 industrially developed and developing countries attended the meeting and discussed how developing countries can raise agricultural production and stimulate the transfer of technology by manufacturing their own agricultural machinery and implements. The report of the meeting noted that developing countries have recognized that agricultural machinery and implements, integrated with other allied inputs, are among the most important means of increasing agricultural production. The importance of some degree of self reliance in agricultural machinery manufacture was also emphasized.

3/ Asian Industrial Development Council.

* Economic Commission for Asia and the Far East

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The Expert Group Meeting recognized the need for developing countries to step up their activities in the field of agricultural machinery and implements directed towards the "Total Manufacturing Sector", including adaptation, design development, manufacture, quality control, cost control, testing, research, marketing, repair and maintenance, etc. UNIDO was called upon to prepare guidelines to assist developing countries in formulating long-term plans for the development and utilization of agricultural machinery. UNIDO should also concentrate on field action-oriented projects in manufacturing agricultural machinery and implements, with emphasis on improving existing manufacturing facilities in developing countries. Recognizing that one of the most pressing problems facing developing nations is to obtain a definition of what is required in the way of agricultural machinery and implements that will contribute greatly to an increase in agricultural production and whose manufacture will be a nucleus of industrialization, the meeting called on governments to assist UNIDO in carrying out a detailed study in order to supplement the available data on the existing usage of, and demand for, agricultural machinery and implements in the developing countries of Africa, Latin America and the Middle East. The primary objective of such a study would be to identify promising projects for manufacturing agricultural machinery and implements.

The metal working and agricultural machinery industry sector, being an important sector in the Middle East, UNESOB's work programme for 1970 included a project for undertaking a survey of this sector to elucidate country situations and prospects in a multinational perspective with the view of identifying problems of rationalization, growth and change as well as projects for the solution of these problems which might benefit from UN assistance.

During the period March to May 1970, a UNIDO/UNESOB mission composed of a UNIDO consultant* and a UNESOB staff member* visited six countries in the Middle East (Jordan, Lebanon, Kuwait, Saudi Arabia, Iraq and Syria). Before departing from each country visited, the mission discussed with government officials concerned, its recommendations regarding possible areas where UNIDO and other UN technical assistance may be usefully provided.

This report covers the mission's findings and main recommendations in each of the countries visited. In addition, a regional report analyzing the situation in the six countries from a multinational perspective is also being prepared.

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THE RELATIONSHIP BETWEEN THE MANUFACTURE OF AGRICULTURAL MACHINERY AND IMPLEMENTS AND THE ENGINEERING INDUSTRIES SECTOR

Production of agricultural machinery and equipment in developing countries usually starts with the simpler products such as ploughs, harrows, trailers, etc. Such simple agricultural equipment and implements are already being produced in most of the UNESOBcountries. However, the manufacture of most modern equipment and agricultural machinery, especially the heavier and self-propelled types is dominated by large international firms. The main reason for this concentration is that the manufacture of the more specialized and sophisticated types of such machinery and equipment requires a wide range and a high level of technology, which is only readily available to the engineering industries of technologically advanced countries. Therefore, the variety and degree of sophistication of the machinery and equipment which can be produced by developing countries will be determined, to a large extent, by the level of the productive facilities available to a country's engineering industries sector. This industrial sector is defined to comprise the following classes of International Standard Industrial Classification (ISIC):

ISIC 35 : Manufacture of metal products, except machinery and transport equipment (simple metal products and simple metal manufactures)

ISIC 36 : Manufacture of machinery, except electrical machinery

ISIC 37 : Manufacture of electrical machinery

ISIC 38 : Manufacture of transport equipment

ISIC 391 : Manufacture of professional, scientific measuring and controlling instruments.

A. The engineering industries place in the total industrial sector of developing economies

The importance of the engineering industries to the industrial development of developing countries cannot be over-stated or exaggerated. Industrial development is the acquisition of means of manufacturing and/or processing, namely, machinery. Machinery may be purchased from other countries but it is only when capabilities are developed to produce locally some of the machinery required can a country fully control its industrial development and move into

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the take-off stage. The price of imported machinery cannot be influenced to any large extent, their capacities are predetermined, and their suitability to local conditions, may be lacking or limited.

However, the complexity of today's world and its modern technologies makes it difficult for any one country, even the most industrialized, to produce all its requirements of machines. At the same time, the higher the stage of development of the engineering industries sector in any one country, the higher is the standard of living of its population. The state of technological dependence from which most developing countries suffer prevents even countries richly endowed with natural resources from achieving real economic development. The engineering industries are also a focal point for the introduction of modern and new technologies, and as a result contribute significantly, possibly more than any other industry, to the improved technical training of labour and management, and to upgrading the level of local technology. They can have a catalytic effect in this respect. They contribute substantially to gross capital formation in the form of metal products, machinery and transport equipment. Together with construction, they are the largest element in the new productive capacities that are required for the growth of national output. This importance is even greater than might be immediately apparent, since they represent the area where capital is most likely to be short during development and where consumption competes with investment. It may, therefore, be useful to examine some of the main characteristics of the engineering industries:

1. Lack of natural resources, not a limiting factor

Although the development of some major industry sectors may depend to a greater or lesser extent on the occurence of some indigenous natural resources - e.g. petrochemicals, food, building materials, etc. - the development and growth of the engineering industries is not governed by the availability or lack of any natural resources but depends mainly on human effort and skillful organisation.

2. Heterogeneity of products of engineering industries

Whereas the typical product of some industries is homogeneous - e.g. cement, chemicals, food, etc. - there is no typical product for engineering industries. Products can have numerous different shapes, sizes, weights, etc.,

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even though certain component parts used to manufacture engineering products lend themselves to some degree of orderly classification. This product diversity is further complicated by continuous changes caused by improvements and innovations. Therefore, in order to make planning and programming of engineering industries feasible, typical individual products must be used to represent entire groups of products and, thereby, provide some order to the operation.

3. Diversity and flexibility of production tools and machines

An important characteristic of the tools and machines used by engineering industries is their large number and variety of types. There are many types of metal-cutting, shaping and fabricating tools and machines. At the same time, most tools and machines for the industry are flexible in that they can perform a variety of different jobs or produce parts for a large variety of different end-products. Naturally, some engineering industry products require special equipment and processes.

4. Capital and labour intensity of engineering industries

The capital/output ratio in engineering industries can vary considerably. However, on the average, the industry is less capital intensive (lower capital/output ratio) than metal producing or chemical industries and more capital intensive than most light industries. At the same time, capital requirements for the production of some simple metal products are as low as, or even lower than, those for some light industries.

Relative to many other industries, the engineering industries are labour intensive. Although this fact would seem to suggest a special advantage for developing countries, it should be borne in mind that most of the labour required in engineering industries is of a relatively high level of education and skill.

Some indicative, though theoretical, figures were presented in a 1965 Economic Commission for Europe (ECE) study of requirements of fixed capital and other factors of production for various engineering enterprises of minimum profitable sizes in Western Europe. The total amount of fixed capital per ton of annual production for some products were given as follows:

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Product	Total fixed capital (dollars per ton of annual production)	Minimum profitable capacity (Thousand tons)
Ball and roller bearings	410	0.2 - 0.3
Metal working machine tools	290	0.7 - 1.0
Wood working machine tools	250	6 - 10
Pumps and centrifuges	180	2 - 3
Earth moving machinery	110	2 - 3
Agricultural machinery used in preparation and cultivation of soil	45	16 - 20
Agricultural machinery used for harvesting, threshing and sorting	42	4 - 6

5. Economies of scale

Three main characteristics of the engineering industries affect and determine the extent to which economies of scale can be realized.

The first of these characteristics is the length of production runs. The longer the production run - i.e., the greater the total output of a single product - the higher is the efficiency of production. The size of population in any country is, therefore, a major determinant of the size of the market, and this has a considerable influence on conditions and costs of production. The second characteristic is the scale and variety of the different products of any one shop. Machines for some operations have a specific minimum capacity which may be considerably greater than the capacity required for the items to be produced resulting in idle capacity. The third characteristic is similar but applies to the human resources in terms of the skilled management, design, research and development man-power required. Regardless of the level of production such skills must be provided and, therefore, per unit costs may actually decrease while total output increases as a result of more efficient utilization of these skills.

6. Linkages between products and processes

The nature of engineering products and processing facilities creates linkages within the industry. Many products pass through several different processes - e.g. precision casting, machining, heat treatment, etc. before their production is completed.

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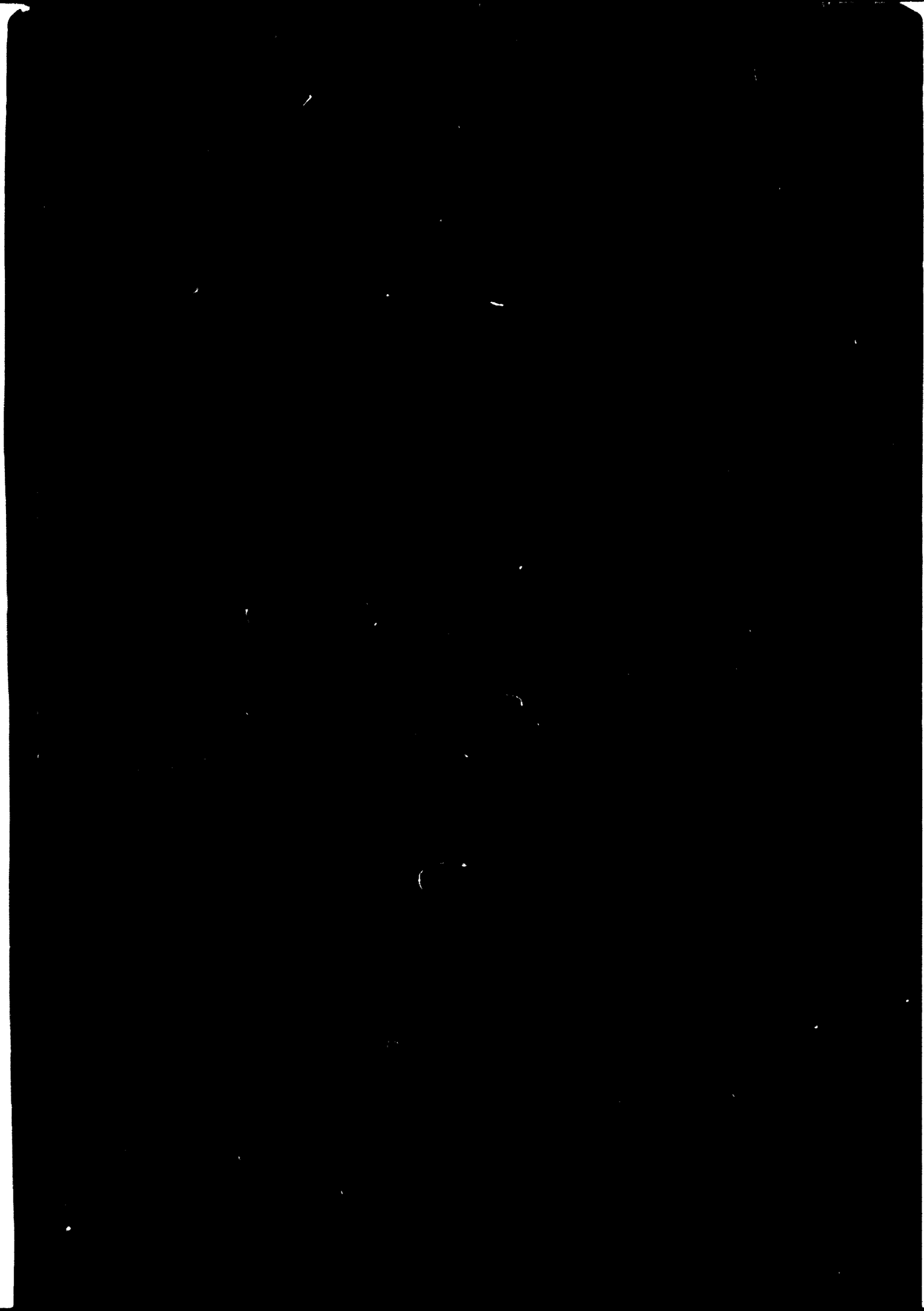

Most of the processes are highly versatile and can contribute to the production of a great variety of engineering products. At the same time, a great many engineering products are themselves inputs in the production of other engineering products. A final product may consist of a number of assemblies, and these may in turn be made up of a number of sub- assemblies consisting of basic components.

B. Planning and policy considerations for the development of engineering industries with special reference to agricultural machinery and implements manufacture

Various studies attempted to identify a number of distinct development stages through which developing countries have passed or are passing in the development of their own engineering industries. Some of these studies speak of four such stages, others suggest that only three distinct stages are identifiable. For the purpose of this report and bearing in mind the situation as it exists in the Middle East, perhaps only two development stages are apparent. Countries in stage one may be characterized by some or all of the following features:

a) Some products are locally manufactured mainly from metal sheets.

b) The production of machinery and equipment is either non-existent or is in its very early stages.

c) Repair and maintenance service facilities are owned and operated by a mixture of foreign and national firms and personnel, but the former may be more predominant.

d) Out of repair and maintenance or fabrication shops, small, multi-purpose machine shops begin to appear producing some acceptable quality replacement parts.

e) The percentage of imports to total domestic consumption of engineering products is quite high, ranging up to about 80 per cent or more.

The second stage of development of the engineering industries in the UNECOB countries may be characterised by some or all of the following main features:

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a) More sophisticated metal products begin to be produced utilising more elaborate processes and skills and creating the beginnings of an indigenous technology or, at least, an awareness of the importance of technology transfer and development considerations.

b) The production of machinery and equipment expands, and more and more such products appear. However, the share of machinery in the total output of the sector is still small when compared with the more industrialised countries. Most of the machinery and equipment produced tend to be import substitution consumer products. The level of protection is normally sizeable and therefore, by and large, prices and qualities cannot compete in international markets.

c) Important strides begin to be made in developing indigenous technology, raising the level and sophistication of skills, and creating an awareness of the importance of technology transfer and development considerations.

d) Some countries in this stage may make a start in the rebuilding and/or production of machine tools. This heralds the gradual reversal of heavy dependence on imports or engineering products.

Action by policy makers in the UNESOB region would seem to be called for in two basic areas:

(i) The upgrading of the existing production facilities manufacturing simple or more complex metal products for agriculture or for other end uses. A great deal can be achieved by increasing productivity, improving methods of production, providing common service facilities, promoting the practice of sub-contracting of components production, and training Policies designed to achieve the above objectives would help in creating an infra-structure of skills and productive facilities able to compete more favourably in international or regional markets with better qualities and lower prices.

(ii) The development of medium and heavy production facilities for engineering industries requires adequate planning by central planning bodies because the size of the investments involved is substantial and the markets are relatively uncertain.

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In this connexion, it is necessary to stress the importance of the manufacture of machine tools which is an example of heavy machine building in the development of engineering industries. Machine tools have been called "the reproductive centre" of the entire manufacturing economy. They lay the foundation for the development of a diversified base for engineering industries. The first steps towards the development of machine tool manufacture are the establishment of repair and maintenance facilities for these tools, and at a later stage their rebuilding. The use of standard designs or of its recent variant modular design for particular components and sub-assemblies can speed up the development of machine tool production.

One of the reasons for the control of the manufacture of most modern agricultural machinery implements by large international firms has already been mentioned. Another important reason, which is significantly relevent to countries of the Middle East, is that these large firms maintain an efficient international sales network and are therefore able to control a sufficiently large share of the world market to spread the high costs of technology and production over a large sales turnover. It is also important to note that sales volume of agricultural machinery and equipment is characterized by wide variations depending on weather, world prices, credit payment facilities, etc. For this reason, these large international firms normally produce a great variety of combinations. The sub-contracting of the manufacture of a number of these components and sub-assemblies to specialized manufacturers which is an important characteristic of the industry may be of special importance to developing countries in two ways. Firstly, the approach may be copied within the countries themselves, and secondly, it affords some developing countries the opportunity to make a significant start in the manufacture of more complex components and sub-assemblies for some of these international firms.

Although the technological, promotional and financial backing required to make agricultural machinery and implements' manufacture competitive internationally may not be easily attainable by most UNESCOB countries in the very near future. There are many smaller firms in the world producing the not very

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highly sophisticated machinery and equipment with reasonable success. However, most national markets in the UNESOB region are limited and will remain so except for normal demand growth rates. It would therefore seem imperative for countries in the region to examine existing capacities and policies and coordinate planning for a rational and speedy development of this key industrial sector.

Two important considerations arise with regard to planning the engineering industries sector. The first question is whether planning for the sector should be centralized and entrusted to a planning ministry or a government agency, or should the initiative for development be left to individual entrepreneurs, and the State's role be limited to coordinating development plans of the individual enterprises with the overall development plans.

In some countries of the UNESOB region, major industries are owned and operated by the public sector and therefore a central planning approach has already been adopted. Even in the more private sector oriented countries such as Lebanon, Saudi Arabia, Kuwait and Jordan, investment decisions relating to the development of a sector as important and as critical as the engineering industries sector, will need to be guided in a manner conducive to a rational, overall and integrated development of the sector within the national development effort. This is especially important when "critical" investment decisions are under consideration.

Secondly /planning policy for the sector could be based on demand, on supply, or on a combination of the two. Demand-oriented planning utilizes past trends for private and public consumption and projects these into the future bearing in mind new and future programmes as well as possibilities for exports. Projected demands are then translated into the production levels required. This planning approach makes it possible to allocate resources on the basis of specific demands, but demand projections are somewhat restricted by past consumption trends.

Supply-oriented planning concerns itself with the setting-up of as many production facilities as possible, relying on the inherent versatility of such facilities to produce the products demanded.

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Although supply-oriented planning facilitates the acquisition of more advanced technologies, its efficiency is restricted by the degree of flexibility or versatility of production facilities. Ideally, the planning approach to be adopted should be a combination of both methods, demand-oriented planning would analyse present and future demand as well as the existing structure of the sector and its efficiency. Final development planning decisions, especially those dealing with long-term requirements, would be taken in the light of supply-oriented planning considerations and, thereby, making it possible to take advantage of up-to-date technological innovations.

Perhaps the other planning policy issues are :

(1) the training and building up of the human skills needed to maintain the desirable development rate of the engineering industries sector, where education and training are not by themselves sufficient. The objectives sought can only be achieved when the institutions where the use, adaptation and application of these skills are also provided. Individual capacities, no matter how highly trained or skillful they are, cannot be very effective in this sector unless they can be combined with other skills within research, design, and other institutions to produce the required end products.

(2) the need for cooperation with and assistance from the more industrialized countries in developing the engineering industries sector. One of the important aspects of this question is technology transfers from industrialized to developing countries. The advantages and disadvantages of using labour intensive as opposed to capital intensive technologies have been repeatedly pointed out and discussed, and no repetition of these is proposed here. However, two important facts would seem to govern the question of cooperation between developed and developing countries. First modern technology is still emanating, by and large, from the industrialized countries of the world, and, therefore, cooperation with the latter is inevitable if the developing countries wish to raise their domestic technology levels. Secondly, as mentioned before, engineering industries have a catalytic and dynamic effect on the entire industrial sector of an economy and, thereby, on the national level of technology.

An ever present question in the minds of policy-makers regarding methods of cooperation with industrialised countries, is whether the cost of the

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cooperation proposed is adequate and fair or not. The criticism is always being made that developing countries are forced to pay excessively high prices. However, the considerations referred to above would seem to suggest that policy-makers should be more concerned with the contribution which the proposed cooperation will make to upgrading the technological capabilities of a country, which can have far reaching effects on the economy, rather than with the cost of foreign cooperation which can be looked upon as a "once-for-all" expenditure. This may be an over simplification of real life situations, but it still remains a useful guideline.

Cooperation between the developing countries themselves by sharing experiences can also be of mutual benefit, and may lead to fruitful coordination simply because it has made the countries involved more aware of each other's development plans for the engineering industries sector.

(3) As mentioned before, self-sufficiency can never be a policy objective with regard to engineering industries. Therefore trade issues represent another key policy question. World trade in engineering products is directed mainly by economies of large-scale production and by technological superiority. Developing countries, deficient in both these factors, must therefore evolve a protection policy designed to enable new and infant engineering industries to establish themselves. With very small markets and very low levels of skills this may not be an easy task.

Import substitution has been considered to be the only practical policy for developing engineering industries, and a number of developing countries have been successful in formulating a complex import substitution development programmes. Such programmes need not be based on complicated mathematical models, but could result from the collective judgement of planners, policy makers, engineers and businessmen with good knowledge of both the country and the economics of the sector. On the basis of raw material prices, estimates of local production costs, the size of the market, and a few other estimates, it is possible to determine the desirable level of protection and the import substitution percentages of the development programme.

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IRAQ

I. THE AGRICULTURAL SECTOR AND ITS PLACE IN THE ECONOMY

Agriculture continues to be the major source of income for a large segment of the population. Table 2 below shows that 54.5 per cent of the total labour force is engaged in agriculture. However, only about 20 per cent of GDP is attributable to agriculture, forestry, hunting and fishing, as shown in Table 3. Although agriculture occupies a significant position in the national economy, the rate of growth of this sector has not been substantial and as a result the growth of the entire economy has been slow.[4/]

Table 2. Iraq: Sectoral distribution of total labour force, 1968

Sector	Number of employed persons (thousands)	Percentage of total labour force
Agriculture	1,399	54.5
Manufacturing	146	5.7
Total number of employed persons	2,469	96.2
Unemployed persons	98	3.8
Total labour force	2,567	100.0

Source: Jawad Hashim and Husein Omar - "Evaluation of Economic Growth in Iraq 1950-1970", pp. 277 and 278 (Arabic).

Table 3. Iraq: Contribution of the agricultural sector to gross domestic product, 1963-1967.

(millions of Iraqi Dinars)

	1963	1964	1965	1966
GDP at 1960 factor cost	736.53	825.53	861.27	850.84
Agriculture, forestry, hunting and fishing	136.87	149.61	162.53	160.18
Manufacturing	52.44	57.48	70.93	61.48

Source: UNESOB - "Studies on Selected Development Problems in Various Countries in the Middle East", 1970, p.142.

4/ An Evaluation of Economic Growth in Iraq 1950-1970, Part 1 (Page 18), by Dr. J. Hashim.

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The 1965-1969 Plan allocated equal amounts (about 30 per cent of total investments) to the agricultural and industrial sectors. The new Five-Year Economic Plan (1970-1974) provides for 19.8 per cent of the total intended public and private investments to be allocated to industrial development and 19.6 per cent to agriculture. Actual expenditures in the agricultural sector over the years 1965-1969 represented only about 36 per cent of total allocations.5/

The oil industry occupies a key position in the Iraqi economy and sizable revenues from oil royalties could finance the development of Iraq's water and land resources and the expansion of its industries.

The Government has taken a number of measures to bring about changes in the pattern of land holding ownership. The Agrarian Reform Laws of 1958 brought about significant changes by introducing a maximum limit on private ownership of land according to soil fertility, location, means of irrigation and land use; and by encouraging agricultural cooperatives and farmers societies.

In order to overcome the problems of small holdings, water management, excessive salinity and fallow system, and to introduce large scale farming management techniques, the Government has now adopted the policy of encouraging collection distribution of land and collective farming. Drainage is expected to remain agriculture's major problem in Iraq for some time. Low yield is said to be largely the result of soil salinity and drainage is essential if output per unit is to be improved.

Of the total area of the country which is 434,000 square kilometers, about 120,000 square kilometers (12 million hectares) are suitable for cultivation. However, only about 8 million hectares are under cultivation; a little more than half the area is irrigated (1.5 million hectares pump-irrigated and 2.8 million hectares flood-irrigated), and the rest is rain-fed. The present system of agriculture leaves a large proportion of the land area (40-50 per cent) as fallow. Therefore, the net cultivated area is only around 4-5 million hectares. It is reported that of this total, over 3 million hectares are under the control of the Ministry of Agrarian Reform.

5/ Ibid. Page 268

The total land area (iirigated and rain-fed) which was affected by Agrarian Reform Laws is said to be about 8,860,000 donums (2,215,000 hectares), and the total number of farmers or farming families who have benefitted from these laws is about 237,000.

Table 4 below shows the four major agricultural products in Iraq to be wheat, barley, rice and dates. In 1969, more than half the country's total production of wheat was produced in the mohafaza (administrative province) of Nineveh. The major barley producing mohafazat are Nineveh, Babylon, Kirkuk and Diala. Kerbala produces about 40 per cent of the country's total rice production and the other major rice producing mohafazat are Maysan, Baset, Babylon and Thi-Qar.

Table 4. Iraq: Production of main agricultural products, 1969

(in thousands of tons)

	Production	Percentage
Wheat	1,189	40
Barley	1,250	42
Rice (paddy)	284	9
Dates	260	9
	2,983	100

Source: Central Statistical Organization: Statistical Abstract, 1969, Baghdad.

The Government of Iraq, through the three Ministries concerned, namely Agriculture, Agrarian Reform and Irrigation has initiated a number of agricultural development projects, involving substantial areas, in soil reclamation irrigation, drainage and floor control. It is reported that these projects cover about one million dunums at present, the largest of which is Greater Mussayib project which is also a demonstration project whose successful results are expected to be introduced in other areas, possibly covering a large part of the areas controlled by the Ministry of Agrarian Reform. This fact, coupled with the complete re-organization of the agricultural sector in Iraq during the past few years point towards great need for a successful farm mechanization programme including multifarm utilization of agricultural machinery and equipment. This appears to be of great importance especially with the Government's programme for the successful introduction of fertilizers, hybrid seed, plant protection coupled with tillage and farm management techniques involving total mechanization.

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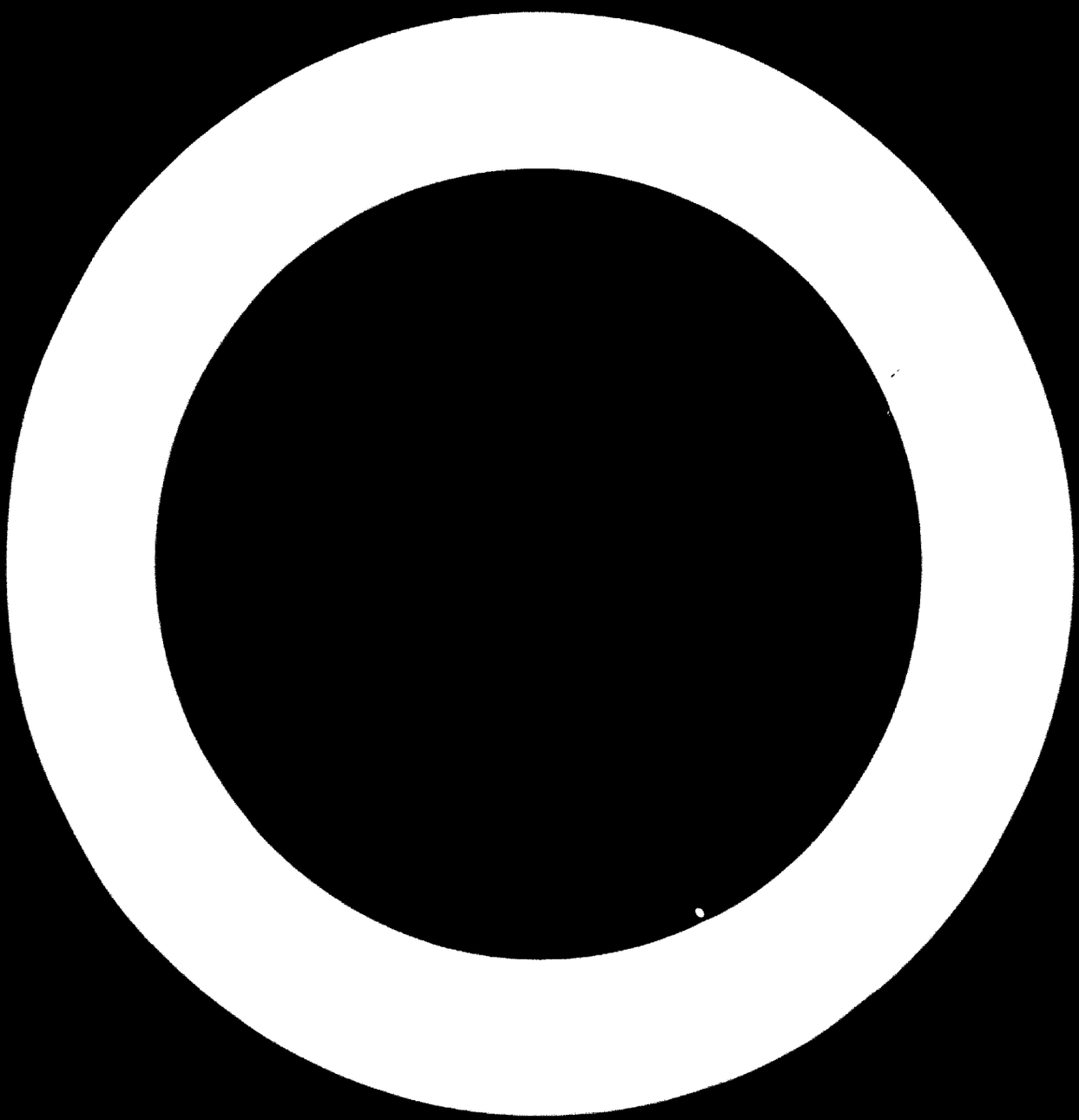

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September 1971

Some aspects of the manufacture of agricultural machinery and implements and of the engineering industries in selected countries of the Middle East

Prepared by

The United Nations Economic and Social Office in Beirut

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This report is based on the findings and recommendations of a joint UNIDO/UNESOB mission which visited Jordan, Iraq, Kuwait, Lebanon, Saudi Arabia and Syria during the first half of 1970.

II. FARM MECHANIZATION

Agricultural machinery were first introduced in Iraq in 1945 and are being increasingly used ever since. It is estimated that in 1967 the total horsepower of farm machinery in use in Iraq was 2.25 million horsepower[6]. Today, agricultural machinery and equipment are fairly widely used, and include tractors, self-propelled and pull-type harvestors, threshers, ploughs, cultivators, harrows, and seed drills. It is estimated that 85 per cent of all ploughing in the country is mechanized. 95 per cent of water pumping for irrigation and 90 per cent of harvesting and threshing is also mechanized. Wheat, barley and linseed, which constitute about 89 per cent of winter crops in Iraq, and when circumstances permit also rice, are machine harvested.

Statistics for the year 1967/1968 suggest that a total of 8,664[7] tractors, with a total horsepower of 506,592, were in use in Iraq. Of this total, 7,919 tractors were owned and operated by the private sector. It is reported that the public sector decided to become an owner of agricultural machinery in order to ensure that the small farmers are not over charged by private machinery contractors. The latter were reported to have charged excessive rates, varying from 20 per cent to 90 per cent of crops, for the use of their equipment. The total number of tractors, sold in Iraq during the years 1945-1967, is reported to be 10,130.

The FAO Indicative World Plan estimated the gross area cropped in Iraq in 1964 to be 3,285,000 hectares, and the total number of tractors operating in that year to be 2,400. Therefore, the ratio of cropped area to tractors was given as 1,370 in 1964[8]. For 1967, this ratio is 925, based on a gross cropped area of 8 million hectares and a population of 8,664 tractors. In 1964, this ratio was 34 for Italy, 92 for Greece, 117 for Australia, 172 for Yugoslavia and

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6/ "Mechanization of Agriculture in Iraq" by H. Al-Rawi.

7/ Ibid.

8/ FAO, Indicative World Plan for Agricultural Development, Near East 1965-1985, Vol. I., 1966, FAO.

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336 for Turkey. On the basis of the following (hectares per tractor) ratios: 450 for lower rainfall cropped areas and 100 for irrigated areas, FAO estimated the 1985 tractor potential in Iraq to be 22,700 tractors, which represents an increase of 260 per cent over the figure for 1967. The average number of tractors imported annually between 1966 and 1969 was about 1,550.

An estimated total of about 2,065 harvesters are operating in Iraq, about 600 by the public sector and the rest by the private sector. An Iraqi study 2/ gave the following figures to represent other equipment "in use and sold" in Iraq during the period 1950-1967:

Disc and moldboard ploughs	6,338
Cultivators and disc harrows	4,408
Seed drills	144
Threshers	38
Trailers	523
Water pumps	1,029

It is also reported by Ministry officials that during 1969 the Ministry of Agrarian Reform purchased heavy agricultural machinery and equipment worth about 10 million dinars. The Directorate of Agricultural Machinery is involved in hiring, at subsidized rates, in operating, and in repairing and maintaining the equipment with preferential treatment to cooperative farms and farmers covered by the Agrarian Reform Laws. The Ministry operates, maintains and rents its fleet of machinery and equipment, including irrigation pumps, through a number of hiring stations, mechanics and other units spread throughout the country. It was also reported that the Directorate is embarking upon a programme for the establishment of eight new agricultural equipment stations in addition to the six major stations already in operation. The Abu-Ghraib agricultural equipment station, which is one of the largest of these stations, was visited by the UNIDO/UNESOB Mission and it was learnt that the station also has a training programme which trained around 1,250 operators of agricultural machinery in 1969. In spite of the many difficulties faced by these stations, it was reported that the percentage of equipment not in operating condition is only

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2/ "Mechanization of Agriculture in Iraq" by H. Al-Rawi.

around 10 per cent. With the additional large area of land coming under the responsibility of the Ministry of Agrarian Reform and due to the importance attached by the Government to the development of agriculture and in particular to the emphasis on increased use of agricultural machinery, the overall operational responsibility of the Agricultural Machinery and Implements Directorate of the Ministry seem to have multiplied many times over during the past year or so.

It is also the policy of the Government to encourage the establishment of agricultural cooperatives and it is hoped that these cooperatives, in due course, will take over the operation of their agricultural machinery and implements. The Government is further assisting the cooperatives to own agricultural machinery, for example some pumps are said to have been sold to some cooperatives at only 25 per cent of their estimated value. However, it would seem that the Government expects that even if a large number of cooperatives are established in the coming years and are able to own and operate agricultural machinery and implements, the Directorate will still need to continue to extend assistance to farmers and cooperatives by repairing and maintaining their equipment in various workshops operated by the Directorate throughout the country. The operation and maintenance of plant protection equipment is handled by the Ministry of Agriculture. The Ministry also hopes that the Directorate, by transferring its agricultural machinery and implements to cooperatives, can concentrate at a later date on the purchase, operation and maintenance of the heavier type of machinery and equipment for agricultural irrigation and drainage. FAO has a number of Special Fund projects in Iraq (about six), some of which provide assistance to the cooperatives programme.

The success of any farm mechanization programme would seem to call for a considerable amount of research, development, adaptation and testing of agricultural machinery suited to local soil, local crops and local practices. There is an immediate need to start work in this direction especially with regard to tillage equipment such as ploughs, cultivators, harrows, levellers, etc., seed drills, fertilizer distributers, harvesting equipment such as mowers, and suitable combine harvesters. There is also need for work in the field of plant protection equipment, pumps and processing machinery. It is encouraging to note that

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significant efforts have been started in this direction in the various agricultural education institutions and agricultural machinery sections of various agricultural projects. Considering the magnitude of the problems, and especially to assist the manufacturing sector at a later date by providing guidance as well as the successful prototypes of the agricultural machinery developed for local conditions and for local manufacture, it was the opinion of the Mission that an integrated programme for research development, adaptation, prototype fabrication and testing of agricultural machinery and implements should be initiated at the earliest possible date.

Such a programme could be initiated in the Greater Mussayib project with the assistance of UNIDO. The Greater Mussayib project offers many of the facilities required for such development work. It has an independent administration, covers a large area, and is involved in research and development work in related fields such as irrigation, drainage, agronomy, usage of agricultural machinery and a workshop. A great deal of attention is being given to this project by the Government in the expectation that the project will serve as a pilot unit whose achievements can be extended to other areas. Furthermore, the largest agricultural machinery manufacturing establishment in the country, which is discussed in detail in Section III of this report, and perhaps one of the largest manufacturing establishments in the Middle East, is located nearby, and could facilitate the necessary liaison between the development work, prototype manufacture, testing and ultimate commercial production. An FAO mini Special Fund project has been in operation to assist the Mussayib project. This assistance is expected to be expanded in the near future through a larger Special Fund project which will reportedly include two agricultural engineers, one for workshop repair and maintenance, and the other for heavy machinery (mainly irrigation and drainage). During the Mission's discussions with the FAO experts at the Mussayib project, it was confirmed that a provision of a UNIDO expert to the Mussayib project to work on development, adaptation and testing to assist ultimate local manufacture would fill an urgent need. The UNIDO expert would necessarily work in close collaboration with the FAO experts; and the advisability of attaching the UNIDO expert to the FAO project would need to be examined. The proposed UNIDO expert may also investigate and recommend ways and means for the ultimate establishment of some permanent institution to carry out and provide the

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necessary continuity for development design and adaptation work in the field of agricultural machinery, implements and equipment. The expert may also investigate the desirability of attaching such an institution at an appropriate time to the manufacturing sector to provide an integrated programme. The need for an action programme in the above mentioned direction was stressed considerably by most senior agricultural engineers of the Government with whom the Mission held discussions. Furthermore, the contributions which such a permanent organisation could make in the technical training of nationals in the important field of design, development, adaptation and testing would also be taken into consideration by the proposed UNIDO expert.

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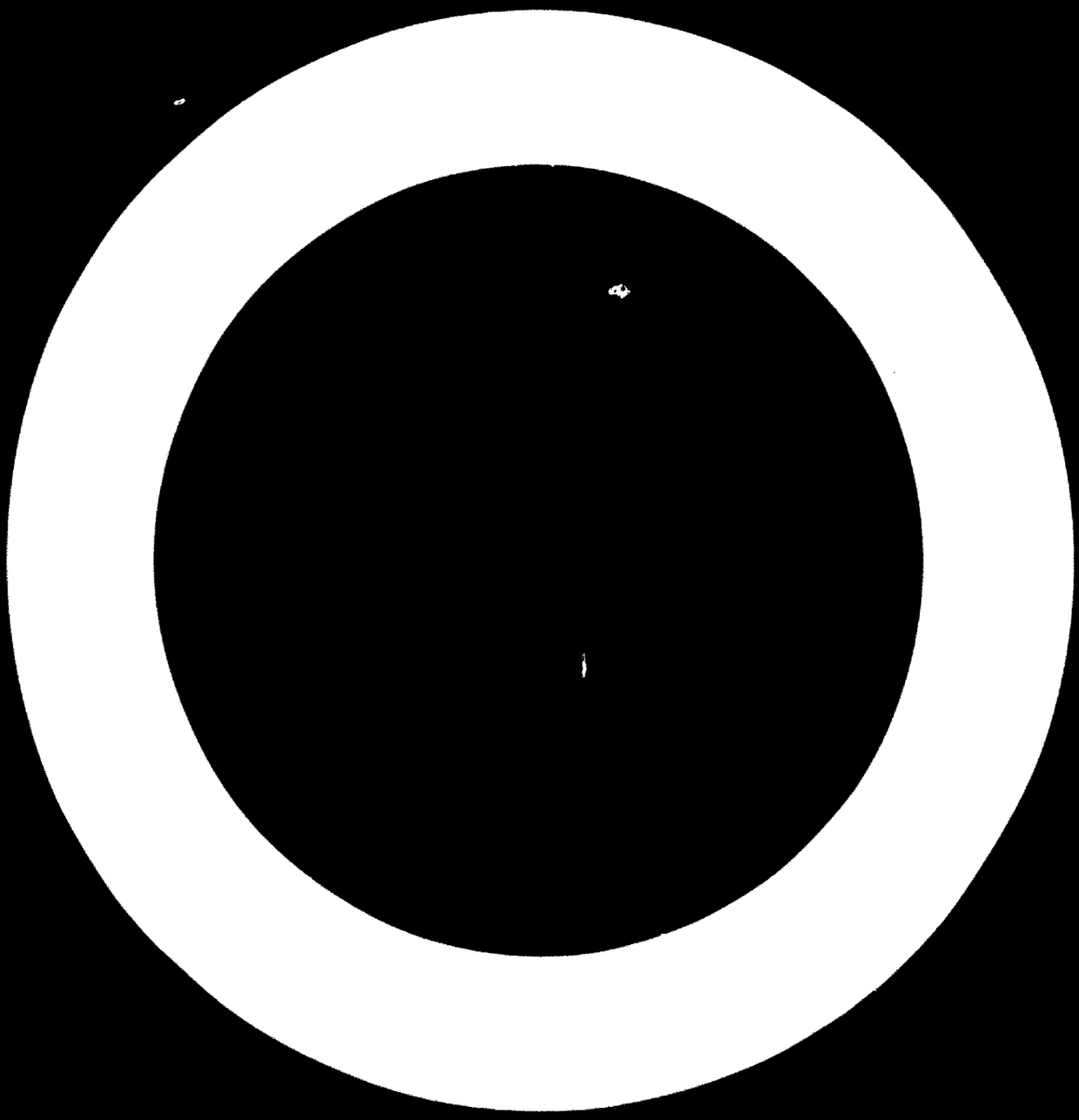

III. ENGINEERING AND METAL-WORKING INDUSTRIES AND THE MANUFACTURE OF AGRICULTURAL MACHINERY AND IMPLEMENTS

A. Imports of engineering and metal-working products including agricultural machinery and implements

Table 5 gives imports for the years 1964-1969 for engineering and metal-working products. These products were selected so that they correspond, so far as possible, to the four ISIC group numbers: 35 (manufacture of metal products, except machinery and transport equipment), 36 (manufacture of machinery, except electrical machinery), 37 (manufacture of electrical machinery), and 38 (manufacture of transport equipment). However, the import figures inevitably include some ferrous and non-ferrous products which may not strictly qualify for classification under the above mentioned ISIC groups. The percentage of the imports shown in the table to total imports for each year fluctuate from a low of 37 per cent in 1964 to a high of 46 per cent in 1966. However, for the other four years it remained at a steady 40 per cent or 41 per cent which is a considerable proportion of total imports.

Table 6 shows imports of some agricultural machinery and implements, selected to the extent possible within the detailed statistics available, for the years 1966-1969. Although it cannot be concluded that this table shows all agricultural machinery and implements imports, the value of these imports varies between 4 per cent of the value of imports of engineering and metal-working products in 1966 and 6.8 per cent in 1969.

B. Manufacturing industry and the share of engineering and metal-working industries

The major industrial manufacturing and processing sectors in Iraq are: food, textiles, building materials, petroleum, and some other consumer goods. All large-size industries are owned by the public sector. The total capital invested in public sector industries was estimated in 1970 to be 62.6 million

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Table 5. Iraq: Imports of engineering and metalworking products, 1964-1969
(Value in thousand Iraqi dinars; weight in tons)

BTN	Description	1964		1965		1966		1967		1968		1969	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
73	Iron and steel and articles thereof	216 479	12 000	384 968	20 000	315 380	18 000	236 266	15 000	287 991	14 000	240 886	16 000
74	Copper and articles thereof	2 041	500	3 070	1 000	3 344	1 000	1 223	1 000	1 835	1 000	1 965	1 000
75	Nickel and articles thereof	14	-	6	-	-	-	4	-	14	-	5	-
76	Aluminium and articles thereof	3 186	1 000	3 156	1 000	4 775	1 000	3 895	1 000	4 412	1 000	3 668	1 000
77	Magnesium and beryllium and articles thereof	33	-	7	-	-	-	15	-	34	-	4	-
78	Lead and articles thereof	8	-	17	-	12	-	131	20	62	-	80	20
79	Zinc and articles thereof	67	-	550	70	301	350	94	20	104	30	351	30
80	Tin and articles thereof	93	50	73	60	98	800	151	1 000	80	60	102	100
81	Other base metals employed in metallurgy and articles thereof	8	-	14	10	26	10	10	10	18	10	12	-
82	Tools, implements, cutlery, spoons and forks of base metal, articles thereof	-	1 000	-	1 000	-	1 000	-	1 000	824	1 000	1 799	1 000
83	Miscellaneous articles of base metals	6 041	2 000	6 146	2 000	7 618	2 000	6 035	2 000	6 791	2 000	6 557	2 000
84	Boilers, machinery and mechanical appliances, and parts thereof	-	15 000	-	13 000	-	24 500	-	24 000	-	24 000	3 365	30 000
85	Electrical machinery and equipment, and parts thereof	-	13 000	-	15 000	-	15 000	-	10 000	-	8 500	-	10 000

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Table 5. Iraq: Imports of engineering and metalworking products, 1964-1969 (continued)

(Value in thousand Iraqi dinars; weight in tons)

BTN	Description	1964		1965		1966		1967		1968		1969	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
86	Railway and tramway, locomotives, rolling-stock and parts thereof	318	100	2 319	1 400	27 757	4 000	1 445	310	-	1 500	-	1 000
87	Vehicles other than railway or tramway rolling-stock and parts thereof	-	10 000	-	9 000	-	13 000	-	10 000	-	8 000	-	8 000
	Total		54 650	-	68 540	-	80 660	-	64 460	-	61 000	-	62 950
	Total imports		147 000		161 000		176 000		151 000		151 000		157 000
	Percentage of total imports		37%		41%		46%		41%		40%		40%

Source: Central Statistical Organization, "Annual Foreign Trade Statistics," 1964-1965-1966-1967-1963-1969.

Table 6. Iraq: Selected imports of agricultural machinery and implements, 1966-1969

(Weight in tons, value in dinars)

BTN	Description	1966		1967		1968		1969	
		Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity
82/1	Hand tools								
	a) Stoves, spades	13 836	103	18 982	151	14 889	99	16 805	128
	b) Picks	4 844	50	2 345	29	2 605	31	6 691	74
	c) Forks and rakes	1 850	9	160	1	-	-	94	-
	d) Scyths	-	-	-	-	1 138	3	1 970	4
	e) Other	3 064	9	4 788	21	13 332	85	3 591	20
84/10	Pumps (including motor and turbo-pumps) for liquids, whether or not fitted with measuring devices, liquid elevators of bucket, chain, screw, bank and similar kinds								
	a) By government	20 579	73	8 355	61	63 657	124	37 597	56
	b) By merchants	593 942	1 012	784 514	975	480 027	890	696 379	1 139
	c) Other parts	109 355	139	97 356	67	182 795	142	137 089	126
84/24	Agricultural and horticultural machinery for soil preparation and cultivation								
	a) Ploughs								
	1) Mold board plough	87 665	311	62 566	203	34 587	117	44 859	139
	2) Disc plough	104 706	312	37 184	134	30 175	130	48 572	167
	b) Harrows and cultivators								
	1) Harrows	-	-	-	-	38 438	74	43 800	120
	2) Cultivators	7 369	23	21 084	69	4 211	13	17 345	71
	c) Other								
	1) Seed drill	28 008	54	5 415	31	8 257	24	-	-
	2) Fertilizer spreader	-	-	120	-	-	-	23 062	47
	3) Other	391 231	1 405	13 919	101	16 629	84	-	-

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Dollar Equivalents of Local Currencies

Local currency	Dollars
Iraqi dinar	2.8
Jordanian dinar	2.8
Kuwaiti dinar	2.8
Lebanese pound	0.32
Saudi Arabian riyal	0.22
Syrian pound	0.24

Measurements of Land area

1 hectare = 2.47 acres = 10,000 square metres = 10 dunums (Jordan, Lebanon and Syria) = 25 dunums (Iraq)

Table 6. Iraq: Selected imports of agricultural machinery and implements 1966-1969 (continued)

(Weight in tons, value in dinars)

BTN	Description	1966 Value	1966 Quantity	1967 Value	1967 Quantity	1968 Value	1968 Quantity	1969 Value	1969 Quantity
84/25	Harvesting and threshing machinery								
	a) Harvesting and threshing machinery	594 487	1 153	599 726	1 450	649 900	2 121	1 019 539	2 391
	b) Lawn mowers	22 393	76	16 829	46	11 668	41	13 469	26
	c) Winnowing and similar cleaning machines for seeds	-	-	-	-	-	-	2 150	1
	d) Other	27 515	118	-	-	2 175	6	4 745	17
87/1	Tractors (other than those falling within heading No. 87.07), whether or not fitted with power takeoffs, winches or pulleys:								
	a) Agricultural tractors (Number)	2 009 495	1 714	1 384 397	1 247	1 497 171	1 378	2 135 479	1 874
	b) Other	41 114	68	8 968	14	24 232	62	47 139	39
	Total	4 061 453		3 066 708		3 075 886		4 300 374	

Source: Central Statistical Organization, Annual Foreign Trade Statistics 1966, 1967, 1968, 1969.

Iraqi Dinars. None of these industries was in the field of engineering or metal-working. However, this situation will change radically when the Iskandria engineering complex starts operating. The Government allocated 10 million Iraqi Dinars for this project which represents some 15 per cent of the total current industrial investments in the public sector. The Iskandria project is discussed in detail later on in this report.

Iraq:
Table 7. Number of industrial projects, capital invested and number of employees in the private sector, 1968

Type of industry	Number of enterprises	Capital (Iraqi Dinars)	Number of employees
Textile industry	492	8,300,000	12,116
Food industry	408	8,632,500	5,539
Building material industry	256	5,311,900	20,320
Chemical industry	209	6,407,450	3,865
Metal-working industry	265	6,108,240	4,941
Wood-working industry	72	1,034,900	819
Glass	10	123,550	238
Paper	69	2,506,320	992
Leather	37	925,150	1,166
Others	29	403,200	286
Total	1,847	39,813,210	50,282

Source: Central Statistical Organization, Industrial Survey, 1968, Baghdad.

Table 7 above shows licensed private sector industries which enjoy state protection and which are registered with the Ministry concerned in Iraq. The table refers to 265 enterprises in the "metal-working industries" sector with a total investment of some 6 million Iraqi Dinars and employing 4,941 persons. Unfortunately, no detailed breakdown of these figures could be obtained, but the figures exclude, by definition, enterprises with machinery and equipment worth less than ID 3,000. Enterprises of this size or less are not licensed by the Ministry.

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However, the 1968 Industrial Census gives details of four groups of engineering and metal-working industries employing 10 persons or more as reproduced in Table 8. Only a few of the enterprises shown in this table are publicly owned. The public & private sector enterprises in these four groups are as follows:

Iraq:
Table 8. Number of establishments, number of persons employed, and value of production of engineering and metal-working industries, 1968 (public and private sectors)

Industry	Number of establishments	Number of persons employed	Value of production (ID)
(1) Metal products other than machinery	97	2,138	3,235,251
- Metal furniture	20	370	551,950
- Blacksmith	45	1,197	1,844,286
- Forging & casting	13	161	196,494
- Nails & wire products	6	127	25,936
- Shaving blades	1	11	7,185
- Household utensils	12	272	609,400
(2) Production and repair of machinery	25	1,606	4,738
- Machinery repair	25	1,606	4,738
(3) Production and repair of electrical machinery and equipment	26	968	1,233,220
- Production & repair of electrical equipment	8	587	160,742
- Radio and T.V. assembly	3	67	274,703
- Heating and air conditioning	15	314	797,775
(4) Transport equipment manufacture and repair	81	8,237	296,075
- Ship and building repair	7	979	66,907
- Railroads repair workshops	14	3,194	-
- Motor vehicles repair	54	3,974	43,611
- Body cars assembly	4	40	38,095
- Radiators	2	50	147,462
Total	229	12,949	4,769,284
Grand total of manufacturing sector (oil and electricity excluded)	1,318	78,253	159,130,842

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Iraq:
Table 9. Number of establishments and value of products of four industry groups, 1968

Industry sector	Number of establishments	Value of products
(1) Metal products other than machinery		
- Blacksmiths	1	193,259
(2) Production and repair of machinery		
- Machinery repair	4	-
(3) Production and repair of electrical machinery and equipment		
- Production and repair of electrical equipment	3	160,742
(4) Transport equipment manufacture and repair		
- Ship-building and repair	3	49,500
- Railroads repair workshops	14	-
- Motor vehicles repair and assembly	38	43,611
Total	63	447,012

It should be noted that the value of production shown in Tables 8 and 9 does not include the value of repair services which are a major activity in most of the enterprises covered by the four groups.

As mentioned earlier in this report, a major engineering complex is nearing completion in Iraq. This complex is situated at the town of Iskandria (about 100 kilometers south of Baghdad) and is under the control of the State Organization for Engineering Industries which is a wholly government owned enterprise. The total amount spent by the Government so far on the Iskandria complex was reported to be ID 11 million (about US $30 million). The construction of the buildings and ordering of equipment were reported to have started in 1961. The Iskandria production facilities are said to have been intended mainly for the manufacture of some 33,000 agricultural implements of 12 different types, spare parts for agricultural implements and five types of hand tools, with a total production capacity of 28,987 tons of agricultural implements and allied parts per year. This programme was in accordance with the

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Iraq/Soviet Economic Agreement signed in 1959 and a subsequent study conducted by the USSR. The Government of the USSR has provided all of the equipment for this plant. When the UNIDO/UNESOB Mission visited Iskandria (April 1970), it was impressed by the size of the production facilities, which consist of five major buildings - Administration, Main shop, Foundry, Power House and Stores. The Main Shop houses machinery for forging, press work, heat treatment, fabrication, welding, electro-plating, nuts and bolts manufacture, tool-making, assembly, painting and carpentry. The covered area of the Main Shop is 44,000 square metres. The Foundry which has an area of 9,240 square metres is fully mechanised with facilities for cast-iron, cast-steel and malleable products. It has a melting section with facilities for automatic pouring, sand-mixing, core-making, heat treatment, etc. The Stores cover an area of 7,240 square metres. A total of 4½ million Dinars have been spent so far for buildings, and 5¼ million Dinars for machinery, equipment and installation. A new building complex for training is under construction costing 1 million Dinars which, when operating, is expected to train 400 skilled technicians a year.

The present staff of the Iskandria complex consists of around 1,200; about 45 of these are engineers and 30 are supervisors. The UNIDO/UNESOB Mission was informed that the training and administration building will be completed within a few months. The main shop and foundry buildings are completed. Although most of the machinery and equipment have been installed in the main buildings, they were not operating yet. The tractor assembly line is yet to be installed. The equipment in the foundry was being installed. None of the sections of the Iskandria industrial complexwere operating.

The Iraq/Soviet Agreement also provided for the provision of necessary drawings, prototypes and technical information for the production of these implements. A detailed demand analysis of agricultural implements in the country in 1968 revealed that a more rational production level should be around 9,000 implements per year. Because of the reorientation of the production programme, about 70 per cent spare capacity has resulted. In order to utilize this excess capacity, the Company has taken the following steps:

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(i) Finalized an agreement with CSSR for the assembly of 1,200 CKD ZCHR 5511 model tractors per year with a programme to achieve local manufacturing of around 25 per cent of tractor parts after the first four years of assembly programme.

(ii) An agreement is about to be finalized with a French Company for the assembly of 2,000 units per year of RENAULT SAVIEM 2, 4 and 8 ton trucks.

(iii) The possibility of manufacturing centrifugal pumps is being explored.

With the proposed diversification of the production programme of the Company, the management expects to be faced with a number of difficulties which will have to be tackled before the Company can operate efficiently and economically. Most of these difficulties are caused by the lack of qualified engineers, technicians and other personnel at all levels. Some of the specific difficulties are as follows:

a) Although a very large number of technical drawings for all agricultural implements have already been received by the Company, these drawings are based on production techniques used in USSR. There are no qualified engineering personnel to adapt them to local manufacturing facilities. The work involves revision of the technical drawings, preparation of bill of materials, process sheets, assembly drawings, etc. to suit local standards system and existing manufacturing facilities.

b) Although it was decided to produce the USSR agricultural implements, there are no qualified technical personnel to analyse the requirements of raw materials and materials specifications.

c) It is also very difficult to find national qualified personnel for stores, inventory control, cost accounting, materials handling, quality control, and for other aspects of production and allied services such as industrial engineering, tool engineering, assembly, development engineering, plant maintenance, etc. There is also need for trained personnel in marketing and administration.

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d) There is also a shortage of foundry technologists and managers to successfully run the foundry.

e) There is a need for a training manager and other personnel to organize and run the training programme to meet the present and future requirements of the industrial complex.

f) Due to the proposed diversification of products, there is also a need for managerial personnel to coordinate a production programme for the industrial complex as a whole.

The Management of the Iskandria complex is making every effort possible to recruit and train personnel required at all levels, but it is very doubtful that all the skills required will be available when actual production starts. Although the management and members of the Mission discussed the possibility of UNIDO extending an integrated programme of assistance in the form of a Special Fund project, the management expressed some concern regarding the speed with which such assistance will be forthcoming if requested by the Government. The Management pointed out that it expects to be assembling tractors in about 3 months time (August 1970) and to start on its other production programme as soon as possible thereafter. It was however, agreed that the Management would proceed with the preliminary investigation of securing UNIDO's assistance in good time to assist in meeting their difficulties. A detailed programme of UNIDO technical assistance was drawn up by the Mission in order to make it possible for the preliminary investigation to proceed as quickly as possible.

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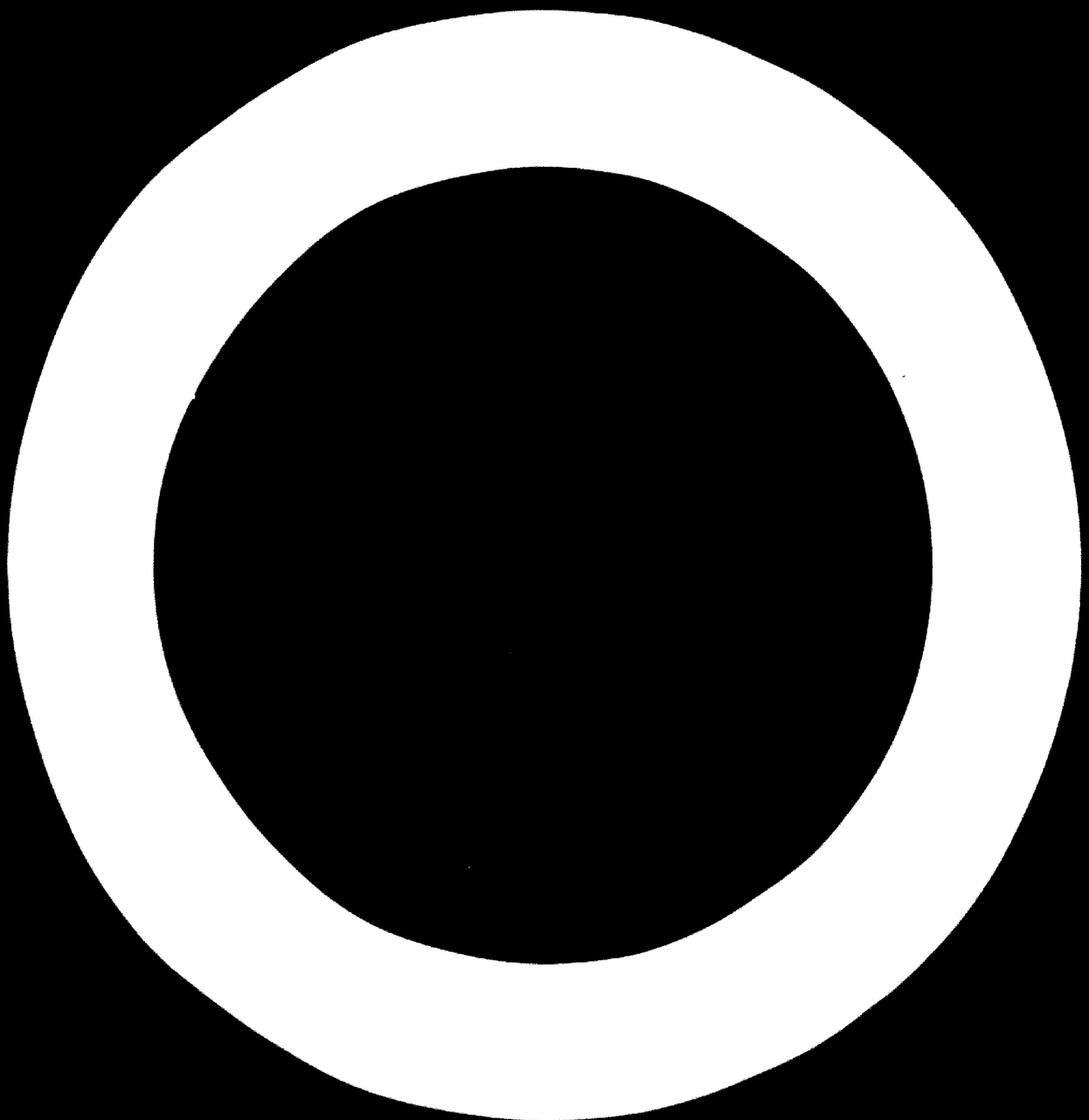

JORDAN

I. THE AGRICULTURAL SECTOR AND ITS PLACE IN THE ECONOMY

The gross domestic product in Jordan increased from an average of JD 47.7 million in 1954 to an average of JD 49.6 million in 1966, i.e. at an annual rate of about 8 per cent. However, per capita income in 1966 remained low at about 214 US Dollars. At the end of 1966, the total population of Jordan was estimated to be 2.1 million and the labour force amounted to 458,000 persons.

Agriculture is the most important sector of the Jordan Economy. About 35 per cent[10] of the economically active population are engaged in agriculture which contributes 22 per cent (1967) [11] to the gross domestic product. However, agriculture proved to be a highly unstable sector because a large proportion of agricultural output is from dry farming areas which are subject to frequent droughts. Lack of sufficient water resources, whether from rainfall, rivers or springs, restricts the development of agriculture in Jordan, where cultivated areas amount to 13,000 kms^2 of which 73.3 per cent depends upon rainfall and only 5.8 per cent is irrigated land. About one fifth of cultivable areas are usually unused due to lack of sufficient water.

The total area of Jordan is approximately 97,000 square kilometres, but about 87 per cent of this area is desert land. Except for the riff valley, most of the country lies at elevations of 300 to 900 meters above sea level.

10/ Source: Metal and Metal Transforming Industry in Jordan (1969), Jordan Centre for Industrial Development.

11/ Studies on Selected Development Problems in Various Countries in the Middle East, 1969, UNIDO.

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Agricultural land in Jordan has often been devastated by war and the people had to reap the harvests with little regard to the maintenance of soil fertility and with negligible use of soil conservation procedures. Furthermore, uncontrolled grazing has stripped hill areas of useful pasture plants leaving the soil exposed to wind and rain. This has resulted in excessive run-off, soil erosion, siltation and consequently lower fertility.

The first seven-year plan of the Kingdom, which ended in 1970, was mainly devoted to the development of infrastructure. Although no future plans are being formulated at present, attempts are being made to crystallize future directions. As indicated by the Jordan Development Board, the production sectors and the agricultural production sector is to be given top priority. Major areas of action are expected to include transformation of rainfed farming to irrigated farming; use of underground water and introduction of new systems of irrigation, rational exploitation of uncultivated land, use of hybrid seeds, fertilizers and modern agricultural management practices, co-operative farming, marketing and agricultural credit and usage of modern agricultural machinery and implements.

The institutional structure of the agricultural sector is dominated by the intense fragmentation of land. The total number of holdings amounted to 93,492 in 1965; 36 per cent of these holdings were less than 10 donums whereas only around 2 per cent exceeded 500 donums. The land is frequently passed over to a share farmer whose aim is quick profits. This situation has been a major hindrance to the introduction of new techniques.

In addition to the three major agricultural projects in progress - Dry Land Farming, Wheat Project, and Irrigation Project - three pilot units on the use of underground water (areas: 212 ha and 150 ha) have been started in South Jordan. Attention is also being given to the formation of co-operative farming units (optimum size 600 ha) in the Kingdom where two such units are being formed and another is to be formed soon.

The Dry Land Farming Project, an FAO/SF Project, started in 1967 on a 7,000 ha pilot area of Baqa Valley near Amman with the primary objective of introducing: a) integrated development programmes; b) soil conservation practices; c) agronomic practices; and, d) agricultural machinery and

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implements suited to dry zone farming. The Wheat Project was started in May 1967, in co-operation with the Oregon State University and USAID. The objective of this project is the doubling of wheat production by 1980 with the area under cultivation remaining almost constant. The four methods used to increase production are : a) summer fallow; b) use of chemical fertilizers; and, c) use of improved seeds ; and d) weed control. It is reported that annually around 10 plots of 5 ha each are selected on which land preparation and agronomic practices are demonstrated and 20 plots of 2 ha each are selected on which only agronomic practices are demonstrated. Trials and demonstration of the most suitable agricultural machinery and implements and optimum tillage practices are one of the major areas of activities of the wheat project. The objective of the Irrigation Project, which is also undertaken in co-operation with USAID, is to develop underground water resources and scientific water management techniques. The project includes six farm equipment units each consisting of a number of implements, as well as a limited number of tractors. These are supplied to farmers on a rental basis primarily to level the land and to introduce tillage practices most conducive to the optimum water management techniques.

The policy of the government is also to encourage farmers to own agricultural machinery and implements either individually or on a co-operative basis. The Agricultural Credit Corporation which started its activities in 1961 is the primary organization which is responsible for agricultural financing. Loans are extended mostly for the purchase of tractors, implements, pumps and engines. There is also a number of agricultural co-operative societies in the country. It is reported that in 1967, the number of co-operative societies in the East Bank area were about 138, owning a total of 24 tractors. All these societies are multi-purpose units.

The Agricultural Marketing Centre, which is assisted by an FAO/SF Project, is engaged in assisting farmers and co-operatives in establishing agricultural marketing units. The Centre, in addition to the preparation of marketing and technical manufacturing feasibility studies, may undertake the establishment of agricultural products processing units. The Centre has prepared a report entitled: "An Economic Feasibility Study of a New Tomato Paste Cannary in Jordan" and is engaged in the establishment of a unit with a capacity of 100 tons of fresh tomatoes per day.

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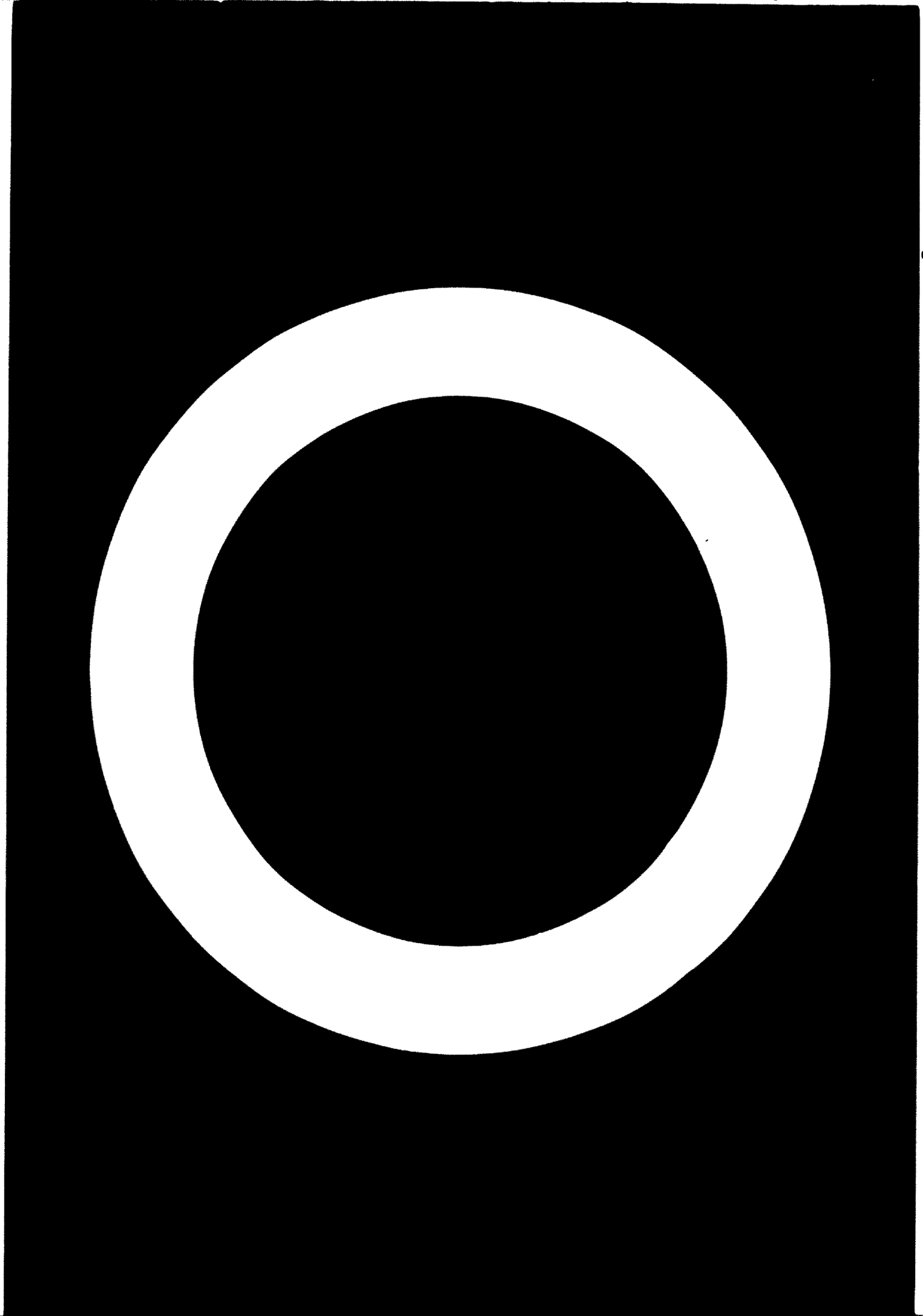

II. FARM MECHANIZATION

The major crops in Jordan are wheat, barley (Winter crops), lentils, tomatoes and melons (Summer crops), and olives. Wheat and barley are grown mostly in the desert border areas where rainfall is less than 300 mm and in the valley areas where maximum rainfall is between 300-400 mm. Normally no irrigation on a significant scale is carried out for these crops. Tillage, sowing, weed and insect control and harvesting operations have been reported to be mechanized to a significant level for wheat and barley.

Government officials are of the opinion that nearly 80 per cent of total crop areas under wheat and barley are mechanized. However, some of the major importers of agricultural machinery and implements in the Kingdom feel that farm mechanization has just started in the country and that only 10 per cent of the required mechanization has been achieved. In addition to the tractors, implements, sprayers, levellers and combine harvesters are commonly used. However, only tillage and sowing operations for lentils have been mechanized. No significant progress has been achieved in successful usage of farm machinery on vegetable crops (tomatoes and melons) and olives. It is the policy of the Government to encourage further mechanization, at an early date, of the major cereals, lentils, vegetable crops and olives.

The Government also encourages farmers to own and operate crop protection equipment. The Crop Protection Department of the Ministry owns and operates large size equipment such as motor sprayers, and power dusters and also provides technical assistance to the farmers.

The overall programme of agricultural machinery development is the responsibility of the Agricultural Machinery Directorate of the Ministry of Agriculture. However, the Department of Agricultural Research and Extension is involved in research and extension activities in all aspects of agriculture, including agricultural machinery and implements.

It is estimated that as of 1968 the population of agricultural machinery and implements in the East Bank (based on the total sales between 1963-1969) were as follows: tractors 2,662; harvesters 94; disc ploughs around

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680; harrows around 583; disc cultivators around 111; and, other cultivators and implements 1,688. It is also estimated that there are around 1,600 hand operated sprayers, 200 powered knapsack sprayers, 40 motor sprayers, 35 power (PTO) sprayers and 5 powered dusters in the Kingdom. The most commonly used agricultural machinery and implements are: standard wheel tractors of 60-65 hp, disc harrows, trailers and hand operated knapsack sprayers. The selling price of a 60 hp tractor is around 1,250-1,350 JD, 3 furrow mould board plough 185 JD, and 3 furrow disc plough 160 JD. It is also reported that there is an increasing trend in the cost of labour for agricultural operations. Agricultural labour which normally costs 0.3-0.5 JD/day costs around 1.0-1.25 JD per day during harvest periods. There is also an increasing trend in custom farming, especially for ploughing, trailer work, PTO threshing and combine harvesting. The normal prevailing rates for custom work are as follows: discing to cover seeds 0.2 JD/donum and plowing 0.35 to 1.0 JD/donum. It was reported by personnel of the Dry Land Farming Project that a limited sample survey carried out by an expert of the United Nations in 1967 on the pattern of ownership of tractors in the Kingdom showed the following ownership distribution pattern: large private farmers (10 per cent); Government farms (2.5 per cent); co-operatives (less than 1.0 per cent); medium farmers, who may also be contractors, (20 per cent); small farmers, consisting of a considerable number of contractors (50-60 per cent); and full time private contractors (10 per cent). It is felt that since 1967, there may have been a considerable increase in the percentage of full time private contractors. No Government subsidies are provided to the farmers for the purchase of agricultural machinery. However, the import duty on tractors and implements is only 4.0 per cent and there is no sales tax. The import duty on spare parts is 42 per cent and there is an additional sales tax. The Agricultural Credit Corporation normally extends loans to farmers for the purchase of tractors, implements and other equipments. The farmer is expected to pay one-third of the price in cash and the rest to be paid back in 5 years plus 6 per cent interest. A monthly pay back system has been recently introduced. It is reported that from 1961 to 1969, the Corporation extended total credits amounting to JD 703,092, of which JD 563,958 was for 344 tractors and the balance for implements. From 1967 to 1969, loans for

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the purchase of 53 engines and 39 pumps were extended. In 1969, the Agricultural Credit Corporation extended loans for the purchase of 93 tractors, 96ploughs, 56 trailers, 9 harvestors, 20 engines and 14 pumps. It is estimated that loans from the Agricultural Credit Corporation cover about one-third of the requirements of the Kingdom. The Corporation has also alloted 50,000 JD to finance dealers to import, for trial and experimentation purposes, models of agricultural machinery and implements which are not used at present.

The total annual demand for agricultural machinery and implements at present in the Kingdom was estimated as follows by some UN Experts, importers, and Government officials: tractors 400; trailers 400; chisolploughs 400; disc harrows 50-70; cultivators 30-60; PTO operated threshers 150-200; hand operated knap sack sprayers 500; and deep well pumps (90--180 m depth) 50. However, the above estimates are based on individual opinions and it is recognized by all persons met by the mission that it will be necessary to undertake a rational analysis of product specifications and demand for the next five years.

The FAO Indicative World Plan gives the gross cropped area in Jordan in 1964 as 577,000 hectares and the total number of tractors in that year as 1,430. Therefore, the ratio of cropped area to tractor was 400. This ratio was 336 in Turkey, 92 in Greece, and 65 in Cyprus in 1964. The IWP suggests a total target number of tractors in 1985, based on cultivated area targets in Jordan for 1985, of 2,140. This target represents a growth rate of about 35 tractors per year which is considerably lower than the estimated annual demand of 400 tractors mentioned above. The average annual sales of tractors, as reported by dealers in the East Bank and quoted in the 1970 Agricultural Statistical Year book, is 220 tractors. However Table 11 on page55 shows total imports of "tractors" for the years 1964-1968 to have varied from a low of 150 tractors in 1967 to a high of 651 in 1965.

The future agricultural production programme in the Kingdom is based on three major crop areas: wheat and barley; lentil and chick peas; and vegetables (mainly tomatoes). Significant research and experimentation is being carried out, by the various departments and projects of the

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Ministry of Agriculture, on the use of agricultural machinery and implements and the optimum tillage practices. The four major projects (Dry Land Farming Project, Wheat Project, Irrigation Project and Tobacco Project) and the Departments of Crop Protection and Agricultural Research and Extension are some of the important units where such research is being carried out. The mechanization of crops in the Kingdom at the present is restricted mainly to the seed bed preparation of wheat, barley, lentil and chick pea crops. Use of seed drills and fertilizer distribution is not significant. Although combine harvesters and threshers are used for barley and wheat, the harvesting operations on lentils and chick peas are undertaken by manual labour. Cash crops such as tomatoes, melons, olives are not yet mechanized. Thus there is a great need for a development and adaptation programme in the agricultural machinery and implements field to suit local conditions and practices.

Although disc ploughs are mostly used for primary tillage operations in dry land areas where wheat, barley, chick peas and lentils are mostly grown, it was reported that the experiments carried out by various departments and projects of the Ministry of Agriculture have definitely indicated that usage of disc ploughs is not desirable for arid zone soils. It is reported that preliminary experiments carried out by the Dry Land Farming Project have shown that there is a need to develop chisel ploughs, cultivators and disc harrows as primary tillage implements. It is also reported that a universal tool bar frame for tractors was developed at the Dry Land Farming Project. The successful summer fallow system of farming used by the Wheat Project has indicated that a combination of chisel plough, disk harrow, sweep and clod crusher is well suited for arid zone soils. The trials have also indicated that usage of seed drills, and crop protection equipment are very necessary for successful agricultural production. Experiments carried out by the Irrigation Project have indicated the nocessity to use levellers and rational irrigation techniques. Thus it is seen that there is a need to assimilate the results of those research results and experiments carried out by the various projects and departments and further develop suitable implements which are suited to local conditions and also assist local manufacturers by identifying correct product specifications. It is also

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reported that effective usage of wheat and barley straw is an important economic factor in agriculture as the cost of straw is between JD 7-15 per ton depending upon the season and contributes up to 50 per cent of the wheat crop price. Therefore there is a need to develop hay bailers. Due to the high cost of labour (1 JD/day) for weeding, there is also need to identify suitable types of sprayers and dusters and assist in local manufacture. In addition to the above, there is a need for the development of harvesters for chick peas and lentils. The Department of Agricultural Research and Extension, Ministry of Agriculture, at JUBIEHA, near Amman, is engaged in research and extension activities in the various fields of agriculture including agricultural machinery and implements. It was reported that an Agricultural Engineering Section was established recently. The section has at present four agricultural engineers and a workshop. Although no detailed work programme has yet been formulated, the mission was given to understand that the department is seriously thinking of formulating a detailed work programme in the research, design, development, adaptation and testing of agricultural machinery and implements. The Agricultural Engineering Section would like to concentrate at first on tillage implements, sprayers, seed drills, fertilizer distributors and irrigation equipment and later on take up problems involved in hay bailing, threshing and lentil harvesting.

In order to assist the Agricultural Engineering Section of the Department of Agricultural Research and Extension in the proper crystallization and drawing up of an adequate and integrated project, the mission recommended that a UNIDO expert be provided at the earliest possible date. The expert proposed may find it useful to recommend further UNIDO assistance through the establishment of an integrated project for the research, design, development adaptation and testing of agricultural machinery and implements.

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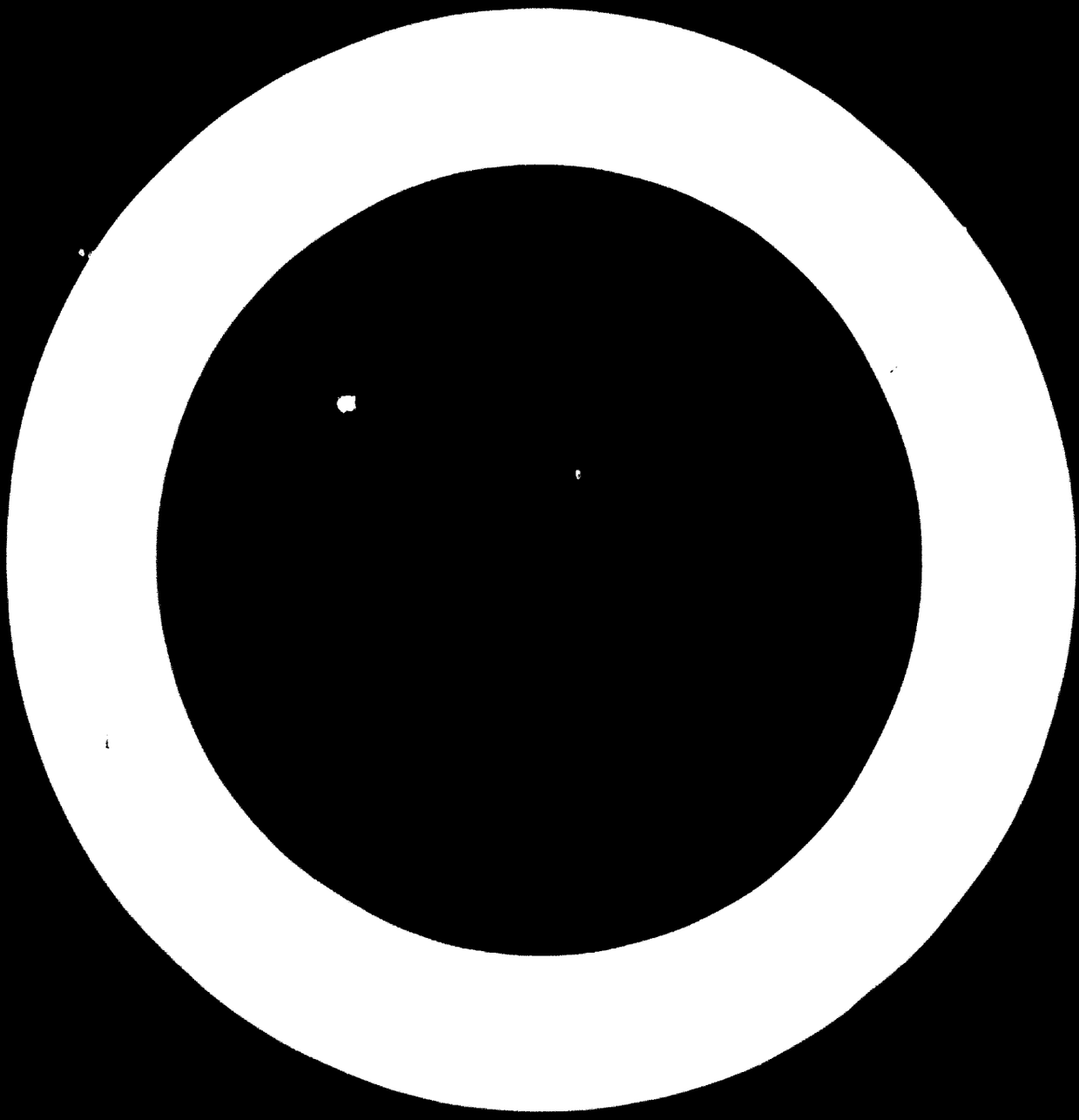

III. THE ENGINEERING AND METAL WORKING INDUSTRIES SECTOR AND THE MANUFACTURE OF AGRICULTURAL MACHINERY AND IMPLEMENTS

A. Imports of engineering and metal products, including agricultural machinery and implements

Table 10 shows total imports for group numbers[12] 73-87 for the years 1964, 1965, 1966, 1967 and 1968. It should be noted that these imports include ferrous and non-ferrous sheets, plates and other shapes imported for transformation in Jordan. A more detailed study of imports should exclude such items on the basis of end uses. The imports of ferrous and non-ferrous metal products, machinery (electrical and non-electrical) and transport equipment covered by group numbers 73-87 as shown in Table 10 amount to about 26 per cent of the total imports of Jordan. This percentage is 33 for 1967 probably because total imports for that year were lower as a result of the June War.

Imports for a number of selected group numbers covering machinery and implements used for agriculture and/or other purposes are listed in Table 11. These imports represent a relatively small percentage of the imports of groups 73-87.

B. Manufacturing industry and the status of the engineering and metal-working industries

It is reported that the net value of industrial production in Jordan in 1967 amounted to JD 17.50 million, i.e. 8.5 per cent of the Gross National Product which amounted to JD 205.43 million. However, the contribution of the metal-working and engineering industries amounted to JD 1.04 million, i.e. 6 per cent of the total value of the industrial production and consequently 0.5 per cent of the GNP which is considered to be very low.

12/ These group numbers represent those used by the Jordan Department of Statistics.

Table 10. Imports of engineering and metal working industries products, 1964-1968
(Value in thousand Jordanian Dinars, Quantity in tons)

BTN	Description	1964		1965		1966		1967		1968	
		Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.
73	Iron & steel & articles thereof	3 317	61 630	4 098	74 031	4 883	98 383	5 789	102 614	3 755	54 111
74	Copper & articles thereof	143	412	162	378	233	456	232	486	169	404
75	Nickel & articles thereof	1	3	1	2	2	10	-	-	1	2
76	Aluminium & articles thereof	97	260	216	563	286	753	217	573	214	703
77	Magnesium, beryllium & articles thereof	-	-	-	-	-	-	-	-	-	-
78	Lead & articles thereof	7	54	22	240	74	809	40	444	47	460
79	Zinc & articles thereof	6	29	16	100	14	70	10	32	16	52
80	Tin & articles thereof	19	19	20	18	29	33	18	18	17	26
81	Other base metals employed in metallurgy & articles thereof	3	11	8	18	10	34	11	42	10	17
82	Tools, implements, cutlery, spoons & forks, of base metal; parts thereof	315	481	324	446	404	605	379	573	458	491
83	Miscellaneous articles of base metal	313	1 031	392	1 237	483	1 405	327	867	359	1 233
84	Boilers, machinery & mechanical appliances; parts thereof	2 982	-	4 143	-	4 191	-	3 974	-	4 200	-
85	Electrical machinery & equipment	1 563	-	2 207	-	2 164	-	2 346	-	2 723	-
86	Railway & tramway locomotives rolling-stock & parts thereof	3	-	5	-	26	-	7	-	11	-
87	Vehicles, other than railway or tramway rolling-stock & parts thereof	5 740	-	3 340	-	5 161	-	4 623	-	3 432	-
	Total	14 196		15 054		17 960		17 973		15 412	
	Total imports	53 558		56 052		68 211		55 048		57 492	
	Percentage of total imports	26 %		27 %		26 %		33 %		27 %	

Source: Department of Statistics, External Trade Statistics, 1964-1968.

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Jordan:

. Table 11. Selected imports of machinery and equipment used for agricultural and/or other purposes, 1964-1968
(Value in Jordanian Dinars, Quantity in Kilograms or Numbers)

BTN	Description	1964		1965		1966		1967		1968	
		Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.
84/21/B	Mechanical appliances for projecting, dispersing or spraying liquids or powders for agricultural, industrial or medical use	20 050	18 105	25 644	21 083	29 596	27 955	18 527	17 742	18 689	23 699
84/21/C	Other mechanical appliances for projecting, dispersing or spraying liquids or powders	-	-	-	-	-	-	23 515	27 522	10 597	15 596
84/24/A	Agricultural ploughs (in number)	19 300	133	69 898	591	66 683	457	21 618	106	13 029	123
84/24/B	Parts & accessories for agricultural & horticultural machinary for soil preparation or cultivation (e.g. ploughs, harrows, cultivators, seed & fertilizer distributors)	10 701	34 964	17 089	55 319	18 518	54 532	-	-	12 109	40 140
84/25/A	Harvesting & threshing machines (number)	53 861	52	168 913	74	-	-	47 640	116	28 605	112
84/29/B	Machinery of a kind used in broad grain milling industry & other machinery	-	-	30 004	102 273	40 099	104 263	-	-	12 485	37 838
84/59/A	Other machinery for agricultural or industrial use	136 814	150 551	122 486	96 334	65 264	65 211	113 436	141 547	204 005	158 832
87/01	Tractors (in number)	457 588	387	656 022	651	646 541	463	264 980	150	466 973	333

Source: Department of Statistics, External Trade Statistics, 1964, 1965, 1966, 1967 and 1968.

Table 12 shows value added for the engineering and metal working industries, imports and apparent consumption for the years 1964, 1965, 1966, 1967 and 1968. It is clear that over 90 per cent of Jordan's consumption is provided by imports.

Jordan:
Table 12. Value added, imports and apparent consumption of engineering metal-working industries products, 1964-1968

(Value in thousand Jordanian Dinars)

Year	Value added a/	Imports b/	Apparent consumption
1964	1 150	14 196	15 346
1965	1 860	15 054	16 914
1966	1 640	17 960	19 600
1967	1 560	17 973	19 533
1968	1 750	15 412	17 162

Source: Department of Statistics, External Trade Statistics 1964, 1965, 1966, 1967 and 1968, and,

Department of Statistics, Industrial Census 1967 and National Accounts, 1968.

a/ Value added of all establishments of basic metal products, non-electrical machinery, electrical machinery and transport equipment.

b/ Imports of group numbers 73-87 inclusive.

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Table 13[13/] shows the total number of establishments and number of workers working for the engineering and metal working industries sector in Jordan.

Jordan:
Table 13. Structure of the engineering and metal-working industries, 1967

Industry	No. of establishments	No. of workers	Wages & salaries (000 JDs)	Value of production (000 JDs)	Value added (000 JDs)
Basic metal production	436	3 454	339	2 522	1 110
Non-electrical machinery	4	23	5	17	11
Electrical machinery & appliances	208	784	51	415	163
Transport equipment	219	1 156	128	485	276
TOTAL	867	5 417	523	3 439	1 560

Source: Manufacturing Industrial Census 1967, Department of Statistics, Amman 1968.

The engineering and metal-working industries in the Kingdom consist mainly of the following industries: aluminium utensils, dry and wet batteries, barbed wire and nails, steel furniture and steel reinforcing bars, metal workshops, grey iron foundries, primus stoves, refrigerators for commercial use (fitted with imported motor), vehicle bodies, pumps, stone crushers, olive presses, and sanitary fittings, etc. However, 93 per cent of these enterprises employ less than 10 persons and are mostly workshops, service and repair units and individual craftsmen and are considered

13/ Metal and Metal Transforming Industry in Jordan (1969), Jordan Centre for Industrial Development.

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to have limited industrial potential. Of the above mentioned units, those which have relatively significant capacities are: iron and steel (steel reinforcing bars), aluminium utensils, steel furniture, batteries, grey iron foundries, primus stoves and gas heaters, and bodies for vehicles.

It is reported that practically no raw materials for metal transforming industries are produced in Jordan. The imports of such raw materials represent about 50 per cent of the total value of production in the metal transforming industry. It is reported that the three foundries presently operating depend mainly on iron scrap for raw materials, and that the iron and steel factory imports iron ingots for its production. The iron and steel factory is a joint stock company with a capital of JD 500,000; it employs 250 persons, and has a production capacity of 60,000 tons/year of steel reinforcing bars. Production at present is around 40,000 tons/year. The mission visited one of the foundries near Amman. Details of the three foundries: I, II and III are as follows:

	I	II	III
Capital (JD)	100,000	12,500	9,000
Labour force	10	18	46
Annual capacity	500 tons	9,240 JD	n.a.
Present capacity (tons)	313	n.a.	n.a.
Raw material used	Billets and iron scrap	Iron scrap	n.a.

It is reported that there are 18 workshops with very small capacities for forging. They produce mainly steel and iron parts needed for construction and for steel furniture. It is also reported that there are about 18 establishments for producing steel furniture out of which only three could be considered important. The following are details of the above mentioned three units:

	I	II	III
Capital (JD)	140,000	8,000	84,000
Labour force	n.a.	23	54
Annual capacity	n.a.	500 units	12,000 units
Present production	n.a.	400 units	8,000 units
Product line	steel furniture	steel furniture	Beds, cupboards, tables, etc.

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It is also reported that there are three factories in the Kingdom which produce household articles of aluminium out of imported aluminium sheets. The following details were obtained regarding these three foundries:

	I	II	III
Capital (JD)	40,000	28,000	20,000
Labour force	19	19	24
Capacity/year	300 tons	100 tons	1 million units
Present production	300 tons (36,000 JD)	100 tons (44,000 JD)	100,000 units

The Jordan Centre for Industrial Development (JCID), assisted by a UNIDO/SF Project, is conducting a survey of the engineering and the metal transforming industries in the Kingdom. Recently an expert in metal-working industries joined JCID. It is reported that his programme of work consists of the following: (a) survey of existing industries; (b) preparation of preliminary feasibility reports; (c) preparation of market analysis, pre-investment study and phased manufacturing services; and, (d) recommendations to the government for a development policy in this branch. The mission was given to understand that the survey of existing industries has been already started. The survey programme consists of the analysis of existing industries in the metal-working sector regarding product range, product specifications, available facilities, machine utilisation, finances, management, technical skill, difficulties faced, etc. in order to formulate a basis for further investigations on the lines mentioned above. This study, representing a major area of activity of the Centre, will be sufficiently detailed and will throw considerably more light, when it is completed, on the status of this sector in Jordan.

C. Present status of agricultural machinery manufacture

A few, very small workshops are manufacturing threshing machines, trailers, disc harrows, ploughsand deep well pumps components. It is reported that there are two manufactures of trailers and one manufacturer

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of irrigation pipes. The total annual production rate in the Kingdom at present is estimated to be around 100-150 trailers, about 60-80 small threshers, and 70-80 disc harrows (with imported discs). Although there are 3-4 medium scale foundries, only two are manufacturing stone crushers and oil presses. It is also reported that improved prototype threshers were made by "Schneller" (a church group), but no commercial production has taken place.

D. Conclusions and recommendations

Because of the present situation in Jordan, it would seem advisable not to embark, at present, on any investigation or specific feasibility studies for the development of engineering industries generally or of facilities for the local production of some agricultural machinery and implements. The time between now and the settlement of the situation in Jordan should be utilized to survey the existing situation of the engineering industries and fully assess its potentialities as well as examine in details future demand trends. Such a survey should be undertaken with the full knowledge of the findings of the study being prepared by JCID. It is also understood that the JCID expects to undertake, in the very near future, an overall industrial survey in co-operation with IDCAS and other Jordanian authorities. It would seem, therefore, highly desirable that the engineering industries sector be investigated in some more detail within this survey since a number of preliminary studies are already in hand; and that specific products or processes be identified with a view to the preparation of specific feasibility or pre-investment studies.

The UNIDO/UNESCOB Mission which visited Jordan in March 1970 has recommended that an expert in agricultural machinery manufacturing feasibility study be provided for a period of four months to assist JCID in their study. Although preliminary work was conducted with respect to the metal-working sector, it is recommended by the mission that further work be undertaken with respect to the agricultural machinery and implements manufacturing field.

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However, the mission had also recommended the provision of an expert in development, adaptation and testing of agricultural machinery and implements to assist the Agricultural Engineering Section of the Ministry of Agriculture in formulating a programme for the adaptation and development of agricultural machinery and implements. If such an expert is provided, his work could lead to a more detailed identification of products worthy of further manufacturing feasibility analysis.

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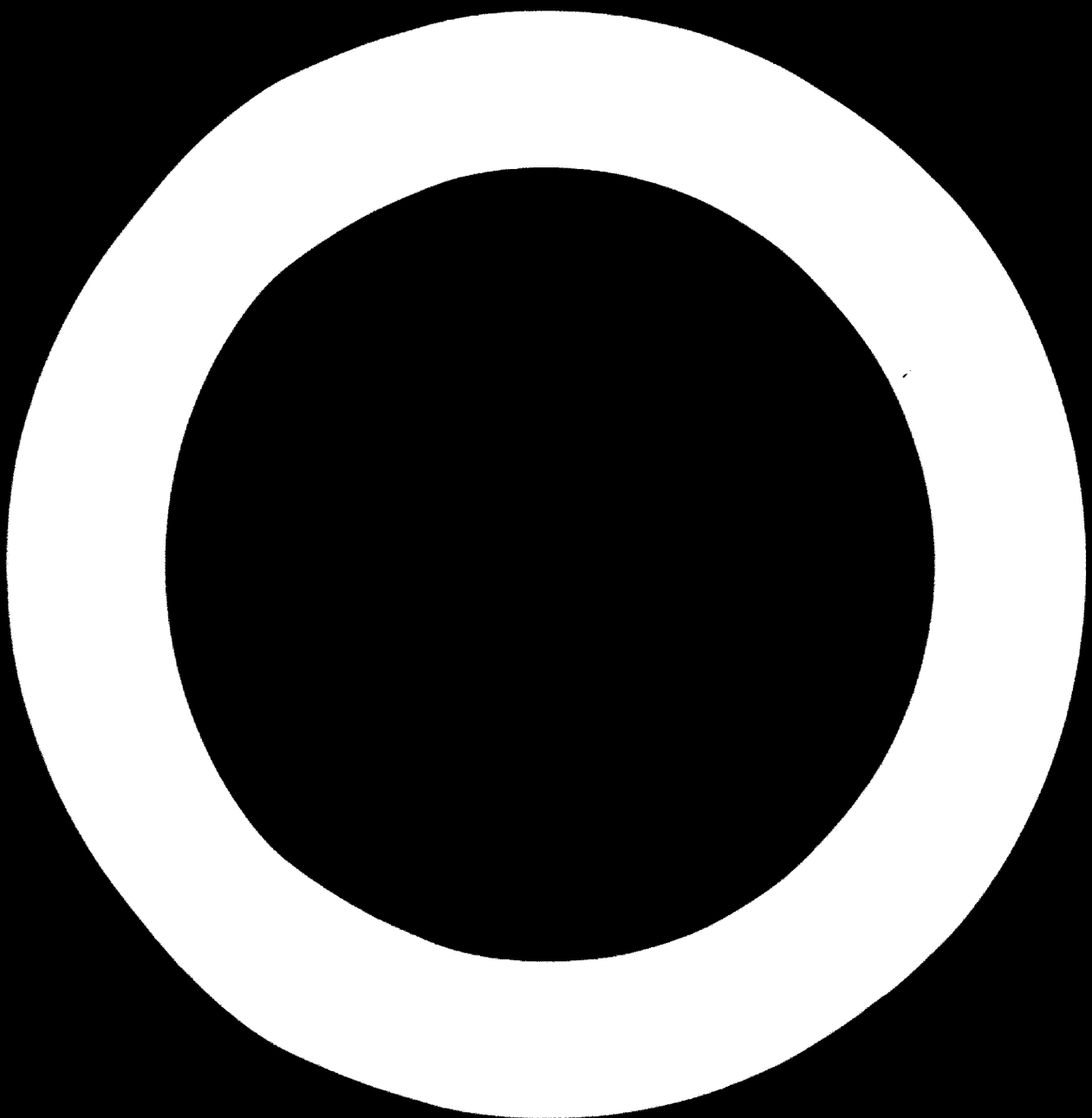

KUWAIT

1. THE AGRICULTURAL SECTOR AND ITS PLACE IN THE ECONOMY

Agricultural production is of limited importance to the Kuwait economy. In 1966/1967, the percentage contribution of the "agriculture and fishing" sector in the gross domestic product was only 0.4 per cent. Of a total of 180,000 persons (Kuwaitis and non-Kuwaitis) gainfully employed in 1965 in Kuwait, only about 1-2 per cent were reported to be engaged in "agriculture, hunting and fishing". The provisional results of the 1970 agricultural census indicate that about 2,300 persons were gainfully employed in agriculture. About 14 sq. kms. were reported to be "under cultivation" in 1967, representing less than 0.10 per cent of the total area of Kuwait which is 17,000 sq. kms. (excluding Neutral Zone).

Although the final results of the 1970 Agricultural Census have not been published yet, the provisional results give the total area of the country, including Kuwait's share of the Neutral Zone, as 23,000.- sq. kms. Land utilization is shown as follows:

Table14. Kuwait: land use, 1970

(In thousand hectares)

	Area		Per cent
(1) Cultivable areas:			
- Under crops (including fallow)	492.4		21.2
- Not cultivated	1,481.8		64.5
(2) Land occupied by fruit and other trees	87.2		3.8
Total (1) and (2)		2,061.4	89.5
(3) Other land		242.4	10.5
Total area of the country		2,303.8	100.0

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Kuwait:

Table 15. Land utilization of areas under crops according to end uses a/, 1970

(In thousand hectares)

	Area	Per cent
Non-commercial uses	75.5	15.4
Commercial uses		
- Vegetables	399.9	81.2
- Cattle and dairy products	12.6	2.6
- Poultry	0.5	0.1
- Mixed	3.9	0.7
	492.4	100.0

The bulk of the country's food requirements are imported. The percentages of food imports to total imports during the period 1963-1968 are shown in the table below:

Kuwait:

Table 16. Total imports and food and live animal imports, 1963-1968

Year	Total imports (million K.D)	Food and live animal imports SITC/0	Percentage
1963	115.7	17.6	15.2
1964	115.1	18.7	16.2
1965	134.7	28.0	20.8
1966	169.3	26.5	16.0
1967	211.9	13.6	6.4
1968	218.3	35.2	16.1

Source: UNESOB publication, Studies on Selected Development Problems in Various Countries in the Middle East, 1970.

The first five-year development plan of Kuwait (1967/1968 - 1971/1972) recognized the dangers inherent in the economy's overwhelming dependence upon oil and its allied industries and services, and therefore established as one of its major overall objectives of economic and social development the achievement of a greater degree of diversification in the sources of the country's national income while, at the same time, increasing the relative contribution of the non-oil sectors of the economy. In allocating investments to the various

a/ Provisional results of 1970 Agricultural Census.

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sectors, the plan provided only 0.9 per cent of the total investment to the agriculture and animal husbandry sector. This percentage was the lowest in the table of sectoral distribution of total plan investments. The bulk of the funds allocated were to be spent on forestry development, with the remainder left to the private sector for the development of poultry and cattle rearing farms.

However, if one adds the amount allocated to the development of water resources and distribution networks, one would find that the total investment envisaged for this sector amounts to KD. 72 million, i.e., 7.9 per cent of the total investment plan.

In the target year 1971/1972, the value of output in the sector of agriculture and animal husbandry is to be 2 million KD representing 0.2 per cent of the total GDP and an increase of 100 per cent over the plan period, i.e., 15 per cent annually.

The development of agriculture in Kuwait is handicapped by the shortage of water, both in quantity and quality, and the unfavourable climatic and soil conditions. The government recently concluded a soil survey and classification contract with a consulting firm. Preliminary and semi-detailed surveys covering a total area of about 260,000 hectares have been completed and it was decided to proceed with a detailed soil survey covering about 17,000 hectares in Solebiya, where a pilot farm of 30 hectares is reported to be under establishment.

It is also reported that there is a "hard pan" under the soil in Kuwait and located at varying depths. The very low permeability of this layer makes it necessary to take into account drainage considerations. Dry farming is not possible in Kuwait due to the low rainfall.

Brackish water is presently obtained from two sources, one at Solebiya and another at Shagaya. These two sources produce some 70 million g.p.d. but some of this water may contain as much as 5,000 p.p.m. of salts.

A large treatment plant was lately completed for the treatment of sewage water and its output is expected to reach 20 million g.p.d. for use for fodder production and afforestation. A pilot plant established in 1965 is producing about 250,000 g.p.d. by electrolysis.

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About half of the total area under cultivation is under the direct supervision of the Agriculture Department of the Ministry of Public Works (there is no Ministry of Agriculture in Kuwait). The remaining half is privately owned and may be classified as follows:

Kuwait:

Table17. Number of holdings, and sizes of holdings, 1970

Numbers of holdings	Sizes of holdings
5	1 - 1 1/2 km. sq.
6	0.3 - 0.7 km. sq.
7	0.1 - 0.3 km. sq.
8	0.05- 0.1 km. sq.

The Government, however, maintains a 36 hectares experimental farm, which includes a dairy farm and an animal husbandry unit.

Agricultural possibilities will also open up considerably when water expected from the Shatt-El-Arab irrigation project becomes available. It is expected that 70 million gallons of water per day from Shatt-El-Arab will be allocated for agricultural and horticultural purposes.

The limited agricultural areas which are scattered throughout the country are used for the growing of some vegetables, and some cattle feed. The total vegetable production in 1967 was estimated to be about 600 tons, which represents about 1 per cent of the country's consumption in that year.

The Department of Agriculture started a pilot hydroponics plant of 3,000 sq. metres in 1964. Additional units were added as successful results were realized and in 1969 the Government completed the first commercial hydroponics pilot plant of 20,000 m^2. The pilot work being undertaken in Kuwait in the field of hydroponics is unique in the Middle East.

Dairy and poultry farming

The achievements of the Government experimental farm have encouraged many private entrepreneurs to begin a significant poultry and dairy industry, and sizable market gardening enterprises.

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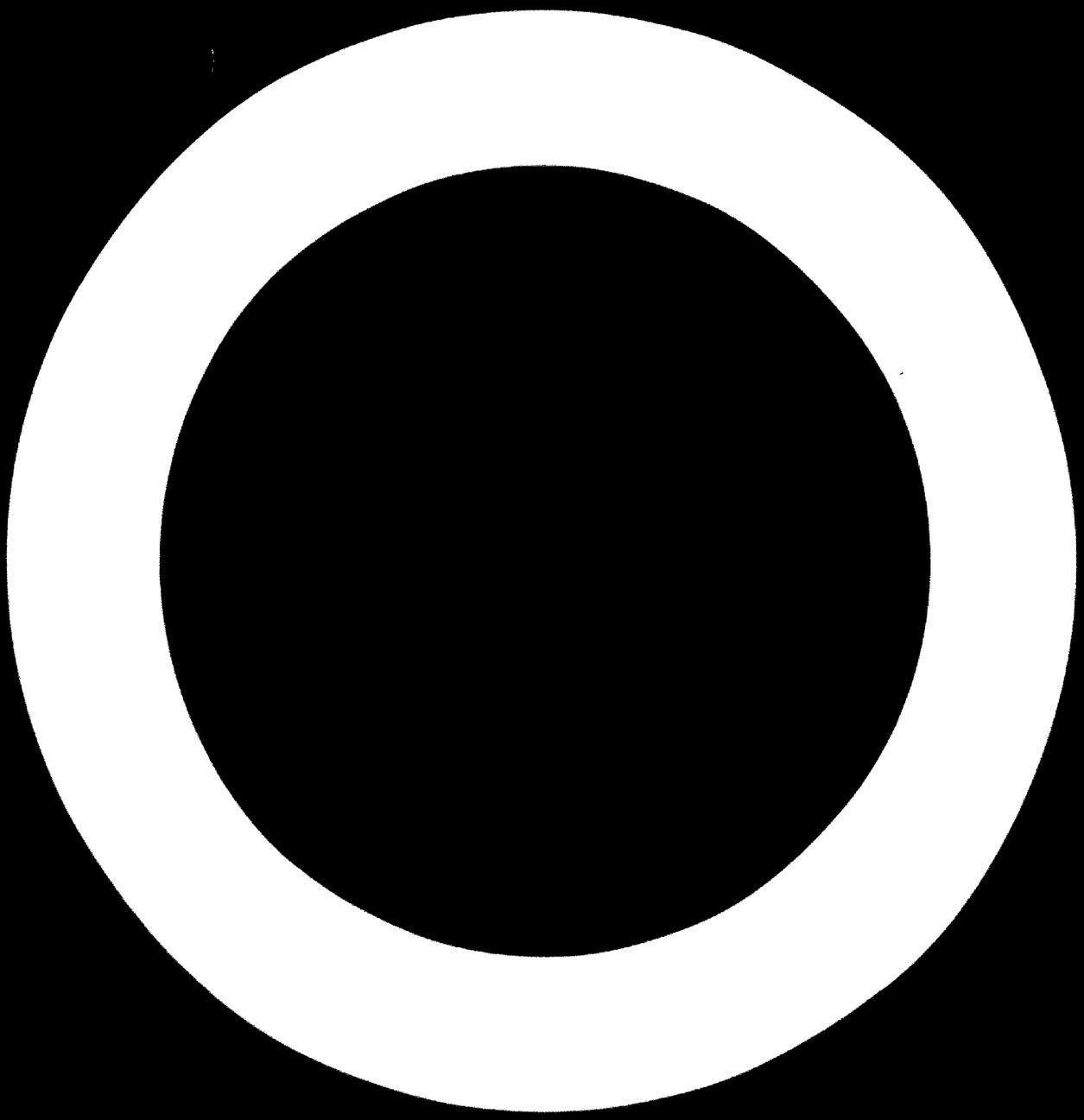
Although in 1966/1967, the total number of cattle in the country was estimated to be 10,000 of which only 1,000 were said to be dairy cattle, the mission was advised that at present (1970) there are 6,500 dairy cattle of which about 1,500 heads are used for commercial milk production and 5,000 for domestic milk production. However, the 1970 Agricultural Census provisional results, which were published early in 1971, give the total number of cattle in the country as 4,941, of which 2,940 are considered household cattle and only 2,001 are in agricultural holdings.

Whereas in 1966/1967, there were only 31 poultry farms, the mission understood that these now total about 70 and are meeting about 60 per cent of the local demand. The establishment of a poultry processing plant with an initial capacity of 2,000 birds/hour has been approved by the Government. The total number of chicken in Kuwait in 1970 was given as 841,517 by the provisional results of the 1970 Agricultural Census.

Kuwaiti bedouins raise camels, sheep and goats and it is estimated that they raise about one-tenth of Kuwait's meat requirements.



II. FARM MECHANIZATION

A. Present status

As there is little agricultural production in Kuwait, the farm machinery population in the country is somewhat limited. In spite of discussions held with almost all officials concerned in the department of agriculture, it was not possible to obtain detailed statistics on the types of agricultural machines and implements and dairy machinery imported into Kuwait. However, the following table shows the total value in Kuwaiti dinars of imports during the period 1965-1968:

Table 18. Kuwait: Imports of dairy machinery, agricultural machinery and machinery for processing agricultural products, 1965-68

SITC		1965	1966	1967	1968
712.100	Dairy machinery	3,602	47,106	10,375	18,650
712.900	Agricultural machinery	23,000	201,832	52,080	127,793
718.300	Machinery for processing agricultural products	142,600	113,100	250,700	176,600

It should be noted that the Central Statistical Office of the Planning Board is in the process of completing a "1970 Census of Agriculture" for which a questionnaire has been prepared. Part V of this questionnaire covers "power and machinery" in each agricultural holding and includes questions on machine, animal and human power used on the holding, tractors, pumps, motors, transport vehicles, implements, sprayers and dairy equipment. It would seem, therefore, certain that the farm mechanisation situation will be fully presented when the results of the census become available.

Although a potential market may exist for the following agricultural machinery and equipment, local production for the sole purpose of meeting local demand would seem to be unrealistic for most items:

Tractors
Disc ploughs
Small fertiliser distributors
Feed grinders and choppers
Planters
Sprinkler-type irrigation systems
Grain storage equipment
Knap sack sprayers
Dusters
Bucket spray pumps

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Any future agricultural production in Kuwait will most probably rely heavily on the use of machinery. Judging by government initiative so far it would be reasonable to expect that when the soil surveys being undertaken are completed, areas selected for production, and water resources made available, the government will proceed to scientifically identify crops to be grown and the machinery required. Kuwait will have no difficulty in importing the most suitable equipment required but may need United Nations technical assistance in the selection of the type of equipment best suited for the crop pattern identified. Because of the present and future size of agricultural production, it would seem most unlikely that Kuwait will embark on its own on any product design, research, development or even adaptation of existing agricultural machines and implements. It is certainly cheaper that such work is undertaken by international manufacturers or possibly by neighbouring countries where facilities exist and conditions of soil, rainfall, etc., may be similar.

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III. THE INDUSTRIAL SECTOR AND METAL WORKING INDUSTRIES

Rapid industrialisation could help considerably in achieving one of the main objectives of development in Kuwait, namely, diversification of the economy and broadening its base in order to reduce dependence on oil. However, industrialisation is handicapped by many factors. The most important of these is the absence of non-petroleum raw materials, the small size of the home market and the shortage of skills coupled with their high cost. On the other hand, capital and entrepreneurship are abundant.

Existing industries in Kuwait either cater for the local market in construction materials, repair and maintenance work, or are petroleum based.

The 1966 Kuwait Industrial Census shows the total number of establishments in the manufacturing sector to be 3,003. This figure includes establishments employing less than 5 persons as well as those employing over 100 persons. The total value added within the sector in 1966 was given as KD. 500,464,068.

Most of the major industrial establishments are located in the industrial park managed by Shuaiba Area Authority. This park is located about 50 km. from Kuwait city and covers an area of about 9 million sq. m. The Shuaiba Area Authority provides services to medium and large scale establishments approved by the Government. The port facilities, roads, land (rent .015 KD./sq.m/year), natural gas, electricity, sweet and cooling water are provided by the Authority. Some of the industrial units operating at present are Kuwait National Petroleum Company (KNCP), Petro-Chemicals Industry (PCI) and Kuwait Chemical and Fertiliser Company (KCFC) and two small companies: (a) Magcobar (making drilling clay); and, (b) Kremenco (maintenance of heat exchangers). One ammonia and one cement plants are under construction.

Kuwaiti imports of machinery and other equipment reached a peak in 1960 when industrial and construction activities were at a maximum.

Because of the low flat rate of 4 per cent ad valorem import duty, the Kuwait market is highly competitive and therefore quality and design are essential factors.

The Kuwait climate calls for machine and machine tools which are able to resist heat and corrosion caused by the prevailing high humidity.

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Climatic conditions, rough handling and inadequate maintenance cause rapid deterioration of equipment. Depreciation of machine and machine tools is calculated at 30 per cent annually.

Table 19 shows net imports of ferrous and non-ferrous manufactured goods, machinery, and transport equipment for the years 1966, 67 and 68.

In 1966, net imports of these items accounted for about 51 per cent of total imports, in 1967 this percentage was 48 per cent and in 1968 41 per cent. Although the percentage appears to be decreasing, it still represents a considerable portion of total imports which is not unusual for a country like Kuwait with a very small market, very high per capita income, no foreign exchange restriction, and many major development projects being implemented.

Table 20 below summarizes the status of manufacturing in Kuwait in the four ISIC Groups 35, 36, 37 and 38. The total value of production for these four groups is KD 9,458,286, but it is significant to note that almost 10 per cent of this total value represents repair services and 36 per cent manufactured products. The share of these four engineering industries groups in total value of production in the manufacturing sector is very small, amounting to only one per cent. Another feature of this sector is the preponderence of small establishments. 953 establishments of the total of 1035 in this sector employ less than ten persons and 633 of these employ less than five persons. Furthermore, the share of value added for the four groups to value added for the entire manufacturing sector is only about one per cent.

Although no detailed classification of the establishments in this engineering and metalworking sector is available, the following is a classification of 27 important establishments within the sector:

Aluminum windows	5
Cast iron products	2
Household metallic ware	1
Iron-working	11
Metal containers	1
Metal furniture	5
Ship building	1
Steel pipes	1

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Table 9. Kuwait: Net imports[1] of ferrous and non-ferrous manufactured goods, machinery and transport equipment, 1966 - 1968

SITC	Description	1966 Value (KD)	1966 Percentage	1967 Value (KD)	1967 Percentage	1968 Value (KD)	1968 Percentage
67	Iron and steel manufactured goods	9 148 310	6.0	13 882 926	6.9	8 767 318	4.4
68	Non-ferrous metal manufactured goods	422 529	0.2	871 564	0.5	552 534	0.2
69	Manufactures of metal n.e.s.	3 813 395	2.5	3 974 497	1.9	4 452 985	2.2
71	Machinery other than electric	18 511 590	12.3	31 448 706	15.8	23 980 250	11.8
72	Electrical machinery, apparatus and appliances	13 586 421	8.8	21 469 872	10.8	23 275 677	11.5
73	Transport equipment	32 425 357	21.4	24 972 040	12.6	23 127 725	11.5
	Total net imports	77 707 602	51.2	96 619 575	48.5	85 906 477	41.6
	Grand total net imports	151 632 806	100.0	198 821 977	100.0	201 998 632	100.0

Source: Planning Board, Foreign Trade Statistics 1966, 1967 and 1968.

1/ Net imports = Imports - Exports.

Table 20. Kuwait: Value added, number of establishments and number of persons employed by size of establishment in the engineering and metalworking industries, 1966

ISIC	Description	Establishments employing less than 10 persons			Establishments employing 10 - 49 persons			Establishments employing 50 or more employees			Total		
		Value added (K.D)	No. of establishments	No. of persons employed	Value added (K.D)	No. of establishments	No. of persons employed	Value added (K.D)	No. of establishments	No. of persons employed	Value added (K.D)	No. of establishments	No. of persons employ
35	Manufacture of metal products	325 500	85	262	128 689	8	150	563 222	8	681	1 085 411	99	1 093
36	Manufacture and repair of machinery except electrical	132 358	54	177	76 547	2	45	405 827	2	250	622 732	58	472
37	Manufacture and repair of electrical machinery	274 739	111	263	29 904	3	65	-	-	-	304 643	114	328
38	Manufacture and repair of transport equipment	2 011 356	705	2 452	776 013	52	527	612 971	7	851	3 400 340	764	3 851
	Total	2 740 953	955	2 764	1 011 153	65	1 195	1 580 020	17	1 788	5 333 126	1 035	5 742
	Total all industries	7 625 040	2 727	8 254	17484 018	223	4 588	475 301 080	63	15 574	500464 088	3 005	26 416

Source: Planning Board, Industrial Census, 1966.

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The Mission also learnt that a steel mill for reinforcement bars for house construction (estimated demand 150,000 tons/year) is under consideration. the Mission was able to visit one foundry which has a capacity of 100 tons/month. A new foundry under the same management with a capacity of 4000 tons/year on single shift or 15,000 tons/year on 3 shift basis is under construction. The mission visited this foundry which is located on a total land area of 22000 sq. metres with a covered area of 3800 sq. metres. The manufacturing programme is planned on a three phases basis: phase 1 - manufactum of grey cast iron and cast iron products such as man-hole covers, sewage requirements, ventilation pipes etc; phase II - malleable castings; and, phase III - bronze plated fittings, water installation valves, etc. The first phase which involves an investment of 400-450 thousand K.D. is expected to be in operation within 12 months. The foundry is to be fully mechanised and includes a complete laboratory for sand testing costing 3000 K.D. The machinery and equipment have been already ordered and many items have been received. Some of the major machinery and equipment are: (a) 3 electrical induction furnaces (2 units in phase I); (b) 2 electrical cupolas; (c) 3 moulding lines (one line for hand moulding with a 5 ton overhead crane and 2 lines for centrifugal casting; (d) sand testing plant; (e) moulding machines; (f) 2 conveyer systems; (g) a complete laboratory for sand testing; and, (h) casting cleaning equipment (pendulum type shot blasting, grinding, etc.). The individual casting capacity is to be 630 x 500 mm on small centrifugal casting line and 1000 x 900 mm on larger centrifugal castingline. It was reported by the management of this new foundry that the present capacity of 4000 tons/year on one shift basis is based on a survey conducted in 1967 for the domestic market and export possibilities to Iraq, Saudi Arabia and Gulf emirates. However, it is felt by the management that due to changed conditions, there may be problems in marketing and it may become necessary to explore possibilities of producing new products. It was felt that quality centrifugal pumps, and small engines may be considered if there is a potential for export to neighbouring countries.

The discussions which the mission held with the management of this foundry pointed clearly to the obvious direction in which the development of the engineering industries in Kuwait must proceed. This direction would seem to necessarily be that of export oriented industries.

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IV. CONCLUSIONS AND RECOMMENDATIONS

Because Kuwait has no shortage of capital, it is feasible for it to undertake the production of some of those engineering products, and agricultural machines and implements for which there is sufficient demand within the region or in other nearby markets. Kuwait is in a specially advantageous position with regard to those production units which require relatively high initial capital investment and for which the automated production technology is sufficiently advanced so as to require as little skilled manpower as possible.

United Nations assistance in the conducting of specific pre-feasibility studies designed to identify products which are potentially suitable for production in Kuwait and for which sufficient demand exists in nearby markets could provide Kuwait industrialists with investment opportunities for further and more detailed studies. The best approach may be to start with a market study for a selected number of engineering products and follow this with a short pre-feasibility of manufacturing study showing minimum optimum economic capacities of production, raw materials and other input requirements, level of technology etc.

Perhaps the major area where United Nations assistance can result in the greatest benefit to Kuwait is that by which the United Nations provides an opportunity for the exchange of views, on the basis of a number of studies on specific relevant subjects between representatives of governments, industrialists and users in the region. Such an opportunity could be provided by the holding of a United Nations sponsored regional meeting to which all interested parties would be invited to attend and discuss short studies previously prepared by the United Nations, perhaps with the collaboration of IDCAS, on topics such as existing capacities in the engineering industries sector in Middle East countries, planned new capacities pending implementation, present and expected demand for engineering products, metal products and agricultural machinery and implements; prospects for the national development of the engineering industries in the region and implications of other neighbouring markets; and specific pre-feasibility studies for selected key engineering production facilities, basic to the future development of the sector. The proposed meeting could also be sponsored jointly with IDCAS. Its basic aim would be that it would hopefully

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lead to some agreement on multi-national co-operation and co-ordination in the development of the engineering industries, and thus enable countries of the region to embark upon investment decisions with some degree of assurance regarding markets.

United Nations assistance in the fields of repair and maintenance and training could also benefit Kuwait considerably by improving the level of skills of Kuwaitis, and thereby possibly reducing the relatively high cost of skills in Kuwait. Better general awareness of the ways and advantages of adequate repair and maintenance could also save Kuwait considerable amounts presently being spent on spare parts and wasted on equipment whose useful life is unduly shortened. Kuwait does not need the funds to implement national and comprehensive training or repair and maintenance programmes, but the expertise to design, formulate, and spell out in some detail such programmes.

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LEBANON

I. THE AGRICULTURAL SECTOR AND ITS PLACE IN THE ECONOMY

Although around 49% of the people of Lebanon depend on agriculture for part or all of their income, the contribution of agriculture to gross domestic produot has been small: 11.9% in 1964 and 11.2% in 1967. The industrial sector's share of GDP in 1967 was about 13% but commerce and other services represented 43% of GDP. However, exports of agricultural products are slightly more than one third of total exports.

The agricultural sector has been growing slowly in Lebanon in spite of the unique climatic conditions which the country is endowed with and which make it possible to grow a large variety of crops. Along coastal areas where the olimate is warm and moist, all types of vegetables and citrus fruits are grown. In the Bekaa valley field crops, cereals, industrial crops and some fruits are grown. The mountainous areas below 1,000 metres in height seem to be the problem areas of Lebanese agriculture because of their low produotivity.

Lebanon's climate has also resulted in a number of specific characteristics in the country's agricultural sector. Climatic conditions have resulted in considerable annual variations in agricultural incomes. The dry period which extends for about six months from the month of May has caused farmers to resort to tree crops which are able to withstand longer dry spells and can also protect the soil from excessive erosion. These climatic conditions have caused agriculture to expand extensively rather than intensively which in turn reduced agricultural incomes. Some have expressed the opinion that the solution to agricultural production problems in Lebanon cannot lie in extensive agrioulture since marginal lands already represent almost half the presently cultivated areas. The solution lies rather in intensifying agriculture in order to reduoe oosts of production by better irrigation and drainage methods, better agricultural roads and improved land levelling to facilitate the suooessful introduction and use of farm machinery.

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The total geographical area of Lebanon is 10,230 sq.km. and the total cultivated area in the country, in 1967, was around 390,000 ha (64,000 ha irrigated) of which around 216,000 ha were actually under crops. About 40% of the country's total area is cultivable and about 20% of this area is irrigable, but almost 75 per cent of the country is mountaineous.

Water appears to be a scarce agricultural resource in Lebanon, but its scarcity is further complicated by inadequate planning for the utilization of the scarce water resources available. Expert opinions have expressed the view that irrigation projects are the cornerstone of agricultural development in Lebanon and that in this respect Lebanon lags behind other neighbouring countries.

The areas under major crops and percentage of total area in 1968, are as follows: cereals 85,700 ha (37.3 per cent); legumes 14,000 ha (6.1 per cent) industrial crops 16,700 ha (7.3 per cent); vegetables 32,000 ha (14.0 per cent); and fruits 81,000 ha (35.3 per cent). For Lebanon as a whole, fruits and vegetables are the most important agricultural products. In 1968, fruits represented about 60% of the total value of agricultural production, vegetables about 19%, industrial crops about 14% and cereals and legumes about 7%. The poultry industry has developed well in the last few years.

The total number of agricultural holdings and the average size of holdings in the four provinces of Lebanon are as follows: North Lebanon 37,218 (1.6ha) Mount Lebanon 34,986 (1.3 ha); South Lebanon 31,449 (2.6 ha); and Bekaa 23,470 (5.0 ha). The total number of holdings is about 127,470 and the average size of holdings for the whole country is 2.6 ha. It is interesting to note that holdings of 5 ha and above represent only around 11 per cent of the number of holdings, and cover around 50 per cent of the total area

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cultivated. However, large holdings represent only about 4% of the total and are divided as follows:

10 - 20 ha	2%
20 - 50 ha	1%
50 - 100 ha	0.5%
Over 100 ha	0.5%

The small size of holdings is considered another handicap to agricultural development in Lebanon and experts have recommended the promotion of co-operatives to improve production and incomes.

Lebanon is very much concerned about the development and growth of its agriculture in order to reduce the country's reliance on commerce and services for 43% of its gross domestic product (1967) and in order to improve conditions in rural areas and reduce migration towards urban centres especially Beirut. Lebanon, however, has had no comprehensive development programme or plan and the economy is private-sector oriented. A number of major agricultural development projects were formulated and implemented. Perhaps, the two most important of such projects are the Green Plan and Litani River Project.

The Green Plan Organization is an autonomous statebody, established in 1964 with a ten-year budget consisting of about $13 million for farmers' loans and about $9 million for non-returnable grants to farmers for plants, seeds, roads, etc.. The Green Plan was established for the purpose of implementing a land development programme with special emphasis on mountain terracing. It contributes to the financing of earth moving operations, road construction, terracing, the provision of seedlings at reduced rates, etc..., on the basis of farmers' applications and its own assessment of these. Most of the agricultural machinery operations of the Green Plan are performed by private contractors, although the Green Plan itself does render some extension services and has had a programme of lending agricultural tractors to farmers

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and training them to operate these tractors. The Green Plan succeeded in increasing the cultivated area in Lebanon by 6,000 hectares. However, the Plan faces a number of difficulties caused by farmers' resistance to new methods, shortcomings in its operations, and financial limitations.

The Litani River project has succeeded so far only in completing the Qaraoun dam in the Bekaa and 3 hydro-electric power plants. Although the project was also intended to develop irrigation, various difficulties have been delaying implementation of this part of the project.

II. FARM MECHANIZATION

Different totals have been given by various sources as to the overall number of tractors presently operating in the country. The FAO Indicative World Plan shows a total of 2,560 tractors in operation in 1964. A study prepared by a UNIDO expert in 1970 gave the total of 4-wheel tractors imported into Lebanon from January 1955 to 14 June 1969 as 2,420, 2-wheel tractors 611, and crawler tractors, 455. Another study on farm mechanization in Lebanon prepared in 1970 by a Lebanese agricultural economist on farm mechanization gave the total number of tractors in operation in 1970 as 4,000 4-wheel tractors, 400 2-wheel tractors and 120 harvester-threshers. The official "Recueil de Statistiques Libanais" gives the following figures for tractors "imported since 1963 and before, and still operating in 1967".

2,649	4-wheel tractors
439	2-wheel tractors
425	crawler tractors

If the figures for 1968 and 1969 are added to the above totals disregarding the fact that some of these tractors were probably discarded during 1968 and 1969, we obtain the following totals:

3,035	4-wheel tractors
503	2-wheel tractors
446	crawler tractors

Table 23 shows import figures for tractors for the years 1962-1968. The distribution of agricultural machinery and irrigation reservoirs amongst the four provinces of Lebanon in 1967 was as follows:-

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Tabel 21. Lebanon: Number of agricultural machinery in Lebanon, 1967

Type of machine	North Lebanon	Mount Lebanon	South Lebanon	Bekaa	Total for the whole country
Crawler tractors	14	42	9	41	106
Tractors	574	98	618	780	2,070
Trailers	570	150	591	926	2,237
Reapers/harvesters	12	-	16	72	100
Threshers	62	-	116	70	248
Combined harvesters	22	-	1	18	41
Sprinklers	5,860	4,603	5,720	1,781	17,964
Motor-sprinklers	963	782	570	139	2,454
Irrigation pumps	262	1,424	908	3,710	6,304
Irrigation reservoirs	830	6,151	2,013	426	9,420

Source: Recueil de statistiques libanaises, 1967

For farm mechanization purposes cultivated lands in Lebanon may be divided into four areas:

(1) Coastal areas where citrus fruits, vegetables and bananas are grown, covering a total area of about 16,000 hectares;

(2) Flat lands in the Bekaa and Akkar valleys where industrial crops and others are grown or where apple and grape orchards exist, covering an area of about 130,000 hectares;

(3) Mountainous regions with moderate gradients in three major areas: namely in Bekaa (grapes), near Tripoli (olives), and in South Lebanon (olives, tobacco, etc..), covering a total area of about 35,000 hectares;

(4) Mountaneous regions with steep gradients and at heights reaching 2,000 metres above sea level, covering a total area of about 70,000 hectares.

Mechanization spread quickly in the plains and especially in Bekaa and Akkar valleys, but only a few agricultural operations are being performed with the use of tractors and the latter are not being widely used for operations such as fertiliser distribution, seed planting, potato harvesting etc.

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At present only standard tractors are mainly used. However, most of the tractors used are provided by contractors as very few farmers own tractors. Most of the 120 harvester-threshers in Lebanon are used in the Bekaa valley.

Primary tillage and, to an extent, sowing operations are mechanised for cereals in the valley area. Among the implements, the Arabic chisel plough, and mould board plough are most popular. Rotary hoes are used on a limited scale.

Little farm mechanization has been introduced to the mountainous areas of Lebanon, and this is caused mainly by the non-availability of farm machinery especially tractors, suited to this type of terrain.

In irrigated areas, farmers plough twice a year (in March/April and in October/November). Subsequently 4-6 sprayings are performed during the spring and summer seasons. Tractors are also extensively used for transportation in those areas.

Because of the small size of holdings in Lebanon very few farmers own the tractors working on their farms. Therefore the practice of private contractors who rent out tractors to farmers is widespread and has helped considerably in accelerating mechanization. Although the acquisition of agricultural machinery through co-operatives would appear to be ideally suited to conditions in Lebanon, very little progress has been made in this direction so far, because of inherent cultural and traditional considerations. A few tractor owners are renting their tractors on a custom farming basis. Rent charges for ploughing in plains is about LL 10 per ha. and in orchards and land grounds may vary from LL 100 - 150 ha. These rates are relatively low but are rarely based on proper estimates of costs.

The mission understood that credits extended by the agricultural banking institution, BCAIF, have not been very significant. The sale of tractors by most dealers is on credit: one-third cash payment on purchase and the rest on a 1-2 years payback at 8 per cent interest.

Figures for costs of production of Lebanese fruits have indicated that labour constitutes between 40 to 70% of the total costs of production of different fruits produced in the Lebanon. Therefore, considerable benefits

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can accrue to Lebanese farmers if the introduction of machinery and implements can save some of these annual labour costs. Some comparative figures of labour and machinery costs of undertaking a number of equivalent operations have been prepared for a 25 donum apple orchard. These figures suggest that the same operations can be performed by machines for a little more than half what it would cost by manual labour.

Although sophisticated tractors are being imported into Lebanon, the implements and tools imported for use with these tractors are somewhat primitive and not sufficiently rugged to operate effectively on the country's tough land with its stone problem.

The basic requirement of a power unit for agriculture in Lebanon is reported to be a 40-60 HP standard tractor for the plains and about 25-35 HP 4-wheel drive orchard tractor with narrow base, low turning radius, and rugged design for the terraces. Under certain circumstances, it has been the custom in Lebanon to use very deep ploughs requiring the use of crawler tractors. The implements and equipment required in arid zones are plough levellers, stone pickers, rotary tillers, sprayers, sprinkler irrigation units and threshers. There is also a need for suitable equipment for potato and sugar-beet cultivation.

Although around 600 walking 2-wheel tractors were introduced a few years ago, it was observed that in future the trend will be for riding tractors.

Recently, 4-wheel drive riding tractors of 14 HP, 23 HP and 34 HP have been introduced and it was reported that mobile sprayers and knapsack sprayers are also in use. The Ministry of Agriculture owns and operates 250-300 knapsack sprayers and 50-75 engine driven sprayers. Altough centrifugal pumps are being used at present, the future appears to be for submersible pumps. Animal drawn and hand operated machinery have limited scope in the country.

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During discussions held with various officials the following estimates were given of annual demand for agricultural machinery and implements. The estimated sales figures for 1969 are shown against those demand estimates:

Table 22. Lebanon: Estimated annual demand and sales of agricultural machinery and implements, 1966

1969 Sales	Estimated Annul Domand	Type
300	400	Standard 40-60 HP tractors
20	300	20-30 HP 4-wheel drive tractor
n.a.	200	Mold board ploughs
n.a.	400	Arab ploughs
n.a.	20-30	Rotary tillers
n.a.	300	Hand sprayers
n.a.	250	Knapsack sprayers
n.a.	50	Large engine mounted sprayers
n.a.	350-500	Stone pickers and crushers
-	100	Potato harvesters

Some officials estimated the total number of tractors required for "field mech nization" in Lebanon to be around 6,000 units. One expert suggested (1969) that the forecast of tractor imports in 1975 is about 370 units, 280 replacements and 90 new units. For 1985, the forecast is 600 units, with 380 units for replacements.

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Table 23 Lebanon: Number of tractors imported, 1962-1968

	1962	1963	1964	1965	1966	1967	1968	Total
Tractors, track	33	51	34	69	99	25	10	321
Tractors, 4-wheels	275	356	234	316	237	228	260	1,906
Tractors, 2-wheels	43	41	57	85	61	129	29	445

Source: 1969 Report prepared by an expert.

In summary, it can be said that with respect to primary tillage, only cereals and industrial crops are mechanized to a fair extent in Lebanon. Although disc ploughs are used normally, Arab chisel ploughs and field cultivators are better implements from the optimum tillage point of view. Usage of seed drills, fertilizer distributors and crop protection equipment is limited. As the scope for extensive usage of self-propelled combined harvesters may be limited, usage of PTO operated threshers, and haybailers may have to be explored. Although at present, the primary tillage operations of cash crops such as beetroot and potato are mechanized, there is a need to develop seeding and harvesting equipment. With the extensive introduction of corn, there will be a need for corn planters. Vegetable crops, such as tomato, and also olives have not been mechanized at all. With the increasing cost of farm labour, efforts will have to be undertaken in this direction. It is reported that one of the major difficulties faced in the effective land preparation is the presence of stones in the fields. The Ministry of Agriculture together with FAO experts had undertaken a programme to develop an effective mechanical stone picker. There is a need to continue the work in this field in order to develop an effective mechanical stone picker.

Ministry of Agriculture officials and others concerned with agriculture often expressed the viewpoint that mechanization of Lebanese farms faces 3 major problems. First, climatic conditions result in the presence of stones in the

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fields and, therefore, hamper effective land preparation. Secondly, the terraced nature of fields makes the standard tractor unsuitable. In this connexion, it may be mentioned that 70,000 ha. of terraced fields are reported to have been abandoned by farmers because of the unsuitability of the types of tractors being imported into the country. At the same time, it is reported that the Green Plan is in the process of preparing 9,000 ha. of new terraces over the next five years at a reported cost of LL 63 million. The fruit orchards in the country also require a special type of tractor. Thirdly, the farmers themselves are unable to purchase tractors because of shortage of funds and are neither able to select adequate machinery for their purposes, nor to operate their machinery and maintain it effectively when the funds become available.

With regard to farm mechanization the following priorities would appear to be in order:

One of the first priorities should be the development of a simple but efficient stone picker which could overcome the hazards caused by the intensive presence of stones and make it possible to use more sophisticated farm machinery. Other priorities are as follows:

- The use of secondary tillage equipment which is seldom used at present, as well as the use of beet and potato planters, pickers and elevators. The latter operations are presently being carried out by hand.
- The utilization of crop seeding and planting equipment. Some work has already been done on this by the American University in Beirut and they have produced a prototype mounting on an existing plough frame.
- The use of improved handling equipment mainly for the fruit and onion crops.
- The more intensive use of locally made sprayers.
- The use of improved cultivating equipment and weed control.
- The utilization of harvesting equipment, the more intensive use of fertiliser distribution equipment, cutting machines, raking and gathering and small threshing machines.

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In addition to the inability of the majority of Lebanese farmers to afford the purchase of machinery, the progress of farm mechanisation is further hindered by the farmers' inability to select the most suitable implement for his purposes and the lack of training in the proper use of the implement finally selected. There is, therefore, a pressing need for practical training courses, aimed at farmers, in the selection, operation and maintenance of agricultural machinery and implements.

It was also reported to the UNIDO/UNESOB mission that an organised repair, maintenance and operation training programme on a national scale is lacking in the country. The major dealers of agricultural machinery in Lebanon have a limited programme and the dealers met by the mission emphasized the need for an integrated repair and maintenance and operation training programme in the country to train Lebanese mechanics, farmers and operators in service repairs, major overhauls, use of special tools, operation techniques and simple repairs and maintenance. One possible approach which could be recommended is to have a repair and maintenance training programme of two cycles, i.e.

(a) technical service (major repairs and overhaul) - two courses per year of three months each for mechanics of existing distributors, free-lance mechanics, Government mechanics and mechanic trainees

(b) operation and maintenance (simple repair, operation, maintenance (simple repair, operation, maintenance and service) - 4 courses of two weeks each for farmers, operators (free lance and Government) and operator trainees.

It was felt by the mission that an integrated national repair, maintenance and training programme will benefit the agricultural machinery and heavy equipment operations of the Green Plan.

With the successful completion of the present activities of the Green Plan and the further continuation of its programme for agricultural development, the farming sector is expected to acquire a large population of agricultural machinery and implements in the near future. This further emphasises the necessity of introducing an integrated national programme in repair, maintenance and operation.

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The Ministry of Agriculture operates a central workshop at FANAR (3 kms. from Beirut) for repairing and maintaining farm machinery and implements and transport vehicles owned and operated by the Ministry in the whole of Lebanon. The equipment owned and operated by the Ministry at present is reported to be approximately as follows: 15 crawler tractors; 5 wheel tractors; 250-300 knapsack sprayers; 50-75 engine driven sprayers and 150 transport vehicles. The Ministry has also started two practical agriculture schools at Fanar and Abdeh for the purpose of training about 30 students per year in each school. A third school at Nasriat Rizik (in Bekaa) which will have a one year training course in agriculture for 30 students is expected to be in operation by late 1970. A fourth school in South Lebanon is expected to be started next year. Although no final decision has been taken so far, it was reported that the school at Nasriat Rizik, which is located on a 7.0 ha. land area, may be devoted to training in repair, maintenance and operation of agricultural machinery and implements. The buildings for this school, costing LL 450,000 are almost completed. It is also the intention of the Ministry to establish a branch at Abdeh (North Lebanon) at a later date for repair and maintenance of agricultural machinery. It is the mission's understanding that the Ministry of Agriculture is interested in establishing integrated facilities at Nasriat Rizik for a national centre for training in repair, maintenance and operation of agricultural machinery and implements to meet overall requirements in this sector. The mission was also given to understand that the Ministry of Agriculture is interested in receiving assistance in drawing up detailed plans and programmes for such facilities. Therefore, the mission recommends that UNIDO considers providing an expert to assist the Ministry of Agrioulture in formulating this programme. It should be mentioned here that the expert may find it useful to recommend the establishment of central repair, maintenance and operation training facilities.

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III. ENGINEERING AND METAL WORKING INDUSTRIES AND THE MANUFACTURE OF AGRICULTURAL MACHINERY AND IMPLEMENTS

A. Imports of engineering products including agricultural machinery and implements

Table24 shows the imports of metals, metalworking and engineering industries products for the years 1967, 1968 and 1969. In terms of weight these imports represented between 8 and 10% of total imports, and in terms of value they represented between 20 and 24% of value of total imports for each of the three years.

Table25 shows imports, for the years 1967, 1968 and 1969 of selected agricultural machinery and implements. The total value of these selected imports represented less than 3% of the value of imports of metals, metalworking and engineering industries products shown in Table24. However, the items shown in Table25 represent only part of the total agricultural machinery and implements imported into the country. The breakdown of the country's published trade statistics did not make it possible to obtain all inclusive totals.

B. Manufacturing industry and the share of the engineering and metalworking industry

The industrial sector grew substantially during the period 1964-1967. Industrial incomes increased from LL 410.6 million in 1964 to LL 492.6 million in 1967. The percentage contribution of industry to national income in 1967 was 12.9% which represents only a small increase over the 1964 percentage of 12.3%. Exports of manufactured goods amounted to LL 145 million in 1966, nearly twice the amount for 1964, and represented about 39% of total exports.

Table26 shows the total number of establishments, number of persons employed and value added for industrial enterprises in the five metalworking and engineering industries groups in 1964. These groups, in relation to the entire industry sector represented about 7% in terms of number of establishments, about 9% in terms of value added, and 10% in terms of number of persons employed.

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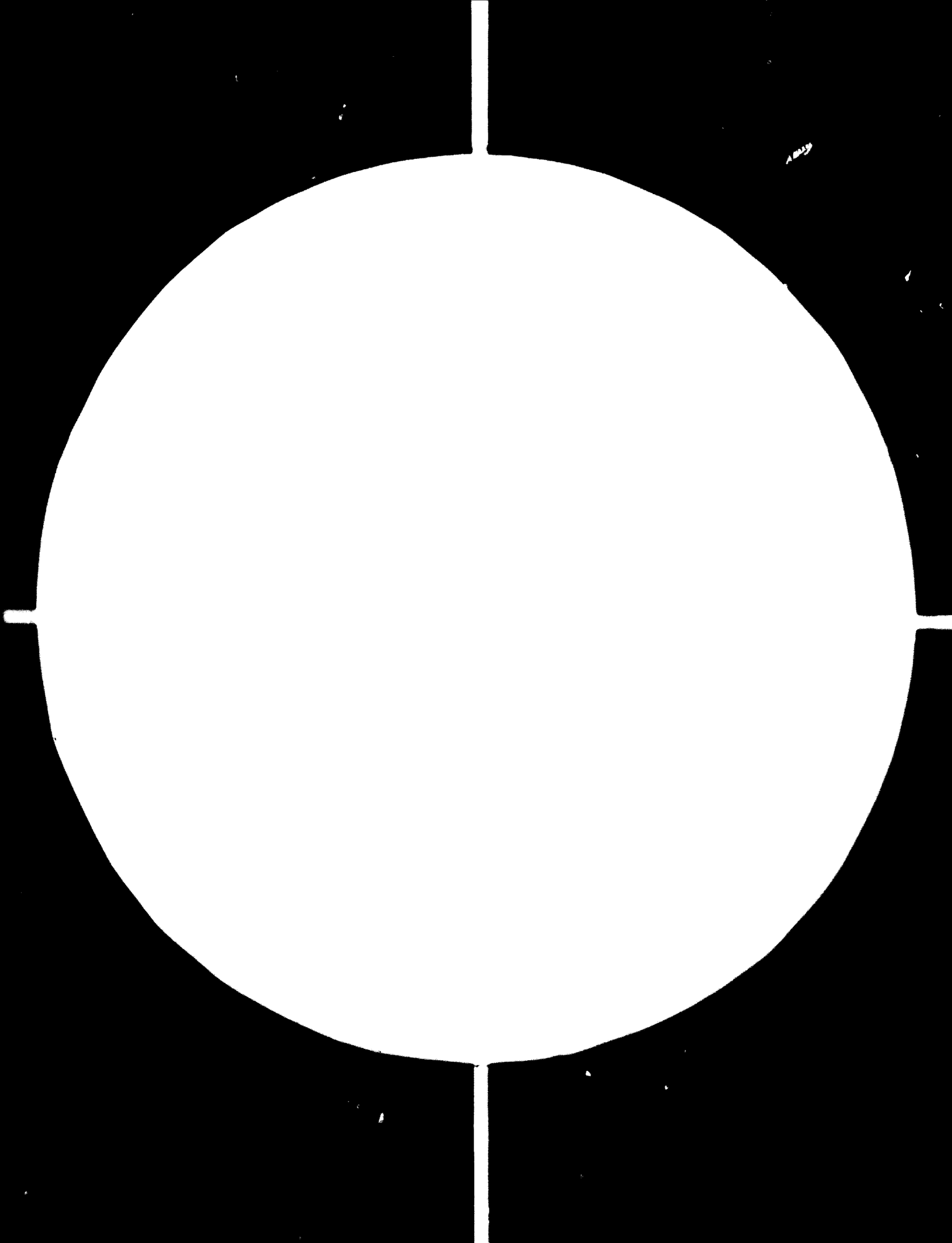

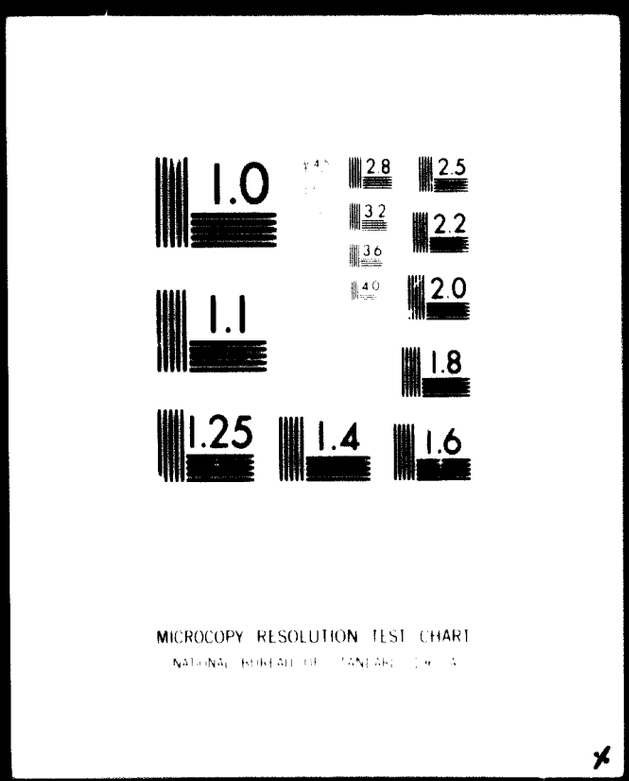

town of Zahle in the Bekaa valley. Most of the existing production facilities developed out of repair shop activities started nearly 15-20 years ago and are therefore more in the nature of developed workshops than manufacturing units. The units at Zahle employ a total of around 100-150 labourers and produce almost 80 per cent of the total production of Lebanon. There are around 10 producers of local ploughs (estimated total production 200 units per year) and 3 producers of deep well pumps; only one company had facilities for quality control and balancing. Although the local Arab plough is manufactured fully by many units, it is the opinion of experts that some redesign is necessary and there is room for improvement of quality. The welding and finish are normally poor. Some 200 ploughs are produced annually with sizes varying from a very large unit ploughing one metre deep to the smallest 20 cm. or less, most of the mould board bottoms are imported, although other components are locally fabricated. Irrigation equipment is imported but one firm specializes in the installation of irrigation equipment and plans to commence manufacturing simple parts. However, the manufacture and use of deep well pumps is well developed. Regarding pumps, all parts except bronze bearings and in some cases bowls are made locally. It was observed that pumps manufactured locally are of all sizes and of good quality. Feed mixers, which are used by the larger poultry farmers, are also made locally. These vary in size from half ton to 3 ton units. Although no attempt has been made to jig and tool the product, the finished product is serviceable and of reasonable quality. Battery cages for egg production are locally made but the methods used cannot be called sophisticated. A variety of trailers, of reasonable quality are made in several workshops and are adapted to the various tractor makes operating in the country. One of the main agricultural machinery manufacturers in Zahle attempted to develop a machine for topping and tailing onions, but the prototype was activated mechanically and suffered from vibration and noise - topping and tailing of onions is a labour intensive operation and it has been claimed that a saving of 80 per cent of the labour cost involved could be saved by such a machine.

With a forecast of annual input of 600 tractor units by 1985, even the assembly of tractors solely for the Lebanese market could not be seriously considered. However, it has been suggested that there may be a case for the establishment of a small scale hand tools factory to produce the somewhat special hand tools which are used by the local farming community and the building industry (e.g. picks, shovels, hoes, pick-axes, rakes, etc.)

In addition to the above production activities, there are a number of small workshops and blacksmiths doing repair work and in some cases making special tools to order but this is too small an activity to consider manufacturing, although it has a growth potential.

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The production of farm machinery in Lebanon is hampered by the following factors:

(1) There is virtually no protection from foreign agricultural machinery and implements which are imported duty free;

(2) The small size of the Lebanese market (although some manufacturers have successfully exported their products - e.g. pumps and ploughs to some neighbouring countries); and,

(3) The shortage of government supported credit to farmers for the purchase of machinery and equipment.

The Agricultural Engineering Section of the Faculty of Agricultural Sciences, American University in Beirut is contributing to a very significant extent in the agricultural machinery activities of the country. Apart from its academic activities, it is involved in assisting the Lebanese agricultural machinery industry to develop new products. It is reported that recently the University assisted a manufacturer at Zahle in developing a standard arab plough suited to arid zone farming. The University is interested in assisting farmers and industry by developing an integrated programme in

(a) development adaptation and testing;

(b) assistance in manufacture; and,

(c) a programme towards training in repair and maintenance of agricultural machinery and implements.

The mission was given to understand by the activities of the University that they would like to participate and contribute in such national activities which may be started by the Government. However, the authorities expressed a desire for assistance to reinforce their existing facilities to enable them to participate effectively.

The Department of Machinery and Irrigation of the Institut de Recherches Agronomiques at Tel Amara, is also involved in research and development of agricultural machinery and implements. The institute is an autonomous body directly responsible to the Minister of Agriculture. The activities of the department in the field of irrigation are research and development to improve

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irrigation techniques, water management and to conduct tests in agroclimatology. In the field of agricultural machinery, the activities consist of a development programme or the mechanization of agriculture and the development and testing of agricultural machinery. The department has three professional staff, 12 mechanics and about 25 unskilled workers. At present, the department is concentrating on the mechanization of sugarbeet. The department's work programme covers a four-year period and is planned by a joint committee consisting of the Ministry of Agriculture, Sugarbeet Office, Sugarbeet Growers Association and the Institute. It is reported that future priorities are mechanization of potato, corn, fruits and machinery for stone picking.

The Institute, in cooperation with a local dealer, is conducting field tests on an imported sugarbeet drill and hopes to evolve a successful seed drill suited to local conditions. The department also has a small workshop. It is the opinion of the mission that the Institute and particularly its department of irrigation and machinery is potentially capable of assuming a vital role in the development of agricultural machinery, rendering assistance to industry to manufacture new product ranges and evolving an overall mechanization programme in Lebanon.

The main problems faced by Lebanese manufacturers of agricultural machinery and implements are lack of product ranges, non-availability of designs, prototypes and technical assistance for manufacture and above all the lack of a national policy for the development of small and medium manufacturing units. It is also felt by the manufacturers that there is a need for the development of implements for potatoes and sugarbeet. The manufacturers feel that such a programme should mainly consist of selection of models already tried and found successful and adaptation of the same from the engineering point of view for local manufacture. It is also felt that there is a need to develop and manufacture sprinkler irrigation units, land levellers, stone pickers etc.

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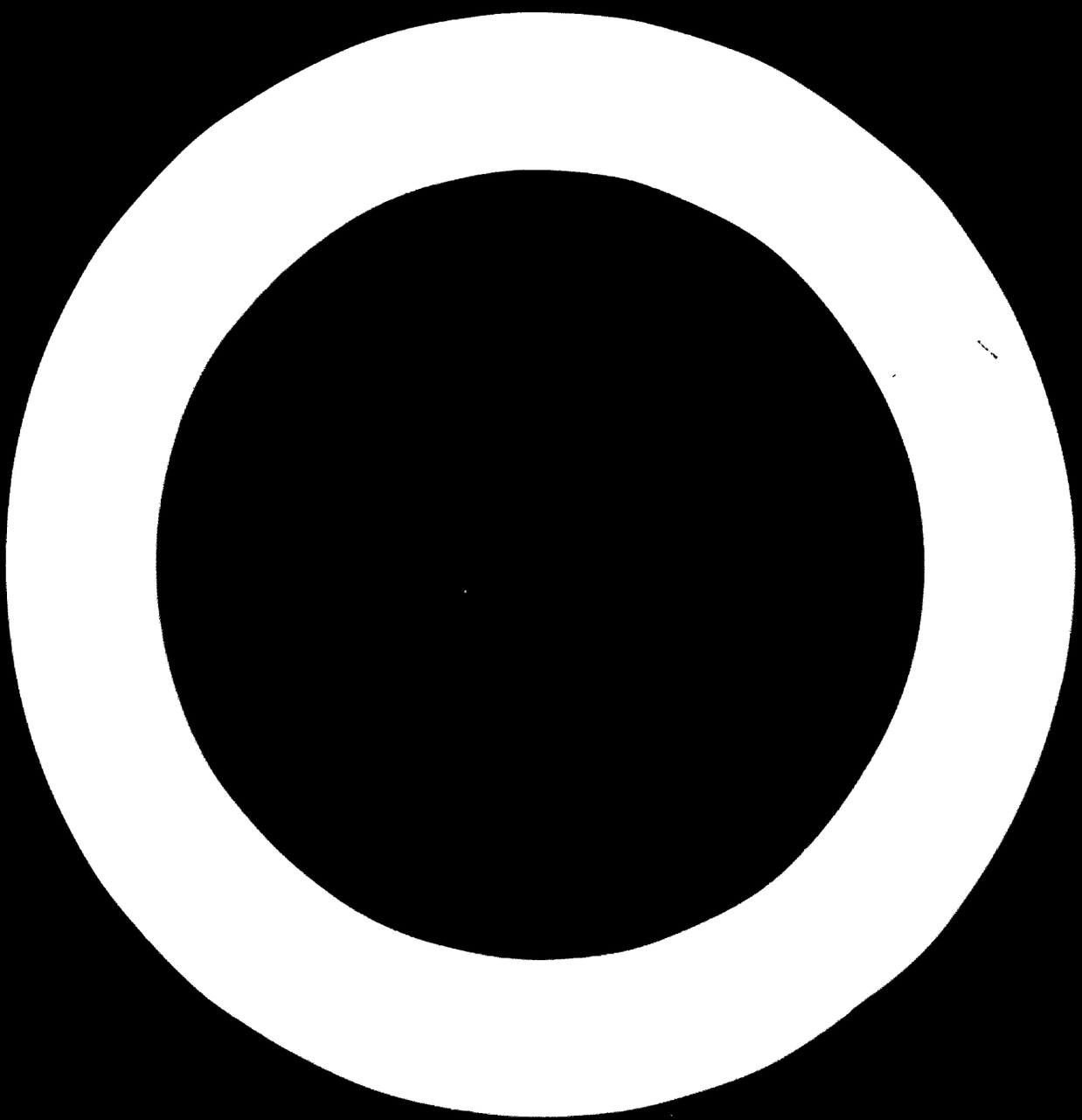
Taking into account the need for development, adaptation and testing of agricultural machinery and implements in Lebanon and the plans of the present agricultural engineering/educational and research institutions to develop this aspect through further strengthening of the existing facilities, an integrated programme may have to be developed taking into account research, design, development adaptation, testing and training in cooperation with agricultural engineering educational institutions, farm machinery research organizations, local manufacturers and major users of agricultural machinery. In order to assist the Ministry of Agriculture to formulate such a programme, the mission recommended that UNIDO provide the services of an expert for a period of 4-6 months.



SAUDI ARABIA

I. THE AGRICULTURAL SECTOR AND ITS PLACE IN THE ECONOMY

Geographically, Saudi Arabia has a narrow coastal plain along the Red Sea separated by a North-to-South mountain range from a great plateau which slopes gradually towards the Gulf. The climate of the plateau is hot and dry with a brief winter season. The whole country is extremely arid with winds strong enough to move sand dunes and cause serious problems by burying roads and other constructions. There are no rivers or large forests in the country and agriculture, therefore, has been concentrated mainly in the many scattered oases.

The extension of cultivated areas depends on underground water resources for irrigation. These resources occur either as shallow perennial groundwater of excellent quality found along valley floors in alluvial fill; or as deep water resources found mostly in sand stone. These deep (as much as 2,000 metres) underground water resources cannot be rapidly replaced and need to be carefully utilised.

Because of the acute shortage of water resources, the area under cultivation (mostly irrigated) was estimated, in 1965, to be only about 2,450 square kilometres (245,000 hectares); or 0.13 per cent of the total area of Saudi Arabia which is about 2.25 million square kilometres. More recent estimates put the total area under cultivation at 4,000 square kilometres (400,000 hectares) or about 0.18 per cent of total area. It has been estimated that the cultivated area could be at least tripled if adequate supplies of water can be found. Between 1950 and 1963, the area under cultivation grew at an average rate of 7.5% per year.

Statistics published by the Ministry of Agriculture, and pertaining roughly to the period 1966-1968 show the following total cultivated areas by districts:

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Table 28. Saudi Arabia: Area of agricultural holdings by districts 1966/67

District	Cultivated area		Uncultivated area	Total
	(thousand hectares)			
	(percentage)			
Northern province	25.2	6.4	8.8	34.0
Eastern province	10.5	2.6	22.2	32.7
Western province	10.2	2.6	2.5	12.7
Qasim	32.0	8.0	237.6	269.6
Inner south	38.2	9.6	7.6	45.8
Central province	51.5	13.0	16.5	68.0
Qunfudah	75.2	19.0	15.3	90.5
Jizan	153.7	38.8	57.6	211.3
	396.6	100.0	368.1	764.6

Field crops appear to be the main products in all major agricultural areas. The Ministry of Agriculture reported the present total under crops to be about 4.5 million donums (450,000 hectares). Table 29 shows the present cropping pattern as given by the Ministry.

Table 29. Saudi arabia: Cropping pattern, 1966/67.

District	Dates and fruits	Alfalfa	Hinnah and coffee	Winter crops	Summer crops	Vegetables	Total area in dnms *	Percentage
Northern P.	23,000	4,430	5	69,600	6,330	7,775	111,340	2.50
Eastern P.	-	14,840	70	-	8,775	8,890	32,560	0.75
Western P.	47,120	3,180	325	155,600	10,925	40,100	257,245	5.70
Central P.	61,240	74,900	-	256,910	72,335	152,310	617,685	13.60
Inner south	63,470	39,160	50	266,440	99,590	14,115	482,910	10.70
Qasim	26,480	78,470	-	172,890	13,400	85,000	374,250	8.30
Qunfudah	1,510	900	-	5,885	785,700	1,475	795,475	17.60
Jizan	510	730	-	28,915	1810,150	1,355	1,841,650	40.80
TOTAL	223,530	216,610	550	956,240	2807,205	309,020	4,513,115	100.00
Percentage	4.95	4.80		21.19	62.20	6.85	100	

* 10 donums = 1 hectare

Table 29 shows that summer crops (sorghum and millet) account for 62% of cropped area, winter crops (wheat and barley) for 21%.

The total population of Saudi Arabia was estimated at 5 million in 1970. Although estimates vary, around 65% of this total is said to be rural population spread over a large number of very small holdings. Therefore, improvements in agricultural productivity would have a favourable income effect for a large section of the country's population. However, the fact that the land tenure system is characterised by small holdings has further discouraged large private investments in agriculture and prevented the effective introduction of mechanization. The breakdown of number of holdings according to size is shown in table 30.

Table 30. Saudi Arabia: Size and number of agricultural holdings (late sixties)

Size of holding (donums) 10 donums = 1 hectare	Number of holdings	Percentage of total
0 - 5	43,444	49.9
5 - 10	7,326	19.8
10 - 15	7,515	8.6
15 - 20	3,479	4.0
20 - 30	4,174	4.8
30 - 40	2,198	2.5
40 - 50	1,868	2.1
50 -100	3,510	4.2
Total	77,201	

The Saudi Arabian economy has two distinct sectors, a modern sector based on oil and a subsistence sector based on agriculture. Oil constitutes about 52% of the country's gross domestic product and about 80% of the government's total annual revenue. In 1968, over 95% of the value of exports was contributed by petroleum and petroleum products. In 1967, agriculture contributed only about 10% of GNP and manufacturing industry 2.5% [15] In 1969, agriculture was reported [16] to have contributed only 6.2% and this contribution is expected to be lower in 1970.

15/ Source: Studies on Selected Development Problems in Various Countries in the Middle East, 1970 (UNESCO)

16/ Source: Development Plan, 1390 H Saudi Arabia

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The first Saudi Arabian Development Plan, published in 1971, has identified some specific policy objectives for the agricultural sector. The most important of these are:

(1) to utilise the three major irrigation projects under completion before undertaking any new projects, bearing in mind the reports and results of water and oil investigations;

(2) to assist and encourage the private sector to invest in agriculture and agro-industries and

(3) to terminate the extension of free services and materials (e.g. machinery and fertilisers) as soon as possible and to expand programmes of technical assistance, training, demonstration and promotion programmes.

The three major irrigation projects referred to in the Plan objectives include:

(a) The El-Hasa project, in the East, which is a major improved drainage-irrigation project expected to increase the cultivated area from about 8,000 hectares to about 20,000 hectares. El-Hasa area suffered from uncontrolled flowing waters from springs which resulted in water-logging and swamps. Other problems were lack of adequate drainage and salinity and improper distribution of irrigation water. Almost half the total cultivated area (20,000 hectares) is expected to be equally divided between dates and barley and on the remaining half it is hoped to produce alfalfa, pulses, rice, corn and other minor crops. Most of the area will be irrigated by gravity from the springs and the remaining area by lifting water to main reservoirs feeding about 430 kilometres of concrete canals;

(b) the other important agricultural project in Saudi Arabia is located in Wadi Jizan in the south-west. The area of cultivable land in Wadi Jizan is around 240,000 hectares and is considered among the most fertile in Saudi Arabia. The FAO and the UNDP Special Fund are assisting the Government in this project mainly with regard to water and soil investigation and development, research on crop production and animal husbandry.

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II FARM MECHANIZATION

Some twelve years ago, very little agricultural machinery was in use in Saudi Arabia. As the development of agriculture became an important government objective, efforts were started to introduce the use of machinery in Saudi agriculture. The government established a special service which has developed into what is now known as the Agricultural Engineering Department of the Ministry of Agriculture.

The first specific mechanisation scheme launched by the Ministry was the mechanisation of water lifting installations in irrigation wells. This scheme succeeded in achieving its objectives during a short period of time; and through a very attractive instalment system, was able to bring about almost a complete adoption of power-operated water-pumping installations in the country.

At a later stage a government operated farm machinery hire service was started. Although, the service made a modest start with the operation of a small number of crawler tractors for land levelling and water control operations, it grew very rapidly. The import of agricultural machinery is exempt from customs duties.

The Ministry's purchases of crawler and wheel tractors between 1962 and 1967 are shown in table 31.

Table 31. Saudi Arabia: Tractors purchased by the Ministry of Agriculture and Water, 1962 - 1967.

Tractor-make and model	1962	1963	1964	1965	1966	1967
(A) Crawler tractors:						
Caterpillar D-8				6	9	10
D-7				1	1	1
D-6				6	6	6
D-4				155	210	208
D-2				17	17	17
Allis Chalmers				3	35	35
Oliver				15	15	15
John Deere				5	5	5
Kumerton				5	5	5

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Table 4. Lebanon - Imports of metals, metalworking and engineering industries products, 1967-1969
(value in million Lebanese pounds, quantity in tons)

BTN No.	Description	1967		1968		1969	
		Quantity	Value	Quantity	Value	Quantity	Value
73	Iron and steel and articles thereof	243,802	90.00	271,597	97.00	300,325	111.00
74	Copper and articles thereof	1,307	5.65	1,153	5.00	1,272	5.65
75	Nickel and articles thereof	5	0.05	10	0.10	8	0.10
76	Aluminium and articles	4,516	9.50	5,779	12.00	8,534	16.50
77	Magnesium and Beryllium and articles thereof	-	-	-	-	-	-
78	Lead and articles thereof	1,329	1.00	1,439	1.00	1,227	1.00
79	Zinc and articles thereof	509	0.50	871	0.83	881	0.85
80	Tin and articles thereof	40	0.50	40	0.35	27	0.30
81	Other base metals employed in metallurgy and articles thereof	48	0.20	48	0.18	84	0.22
82	Tools, implements, cutlery spoons and forks of base metal; parts thereof	1,122	8.00	1,394	9.00	1,519	10.00
83	Miscellaneous articles of base metal	2,450	12.00	2,502	12.50	2,894	13.35
84	Boilers, machinery and mechanical appliances; parts thereof	23,399	124.00	18,334	119.00	24,258	140.00
85	Electrical machinery and equipment; parts thereof	13,604	76.00	12,082	66.00	13,153	79.00

Table 31. Continued

Tractor-make and model	1962	1963	1964	1965	1966	1967
(A) International				-	48	75
Fiat				-	2	2
Hanomag				-	2	2
Graders				1	1	5
Yearly Total	76	141	207	214	357	391
(B) Wheel type:						
Massey Ferguson 65				99	182	182
Massey Ferguson 35				70	71	71
Fordson Major				11	21	35
David Brown				5	5	5
Economy				-	20	20
International				-	20	20
Yearly Total	86	141	185	185	325	333

The Ministry estimates that, up to 1967, its purchases represented about 90% of all imports. Based on this estimate total imports of wheel tractors were estimated in table 32 for the years 1962-1967.

Table 32. Saudi Arabia: Estimated imports of crawler and wheel tractors, 1962 - 1967.

Year	Number of crawler tractors	Number of wheel tractors
1962	84	96
1963	157	157
1964	230	206
1965	238	206
1966	397	361
1967	434	373
Total	1,540	1,399

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The FAO Indicative World Plan (IWP) gave the number of tractors in operation in the kingdom in 1964 as 360. Based on a 1985 irrigated cropped area target of 360,000 hectares and a desirable tractor/hectare ratio of 1:100 the IWP estimated the total tractor potential of Saudi Arabia in 1985 as 3,730 tractors. However, on the basis of the Ministry of Agriculture's estimates, the total number of tractors imported during the six-year period 1962-1967 was about 1,400 wheel-tractors (see table 32 above).

The Foreign Trade Statistics publication of Saudi Arabia gave imports of tractors (BTN No. 87.01) as follows:

Table 33. Saudi Arabia: Total imports of tractors. 1964/65-1967/68.

Year	Number	Value in SR 1,000	Value per unit in US$
1964/65	374	23,500	13,860
1965/66	1,077	90,199	18,480
1966/67	687	47,730	15,180
1967/68	629	45,426	15,840
Total	2,767	206,855	

A Ministry of Agriculture report speculated that if Saudi Arabia were to achieve 100% mechanisation with the area of agricultural holdings amounting to about 765,000 hectares plus a new area of 70,000 hectares expected to go under cultivation upon the completion of agricultural development projects, the country would require 10,000 wheel tractors with an average hp of about 40.

The farm mechanisation policy of the Ministry has suffered from a number of drawbacks. Tractors and implements and other machinery seem to have been purchased without due regard or study of the farm machinery requirements of the country. There was also little research work done to match machinery to the size of holdings, climatic conditions and the level of technology in the country. The small size of agricultural holdings in the country has been considered a serious problem to the adoption of farm machinery. Fifty per cent of agricultural

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holdings are less than 5 donums (see table 30). The Ministry of Agriculture has been, however, very much aware of the need to mechanize farm operations not only because of the normal benefits of mechanization but also because there is a very considerable drift of labour away from the land to urban centres where wages are higher. This trend has caused a further increase in agricultural labour costs. Furthermore, because of some cultural considerations, very few Saudi landowners work on their land holdings themselves or allow their families to do so.

Valid and accurate total figures on the agricultural machinery and implements used in Saudi Arabia were not available during the mission's visit to Saudi Arabia. However, a reasonably reliable estimate gave a total of 1,000 tractors (roughly 50% wheel-type and 50% crawler-type) as the number being "operated" by the Ministry, in addition to implements, mainly for tillage. This is a theoretical figure since only 40 to 50% of the Ministry's equipment is operational at one time. No reliable figures could be obtained for implements. However, the Ministry of Agriculture also reported that grain threshers were introduced to the country in two different periods. Sixteen wooden-framed threshers arrived around 1960 and fifty metal-framed threshers around 1967. Both types failed to achieve their specific objectives. The failure of the wood-framed threshers was caused by climatic conditions which caused the frames to dry and crack; and the metal-framed type failed because straw in Saudi Arabia is more brittle than the straw types for which the machine was designed. Furthermore, the absence of a tailing auger prevented the threshing of ears which escaped the threshing drum unthreshed. It was also reported that about 35,000 pumps (mostly centrifugal, but includes deep well pumps) and about 54,000 engines (diesel and petrol) are operating in the kingdom.

The Ministry's fleet of equipment is directly under the Ministry' control and operates on custom basis through the 61 field units of the Directorate of Extension Services. These units provide agricultural machinery services as well as other agricultural extension services in plant protection, field crops, horticulture and animal husbandry. The Unit's staff is responsible for operating

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and maintaining the equipment. The selection and purchase of the equipment and the recruitment of technical personnel remains with the Ministry of Agriculture. This is one of the main functions of the Ministry's Agricultural Engineering Department which works in consultation with the Agricultural Extension Service Department.. Moreover, the Agricultural Engineering Department controls maintenance and repair of the equipment, and the Extension Service Department assumes responsibility for the overall programming of the activities of the farm machinery hire service as well as the control of the field activities.

The machinery hire service was primarily intended to demonstrate and thus promote the use of modern power farm equipment. Many big farmers followed the example of the Government; some of them soon began to undertake contract work on adjacent farms with their own equipment. The rental charged to farmers by the Units is reported to be about one-third of the operational cost to the Ministry and about 40% less than the rental charged by private individuals engaged in hiring out tractors and implements. It was not possible to obtain any estimates of the areas covered by the tractors of the Ministry and that covered by private farmers/contractors.

It has been reported that some of the small farmers were often unable to avail themselves of the Ministry's services because of financial inability or because their farms offered little opportunity for the use and application of farm machinery. The mechanization situation is reported to be better on larger farms. However, the utilization efficiency of equipment is still limited by field conditions. Table 34 was compiled by the Ministry of Agriculture and illustrates the degree of under-utilisation of the fleet of tractors. The table is based on a minimum number of hours of annual operation considered sufficient for a wheel tractor (1000 hrs.) and for a crawler tractor (1500 hrs.) to be economical. It should be noted that this table reflects not only the degree of under-utilisation but also drawbacks in organisational system in effective utilisation of the fleet of tractors.

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Table 34. Saudi Arabia: Number and performance of the Ministry's fleet of tractors 1966/67 and 1967/68

Percentage of standard performance	1966/67		1967/68	
	crawler	wheel	crawler	wheel
0 - 10	8	20	2	22
10 - 20	8	15	6	19
20 - 30	5	-	7	11
30 - 40	10	3	10	-
40 - 50	4	-	11	-
50 - 60	3	1	6	-
60 - 70	-	-	6	-
70 - 80	1	-	4	-
80 - 90	1	-	3	-
90 -100	1	-	2	-
Depots not reporting	18	20	1	6
Total number of depots	59	59	58	58

The major causes for this high percentage of idle equipment are said to be the unavailability of spare parts, when and where they are required, and the large variety of makes of tractors. Furthermore, the level of repair and maintenance and other personnel which the Ministry is able to recruit under its present level of salary scales, is much below the required skills. This low level of personnel has also contributed to the creation of organizational bottlenecks, which have further contributed to the inefficiency of the operation. Officials of the Ministry of Agriculture are now of the opinion that

(a) the aim of the Ministry in the initial introduction of farm mechanisation has been achieved;

(b) too many of the Ministry's personnel are occupied in one way or another in the Ministry's programme of purchasing, operating and maintaining its fleet of tractors and equipment;

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(c) the time has come for the Ministry to transfer this operation to the private sector as well as to the farmers themselves.

The officials believe that the demand for machinery has now outstripped the resources of the Ministry to satisfy it and a policy of increased involvement by the private sector through private ownership is being formulated. The Ministry of Agriculture officials have, therefore, recommended that the Ministry's role be restricted to:

(a) establishing the optimum ways and means of mechanizing all sizes of farms in the kingdom and

(b) establishing a farm machinery purchasing advisory programme backed by machine performance testing facilities and screening procedures.

It would appear, therefore, that farm mecahnization in Saudi Arabia suffers from:

(1) Inadequate selection of equipment;

(2) Inadequate operation; and

(3) Inadequate repair and maintenance.

The problem of inadequate selection of equipment

The UNIDO/UNESOB mission understood that although during the past ten years more than 20 types of tractors and various implements, 34 makes of diesel engines, 12 makes of petrol engines and 19 makes of deep-well pumps and other equipment have been imported for use in the kingdom, there appear to be no suitable facilities or qualified personnel to undertake product performance evaluation, analysis of economics and suitability, adaptation for local conditions and product development. Furthermore, some 70,000 hectares are expected to be ready for cultivation in the near future with the completion of the various irrigation and other agricultural development projects of the Ministry of Agriculture and Water. Most of the area presently under field crops is under limited irrigation, and soil type varies from sandy loam to sandy humus. It seems that the tractor most commonly used at present is a 60 hp. standard tractor with diso ploughs, disc harrows and cultivators.

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Based upon the existing crop pattern, soil type and water resources and on the experience of other countries with similar conditions, it was concluded that the machinery range may include in the future standard 35 hp. tractors with provision for tropical agriculture, chisel ploughs, mould board and disc ploughs, spring loaded and rigid tyne cultivators, leveller planks, furrowers, simple seed drills, fertilizer distributors, knap-sack and hand sprayers, centrifugal and deep-well pumps, small and medium size engines for agricultural usage, sprinkler irrigation units, mowers, reaper binders, threshers and combines etc. At the same time, the mission agreed with and stressed the recommendation of an FAO Farm Machinery expert that the equipment selected for operation in Saudi Arabia should preferably have the following features; versatility simplicity in operation, low maintenance requirements, and ability to work in confined areas without disturbing the land level.

Inthe opinion of this same expert, the man and animal power resources of Saudi Arabia represent one of the biggest assets of the country's agriculture, and therefore, any farm equipment improvement programme should be based on these resources, and expensive farm machinery introduced only as and when needed to supplement these two power resources. Specifically a programme should aim at:

(1) Introducing modern hand tools, implements and small machines which permit an optimal utilization of the manpower resources in agriculture;

(2) Introducing implements and small machines which permit the use of the animal power resource for field-work; and,

(3) The introduction of light, inexpensive power farm machinery on such farms where a power deficit exists.

However, in order to identify products and products specifications correctly, it is necessary that;

(a) Selected machinery and implements should be tested under actual existing local soil and agricultural conditions with necessary adaptations to determine their suitability and economics; and

(b) Based upon the crop pattern and cultural practices that will be introduced in the new areas reclaimed by irrigation practices, a systematic usage of suitable farm machinery is to be developed.

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The above mentioned approach should ultimately result in:-

(a) Assistance being extended to the farmers in terms of improved agricultural practices and more effective use of existing and developed machinery and implements; and

(b) Assistance being extended to local manufacturers through rational product identification and product specification, thereby facilitating local manufacture.

The Research and Development Department of the Ministry of Agriculture and Water, having already identified the above mentioned needs, has submitted a proposal for the establishment of facilities for testing, research and development work. In order to assist in the proper crystallization and drawing-up of an adequate and integrated approach, the UNIDO/UNESOB mission recommended the provision of an expert to the Ministry.

The Department's proposal gave the following estimate of equipment required and cost over a five-year period (startin g from about 1970):-

Table 35:- Saudi Arabia: Estimates of equipment required and their cost over a five year period.

Equipment		Total cost (thousand SR)
Type	Imports per year over five years	
1. Crawler tractors (D4)	300	22,500
2. Wheel tractors (40hp)	2,000	30,000
3. Ploughs	2,000	6,000
4. Cultivators	2,000	3,000
5. Seed drills	40	200
6. Harvesting equipment	-	1,000
7. Miscellaneous (e.g. trailers, levelling blades, sprayers and dusters etc.)	-	1,000

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The problem of inadequate operation and inadequate repair and maintenance

Perhaps, the most serious obstacle to the efficient operation of farm machinery in Saudi Arabia is the low level of operators and maintenance personnel. Although this is a problem prevalent in most developing countries, it is especially acute in Saudi Arabia. Therefore, the need for training programmes and incentives in machinery operation and maintenance and in farm machinery management at all levels cannot be over-emphasized. The Government is aware of this serious need and has already initiated several such programmes. Most important of these is the Farm Engineering Centre, an FAO assisted institution. The Centre will be concerned with the training of technicians and instructors in farm machinery operation and maintenance in addition to modern irrigation and other agricultural engineering practices. One of the Experts of the Centre (The Trials and Demonstrations Expert) was expected to start his work by first undertaking a survey of existing agricultural practices, and usage of farm machinery based on extensive travel within the Kingdom. The purpose of this survey is primarily to develop suitable training programmes. The UNIDO/UNESOB mission also recommended the provision of an expert to assist the Ministry in improving the operating efficiency of its fleet of equipment.

III. THE ENGINEERING AND METALWORKING INDUSTRIES SECTOR AND THE MANUFACTURE OF AGRICULTURAL MACHINERY AND IMPLEMENTS

A. Imports of engineering and metal products, including agricultural machinery and implements

Table 36 shows imports of engineering and metalworking industries produots for the years 1964/65 to 1967/68. The imports shown against BTN items Nos 73 to 81 include imports of the base metals in an unworked condition. However, in most cases imports of the metals represented an insignificant proportion (up to 2%) of total imports by value. But, in a few cases, the proportion was high - e.g. in 1967/68 the proportion of tin metal imports to imports of the metal and artioles thereof (BTN No. 80) was over 75%. However, the value of imports of metals represents a very insignificant peroentage (less than 0.2%) of total imports of the entire sector of metals, artioles thereof, and machinery and equipment.

The imports of engineering and metalworking industries produots to Saudi Arabia varied in value between about SR 559 millions in 1964/65 to SR 848 millions in 1966/67. These imports represented an average of about 35% of total imports.

Because of the system used in aggregating import figures in Foreign Trade Statistics publications, it was not possible to ascertain whether import figures of agricultural machinery and implements as shown in table 37 represent all such imports or not, It seems possible that some imports were excluded from the table because of the aggregated headings given in national statistics sources. This factor may be one of the causes of the variations which can be seen from table 37. The value of annual imports of agricultural machinery and implements varied between SR 25 millions in 1964/65 to SR 92 millions in 1965/66 but dropped again to SR 47 millions in 1967/68. The high import value in 1965/66 is due mainly to a large increase (almost 300%) in the number of tractors reported to have been imported in 1965/66.

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Table 24 Lebanon - Imports of metals, metalworking and engineering industries products, 1967-1969 (Cont'd)

BTN	Description	1967		1968		1969	
		Quantity	Value	Quantity	Value	Quantity	Value
86	Railway and tramway locomotives rolling-stock and parts thereof	65	0.22	140	0.12	24	0.05
87	Vechicles, other than railway or tramway rolling-stock and parts thereof	16,907	76.00	21,976	90.00	22,618	101.00
	TOTAL	309,105	405.62	336,365	413.08	376,924	478.98
	TOTAL IMPORTS	2,902,947	1,850	3,971,604	2,045	3,549,264	1,957
	Percentage of total imports	10.6	22	8.5	20	10.6	24.5

Source: Recueil de Statistiques Libanaises, published by the Ministry of Planning

Table36. Saudi Arabia : Imports of metals, engineering, and metalworking industries products 1964/65 - 1967/68
(Value in thousand Saudi Riyals; quantity in tons)

BTN	Description	1384 H 1964/65 Quantity	1384 H 1964/65 Value	1385 H 1965/66 Quantity	1385 H 1965/66 Value	1386 H 1966/67 Quantity	1386 H 1966/67 Value	1387 H 1967/68 Quantity	1387 H 1967/68 Value
73	Iron and steel and articles thereof	123584	38588	142740	128675	80015	144509	132807	118072
74	Copper and articles thereof	1715	8074	1137	7321	1130	7077	1702	9664
75	Nickel and articles thereof	21	253	35	350	5	74	10	244
76	Aluminium and articles thereof	1029	4775	1910	7879	1520	7664	1552	7886
77	Magnesium and beryllium and articles thereof	6	30	16	60	11	42	7	25
78	Lead and articles thereof	160	518	290	789	334	762	202	413
79	Zinc and articles thereof	438	548	320	412	762	752	500	553
80	Tin and articles thereof	34	290	32	353	36	459	16	233
81	Other base metals employed in metallurgy and articles thereof	2	16	94	51	17	114	2	19
82	Tools, implements, cutlery, spoons and forks of base metal, parts thereof	1367	7267	2983	9089	2317	10904	1505	8968
83	Miscellaneous articles of base metal	2261	8885	3456	11049	2912	10525	2572	9207
84	Boilers, machinery and mechanical appliances; parts thereof	-	125427	-	173443	-	227058	-	195940
85	Electrical machinery and equipment; parts thereof	-	67405	-	110157	-	131789	-	154231
86	Railway and tramway locomotives; rolling-stock and parts thereof	-	563	-	766	-	2451	-	12413
87	Vehicles, other than railway or tramway rolling-stock and parts thereof	-	246560	-	340221	-	304714	-	305072
	Total	-	559197	-	790625	-	848674	-	820920
	Total imports	-	1692675	-	2053149	-	2258287	-	2212280
	Percentage		33.0%		38.4%		37.5%		37.1%

Table 37. Saudi Arabia: Imports of agricultural machinery and implements, 1964/65-1967/68.
(Value in thousand Saudi Riyals; quantity in tons)

BTN No. / SITC No.	Description	1964/65		1965/66		1966/67		1967/68	
		1384 H		1385 H		1386 H		1387 H	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
82.01 695.1	Hand tools, the following: spades, shovels, picks, hoes, forks and rakes, axes, billhooks and similar hewing tools; scythes, sickles, hay knives, grass shears, timber wedges and other tools of a kind used in agriculture, horticulture or forestry	235	572	381	961	770	1794	392	857
84.24 712.1	Agricultural and horticultural machinery for soil preparation or cultivation (for example ploughs, harrows, cultivators, seed and fertilizer distributors), lawn and sports ground rollers	87	612	95	375	238	897	142	629
84.25 712.2	Harvesting and threshing machinery; straw and fodder presses; hay or grass mowers; winnowing and similar cleaning machines for seed, grain or leguminous vegetables and egg-grading and other grading machines for agricultural produce (other than those of a kind used in the bread grain milling industry falling within heading No. 84.29	51	387	297 (number)	571	80	821	42	222

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Table 37 Saudi Arabia Imports of agricultural machinery and implements, 1964/65-1967/68 (Cont.)
(Value in thousand Saudi Riyals; quantity in tons)

BTN No. SITC No.	Description	1964/65 1384 H Quantity	1384 H Value	1965/66 1385 H Quantity	1385 H Value	1966/67 1386 H Quantity	1386 H Value	1967/68 1387 H Quantity	1387 H Value
84.28 712.9(9)	Other agricultural, horticultural poultry-keeping and bee-keeping machinery; germination plant fitted with mechanical or thermal equipment; poultry incubators and brooders	-	51	47 (number)	82	16	140	11	56
87.01, 712.5	Tractors (other than those falling within heading no. 87.07), whether or not fitted with power take-offs, winches or pulleys	374 (number)	27500	1077 (number)	90199	687 (number)	47750	629 (number)	45426
	A. Tractors, other than those of sub-heading B								
	B. Other								
	Total	-	28132	-	92188	-	51382	-	47190
	Total imports of metalworking industries (BTN 73-87)		559197		790625		848674		820920
	% of total imports of metalworking industries (BTN 73-87)		4.5		11.6		6.1		5.7
	Total imports		1692675		2058149		2258287		2212280
	% of total imports		1.4		4.4		2.2		2.1

Source: General Statistical Organization Foreign Trade Statistics 1384, 1385, 1386, 1387 H

The value of the imports of agricultural machinery and implements represents only a small percentage of total imports (about 2-4 per cent), and a slightly higher percentage of the imports of engineering and metalworking industries.

B. Manufacturing industry and the status of the engineering and metal working industries

Industrialization in Saudi Arabia started in earnest only during the past decade when the number of establishments increased substantially and the average size of firms also increased. This growth has taken place largely as a result of the initiative of private entrepreneurs and government support. The development of industries in the kingdom is, however, hampered by a number of difficulties such as the fragmentation of markets for industrial products, coupled with inadequate transport and a large land area, the scarcity of local raw materials and of management and technical know-how and the low productivity of labour.

Manufacturing industries in Saudi Arabia are characterized by the limited extent of inter-dependence with other sectors of the economy. Almost all manufacturing industries depend on local markets for the sale of their products and on imports for the supply of raw materials. Furthermore, a considerable proportion of installed capacity in manufacturing industries remains idle for one reason or another.

An "Establishment Survey" undertaken in 1967 revealed that there were about 9,665 "establishments" in the kingdom. An "establishment" was defined as employing one or more persons. However, a survey of "manufacturing establishments" employing five or more persons was carried out in 1967 for the three main provinces of the kingdom. This survey revealed (see table 38) that over 60 per cent of the establishments surveyed were located in the Western Province. 17/

The establishments survey, which covered those employing one or more persons, showed that 1,018 establishments, or about 10.5 per cent of the total number of establishments were engaged in activities falling under ISIC numbers pertaining to engineering and metal-working industries. These are ISIC Nos. 341, 342, 350, 360, 370, 381, 382 and 383.

17/ The kingdom is divided into five main provinces: Central, Western, Eastern, Southern and Northern.

Table 38. Saudi Arabia: Number of manufacturing establishments, persons employed, and total paid up capital by region, 1966/67

ISIC Number	Name of industrial activity	Number of establishments per province				Total No. of persons engaged per ISIC group a/	Total Paid-Up Capital 1000 SR
		Cent.	East.	West.	Total		
202	Dairy products	2	1	2	5	50	2,188
208	Sugar confectionery	3	1	10	14	387	3,637
209	Miscellaneous food products	-	5	13	18	1,126	31,947
214	Soft drink and carbonated water	2	2	8	12	861	18,485
231	Finishing textiles	-	1	2	3	45	1,240
243	Wearing apparel, except footwear	1	2	1	4	76	836
251	Sawmills, planning and other wood mills b/	-	-	1	1	15	200
260	Furniture and fixtures	8	2	20	30	622	7,137
272	Articles of pulp paper and paper board	1	2	2	5	132	2,159
280	Printing, publishing and allied industries	7	7	13	27	614	15,450
291	Tanneries and leather finishing plants	-	-	1	1	178	2,000
300	Rubber products	-	-	2	2	70	739
311	Basic chemicals, including fertilisers	-	3	1	4	439	102,700
319	Miscellaneous chemical products	-	-	1	1	84	3,375
321	Petrpleum refineries a/	-	-	1	1	230	70,000
331	Structural clay products	5	12	28	45	942	15,667
334	Cement	1	1	1	3	981	96,250
339	Non-metallic mineral products (not elsewhere classified)	5	6	3	14	318	15,387
341	Iron and steel basic industries	-	-	2	2	200	30,380
342	Non-ferrous metal basic industries	2	-	-	2	46	208
350	Metal products except machinery and transport equipment	8	-	17	25	444	3,349
360	Machinery, except electrical machinery	2	-	2	4	46	905
381	Shipbuilding and repairing	-	-	2	2	23	694
383	Motor vehicles	2	-	1	3	39	435
394	Jewellery and related articles	-	-	1	1	10	150
399	Manufacturing industries not elsewhere classified	3	1	4	8	97	1,924
	Total	52	46	139	237	6,074	427,442

Source: ISDC

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Table 38. Saudi Arabia: Number of manufacturing establishments, persons employed and total paid up capital by region, 1966/67. (continued).

a/ According to replies to questionnaires plus estimates by CDS, when deemed necessary to correct obvious understatements.

b/ Sawmills, planning and other wood mills are not included except one establishment in the Western Province producing for the market shutter windows and doors.

c/ The Ras-Tanura Refinery of Aramco in the Eastern Province is excluded from this table.

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The manufacturing establishments survey showed that there were 38 establishments, or 16 per cent of the 237 manufacturing establishments surveyed, engaged in metal-working or engineering industries. These are shown in table 38 against ISIC Nos. 341,342,350,360,381 and 383. Twentyfour of these establishments were located in the Western Province, 14 in the Central Province and none in the Eastern Province. The products of these establishments are: steel bars, cans, aluminium ware, kitchenware, springs, tanks, trailers and small boats.

The total paid-up capital of these 38 manufacturing establishments was given as about SR 36 million, or about 8.4 per cent of total paid-up capital for the 237 manufacturing establishments surveyed. It is interesting to note, however, that about 83 per cent of the paid-up capital of the engineering and metalworking industries establishments is attributable to Iron and Steel Basic Industries (ISIC No. 341).

It was reported in a study undertaken by advisors to the Ministry of Commerce and Industry that the "value of imported metal products" rose at an annual rate of 20 per cent during the period 1960/1 to 1966/67. During the same period, total imports were reported to have grown at the rate of 14 per cent per year and GNP at 12 per cent per year. The study also presented a table of annual growth rates for some individual categories of engineering and metalworking products. This table is reproduced in table 39.

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Table 39. Saudi Arabia: Selected imports of metal products (SR millions) 1382H (1962/63) + 1386H (1966/67).

	Imports		Per cent annual growth
	1382 H	1386 H	
Mechanical machinery and appliances	59	218	44
Electrical machinery and appliances	44	131	37
Iron and steel primary forms	38	109	37
Secondary iron and steel products	16	46	34
Motor vehicles	87	169	17
Miscellaneous base metal articles	6	10	16
Metal furniture	4	7	11

Table 40 shows actual growth rates of total imports, of imports of metals, engineering and metalworking industries products and of imports of agricultural machinery and implements for the years covered in table 36. The average growth rates are lower than 20 per cent and 14 per cent, but this may have been caused by a different definition having been adopted for the import items included in calculating the two series of growth rates and also because of the consequences of the 1967 political and military events.

Table 40. Saudi Arabia: Growth rates of total imports; metals, engineering and metalworking industries, and agricultural machinery and implements 1964/65 - 1967/68.

	%	%	%	%	%	%
	Total imports		Imports of metals engineering and metalworking industries products		Imports of agricultural machinery and implements	
	Actual annual growth rate	Average annual growth rate	Actual annual growth rate	Average annual growth rate	Actual annual growth rate	Average annual growth rate
1964/65-1965/66	21	9.3	41	13.6	267	23
1965/66-1966/67	10	9.3	7	13.6	- 44	23
1966/67-1967/68	- 2	9.3	- 3	13.6	- 8	23

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At present, there is no base metal production in Saudi Arabia. The General Petroleum and Mineral Organization (Petromin) has been assigned the task of developing basic metal production and its conversion into primary forms. Because of the reportedly huge iron ore deposits found in a number of areas in Saudi Arabia and the availability of a ready source of energy, and the importance of iron and steel to industrialization, Petromin has given pricrity to the creation of an integrated iron and steel industry. Petromin started its programme by establishing a Steel Rolling Mill in Jeddah where production started in 1967. The mill was designed for an annual production capcity of 30,000 tons (two daily shifts) or 45,000 tons (three shifts). The production programme includes reinforcement wires (6 to 10 mm) reinforcement rods (10 to 20 mm), six sizes of sheet iron and three sizes of angle iron. It is planned to expand the plant, in two stages, in order to produce square and round iron rods, channel iron, iron beams etc. In 1970 it was reported that the mill was only operating one shift.

The Saudi Arabian metal fabricating sector, as a whole, is still in its early stages of development. However, imports are rising rapidly and the Saudi industrial sector is expanding rapidly, thereby creating opportunities for additional production capacity. However, Saudi light engineering and metal-working industries have not been able to take full advantage of these opportunities mainly because of lack of guidance and assistance in management and product identification.

One private enterprise, in Jeddah, visited by the UNIDO/UNESOB mission was engaged in a number of activities related to the metal fabricating sector such as the fabrication of tin cans, gasoline tanks, steel structure, ships and tenders (250-400 tons).

C. Present status of agricultural machinery manufacture:

No agricultural machinery and implements, or parts thereof, are being manufactured or fabricated in the kingdom at present. However, on the basis of visits paid to four metal workshops by the UNIDO/UNESOB mission and as some agricultural implements are prefabricated from standard components such as

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angles, beams etc, it is felt that existing facilities could undertake fabrication of parts and equipment. The skills required for such fabrication and assembly are not of a very high level, but there will be need for assistance and guidance regarding product identification and production requirements and possibly also some financial assistance.

D. Conclusions and recommendations

The time seems to be appropriate for the government to adopt a comprehensive policy for the promotion and development of the engineering and metalworking industries sector. With regard to the sector as a whole, policies need to be formulated to improve national training programmes and facilities and to expand overseas training programmes. During the early years, it may be found useful to liberally import the required skills. However, greater attention will need to be paid to assistance at the project level. The government has already had surveys and preliminary feasibility studies prepared for a number of projects, one of these is a comprehensive report on the feasibility of establishing a highly mechanized iron foundry in Saudi Arabia. The government's programme of direct and indirect assistance at the project level will need to be considerably expanded. Perhaps, the ideal agency through which the government can initiate and implement such a programme is the Industrial Studies and Development Centre of the Ministry of Commerce and Industry.

The Centre is in a position to extend assistance at all stages of project identification, appraisal, implementation and efficient operation. The Centre will also be responsible for the management of the three relatively large industrial estates which it established. The development of the engineering and metalworking industries sector should not, however, be considered in isolation of prevailing conditions of demand and supply in neighbouring and other Arab countries.

With regard to agricultural machinery and implements, two main areas call for attention:

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Table 25. Lebanon: Imports of selected agricultural machinery and implements, 1967-1969

	Description	1967 Quantity (Tons)	1967 Value (LL)	1968 Quantity (Tons)	1968 Value (LL)	1969 Quantity (Tons)	1969 Value (LL)
84-21-11	Spraying equipment for liquids for agricultural use	55	479	49	391	46	456
84-25-00	Machinery and equipment for harvesting agricultural products	97	448	151	925	195	869
84-28-00	Agricultural machinery and equipment n.e.s.	144	685	102	551	196	927
85-01-11	Generators and prime movers for industrial and agricultural uses	3,806	10,494	1,829	7,382	1,940	6,092
87-06-21	Tractor spare parts	157	602	158	521	195	797
	Total	4,259	12,708	2,289	9,770	2,570	9,141

Source: Recueil de Statistiques Libanaises, published by the Ministry of Planning, 1969

(1) Training of operators and maintenance personnel, which could be mainly tackled by the Farm Engineering Centre. National policies will need to be formulated and specific programmes identified and implemented to raise the levels of operators and repair and maintenance personnel;

(2) Testing, adaptation and development of agricultural machinery and implements: The Ministry of Agriculture and Water has already recognized the need for establishing adequate testing facilities. The UNIDO/UNESOB mission recommended that assistance in the form of experts should be favourably considered by the United Nations if requested by the Government. The estimated financial layout for the research related activities, in the next five years (1970/71 - 1975/76), in expanding agricultural mechanization is 3.3 million S.R. with an annual requirement of approximately 650,000 S.R.

The Directorate of Research Development has formulated a preliminary programme for farm mechanization in general and agricultural machinery and implements development in particular. The Government is in the process of crystalization of this programme. There is a need for identification of suitable implements and machinery suited to the local conditions.

At the same time, some fabrication of implements is feasible and should be encouraged to proceed in harmony with the development of the engineering and metalworking industries sector as a whole.

SYRIAN ARAB REPUBLIC

I. THE AGRICULTURAL SECTOR AND ITS PLACE IN THE ECONOMY[18/]

"Syria is primarily an agricultural country which depends greatly on the production of cereals and cotton for its subsistence and for the earning of foreign exchange necessary for its development efforts. Despite the achievement of a reasonable rate of economic growth (about 5 per cent per annum) in the 1950s and the early 1960s, which was accompanied by a certain degree of diversification of production through the establishment of a number of industries, the Syrian economic structure is still characterized by the predominance of agriculture, and its per capita income in 1967 remained low at about $174. Agriculture, which generates about one-third of national income, remains subject to wide fluctuations because of irregularities in rainfall. In order to reduce the dependence of Syria on weather conditions and to achieve steady growth, efforts have been made to increase the irrigated area and to diversify the economy through the further development of the industrial sector[19/]."

The opening paragraph of the introduction to the Agricultural Sector Section of the Second Five-Year Plan (1965-1970) states: "The agricultural sector, in spite of the structural change that occured in the Syrian Arab Republic economy in recent years, still occupied an important place in the ecenomy among the other sectors, such as industry, transport, etc. It

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18/ See Annex I for relevant information on the country's geography, administrative divisions, etc.

19/ Quotation from "Studies on Selected Development Problems in Various Countries in the Middle East, 1969", UNESOB.

seems that this sector will keep this place for many years to come for two basic reasons: first, the agricultural natural resources constitute a high proportion of the country's total natural resources; and second, an important part of the agricultural resources is still under-utilized, technically and economically".

Table 41 shows that the contribution of agriculture to national income has declined from about 33 per cent in 1963 to about 26 per cent in 1968, whereas the contribution of industry increased from 11 per cent to 13 per cent during the same period.

Table 41. Syrian Arab Republic: Contribution of the agricultural and the industrial sectors to national income 1963 - 1968 (in Million S.L. at constant 1963 prices)

	1963	Per cent	1964	Per cent	1965	Per cent	1966	Per cent	1967	Per cent	1968	Per cent
Agriculture	1,037.0	33	1,055.6	32	875.4	28	846.7	25	1,039.3	28	1,049.5	26
Industry	347.2	33	365.1	32	364.8	12	447.0	13	442.0	12	519.5	13
Total NI	3,115.4		3,288.6		3,141.2		3,434.8		3,736.6		4,041.4	

Source: Bulletin periodique VIème année 1968, Banque Central de Syrie, p.7.

A. Land use and crop distribution pattern

The total cultivable area in the Syria Arab Republic (S.A.R.) is reported to be about 8.75 million ha., of which 6.2 million ha. are under cultivation (0.53 million ha. irrigated and the rest dry farmed). Because of the fallow system followed in the S.A.R., the actual area under crops in dry farming areas is estimated to be around 3.4 million ha. and total net cultivated area in the Republic is only around 3.9 million ha.

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Table 42. Syrian Arab Republic: Land use, 1970
(in million hectares)

Cultivable areas	Area		Per cent	
- Irrigated areas under crops	0.53		2.9	
- Dry farming areas under crops	3.45		18.5	
- Areas not under crops (mostly fallow in dry farming areas)	2.27		12.4	
- Uncultivated areas	2.5		13.3	
Total cultivable areas		8.75		47.1
Total uncultivable areas		9.8		52.9
Total area of the country		18.55		100.0

In 1968, total agricultural production in the Syrian Arab Republic was divided as shown in Table 43 below:

Table 43. Syrian Arab Republic: Agricultural production, 1968

Product	Production (in thousands of tons)	Percentage of total production
Cereals	1,167.3	44.39
Dry legumes	126.6	4.81
Vegetables	286.5	10.89
Main crops used in industry	578.0	21.98
Fruits	471.4	17.92
Total	2,639.8	100.00

Source: Ministry of Planning, Directorage of Statistics, Statistical Abstract, pp. 68-93.

It is reported that in 1968, a total of 1.58 million ha. were under cereals (mainly wheat and barley), 0.32 million ha. under industrial crops (cotton, beet-root and tobacco, etc.) and 0.21 million ha. under legumes, (see Table 44).

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Syrian Arab Republic

Table44. Area and production of cultivated lands by groups of crops and mohafazats, 1968

(Area 1,000 ha. - Production 1,000 t)

Mohafazat	Fruits		Crops industrial		Vegetables		Dry legumes		Cereals	
	Crops	Area	Crops	Area	Crops	Area	Crops	Area	Crops	Area
Damascous	74.7	26.5	63.8	6.9	46.0	3.0	5.0	5.0	40.0	46.0
Homs	51.5	17.4	98.1	11.2	29.0	3.0	8.0	22.0	44.0	97.0
Hama	27.3	11.7	96.1	46.6	22.0	3.0	12.0	25.0	103.0	149.0
Aleppo	101.0	65.1	75.1	68.6	25.0	4.0	19.0	32.0	92.0	282.0
Idleb	82.7	817.0	20.8	32.0	42.0	4.0	17.0	30.0	43.0	92.0
Latakia	67.5	55.4	11.2	16.4	71.0	7.0	7.0	11.0	33.0	57.0
Deir-ez-Zor	2.6	0.3	72.3	44.6	13.0	1.0	1.0	1.0	67.0	69.0
Al-Rakka	0.1	0.1	82.2	58.0	1.0	0.0	0.0	0.0	151.0	159.0
Hasakeh	2.5	1.3	56.8	34.1	12.0	2.0	8.0	6.0	504.0	492.0
Dar'a	4.3	1.2	1.3	1.4	26.0	2.0	48.0	67.0	63.0	90.0
Sweida	56.7	14.2	-	-	0.0	0.0	2.0	9.0	27.0	42.0
Quneitra	-	-	-	-	-	-	-	-	-	-
Total	470.9	274.9	578.2	319.7	287.0	29.0	127.0	208.0	1167.0	1575.0

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B. Population distribution in industry and agriculture

As can be seen from the following table, the labour force represents about 28 per cent of the total population. Of the latter, about 60 per cent are employed in the industrial sector.

Table 45. Syrian Arab Republic: Total population and total labour force, 1967

Sex	Agriculture and hunting	Manufacturing	Total Labour force	Total Population
Male	593,153	152,591	1,226,621	3,051,768
Female	392,917	5,508	426,186	2,904,001
Total	986,070	158,099	1,652,807	5,955,769

C. Distribution pattern of size of holding

As a result of the Agrarian Reform Law, the maximum size of holding as established by Law is 40 ha. of irrigated land and 120 ha. of dry farm land depending on rainfall. Some of the land expropriated by the government has been distributed to farmers (142,500 families) on the basis of 15-30 ha. (dry farmed) and 3-8 ha. (irrigated) per family. A total of about 140,000 hectares of irrigated lands and about 2.4 million ha. of dry farming lands were affected by Agrarian Reform Laws. The government also owns and operates a small number of state farms the largest of which is in Kamishly, covering an area of about 15,000 ha. It is also the policy of the government to encourage co-operatives. About 1,120 co-operatives are reported to be in operation at present. Most of these co-operatives are of the multi-purpose type.

D. Agricultural development plans

The Third Five-Year Plan provides for investments of LS 436 million in the agricultural sector during the plan period. This constitutes around

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6.8 per cent of total investments in all sectors. The main objectives of the plan are:

(a) Increasing production of the major crops especially wheat, barley and cotton;
(b) diversifying animal and plant products;
(c) intensifying mechanisation in cultivation;
(d) increasing fertilizer use;
(e) introducing new seeds;
(f) conducting training programmes; and,
(g) completing the organisation and development of co-operatives.

A number of irrigation projects are under execution, and are expected to be completed during the Third Five-Year Development Plan period. As a result of these projects, the irrigated area is expected to increase from 0.53 million ha. to around one million ha. by 1975, at a rate of around 15 - 20 thousand hectares per year.

The largest of these projects is the Euphrates Basin Project which will have a total command area of 640,000 ha. under irrigation, including around 200,000 ha. already under irrigation. However, it is worthy to note that the major agricultural areas are around the Euphrates Basin, Orantes Basin, El-Khabour Basin, Basin of Barada and Damascus, Coastal areas of North Khabour, Ghab and Kamishly areas. An area of 500 ha. is being developed by FAO/UNDP as a pilot project in the Ghab area which covers about 75,000 ha. Similarly, a pilot area of 5,000 ha. will be developed by FAO/UNDP in the Euphrates Projects region.

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II. FARM MECHANIZATION

The UNIDO/UNESOB mission was made to understand that dry farming field crops such as wheat and barley are mechanized to a fair extent. Mechanization is prevalent in primary tillage and combine harvesting, but use of seed drills and fertilizer distributors is limited. Although many types of tillage implements are in use, no systematic analysis has been undertaken to identify the most suitable type of implements, optimum tillage and effective moisture conservation practices. Crops, such as cotton, lentils and sugar-beet are partially mechanised, and mostly in the preparation of the seedb d. Although a number of agricultural experimental stations are in operation in the major agricultural areas of the country, it was reported that because of lack of equipment and expertise, national or international, no special research and development programme has so far been initiated. The Directorate of Rural Engineering of the Ministry of Agriculture and Agrarian Reform is, howeever, very much aware of the need to develop such programmes as soon as possible. It should be mentioned in this connexion that a number of agricultural machinery workshops are either completed or are being built for the purpose of owning, operating, renting and maintaining tractors, agricultural implements and heavy equipment. The government intends to utilise these workshops for the purpose of encouraging and assisting farmers in accelerating the mechanisation of agriculture. The mission visited one of these workshops at Skelbyeh where the building has been completed, but is not yet equipped. Two other major stations are located at Kamishly and Rakka. It is reported that all the three stations are not yet fully operational. The government intends to establish an additional number of such workshops to serve other agricultural areas.

The total agricultural machinery and implements population in the country is reported to be as follows as at the end of 1968: 13,750 tractors, 2,000 combine harvesters, 20,000 engines, 16,500 agricultural pumps and a number of a variety of agricultural implements (see Tables 46 - 51 below). The figures for tractors and combine harvesters represent total imports; for pumps and engines, the figures represent the number of pumping licenses issued up to the end of 1968. It is estimated that at present (1970) only about 9,000 tractors are actually operating.

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Table 46 shows a general decline, by 1968 in the sale of all agricultural machines and implements when compared to the years 1963 and 1964 and to some extent also 1965. This decline is especially obvious for tractors. The cause of this decline was reported to be import restrictions.

Table 47 shows that Aleppo Mohafasa has the highest sales figure for agricultural machines and implements. It appears from Table 48 that the great majority (85 per cent) of all wheel tractors used in Syria are over 30 HP. In 1967 and 1968, the largest buyers of tractors were Aleppo and Hasakeh Mohafasat.

Table 50 clearly indicates the importance of the following three Mohafasat in the use of agriculture machinery: Aleppo, Hasakeh and Damascus. The same table also shows the major exporters of agriculture machinery to SAR to have been the UK and USA.

The FAO Indicative World Plan gives the total number of tractors operating in Syria in 1964 to be 7,270. Using a figure of 3.13 million hectares of cropped areas in Syria in that year, the ratio of area to tractor would be 430 as compared with a ratio of 92 for Greece and 172 for Yugoslavia. The importation of tractors and implements is now under the control of Afto-Machine which is a Government organisation. AftoMachine imported last year around 1,000 tractors of the type which is to be assembled in the Aleppo project referred to later on in this report. The same organisation also imported about 150 self-propelled combine harvesters. On the basis of calculations made by FAO for the Indicative World Plan, the "tractor potential" in Syria in 1985 should be about 16,230 tractors. Considering that the number of tractors increased 8-fold in Syria during the years 1950-65, it is not unreasonable to expect this number to be attained by 1985.

However, the number of tractors required for full mechanisation depends a great deal on the average size of farms and the average size of tractors. In this connexion, it may be useful to review some of the information given in the Statistical Abstract (1968) of the SAR (Tables 46 - 51).

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Syrian Arab Republic:
Table 46. Agricultural machinery and implements sold, 1963 - 1968

	1963	1964	1965	1966	1967	1968
Tractors	1,786	1,538	630	105	45	61
Harvesters	57	3	1	-	4	6
Combined harvesters-threshers	337	99	27	-	8	9
Threshers	16	44	42	13	33	10
Mould board plows	123	108	66	52	575	8
Disc harrows	966	682	272	51	227	147
Harrows	251	151	49	60	21	12
Seed drills	57	49	16	7	5	1
Fertilizer distributors	4	1	7	-	-	1
Tuber harvesters	-	1	-	-	-	-
Irrigation pumps	570	700	668	434	481	481
Motors (Mobile and immouile)	1,943	2,022	1,534	1,124	533	740
Sprayers, dusters, etc.	11	658	421	706	279	133

Syrian Arab Republic:
Table 47. Agricultural machinery and implements sol , by Mohafasat, 1968

	Quneitra	Dar'a	Sweida	Deir-es-Zor	Hasakeh	Al-Rakka	Aleppo	Idleb	Latakia	Hama	Homs	Damascus	Total
Tractors	-	-	1	1	14	3	24	-	1	7	7	3	61
Harvesters	-	-	-	-	-	-	3	-	-	-	-	3	6
Combined harvester-threshers	-	1	-	-	-	-	-	-	-	-	8	-	9
Threshers	-	-	-	-	-	-	1	-	5	-	4	-	10
Mould board plows	-	-	-	-	-	-	8	-	-	-	-	-	8
Disc harrows	-	-	-	1	2	-	134	-	-	-	9	1	147
Harrows	-	-	-	3	-	-	7	-	-	1	1	-	12
Seed drills	-	-	-	-	-	-	1	-	-	-	-	-	1
Fertiliser distributors	-	-	-	-	-	-	1	-	-	-	-	-	1
Tuber harvester	-	-	-	-	-	-	-	-	-	-	-	-	-
Irrigation pumps	-	-	-	6	2	-	279	-	2	-	71	121	481
Motors (immobile & mobile)	-	4	-	38	32	11	150	4	165	89	93	214	740
Sprayers, Dusters, etc.	-	-	8	-	-	-	16	-	14	-	-	95	133

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Table 26. Lebanon: Number of establishments by size, value added, and number of persons employed in the metalworking and engineering industries, 1964

	Sector	Number of establishments according to size					Total Value added	Number of persons employed
		5 - 9	10 - 24	25 - 49	Over 50	Total		
34	Base metal industries	-	-	-	3	3	4,117	921
35	Manufacture of metal products except machinery and transport equipment	60	41	8	13	122	19,080	2,922
36	Manufacture of machinery except electrical machinery	2	8	1	1	12	1,827	268
37	Manufacture of electrical machinery	8	7	2	-	17	1,706	188
38	Manufacture of transport equipment	-	2	1	1	4	729	153
	Total					158	27,469	4,452
	All industries					2,099	312,327	41,093

Source: Recueil de Statistiques Libanaises published by the Ministry of Planning, 1969

Syrian Arab Republic
Table 48. Number of tractors sold for agricultural use, 1958-1968

Years and Mohafasat	Tractors with belt				Tractors with wheels			Total
	Over 80 HP	51-80 HP	25-50 HP	Under 25 HP	Over 30 HP	16-30 HP	Under 16 HP	
1958	9	23	66	1	466	14	10	589
1959	5	20	1	-	533	18	17	594
1960	1	16	13	-	751	79	2	862
1961	21	49	12	-	830	37	9	958
1962	5	15	6	-	1,549	17	-	1,592
1963	9	46	5	-	1,622	82	22	1,786
1964	58	41	24	-	1,319	91	5	1,538
1965	3	101	7	1	486	27	5	630
1966	18	6	1	2	63	7	8	105
1967	1	1	1	-	42	-	-	45
1968	-	3	1	2	38	13	4	61

Syrian Arab Republic
Table 49. Number of pumps sold for agricultural use, 1958-1968

Years and Mohafasat	6 inches and over	4 and under 6 inches	2.5 and under 4 inches	Total
1958	194	568	893	1,655
1959	115	234	975	1,224
1960	231	318	571	1,121
1961	230	404	485	1,119
1962	300	262	260	822
1963	93	250	227	570
1964	167	316	217	700
1965	156	273	239	668
1966	80	154	200	434
1967	137	96	248	481
1968	80	198	203	481

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Syrian Arab Republic
Table 50. Number of agricultural machinery registered at the end of 1968 by Mohafasat and country of origin

Country of origin	Deir-ez-Zor a/	Hasakeh	Aleppo b/	Latakia	Hama	Homs	Damascus c/	Total
Tractors								
United Kingdom	378	319	3 242	815	1 050	922	1 871	8 597
U. S. A.	48	963	958	36	137	132	98	2 372
Germany	2	98	185	25	57	27	216	610
Italy	6	177	132	7	26	20	19	387
Canada	2	51	101	5	2	2	16	179
East. countries	7	52	301	40	139	171	167	877
Sweden	115	38	82	3	44	175	94	551
France	4	7	67	-	11	28	12	129
Other countries	2	5	5	6	6	2	25	51
Total	564	1 710	5 073	937	1 472	1 479	2 518	13 753
Combined harvester-threshers								
U. S. A.	6	702	455	7	44	16	10	2 001
Canada	5	268	83	-	-	1	-	357
United Kingdom	-	7	110	-	6	-	3	126
East. countries	-	5	9	-	-	-	-	14
Germany	-	1	15	-	1	-	-	17
Italy	-	1	2	-	-	-	-	3
Sweden	-	1	2	-	-	7	14	24
Belgium	-	1	202	-	10	-	-	213
Other countries	-	-	6	1	-	-	-	7
Total	11	986	884	8	61	24	27	2 001

a/ Including Al-Hakka figures.
b/ Including Idleb figures.
c/ Including Sweida, Dar'a and Quneitra figures.

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Syrian Arab Republic
Table 51. Number of agricultural machineryregistered at the end of 1968 by country of origin and horse power

Country of origin	HP Over 80	HP 51-80	HP 31-50	HP 16-30	HP Under 16	Total
Tractors						
United Kingdom	12	3,240	3,844	1,351	150	8,597
U. S. A.	454	967	845	98	8	2,372
Germany	5	151	198	183	73	610
Italy	16	225	136	8	2	387
Canada	-	21	125	33	-	179
East. countries	9	483	240	143	2	877
Sweden	31	357	121	37	5	551
France	1	83	17	28	-	129
Other countries	2	12	26	4	7	51
Total	530	5,539	5,552	1,885	247	13,753
Combined harvester-threshers						
U. S. A.	88	345	649	157	1	1,240
Canada	5	49	229	74	-	357
United Kingdom	1	50	31	44	-	126
East. countries	-	5	7	2	-	14
Germany	2	2	1	10	2	17
Italy	-	1	2	-	-	3
Sweden	-	20	4	-	-	24
Belgium	114	40	49	10	-	213
Other countries	-	-	5	2	-	7
Total	210	512	977	299	3	2,001

In addition to effective development and adaptation activities in primary tillage implements, sowing and fertiliser distributor equipment to suit local conditions, there is a real need for research and development work to be undertaken in the field of harvesting of lentils, sowing and harvesting of beet-root and cotton. The Agricultural Engineers of the

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Ministry of Agrioulture and Agrarian Reform quite rightly believe that the successful mechanization of lentils would, by changing the present fallow system, lead to a very substantial increase in the effective area under crops in the dry farming region. The Mission understood that the Ministry of Agrioulture and Agrarian Reform had co-operated with an overseas organization for the purpose of developing a lentils harvester. Although a considerable amount of research and development work was undertaken, this co-operation has been concluded without achieving any concrete results.

Bearing in mind the importance of research and development work to effective local manufacture of agricultural machinery and implements, the Mission recommended the provision of an Expert in the Development, Adaptation and Testing of Agricultural Machinery and Implements. The Mission felt that this expert could play a very important role in initiating and perhaps in launching a comprehensive and integrated programme in research, design, development, adaptation and testing of agricultural machinery and implements. The Mission also strongly recommended that agricultural engineering education at University level be introduced at the earliest possible date. It was surprising to note that although there are agricultural and engineering colleges in Syria, none of these higher education institutes offer any degree courses in Agricultural Engineering. It was the Mission's opinion that Agricultural Engineering degree courses could be easily started at an early date at both Aleppo University and the Technological Institute in Damascus.

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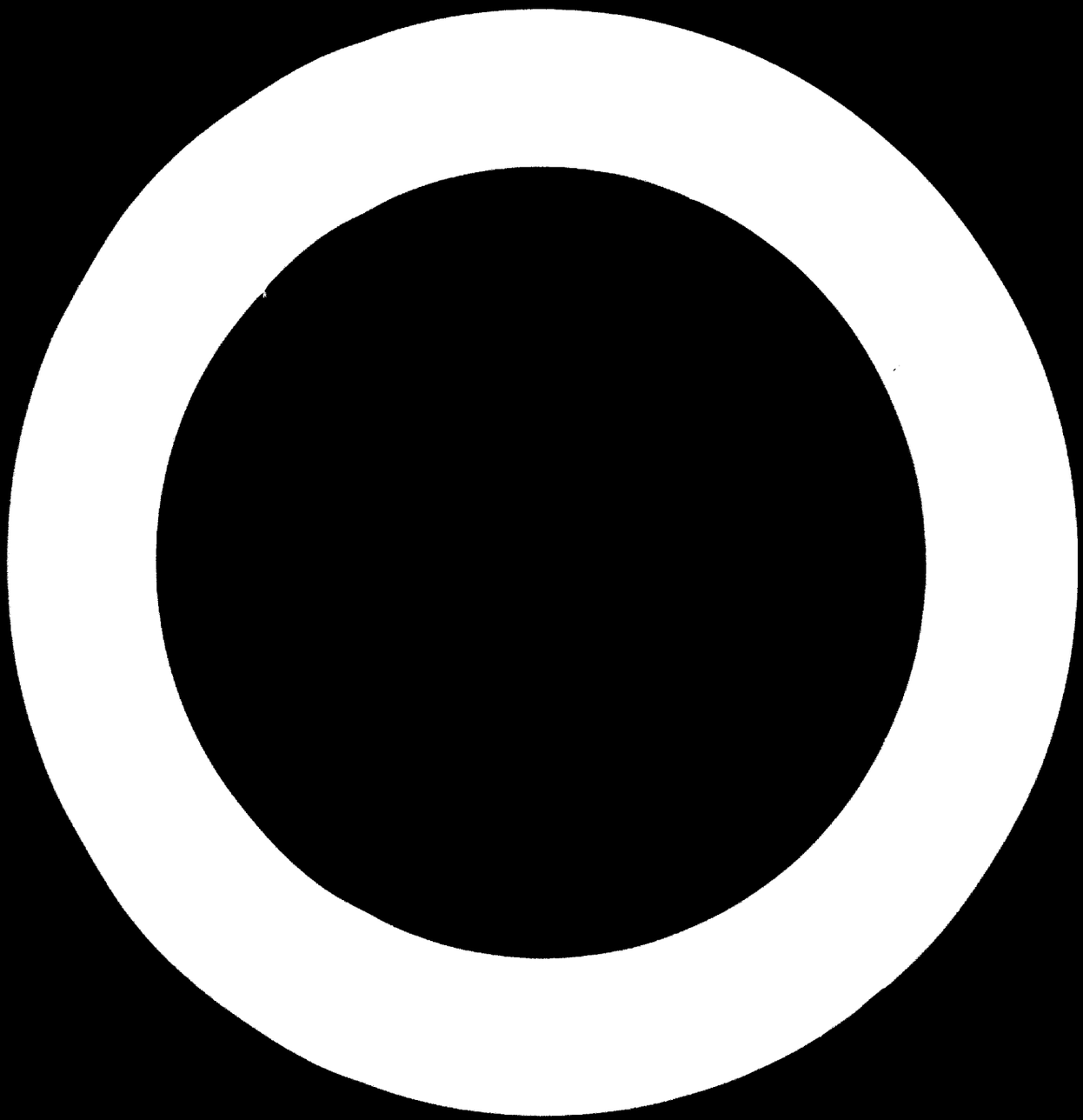

III. ENGINEERING AND METAL WORKING INDUSTRIES AND THE MANUFACTURE OF AGRICULTURAL MACHINERY AND IMPLEMENTS

A. Imports of engineering products including agricultural machinery and implements

Table 52 below was extracted from the Foreign Trade Statistics figures of the Syrian Arab Republic. All SITC items of imports for the years 1967, 1968 and 1969 are shown except those for which the total value of imports in 1969 was below one million Syrian pounds. This limitation was not applied for the SITC items considered to represent agricultural machinery and implements.

B. Manufacturing industry and the share of engineering and metal-working industry

Table 53 does not show any significant share for the metal-working industry. Indeed the only industry related to metal-working appears in Table 53 for refrigerators.

However, Table 54 shows value of gross output and net value added (NVA) for the entire industrial sector during the period 1963-1966, and includes the following five ISIC groups:

ISIC No.	Industry group
34	basic metal industries
35	metal products industries (except machinery)
36	manufacture and repair of machinery
37	manufacture and repair of electrical machinery
38	manufacture and repair of transport equipment

The NVA for all five groups above represents about 15 per cent of total NVA for industry in 1966. The value of gross output for the five groups represents less than 10 per cent of the total gross output.

The Mission was made to understand that no special surveys have been or are being undertaken of the total metal-working industries sector. Although the Third Five-Year Development Plan (1970-75) is presently under preparation, the Mission understood that some of the general areas of future development

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Table 52. Syrian Arab Republic: Imports of main metal-working industries products[a/] 1967-1969
(Value in thousand Syrian Pounds, Quantity in Tons)

SITC	Description	1967		1968		1969	
		Quantity	Value	Quantity	Value	Quantity	Value
670.00.102	Other bars & rods	73,359	26,062	84,298	27,812	132,321	45,695
670.00.11	Angles, shapes & sections of iron & steel, hot-rolled, forged, extruded, cold-formed or cold-finished, sheet piling of iron or steel whether or not drilled, unched or made from assembled elements	13,941	7,125	14,067	7,201	25,250	11,545
670.00.12	Hoop & string, of iron or steel, hot-rolled or cold-rolled	2,478	1,463	1,129	653	2,343	1,532
670.00.131	Sheets & plates, of iron & steel, not worked	16,011	13,271	13,432	8,646	32,781	16,231
670.00.132	Sheets & plates, of iron or steel enameled with zinc or lead	3,280	2,101	4,486	3,134	10,583	7,161
670.00.133	Sheets & plates of iron or steel, tinned	-	-	6,436	4,881	18,431	5,824
670.00.14	Iron or steel wire, whether or not coated, but not insulated	4,971	3,439	5,899	4,220	10,883	7,629
670.00.15	Alloy steel & high carbon steel in the forms mentioned in headings No. 670.00.06 to 670.00.14	1,698	1,303	1,258	1,300	3,315	2,201
670.00.16	Railways & tramway track construction material of iron or steel	11,353	4,915	25,829	11,805	18,427	10,177
670.00.17	Tubes & pipes of cast iron	61,366	48,387	9,172	9,569	15,851	12,183
670.00.18	Tubes & pipes of iron or steel excluding the sorts mentioned in heading No. 670.00.19	14,036	17,043	11,904	20,660	25,327	24,003
670.00.20	Tubes & pipes fittings of iron or steel	1,199	3,760	957	2,617	1,202	2,020

Table 52. Syrian Arab Republic: Imports of main metal-working industries products[a/] 1967-1969
(Value in thousand Syrian Pounds, Quantity in Tons). (Continued)

SITC	Description	1967		1968		1969	
		Quantity	Value	Quantity	Value	Quantity	Value
670.00.40	Other articles of iron or steel	3,024	4,936	3,071	7,260	1,753	2,662
	Total for SITC 67 (Iron & Steel manufactured goods)	206,736	133,805	181,938	109,758	298,467	148,863
682.2(1)	Bars, rods, angles, shapes, sections and wire of copper	722	3,180	519	2,170	499	2,326
684.2(2)	Plates, sheets & strips of aluminium	834	2,073	1,245	3,321	1,498	3,966
684.2(3)	Aluminium foil	223	794	141	498	335	1,259
	Total for SITC 68 (Non-ferrous metal manufactured goods)	1,779	6,074	1,905	5,989	2,332	7,551
691.1	Finished structural parts & structures of iron or steel	4,549	9,890	3,071	8,715	6,018	9,432
692.1(1)	Tanks, etc., for storage or manufacturing use of iron or steel	9,285	13,575	2,121	10,554	991	1,790
692.3(1)	Compressed gas cylinders of iron or steel	360	383	1,343	1,202	1,580	1,654
693.1(1)	Wire cables, ropes, plaited bands, slings & similar articles, not insulated of iron or steel	220	641	-	-	982	1,522
693.1(3)	Wire, cables, ropes, plaited bands, slings & similar articles, not insulated of aluminium	630	2,302	2	13	944	2,201
694.2(1)	Nuts, bolts, screws, rivets, washers, etc. of iron or steel	1,745	2,101	3,089	4,526	2,748	3,253

Table 52. Syrian Arab Republic: Imports of main metal-working industries products[a/], 1967-1969
(Value in thousand Syrian Pounds, Quantity in Tons) (Continued)

SITC	Description	1967		1968		1969	
		Quantity	Value	Quantity	Value	Quantity	Value
695.1	Hand tools of a kind mainly used in agriculture of forestry	160	183	310	348	417	485
695.2(1)	Hand saws & saw blades	39	279	84	502	106	653
695.2(2)	Pliers, pincers, spanners, wrenches, metal cutting shears, files, rasps, etc.	64	337	92	501	165	956
695.2(3)	Hand tools, etc., n.e.c.	61	207	340	538	323	879
695.2(4)	Inter-changeable tools for hand or machine tools	23	486	50	657	116	1,117
696.0(3)	Razors & razor blades	115	1,774	79	2,002	85	1,984
698.1(1)	Locks, padlocks & keys therfor of base metals	345	1,353	605	2,517	632	2,753
698.6(1)	Springs & leaves for springs of iron or steel	430	578	1 556	1,551	1,419	1,657
698.8(7)	Soldering & welding rods etc. of base metal or of metal carbides	612	802	1,235	1,564	1,416	1,671
	Total SITC 69 (Manufactures of metal n.e.s.)	18,638	34,891	13,977	35,190	17,942	32,007
711.4(1)	International combustion engines for aircraft	28	4,448	21	2,655	64	4,480
711.5	Internal combustion engines, other than for aircraft	1,790	10,035	2,203	13,805	3,806	19,839
712.1	Agricultural machinery & appliances for preparing & cultivating the soil	74	142	336	484	267	544
712.2	Agricultural machinery & appliances for harvesting, threshing & sorting	23	150	35	223	389	2,229

Table 52. Syrian Arab Republic: Imports of main metal-working industries products[a/], 1967-1969
(Value in thousand Syrian Pounds, Quantity in Tons) (Continued)

SITC	Description	1967		1968		1969	
		Quantity	Value	Quantity	Value	Quantity	Value
712.5	Tractors, other than road tractors for tractor-trailer combinations	466	1 790	429	1,175	2,853	10,607
712.9(1)	Presses for wine-making, etc.	-	1	49	316	53	478
712.9(9)	Other agricultural machinery	1	2	-	-	11	284
715.1	Machine-tools for working metals	490	2,491	251	1,203	1,102	13,762
717.1(1)	Spinning extruding, etc., machines	126	926	69	918	583	4,931
717.1(2)	Weaving, knitting, etc., machines	156	1,218	238	1,806	291	3,095
717.1(3)	Machines auxiliary to those of heading No. 717.1(2)	128	2,256	143	2,142	815	6,173
717.1(5)	Textile bleaching, washing, dressing, coating, printing, etc. Machinery (excluding domestic washing machines)	88	735	61	528	403	3,360
717.3	Sewing machines	566	2,044	393	1,557	956	3,407
718.4(1)	Road rollers, mechanically propelled	103	391	243	580	604	1,240
718.4(2)	Excavating, levelling, boring, etc. machinery	-	-	-	-	5,627	24,752
719.1(3)	Furnace burners, mechanical stokers, etc.	12	81	104	524	147	1,484
719.1(4)	Industrial & laboratory furnaces & ovens non-electric	542	1,013	41	185	2,204	4,362
719.1(9)	Other apparatus for treating materials with heat or cold (excluding domestic equipment)	2,152	12,877	5,766	31,855	723	2,923
719.2(1)	Pumps for liquids	390	5,394	798	6,012	1,595	6,583
719.2(2)	Pumps for gases, etc.	660	5,208	392	2,468	699	3,559

Table 27 shows the number of establishments, number of persons employed and capital for the entire Lebanese industrial sector in 1967. It is interesting to note that for the five groups referred to in table (26) the number of establishments increased from 158 in 1964 to 534 in 1967, and the number of persons employed increased from 4,452 in 1964 to 6,754 in 1967.

Table 27. Lebanon: Number of establishments, number of employees, and capital, by industry, 1967

Industry	Number of establishments	Number of employees	Capital (million L.L.)
Quarrying	318	1,154	4.9
Food products	2,386	10,871	138.1
Beverages	151	1,940	33.9
Tobacco	1	3,083	48.4
Textiles	297	6,153	99.4
Shoes, other clothes blankets and underwear	283	3,843	24.2
Wood and corks	162	1,987	20.9
Furniture	404	4,720	43.0
Paper and paper products	52	626	19.0
Printing and publishing	290	3,180	80.7
Leather and leather products	108	968	11.4
Rubber products	35	282	5.2
Chemicals	194	2,284	52.1
Petroleum and derivative	30	716	73.8
Non-metallic minerals	707	6,180	154.0
Metallurgical industries	10	739	23.0
Metallic manufactures	304	4,413	60.2
Machinery	103	646	9.6
Electrical products	47	996	15.1
Transport equipment	70	3,400	66.2
Others	162	1,493	26.3
Total	6,114	59,114	989.4

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Table 52. Syrian Arab Republic: Imports of main metal-working industries products[a/], 1967 - 1969

(Value in thousand Syrian Pounds, Quantity in Tons) (Continued)

SITC	Description	1967		1968		1969	
		Quantity	Value	Quantity	Value	Quantity	Value
719.2(3)	Centrifuges (other than cream separators) & filtering & purifying machinery for liquids & gases	546	2,990	1,087	6,447	128	1,524
719.3(1)	Lighting & loading machinery	680	3,330	606	3,149	905	3,624
719.5(2)	Machine tools for working wood, plastic	71	259	91	335	284	1,043
719.6(4)	Spraying machinery	64	608	87	576	134	1,062
719.7	Ball, roller or needle-roller bearings	150	1,654	254	2,555	406	3,726
719.8	Machinery & mechanical appliances	722	4,621	744	4,239	1,554	9,351
719.9(2)	Taps, cocks, valves & similar appliances n.e.s.	930	5,892	1,024	6,604	934	4,566
719.9(3)	Transmission shafts & cranks, pulleys	489	1,570	400	2,398	1,138	9,426
719.9(4)	Metal plastic joints (gaskets)	35	591	59	978	73	1,291
	Total for SITC 71 (Machinery other than electric)	11,482	67,509	15,924	95,717	28,748	153,705
722.1	Electric power machinery	2,174	14,217	1,672	13,345	2,837	14,433
722.2	Electric apparatus for making & breaking or for protecting electrical circuits e.g. (switchgear, etc.)	562	7,714	1,123	8,107	768	4,937
723.1	Insulated wire & cable	3,200	11,800	5,261	20,203	2,847	9,612
723.2(1)	Electrical insulators	311	764	606	1,045	1,617	1,757
724.1	Television broadcast receivers, whether or not combined with gramophone or radio	148	4,313	128	1,824	121	2,016
724.2	Radio broadcast receivers, whether or not combined with gramophone	94	2,292	172	4,540	214	5,382

Table 52. Syrian Arab Republic: Imports of main metal-working industries products[a/], 1967 - 1969
(Value in thousand Syrian Pounds, Quantity in Tons) (Continued)

SITC	Description	1967		1968		1969	
		Quantity	Value	Quantity	Value	Quantity	Value
724.9(1)	Electrical line telephone & telegraph equipment	568	6,794	195	2,693	341	5,591
724.9(9)	Other telecommunications equipment	157	3,516	45	2,844	39	1,889
725.0(1)	Domestic refrigerators, electrical	151	1,079	161	1,228	278	1,904
725.0(3)	Electric-mechanical domestic appliances, n.e.s.	108	871	46	269	204	2,042
729.1(2)	Electric accumulators (storage batteries)	433	1,077	248	778	784	1,635
729.2	Electric lamps	188	1,244	246	1,884	685	5,427
729.4(1)	Electrical starting & ignition equipment for internal combustion engines	119	1,032	237	1,710	257	2,171
729.5(2)	Other electrical measuring & controlling instruments & apparatus	31	765	184	3,516	119	2,239
729.9(3)	Electric traffic control equipment	11	163	27	277	309	1,916
	Total for SITC 72 (Electrical machinery)	8,255	54,641	10,351	64,263	11,420	62,951
732.1	Passenger motor cars (other than busses or special vehicles), whether or not assembled	260	1 079	333	1,230	1,490	10,089
732.2	Busac (including trolley buses whether or not assembled	90	313	409	2,225	674	5,552
732.3	Lorries & trucks (including ambulances, etc.) whether or not assembled	2,591	12,070	2,471	8,744	8,589	47,644
732.4	Special purpose lorries, trucks & vans, whether or not assembled	560	4,466	809	5,073	699	4,054

Table 52. Syrian Arab Republic: Imports of main metal-working industries products[a/], 1967 - 1969

(Value in thousand Syrian Pounds, Quantity in Tons) (Continued)

SITC	Description	1967		1968		1969	
		Quantity	Value	Quantity	Value	Quantity	Value
735.7	Other chassis with engines mounted	26	144	331	1,359	609	3,036
732.8(9)	Other parts for motor vehicles other than motorcycles	2,504	4,755	6,288	8,817	6,354	12,861
732.9(1)	Motorcycles, auto-cycles, etc. & side cars	255	1,463	168	1,023	555	4,412
733.1(1)	Cycles, not motorised	387	1,288	236	622	592	1,579
734.9(2)	Parts of aircraft, airships & balloons (not including rubber tyres, engines or electrical parts)	1	10	11	3,040	12	1,790
735.9	Ships & boats, n.e.s.	111	728	1,017	1,331	4,199	4,354
	Total for SITC 73 (Transport equipment)	6,785	26,316	12,073	33,464	23,773	95,371
	Grand total	253,675	323,236	236,168	334,381	382,682	500,448
	Grand total imports	2,427,041	1,008,606	3,022,523	1,556,889	3,425,791	1,405,404

a/ Only imports, other than agricultural machinery, whose value in 1969 is greater than one million Syrian Pounds.

development which the Plan may stress are: exploitation of mineral wealth, establishment of machine tool manufacturing industries, development of petroleum and petrochmical industries, and the development of irrigation systems.

Almost all medium and large scale industrial units in the metal-working sector are government-owned. Individual units under implementation are attached to the Ministry of Petroleum, Electricity and Executing Industrial Projects. Whereas operating units are attached to the Union of Engineering and Chemical Industries which is responsible to the Ministry of Industry. Operating units in the sectors of textiles, food processing, etc. are owned and operated in a similar fashion by two other unions. About 42 factories, under 19 companies, are now operated by the Union of Engineering and Chemical Industries. Although no exhaustive details could be obtained, it was reported that about 12-15 factories of the 42 are considered to be in the engineering and metal working sector.

Table 53. Syrian Arab Republic: Main industrial products of the public industrial sector, 1964-1968

Name of products	International classification for foreign trade	Unit	Years				
			1964	1965	1966	1967	1968
1. Union of textile industries							
Wool yarn	651.2(1)	Ton	483	464	643	947	1,440
Cotton yarn	651.3	Ton	17,631	17,972	18,212	19,380	19,517
Cotton textile	652.1	Ton	11,089	12,045	11,650	12,000	12,841
Wool carpets	657.5	M^2	39,458	57,786	61,874	74,128	85,000
Stockings	841.2(1)	Dozen	-	-	-	196,332	209,954
Industrial threads nylon	651.7(2)	Ton	-	-	-	251	250
Wool textiles	653.2(1)	Ton	-	-	-	857	1,090
Underwear clothes	841.1(3)	Dozen	-	-	-	525,984	621,437

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Table 53. Syrian Arab Republic: Main industrial products of the public industrial sector, 1964 - 1968 (continued)

Name of products	International classification for foreign trade	Unit	Years				
			1964	1965	1966	1967	1968
2. Chemical engineering industries							
Cement	661.2	Ton	635,139	674,490	681,596	688,172	917,091
Bottles & glass utensils	664.4	Ton	2,346	4,848	5,199	4,284	4,875
Paints	533.3(1)	Gallon	64,942	65,941	82,877	101,868	90,541
Windows glass	665.2	Ton	4,582	8,768	4,741	9,367	11,180
Matches	899.3(2)	Gross	50,070	1,310,685	1,260,100	1,299,975	1,800,000
Medical products	541.0	Syrian Pounds	156,290	147,869	300,000	310,416	352,370
Refrigerators	725.0(1)	One	7,554	4,394	7,441	5,695	8,979
Cables	723.1	1000 P.	3,917	4,669	7,500	5,387	5,217
Batteries	729.1	One	10,500	15,588	20,622	23,453	24,702
Rubber shoes	851.0(1)	Pair	2,896,616	1,947,926	2,298,356	2,291,535	1,505,947
Plastic shoes	851.0(4)	Pair	259,523	260,099	360,013	-	-
Wood (pano latteh)	631.4(1)	M^3	804	1,274	836	873	1,089
Plywood	631.2(1)	M^3	4,656	6,088	5,739	4,926	5,076
Porcelain	662.4(5)	One	-	-	-	6,828,900	5,991,160
3. Union of food industries							
Salt	276.3	Ton	16,000	21,140	11,811	19,553	19,717
Vegetable oil	421.3	Ton	28,099	35,743	30,416	26,119	22,933
Cottonoake	081.3	Ton	107,428	131,000	114,068	-	94,187
Fruit canning	053.3	Ton	1,287	791	1,037	4,319	4,777
Vegetable canning	055.5	Ton	1,262	1,086	1,212		
Sugar	061. (2)	Ton	19,140	19,490	20,537	-	83,144
Refined sugar	061. (2)	Ton	58 792	75 145	70 331	72 315	
Beer	112.3	Litre	2,377,063	1,992,295	2,069,844	1,907,000	2,336,000
Tobacco, manufactured	122.3	Ton	4,470	3,995	4,059	4,114	4,038

Source: Central Bureau of Statistics, Statistical Abstract, 1969-1970, 1971, p.144.

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Table 54. Syrian Arab Republic: Value of gross output and net value added of the industrial sector, 1963 - 1966
(at current prices thousands S.P.)

Economic activity	1963		1964		1965		1966	
	Net value added	Gross output	Net value added	Gross output	Net value added	Gross output	Net value added	Gross output
Food manufacturing	51729	261409	112777	280718	110041	362528	107773	333042
Beverage industry	5032	12897	4106	9185	4489	10642	2551	10999
Tobacco industry	66136	92688	54959	90902	70813	101210	75069	101472
Yarn and textiles industries (ginning incl.)	145170	502629	113316	527702	201009	725023	199962	696585
Clothing wearing apparel and footwear	8953	33867	9870	25437	10988	28275	14201	31571
Wood and cork manufacturing	3225	7627	2722	5981	2531	5926	3855	12869
Furniture manufacturing	35679	56713	15784	37908	15138	37159	13877	33512
Paper and products manufacturing	892	3611	419	1329	343	1106	487	2835
Printing industries	4644	7466	2483	6505	2885	7602	4369	12009
Leather and its products industries	5495	35696	2113	9505	2840	11450	2033	15627
Rubber products industry	4023	11405	2226	7663	5261	12462	5371	13579
Chemical and petroleum industries	30759	147585	20077	114787	20519	114589	21123	113322
Non metallic products industries	28571	66160	25082	66240	27095	61875	12537	44857
Basic metal industries	1490	4417	1801	3750	1612	4232	11981	31923
Metal products industries (except machinery)	18767	31529	9738	26545	10980	25339	4202	11573
Manufacture and repair of machinery	2621	11999	1702	3368	1537	2995	19765	47282

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Table 54. Syrian Arab Republic: Value of gross output and net value added of the industrial sector, 1963 - 1966 (cont.)

(at current prices thousands S.P.)

Economic activity	1963 Net value added	1963 Gross output	1964 Net value added	1964 Gross output	1965 Net value added	1965 Gross output	1966 Net value added	1966 Gross output
Manufacture and repair of electric machinery	1137	4869	5147	10110	10145	21739	13809	23806
Manufacture and repair of transport equipment	8751	14553	7408	11339	7075	10951	33377	33529
Miscellaneous	3436	12588	4925	15204	5519	17482	6495	24713
Non-industrial input	21912	21912	18881	18881	20390	20390	-	-
Total	445578	1341618	415546	1271059	530809	1580755	552837	1594985
Mining and quarrying	4018	5122	4286	5386	4500	5655	3045	3830
Electric and water	27363	48509	31934	64179	36087	72522	34902	66823
Total	476959	1395249	451766	1340624	571396	1658952	590784	1665636

Source: Central Bureau of Statistics, Statistical Abstract 1969/1970, Syrian Arab Republic, p. 147

Note: The gross output value includes the value of goods and services produced or rendered even if it is not of the nature of its main activity.

The major metal working units are the following:

(a) Two factories (about 9 years old) producing about 20,000 refrigerators per year;

(b) a factory (about 5 years old) producing stoves, household pressure cookers, cutlery, etc.,

(c) a factory (about 12 years old) producing petrol tanks, steam boilers and fabricated items such as hangers, roof trusses, etc. and also automotive oil filters and filter elements. The annual turnover of this unit was reported to be around 2.75 million dollars; and,

(d) a factory in Aleppo (about 7 years old) producing nails and allied products.

The Mission understood that the Union is also in the process of establishing a factory for the manufacture of electric motors (capacity 25,000 units per year, 1/3 HP - 5 HP). Mention should also be made here of a factory owned by the same Union, and producing automotive batteries (capacity 30,000 units per year).

In the private sector, a large number of small workshops are in operation in Damascus, in Aleppo as well as in other major cities. Most of these workshops have between 1-5 workers, occupy small and inadequate work areas, and own some basic universal machine tools. They are mostly involved in the repair of motor vehicles, tractors, combine harvesters and engines; and some manufacture deep-well and centrifugal pumps and some agricultural implements and machines which are more adapted to local requirements than imported models. The Mission observed that these units possess a high-level of mechanical skill, ability and ingenuity and are quite capable of manufacturing a variety of components if they are given some guidance and assistance. Such guidance and assistance should include raw material selection, standardization, tooling, improved production techniques (use of jigs, fixtures and dies), inspection and quality control, heat treatment, etc. The Mission therefore recommended that a special and comprehensive national survey be undertaken so that the potential of these small units may be developed to its fullest extent. It is possible that a programme for the establishment of new, and the improvement of existing,

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industrial estates, including the provision of common facilities centres (quality control, heat treatment, etc.) may provide most of the required guidance and assistance.

Of the major industrial projects under implementation by the Ministry of Petroleum, Electricity and Executing Industrial Projects, the Mission concerned itself mainly with the Syrian Tractors, Engines, Mechanical and Engineering Products Factories (M.G.M.), Aleppo. A land area of 156 hectares has been allocated near Aleppo for this factory. The production facilities which the M.G.M. proposes to establish are: a tractor and engine assembly line, a machine shop, a foundry and a forge shop. The production programme proposed for these facilities includes tractors, engines, agricultural implements, spare parts, etc. M.G.M. is commencing its programme with an assembly line for tractors and engines. The equipment for the assembly line is about to be ordered by the Management. The civil engineering construction has been started, but not yet completed, on an area of 60 m. x 240 m. (spans of 12 m.). This area is a part of the total covered area of 132 m. x 240 m. which will ultimately house the machine shop and the assembly line. M.G.M. concluded, in November 1968, a contract with the firm of SOMECA for the manufacture, under licence, of SOMECA -670 standard wheel type tractor of 65 HP with OM/CO-3-60 Diesel engine. Under the terms of the contract, SOMECA will provide M.G.M. with the technical know-how in terms of technical drawings, bill of materials, process sheets, identification of production equipment, and provision of jigs and fixtures, etc. It was the Mission's understanding that SOMECA will train M.G.M. engineers and technicians and will advise M.G.M. on the installation of the equipment; but the responsibility for the proper installation, start up and operation rests with M.G.M. Management. With regard to the machine shop, the Management is in the process of selecting the machine tools and equipment and preparing specifications for international tenders. With regard to the foundry and forge shop the Management is still investigating alternative capacities, processes and equipment. At present, the Management feels that a capacity of 3,000 tons per year for the forge shop and 5,000 tons per year for the foundry (grey cast iron, malleable iron and cast steel) would be suitable. The machine shop, foundry and forge, which are not expected to become operational before 1974, are intended mainly for

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the phased production of about 40 per cent of the tractor and engine components. The Management expects to be faced with the problem of spare capacities in their production facilities and is seeking ways and means of effective utilization of this spare capacity. In this connection, the Management has decided to manufacture agricultural implements and has initiated steps to conclude arrangements for the assembly and part manufacture of other products.

The M.G.M. Management is anxious to finalize as soon as possible its agricultural implements manufacturing programme, in order to be able to determine the suitable capacities and equipment for the machine shop, foundry and the forge shop. The Ministry of Agriculture and Agrarian Reform suggested late in 1969 the following implements for manufacture by M.G.M.:

(a) Mould Board Plows	350 Nos/yr
(b) Disc Plow	650
(c) Disc Tillers	150
(d) Tandem Disc Harrows	150
(e) Cultivators	200
(f) Furrow Openers	75
(g) Fertilizer Distributors	50
(h) Grain Drills	50
(i) Trailers	400

The preliminary specifications of the above implements, as provided by the Ministry, require further detailed technical elaboration in terms of design, raw material selection and detailed specifications on heat treatment of components and physical properties of final product. The Management of M.G.M. is yet to decide whether to manufacture the implements under licence or develop local designs. The production programme proposed by the Ministry is based on a study undertaken by a Committee in 1969.

In view of the significant importance of M.G.M. not only to the engineering industries sector in the Syrian Arab Republic, but also to the entire industrial sector of the national economy, the mission was of the opinion that every effort should be made to ensure the successful implementation,

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In 1969, a survey was undertaken by UNFSOB and the survey results were presented in a document entitled "Short and Medium-term Prospects for Exports of Manufactured Goods from Lebanon" (TD/B/c.2/79). The document refers to a number of products which are relevant to this report. These are as follows:

Iron and steel bars (SITC 673)

In 1966, the four largest iron and steel plants reported production of about 81,000 tons of twisted reinforcing bars or braided and plaited bars, mostly of the former type. In addition, about 48,000 metres of bars were produced by miscellaneous manufacturing enterprises.

Domestic production increased in recent years. The two principal manufacturers of reinforcing bars produce about 100,000 tons per annum. The largest firm is operating at about 75 per cent capacity, producing around 30,000 tons of smooth bars and 30,000 tons of twisted bars. Exports of bars amounted to 10,000 tons in 1966. However, exports in subsequent years declined due to intensive competition.

Steel tubes, pipes and fittings (SITC 678.3 and 678.5)

In 1968, the output of steel tubes, pipes and fittings in Lebanon was expected to reach about 13,000 tons. Imports were estimated at 10,000 tons and exports at 3,000 tons. Domestic consumption has apparently increased from about 16,000 tons in 1966 to about 20,000 tons in 1968.

The largest producer increased his capacity in 1967 to 30,000 tons on a one-shift basis (with a possible two-shift capacity of 60,000 tons). However, his current production is only 10,000 tons or one-third of his one-shift capacity.

Iron castings and forgings (SITC 678.1 and 679)

The Lebanese foundry industry produced in 1966 about 11,500 tons of different products such as cast-iron pipes and corners, tops, iron joints, iron sewers etc. Exports amounted to around 1,200 tons in the same year.

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start-up and operation of the project. In particular, the Mission made the following specific recommendations:

(a) In order to assist M.C.M. in launching a successful agricultural implements programme, the Mission recommended the provision of an expert in the Rationalization of Agricultural Implements Manufacturing;

(b) the Mission further recommends the provision of a senior expert in the Organization and Operation of Engineering Industries;

(c) the provision of an expert in the Establishment of Foundries was also recommended by the Mission;

(d) the Mission further recommends the provision of an Expert in the Establishment of a Forge Shop;

(e) in addition to the above, the provision of an Expert in the Rationalization of Engineering Components Sub-Contracting was also recommended; and,

(f) finally, the Mission recommends that a programme of fellowships for the training of Syrian nationals in the various disciplines of metal-working and engineering industries, foundry and forge technology should be formulated and implemented at the earliest possible date by UNIDO.

In addition to the above, the Mission was of the opinion that some relevant specialized training courses in the same disciplines could be initiated by existing higher education institutions such as the Technological Institute in Damascus and the Aleppo University.

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ANNEX I

SYRIAN ARAB REPUBLIC

A. Geographic features

The Syrian Arab Republic lies on the eastern coast of the Mediterranean sea, bounded by Turkey on the north, Irak from the east, Palestine and Jordan from the south and by Lebanon and the Mediterranean sea on the west.

The total area of the Syrian Arab Republic is 18,517,971 hectares, of which 8 million hectares are cultivated land and the remainder is desert or rocky mountains. The desert areas are suitable for grass growing and are used as pastures during years of sufficient rainfall.

Geographically, Syria may be divided into four areas:

(1) The coast: which lies between the mountains and the sea.

(2) The mountains: which lie from the north to the south of the country and include all mountains and hills.

(3) The interior areas or the plains which contain the plains of Damascus, Homs, Hama, Aleppo, Hasakeh and Dar'a situated to the east of the mountains.

(4) The desert area which consists of the desert plains situated in the south-eastern part of the country on the Jordan and Iraqi borders.

B. Administrative divisions

The Syrian Arab Republic is administratively divided into 14 Mohafazat. (plural of Mohafaza, the Arabic equivalent of District) Each Mohafaza is generally divided into Manatik (plural of Mantika, Arabic equivalent of sub-district). Each Mantika is further sub-divided into smaller administrative Units called Nawahi (plural of Nahia). A Nahia contains a number of villages and a village is the smallest administrative unit.

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A Mohafaza is headed by a "Mohafez" (District Commissioner), a Mantika is headed by a "Mudir-el-Mantika" (sub-district officer) while a Nahia is directed by a "Mudir-el-Nahia" and a village is represented by one (or more) Mokhtar (village headman) who is responsible for the village and the surrounding farms. All these employees are appointed by the Ministry of Interior.

Usually Mokhtars are responsible to the Mudir-el-Nahia. He is responsible to the Mudir-el-Mantika and the latter is responsible to the Mohafez except in the cases noted below where villages are attached directly to the Mudir-el-Mantika or to the Mohafez.

Mohafazat centres are the chief cities after which the Mohafazat are named and Mantika centres are the chief towns. There are in all 44 Mantika and 115 Nahias.

Bibliography

Al-Rawi, H., Mechanization of Agriculture in Iraq

FAO, Indicative World Plan for Agricultural Development, Near East, 1965-1985, Vol. I, 1966, FAO.

Hashim Dr. J., An Evaluation of Economic Growth in Iraq 1950-1970, and Part I.

Iraq: Central Statistical Organization, Statistical Abstract, 1966, 1967, 1968, 1969, Baghdad.

Iraq: Central Statistical Organization, Industrial Survey, 1968, Baghdad.

Jordan Centre for Industrial Development, Jordan Centre for Industrial Development Report, 13 December 1965.

Jordan: Department of Statistics, External Trade Statistics, 1964, 1965, 1966, 1967, 1968.

Jordan: Department of Statistics, Industrial Census 1967.

Jordan: Department of Statistics, National Account, 1968.

Kuwait: Planning Board, Foreign Trade Statistics 1966, 1967 and 1968.

Kuwait: Planning Board, Industrial Census, 1966.

Lebanon: Statistical Bureau, Recueil de Statistiques Libanaises, 1967, 1968, 1969.

Saudi Arabia: General Statistical Department, Foreign Trade Statistics, 1384, 1385 H.

Saudi Arabia: Planning Board, Development Plan, 1390 H.

Syrian Arab Republic: Central Bureau of Statistics, Statistical Abstract, 1969-1970.

UNESOB: Studies on Selected Development Problems in Various Countries in the Middle East, 1969.

UNESOB: Studies on Selected Development Problems in Various Countries in the Middle East, 1970.

UNESOB: Short and Medium-Term Prospects for Exports of Manufactured Goods from Lebanon, 1969, (TD/B/C.2/79).

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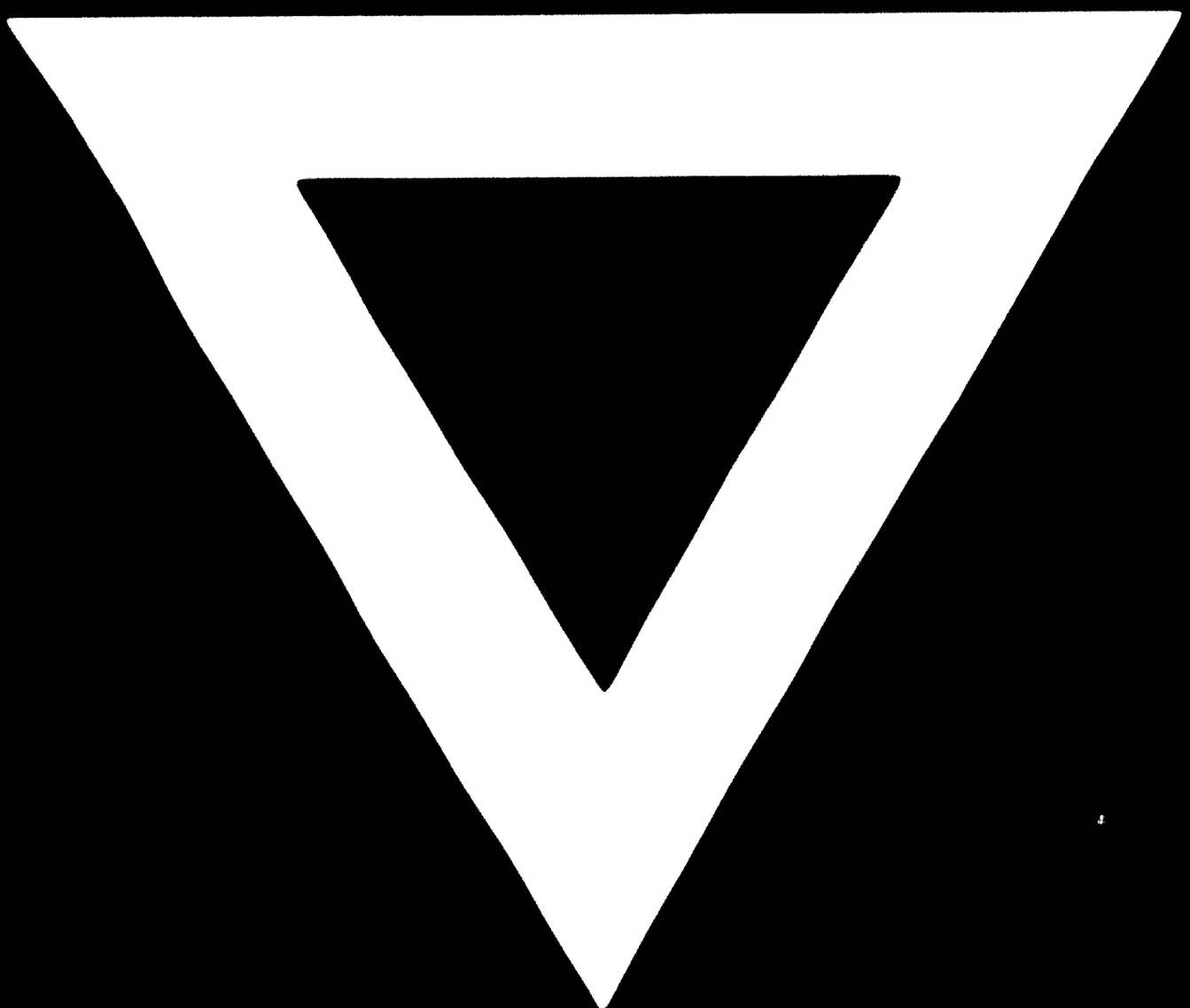

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In 1968, there was only one predominant producer of cast-iron products, who also manufactured brass foundry products. The firm worked at only about two-thirds of its one-shift capacity.

Aluminium sheets, discs etc and finished structural parts and structure (SITC 684 and 691)

In 1966, 18 out of 25 aluminium products manufacturers reported an output of 10,000 tons, mainly doors, windows, discs and profiles. The two largest establishments account for the bulk of output and exports.

Although the industry has much idle capacity, the domestic market is, to a considerable extent, supplied by imports.

Domestic electrical equipment (SITC 725)

Exports of domestic electrical equipment increased rapidly during the early sixties and amount L 712,000 in 1966. These were mainly composed of electric domestic refrigerators and electric water heaters.

In 1966, a large new plant started manufacturing refrigerators. The full capacity of this plant permits an output of 30,000 to 40,000 units a year working two-shifts, but actual production was estimated to be 6,000 units in 1968 with one-shift operation.

Domestic producers face competition in the local and export markets. However, the domestically produced 12 cubic-foot model, for example, is retailed at a price 16 per cent lower than that of the United States product, which includes 30 per cent import duty.

Metal containers for storage and transport; household equipment of basic metal, (SITC 692 and 697)

This group comprises containers for oil, kerosene tins, miscellaneous tin boxes (for canned food, paints, etc) and gas cylinders. Only gas cylinders have been exported in considerable quantities. In 1966, these exports of the whole group (including gas cylinders) amounted to about LL 3 million, while total

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exports of the whole group (including gas cylinders) amounted to LL.3.8 million.

Boilers (bathroom water heaters, steam boilers etc.) metal stoves, and iron, steel and aluminium domestic utensils are the main products in the base-metal household equipment. Exports in this group amounted to LL.561,000 in 1966. However, on the domestic market, boilers have to compete with imports from Italy, France, the Federal Republic of Germany and other European countries.

It is believed that the same level of protection, combined with standardization measures, could reduce imports and increase domestic sales. If the ten leading firms rationalized production and drawback procedures were streamlined, exports of household equipment could expand.

Nails, wire products, blacksmiths' wares, etc (SITC 693, 694 and 698)

The domestic demand for these products is covered mainly by imports. Output could be expanded with existing production capacity. Sharp competition in both the domestic and external markets, makes it difficult for this industry to increase its share in domestic supply or to expand exports.

C. The manufacture of agricultural machinery and implements in Lebanon

Although it is felt that the domestic market for agricultural machinery and implements is limited in Lebanon, it is also accepted that there are items which could be manufactured locally. The standard Arab chisel plough, cultivators, harrows, sprayers, sprinkler irrigation units, equipment for potato and beetroot crops, pumps, stone pickers and trailers are some of the items for consideration.

Most of the existing facilities for the manufacture of agricultural machinery in the country are small-scale, with limited production facilities and product line. It is reported that there are 15-18 manufacturers of agricultural machinery out of which around 10 are located in and around the

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