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# AGRICULTURAL DEVELOPMENT STRATEGIES IN A SMALL ECONOMY: THE CASE OF TUNISIA

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# Agricultural Development Strategies in a Small Economy: The Case of Tunisia

by

Reynold P. Dahl*

In recent years there has been increased emphasis on agricultural development and its contribution to economic growth in developing countries. Development economists have referred to this as a shift away from an earlier "industrial fundamentalism" to an emphasis on growth in agricultural production and productivity in the overall development process (7). In fact, we may be witnessing today a shift toward "agricultural fundamentalism" as evidenced by a recent study which points out that "few nations achieve high per capita incomes without first achieving substantial gains in agricultural productivity" (4).

The formulation of successful strategies for total economic development in individual countries is related to their basic factor endowments. While most countries have an agricultural resource base, some are more favorably endowed than others with productive agricultural land, a favorable climate with adequate amounts and distribution of rainfall, and cheap supplies of irrigation water. The returns to public investments in the agricultural sector may compare less favorably with investments in other lines of economic activity in countries with limited agricultural resources.

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The purpose of this paper is to analyze agricultural development strategies and policies in Tunisia, a small country that is poorly endowed with all agricultural production factors except labor. Even in the case of the latter, the quality has been low because of limited levels of education and training of the rural population. The Government of Tunisia is attempting to alleviate this problem through sizeable investments in public education. Since achieving its independence, Tunisia has devoted nearly one-third of its public investments to education. Improving the quality of its most abundant resource, human capital, through public support of education has been its principal overall strategy for total economic development.

While much of Tunisia's agricultural resources must be considered marginal relative to other countries endowed with a more favorable climate, agriculture has figured high in Tunisia's development plans because much of its limited resources are in this sector.

## The Agricultural Economy

Tunisia is the smallest of the North African countries and is situated in a favorable position near the center of the Mediterranean. In 1968, it had a population of 4.8 million with more than one-half of the population deriving its livelihood from agriculture and agriculturally related industries. The current population is large relative to other resources such as land and capital. Consequently, its annual population growth of 2.5-2.8 per cent is considered excessive and the Government of Tunisia is supporting family planning programs to reduce the rate of population growth.

Tunisia's attempts to achieve economic development have met with some success. Between 1960 and 1968, Gross Domestic Product grew in real terms at a compound annual rate of 4.2 per cent. Average per capita GDP was $187 in 1968, although in the rural sector it is much lower. Much of Tunisia's economic growth is attributable to the extractive industries such as phosphate rock mining and processing and petroleum. Tourisim and related service industries have grown at a very rapid rate because of Tunisia's favorable location on the Mediterranean and the expansion in tourist facilities.

Economic growth in the total economy would have occurred at a faster rate had agriculture, the largest single sector of the economy, been able to contribute to that growth. As shown in Table 1, agriculture and food industries accounted for one-third of the GDP in 1961. Value added by the agricultural sector reached a high of 131 million dinars in 1965 but declined to 88 million dinars in 1967. During the latter year, agriculture and food industries contributed only 20 per cent toward the total GDP.

The poor performance of the agricultural sector during the years 1966 through 1968 is due in no small part to droughts that occurred during this period. There can be little doubt that climate is a limiting factor in agricultural production in Tunisia. Rainfall is extremely variable both within and between crop years which results in substantial variability in crop and livestock output from year to year.

One study of Tunisian agriculture points out "Historical data indicate a good grain crop usually occurs once during a five year cycle, which

Table 1. Gross Domestic Product at Factor Cost from Agriculture, Agricultural and Food Industries, and Total, at 1966 Prices, 1960-68

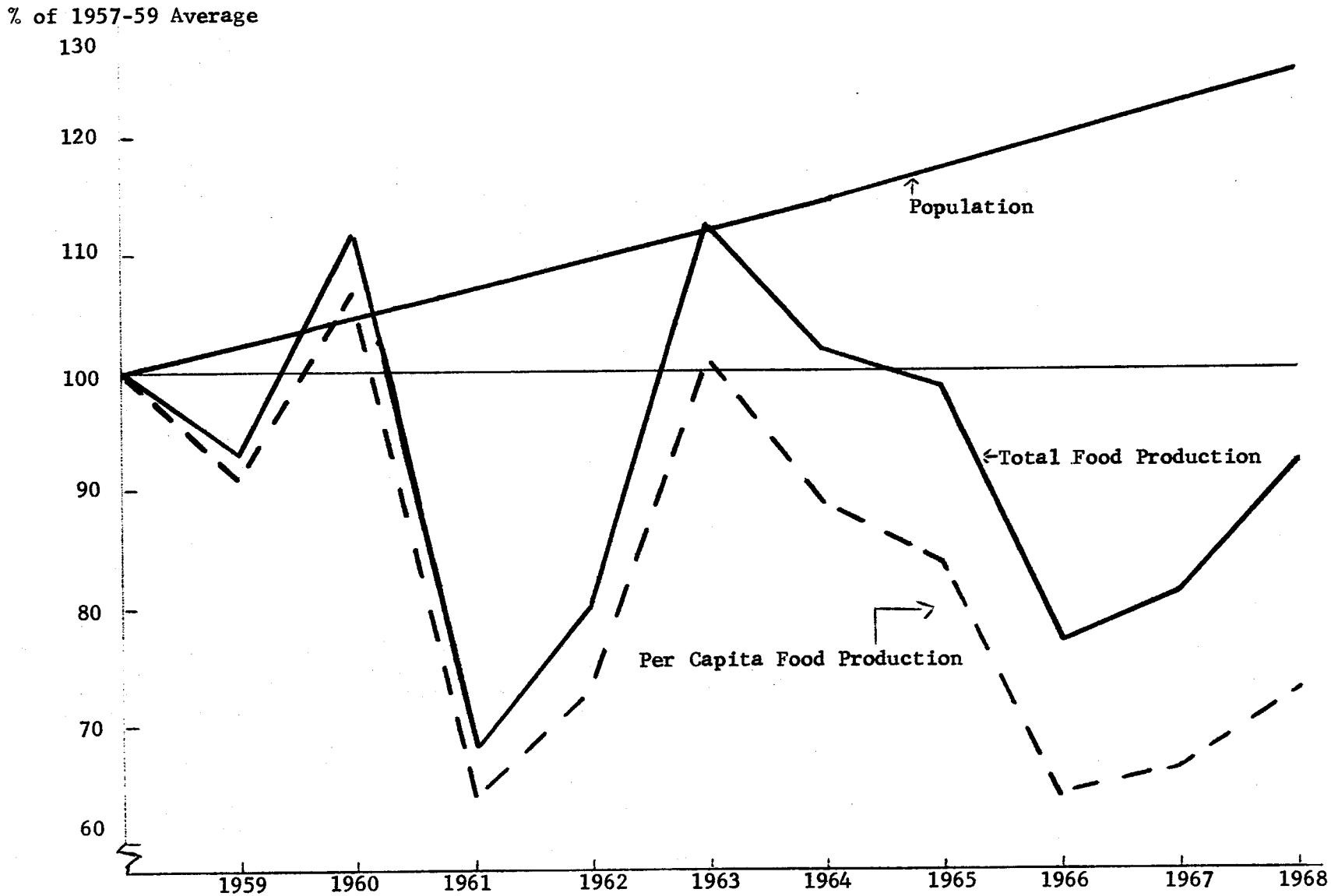
| Year | Agriculture | Agricultural and Food Industries | Total Agriculture and Food Industries | GDP Total | Percent Agriculture and Food Industries of Total |
|---|---|---|---|---|---|
| | | | (millions of dinars) | | |
| 1960 | 85.2 | 23.7 | 95.0 | 337.7 | 28.1 |
| 1961 | 92.0 | 31.8 | 123.8 | 368.5 | 33.6 |
| 1962 | 89.0 | 27.2 | 116.2 | 381.4 | 30.5 |
| 1963 | 95.7 | 26.3 | 122.0 | 396.8 | 30.7 |
| 1964 | 99.3 | 27.6 | 126.9 | 418.6 | 30.3 |
| 1965 | 102.5 | 28.5 | 131.0 | 441.7 | 29.7 |
| 1966 | 74.5 | 26.3 | 100.8 | 429.9 | 23.4 |
| 1967 | 63.8 | 24.6 | 88.4 | 434.7 | 20.3 |
| 1968 | 76.7 | 27.6 | 104.3 | 470.3 | 22.2 |

Source: Republique Tunisienne, Secrétariat d' Etat au Plan et à l' Economie Nationale, Plan de Developpement Econonmique et Social, 1969-1972, Annexe Statistique.

also includes two fair and two poor crop years. Cereals are particularly susceptible to damage by hail, the hot sirocco wind from the desert, locusts, and fungoid blights. In addition, serious crop failure may result from unusually dry fall and winter weather, which delays sowing. In general, grain farmers only on the northern plains and inland plains of the Upper Tell can expect a reasonably regular production pattern from year to year" (1). The Tell is the region of Tunisia that lies north of the southern dorsal of the Atlas Mountains. It comprises about one-fourth or less of the country and contains the productive valleys of Tunisia's principal river, the Medjerda. Average annual rainfall in this area is 16-24 inches. The Central Region of Tunisia consists of a plateau which has a climate that is a mixture of the Mediterranean and desert climates. It is best suited for grazing and olive production with the latter concentrated in the coastal areas of the Region. Dryland cereal production also occurs here, but it is a hazardous enterprise. A study has shown that wheat yields in Central Tunisia are twice as variable as in the North. In only four years out of six did durum wheat yields lie in the range .9 - 3.3 quintals per hectare. In the other two years, it was outside the range, either above or below. In one year out of six the farmer in Central Tunisia only gets back a little more than twice his seed (8).

Trends and variablilities in total food production in Tunisia relative to population changes are shown in Figure 1. Average total food production and population during the three years 1957-59 is the base period. In only three years of the following decade did total food production rise above that in the base period. While trends are difficult to delineate when

Figure 1. Indices of Total and Per Capita Food Production and Population, Tunisia, (1957-59 = 100)




Source: Indices of Agricultural Production, 1959-1968, U.S. Department of Agriculture, Economic Research Service, Foreign Regional Analysis Division, ERS, Foreign 265.

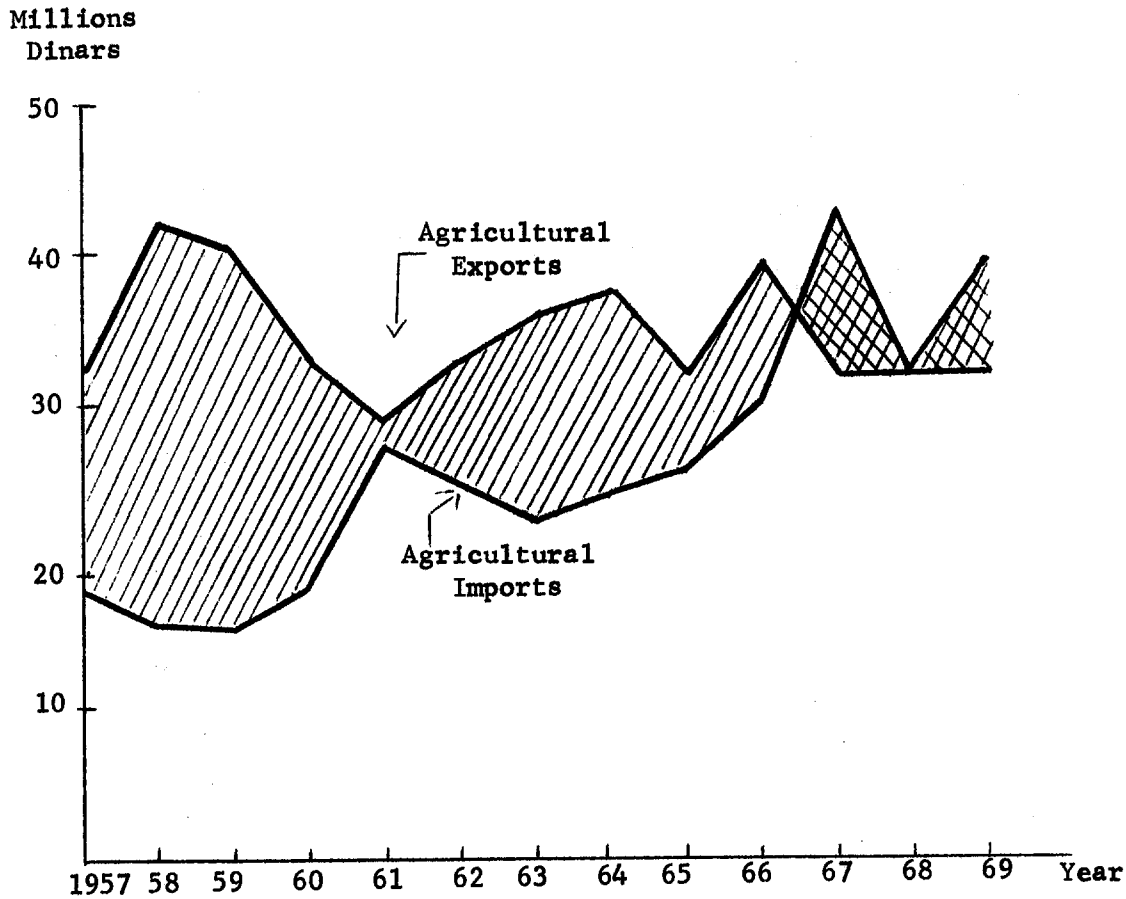
food production varies so much from year to year, one cannot conclude from this chart that Tunisian food production has shown a rising trend over the past decade. Population, on the other hand, in 1968 was 26 per cent higher than in the base period 1957-59. As a result, food production per capita in Tunisia has fallen. Domestic food production per capita in 1968 was only 68 per cent of its level in 1957-59. As was previously pointed out, the last three years of the period were plagued by drought. Had these years been more "normal", however, it is still difficult to conclude that domestic food production would have improved much in total or on a per capita basis over the past decade.

Agricultural Trade

The stagnant nature of domestic food production in Tunisia coupled with a steady increase in population is reflected in rising imports of food and agricultural products. As shown in Figure 2, agricultural imports increased from 18.3 million dinars in 1957 to an all-time high of 43.7 million dinars in 1967. While Tunisia's agricultural exports have varied substantially from year to year, they have not trended up as have imports. The total value of agricultural exports in 1969 was 32 million dinars or about the same as in 1957.

Since agricultural exports have not increased to offset the higher imports of food and agricultural products, the commercial balance of trade in the agricultural sector has shifted from a positive trade balance in the period 1957-66 to a negative balance in 1967 and 1969. Tunisia, like many other developing countries, is confronted with the problem of a shortage

Figure 2. Food and Agricultural Exports and Imports, Tunisia, 1957-1968




Sources of Data: See Tables 1 and 2, Appendix

of foreign exchange and a deficit in its overall balance of payments. It has been disappointing to Tunisian economic planners that the agricultural sector has not been able to contribute to the solution of the payments deficit problem.

Food Imports

As shown in Table 2, cereals comprise the largest category of Tunisia's food imports. It is also evident from the table that growth in cereals imports in recent years has accounted for a substantial share of the increase in total food imports. In 1969, imports of cereals, most of which is wheat, accounted for nearly half of the total food imports shown in the table. Tunisia has been fortunate in being able to import most of its increased wheat needs under concessional terms such as those available under the United States PL480 program. This program together with food aid provided under the World Food Program and special grants from EEC countries and Canada have enabled Tunisia to cover much of its increased wheat import needs without using scarce foreign exchange reserves for this purpose (Table 3).

Since cereals loom so large in Tunisia's total food imports, it is evident that imports could be substantially reduced if productivity in the domestic cereals sector is improved. The Government of Tunisia recognizes this and has undertaken a major effort to increase cereals output through its accelerated cereals production program that was adopted in 1967. Although the best prospects for substituting domestic food production for imports are probably in cereals, limited additional opportunities for import substitution are found in milk and dairy products. Tropical

Table 2. Imports of Principal Food Products, Tunisia (1957-1969)

| Year | Cereals | Dairy Products | Coffee and Tea | Sugar | Others | Total |
|---|---|---|---|---|---|---|
| | | | (millions of dinars) | | | |
| 1957 | 3.5 | 1.3 | 2.6 | 3.8 | 4.9 | 16.1 |
| 1958 | 1.0 | 1.2 | 2.1 | 3.6 | 4.4 | 12.3 |
| 1959 | 2.3 | 1.2 | 2.4 | 3.2 | 3.4 | 12.5 |
| 1960 | 5.1 | 1.2 | 2.2 | 3.1 | 3.7 | 15.2 |
| 1961 | 1.3 | 1.3 | 2.4 | 2.7 | 17.0 | 23.8 |
| 1962 | 1.1 | 1.5 | 2.4 | 2.8 | 13.2 | 20.9 |
| 1963 | 5.0 | 1.3 | 2.7 | 3.1 | 3.5 | 15.5 |
| 1964 | 2.8 | 1.3 | 2.8 | 7.4 | 2.8 | 17.1 |
| 1965 | 8.6 | 1.3 | 2.3 | 3.2 | 2.4* | 17.9 |
| 1966 | 8.3* | 1.9 | 3.1 | 2.8 | 3.6 | 19.5 |
| 1967 | 17.4 | 2.1 | 3.9 | 3.1 | 2.8 | 29.4 |
| 1968 | 11.4 | 2.5 | 2.1 | 2.9 | 3.6 | 22.4 |
| 1969 | 13.4 | 3.5 | 2.6 | 3.5 | 4.3 | 27.3 |

* Estimated

Source: Evolution Du Commerce Exterieuv De La Tunisie, 1956 à 1965, République Tunisienne, Secretariat d' Etat au Plan et à l' Economie Nationale, Service des Statistiques du Commerce, Mars 1966.

RAPPORT ANNUEL, 1968, 1969, Banque Centrale de Tunisie.

Table 3. Estimated Wheat Imports by Type of Program, Tunisia

| Program | 1967/68 | 1968/69 | 1969/70 |
|---|---|---|---|
| | (thousand metric tons) | | |
| Commercial | 243 | 66 | 77 |
| Concessional | 171 | 225 | 458 |
| PL 480 | 171 | 206 | 201 |
| Title I | 152 | 120 | 115 |
| Title II | 19 | 86 | 86 |
| Other | | | |
| World Food Program | --- | --- | 69 |
| EEC and Canada | --- | 19 | 163 |
| Flood Relief | --- | --- | 25 |
| TOTAL | 414 | 291 | 535 |

Source: Food for Peace Office, USAID, Tunis

commodities such as coffee and tea cannot be produced in Tunisia. A small domestic sugar industry has developed in the country and sugar beets have figured in Tunisia's agricultural production plans. It is questionable, however, whether Tunisia can produce sugar domestically as cheaply as this commodity can be purchased in international markets.

Although not included among the imports of principal food products in Table 2, Tunisia has imported sizeable quantities of soybean oil from the U.S. under PL480 since 1962/63. Imports of soybean oil are included with "other agricultural products" in Table 1, Appendix. These imports have enabled Tunisia to increase its consumption of vegetable oils during a period when domestic production of olive oil has been at low levels. The substitution of cheaper imported soybean and other vegetable oils in home consumption for more expensive domestically produced olive oil has made it possible for Tunisia to register only a small decline in olive oil exports. Olive oil production declined 15 per cent from its average in 1956/57-1961/62 to 1962/63-1967/68, but exports registered only a 7 per cent decline during this period. The soybean oil imports also enabled the country to increase its total consumption of vegetable oils by 15 per cent over this same period (2).

## Food Exports

As shown in Table 4, olive oil is Tunisia's most important agricultural export. Tunisia often has ranked second only to Spain in world olive oil exports. In the past, this commodity has accounted for about 20 per cent of Tunisia's total export earnings and about 40 per cent of

Table 4. Exports of Principal Food Products, Tunisia, 1957-1969

| Year | Live Animals | Vegetables | Fish | Citrus | Fruits and Nuts | Olive Oil | Canned Fruits and Vegetables | Wine | Cereals | Other | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (millions of dinars) | | | | | | |
| 1957 | 1.6 | * | 0.9 | 1.6 | 0.9 | 7.9 | 0.7 | 7.6 | 4.0 | 2.7 | 27.7 |
| 1958 | 1.8 | * | 0.8 | 1.9 | 1.2 | 9.2 | 0.9 | 12.9 | 6.4 | 1.7 | 36.7 |
| 1959 | 1.0 | * | 0.7 | 1.8 | 0.8 | 14.4 | 0.8 | 7.4 | 6.3 | 2.1 | 35.3 |
| 1960 | 1.3 | * | 0.8 | 1.6 | 1.2 | 5.8 | 0.9 | 7.3 | 7.0 | 1.8 | 27.6 |
| 1961 | 1.1 | * | 0.6 | 1.9 | 0.8 | 9.6 | 1.0 | 7.9 | 1.6 | 1.3 | 25.7 |
| 1962 | 1.2 | * | 0.7 | 1.8 | 1.3 | 12.8 | 1.5 | 7.6 | 1.4 | 1.5 | 29.8 |
| 1963 | 1.4 | * | 0.6 | 1.8 | 0.7 | 9.9 | 1.6 | 10.0 | 4.0 | 1.4 | 31.4 |
| 1964 | 1.5 | * | 0.6 | 2.2 | 1.8 | 11.9 | 2.2 | 8.6 | 3.3 | 1.5 | 33.6 |
| 1965 | 2.5 | * | 0.3 | 2.6 | 1.5 | 13.5 | 2.0 | 2.6 | 0.3 | 1.0 | 26.4 |
| 1966 | 2.2 | * | 1.4 | 2.9 | 2.5 | 13.4 | 1.8 | 4.0 | 4.3 | 1.0 | 33.3 |
| 1967 | 1.5 | 1.1 | 0.8 | 3.3 | 1.1 | 8.0 | 2.3 | 5.0 | 0.1 | 2.2 | 25.3 |
| 1968 | 1.4 | 0.8 | 0.6 | 1.6 | 1.7 | 11.9 | 1.8 | 3.0 | 0.0 | 2.3 | 25.1 |
| 1969 | 0.9 | 0.8 | 0.7 | 3.6 | 0.7 | 10.0 | 1.3 | 2.9 | 0.0 | 4.1 | 25.0 |

* Included with canned fruits and vegetables and other exports.

Sources: Evolution Du Commerce Exterieur De La Tunisie, 1956 à 1965, République Tunisienne, Secretariat d' Etat au Plan et à l' Economie Nationale, Service des Statistiques du Commerce, Mars 1966.

RAPPORT ANNUEL, 1968, 1969, Banque Centrale de Tunisie.

total agricultural export earnings. Olive oil exports, however, vary substantially from year to year with variations in production associated with weather conditions and the peculiar physiological nature of the olive tree. As pointed out above, olive oil exports declined slightly from 1957 to 1969. A larger decline in olive oil exports would have occurred had not concessional soybean oil imports been substituted for domestic olive oil consumption.

During the early part of the decade 1957-1969, exports of wine were often as large or larger than those of olive oil. Wine exports, however, fell off sharply after 1964 when Tunisia lost its trade preference in the French market. To date it has not been able to find other export markets for wine to replace the lost French sales.

Exports of citrus, fruits and vegetables have increased slightly during the past decade, but these increases have been offset by declines in durum wheat and wine exports. Stagnating production of durum wheat together with rises in domestic demand resulting from increasing population and incomes have caused durum wheat exports to disappear.

## Agricultural Development Policies

Tunisia was a Protectorate of France for nearly 75 years and obtained its independence in 1956. The French left Tunisia with a relatively advanced infastructure for a developing country. The newly independent country began with a good road system, agricultural marketing and processing facilities such as grain elevators and wineries so it was in a favorable position from which to start its economic development.

Agriculture has figured prominantly in Tunisia's economic development plans. The broad framework for Tunisia's agricultural development was first established in the Perspectives Decennial for the period 1962-1972. Within this generalized framework, a Plan Triennal (1962-64) and two Plan Quadriennals (1965-68) and (1969-72) were designed and implemented.

## Objectives of Agricultural Development

The principal objectives of agricultural development were outlined in the Perspectives Decennial, 1962-72 and have remained the same throughout the three detailed plans that followed. These objectives of agricultural development are as follows:

1. To move towards food self-sufficiency in Tunisia in assuring that all strata of the population have a sufficient and balanced diet.
2. To participate in the improvement in the balance of payments by increasing exports of agricultural products.
3. To favor the development of industry and commerce through a greater integration of agriculture into the National Economy.
4. To increase the income of the agricultural population and at the same time participate in increasing the national level of living.

To achieve these development objectives, the Plans have emphasized three principal policies for development: (1) Agricultural diversification and intensification, (2) Structural reform (shifts in systems of land tenure), and (3) Development of water resources.

The remainder of this paper will be devoted to a discussion of these agricultural development policies. The extent and means through which they have been implemented and their results as reflected by changes in production will be emphasized. Policy, planning, and changes in the cereals sector will be analyzed in more depth since this is the largest sector of the Tunisian agricultural economy. Data used in the analysis have been obtained in large part from official Tunisian sources such as the Annuaire Statistique de la Tunisie. As is true of many developing countries, the reliability of statistics is open to question and may be subject to a wide margin of error. Consequently, they must be interpreted with caution.

## Agricultural Diversification and Intensification

Tunisian agriculture has been heavily dependent upon cereals for many years. This dependence is well illustrated by the use of agricultural land in the country in 1960 as reported in the Perspectives Décennales, 1962-1971, (Ten Year Plan). As shown in Table 5, nearly two-thirds of the cultivated land in Tunisia was devoted to cereals in 1960. Tree crops, primarily olives, were second in importance with a little over 30 per cent of the cultivated land. Other crops such as industrial crops (sugar beets), grain legumes, vegetables, and forage crops were of minor importance as measured by land usage in comparison to cereals and olives.

The importance of cereals in the North, where a substantial share of the more productive land in the country is located, was even greater than for Tunisia as a whole. In fact, the agriculture of the North could

Table 5. Distribution of Agricultural Land in Tunisia in 1960 and Planned Changes to 1971

| Use | Hectares (1,000 ha) | Per Cent | Planned 1971 Hectares | Per Cent |
|---|---|---|---|---|
| Cereals | 2,000 | 63.5 | 1,600 | 44.7 |
| Industrial Crops | 5 | 0.1 | 15 | 0.4 |
| Grain Legumes | 75 | 2.4 | 210 | 5.9 |
| Vegetable Crops | 26 | 0.8 | 50 | 1.4 |
| Forage Crops | 49 | 1.6 | 280 | 7.8 |
| Tree Crops | 995 | 31.6 | 1,428 | 39.8 |
| Total Cultivated | 3,150 | 100.0 | 3,583 | 100.0 |
| Non-Cultivated Land | 1,300 | | 742 | |
| Permanent Pasture | 50 | | 175 | |
| Alpha Grass | 3,600 | | 3,400 | |
| Forest | 900 | | 1,100 | |
| Total Agricultural Land | 9,000 | | 9,000 | |

Source: Perspectives Tunisiennes, Publication Du Secretariat D' Etat Aux Affaires Culturelles Et A L' Information, Tunis 1962, p. 154.

almost have been classified as monoculture because of the predominance of cereals. A study made by the Service des Statistiques showed that cereals and fallow occupied 97 per cent of the agricultural land, excluding pasture land, in the Governorate of Le Kef in 1962. The cropping pattern that had developed over the years was predominately a bi-annual rotation of wheat and fallow. Most of the cereal land that was fallowed every other year was not cultivated during the year it was in fallow. Rather, it was left idle and weeds were allowed to grow. Such "weed fallow" land served as pasture for sheep and other livestock.

Studies have shown that the one-crop cereal production of the North was not practiced by only one type of farmer, but by all types of farmers: large and small, modern and traditional, Tunisian and foreign colons. The principal difference between the large and small farmer was in the size of farm, use of fertilizer, and the amount of land fallowed each year (12, p. 30).

The Perspectivies Decennial (1962-1971) emphasized the importance of crop diversification to reduce the dependence on cereals. It was planned that by 1971, only 45 per cent of the countrie's cultivated land would be devoted to cereals with significantly larger areas devoted to grain legumes, industrial, vegetable, forage and fruit tree crops (Table 5).

These plans were based on the introduction of new crops and crop rotations that were more intensive than the land-extensive biennial rotation of wheat and fallow. The Plan Triennal (1962-64) further

specified the planned changes in cropping patterns as follows:

1. Reduction in the land area devoted to cereals and lands with "more specific" agricultural uses were to be shifted to other crops.
2. Crop rotations were to be changed to obtain a higher yield from the land. Modifications in crop rotations would permit the modern sector to produce more intensively, control erosion and preserve and develop soil fertility. These changes were to result in cereal production sufficient for for domestic consumption as well as maintaining a medium amount of durum for export. In addition, the new rotations would result in sufficient forage production to increase animal production (15, p. 112).

New cereal crop rotations, including forage crops, were recommended for Northern Tunisia that were triennal with or without fallow in contrast to the established biennial rotation of wheat and follow. Two new triennal crop rotations were recommended for Northern Tunisia in accordance with average rainfall in a particular area. First, in areas that receive more than 400 mm of rainfall per year, the recommended crop rotation was as follows (12, p. 31):

First year: durum wheat

Second year: bread wheat or barley

Third year: forage crops and legumes (oats-vetch, horsebeans or green manure)

In areas that received less than an average of 400 mm of rainfall per year, the recommended rotation was as follows:

First year: durum wheat

Second year: bread wheat, barley or oats-vetch

Third year: fallow-legumes

Part of the land was to be fallowed in the third year for moisture conservation.

It was argued that new systems of crop diversification with fruit trees, irrigated crops, forage crops, and intensified animal production would reduce the catastrophic effects of climatic variations on agricultural production. Increased forage production associated with the new triennial rotations would also make possible more intensified livestock production, thereby increasing member income on the new Cooperative Producing Units (12, p. 33).

Tunisia's agricultural development strategy which was based on agricultural diversification made sense from both technical and economic viewpoints. On the technical side, the new crop rotations were based on agronomic research that had been completed at the Institute Nationale de Research Agronomie de Tunis (INRAT) over a period of years. On the economic side, it made sense because it would result in the expansion of high value, labor intensive crops such as forage, livestock, fruits, and vegetables in a labor surplus economy. One of Tunisia's principal economic problems has been high unemployment and underemployment in the total economy and particularly in the rural sector. Further, the commodities for which expanded production was visualized have high income elasticities

of demand so, with economic growth, their demand should increase at a more rapid rate than for cereals.

It is significant to note, however, that little information is available in Tunisia on the costs and returns from farm operations under new crop rotations with forage and livestock as compared with traditional biennial cereal rotations and extensive livestock grazing on weed fallow. Farm management research involving the budgeting of various types of farms at a given point in time and over time is needed.

Since agricultural diversification and intensification were to be implemented through changes in the cereals sector, a more detailed examination of this important sector of Tunisian agriculture is warranted.

## The Cereals Sector

The three principal cereal grains produced in Tunisia are durum wheat, bread wheat, and barley.1/

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1/ The purpose of this section of the paper is to discuss the role of the cereals sector in agricultural development of Tunisia. For more complete information on the economics of the cereals sector see the following reports:

1. J. D. Hyslop and R. P. Dahl, Wheat Production in Tunisia: Trends and Variabilities, Staff Paper P70-9, Department of Agricultural and Applied Economics, University of Minnesota, June 1970.

2. J. D. Hyslop and R. P. Dahl, Wheat Prices and Price Policy in Tunisia, Staff Paper P70-10, Department of Agricultural and Applied Economics, University of Minnesota, June 1970.

3. R. P. Dahl, International Trade and Price Prospects for Cereals and Their Implications to Tunisia, Staff Paper P71-24, Department of Agricultural and Applied Economics, University of Minnesota, November 1971.

4. J. D. Hyslop, The Tunisian Cereals Sector: An Examination of Production, Prices and Some Alternatives for the Future, St. Paul: University of Minnesota Agricultural Experiment Station Bulletin No.____, forthcoming 1971.

Durum wheat (blé dur) is the most important cereal produced in Tunisia both in terms of quantity produced and area planted. About 60 per cent of the total land planted to cereals has been in durum. Durum is widely cultivated throughout the countries of the Mediterranean Basin. To the market, durum is a unique commodity that is used primarily for pasta products, macaroni and spaghetti, and in these products it has no really good substitutes. This is evidenced by the fact that durum prices sometimes rise to substantial premiums over bread wheat prices in world markets during periods of shortage. In Tunisia, it is the preferred commodity for cous cous, a staple in Tunisian diet.

Bread wheat (Blé tendre) is the least important in terms of quantity produced and area planted. About 10 per cent of the total land planted to cereals has been in bread wheat. It was introduced into Tunisia by the French colon farmers. The most common variety produced was Florence-Aurore until recent years when Mexican varieties have been introduced. Most of the bread wheat is ground into flour for bread production. Nearly all of Tunisia's wheat imports have been bread wheat varieties from the United States, Canada, and the European Community under concessional terms.

Barley (Orge) is grown widely in Tunisia, particularly in the central and southern regions where rainfall is insufficient for wheat. About 30 per cent of the total land planted to cereals has been in barley. Barley has a shorter growing season and will produce a crop where wheat will fail. Barley is usually regarded as being a feed grain but in Tunisia it is widely used as a food grain in rural areas.

Table 6. Average Areas Devoted to Cereals and Cereals Production in Tunisia, Annual Averages Five Year Periods, 1934-1969

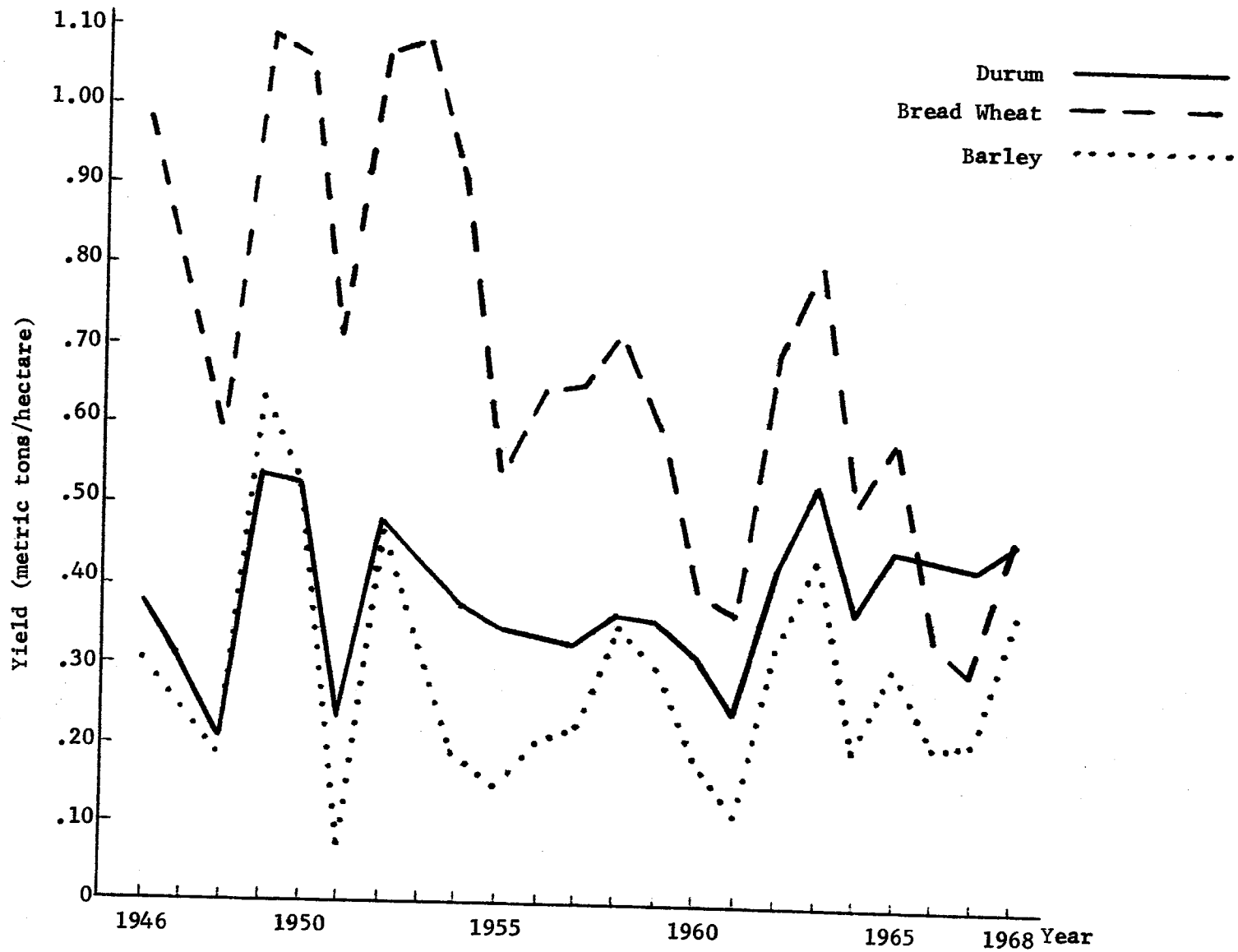
| Harvest Years | Hectares (1,000 ha) | Production (1,000 m.t.) |
|---|---|---|
| 1934-1938 | 1,202 | 552 |
| 1949-1953 | 1,543 | 750 |
| 1954-1958 | 1,981 | 679 |
| 1959-1963 | 1,683 | 607 |
| 1964-1968 | 1,296 | 483 |

As shown in Table 6, the average area devoted to cereals declined from a high of 1,981 thousand hectares in 1954-1958 to 1,296 thousand in 1964-1968. This indicates that Tunisia has made some progress in implementing its policy of agricultural diversification in accordance with the Plans by transferring some of the poorer cereal lands into tree crops such as apricots, almonds, and olives as well as into permanent pasture. As shown in Figure 3, most of the reduction of cereal area has come out of the areas in durum and barley since 1960. Bread wheat area has remained relatively constant over the period. The Triennial Plan, 1962-1964, and succeeding Plans have emphasized the expansion of bread wheat area by transferring some durum land to bread wheat since this bread wheat usually has higher yields than durum. This had not been accomplished through 1968.

Tunisia's hopes of increasing cereal production on a reduced area through intensification of production and the application of modern technology to farming have not been realized (Table 6). Figure 4 shows that yields of all three cereals have been extremely variable from year to year

Figure 3. Area of Three Cereal Grains: Durum, Bread Wheat, and Barley in Tunisia, 1946-68

Figure 4. Yield of Three Cereals: Durum, Bread Wheat, and Barley in Tunisia, 1946-68.



and have not exhibited a rising trend. In fact, bread wheat yields have registered a secular decline since the early 1950's. An attempt to arrest this decline was undertaken in 1967-68 with the Accelerated Cereals Production Program which was jointly sponsored by the Tunisian Government, USAID, and CIMMYT (International Maize and Wheat Improvement Center). The program emphasizes the use of improved wheat varieties, mainly the Mexican bread wheats, the use of improved cultural practice, and breeding superior new varieties.

The area planted to Mexican bread wheat varieties has expanded from 450 hectares in 1967/68 to 12,000 hectares in 1968/69, 53,000 hectares in 1969/70 and just over 100,000 hectares in 1970/71. The yields of the new varieties have averaged considerably higher than the indigenous Tunisian varieties such as Florence-Aurore in each of the above years according to annual reports of the Accelerated Cereals Production Project, but a comprehensive analysis of yield comparisons over the entire period is not yet available.

Most of the experience with the new Mexican wheats in other countries such as India and Pakistan has been under irrigated conditions. Tunisia is one of the first countries where the new wheats are being planted under dry-land conditions. Since they have been designed to respond to heavy applications of fertilizer which require adequate and timely moisture availability, it is not surprising that their relative performance in Tunisia has varied considerably with the amount of rainfall. In 1968/69, for example, they averaged only 3 per cent higher than the Tunisian variety where rainfall was less than 270 mm a year, 34 per cent

higher where there was 270 to 350 mm, and 48 per cent higher where there was more than 350 mm (5). Consequently, they are best suited to the better cereal lands in Northern Tunisia where average yearly rainfall is higher and less variable both between and within crop years. This has been recognized and the new varieties have been planted mainly on the large state-owned and private farms in the North under mechanized farming where the required cultural practices are more easily applied. This is also the area where most of the bread wheat was produced in the past by the French colon farmers. It is evident, however, that before the Accelerated Cereals Production Program can have a significant impact on aggregate wheat production, it must reach the small private and traditional farmer. Such farmers continue to rely heavily on native varieties of durum wheat and barley. This is indicated by a recent survey of the Tunisian Ministry of Agriculture of agricultural land usage in the private sector on 400,000 hectares in Northern Tunisia. As shown in Table 6, these farmers planted 119,200 hectares in durum and only 37,200 hectares in bread wheat or a ratio of 3.2 hectares in durum for every hectare in bread wheat. For the country as a whole, durum is even more important relative to bread wheat. During the five year period 1964-1968, the ratio of durum to bread wheat area was 4.8 to 1 for all of Tunisia.

The data in Table 6 also indicate that private farmers in Northern Tunisia continue to rely heavily on cereals. Forty-five per cent of their land was planted to durum, bread wheat, and other cereals (mainly barley). Nearly one-third of the land was in fallow which is usually part

Table 6. Agricultural Land Use in 1968 on Private Farms in Northern Tunisia

| Use | Hectares | Per Cent |
|---|---|---|
| Durum Wheat | 119,200 | 29.8 |
| Bread Wheat | 37,200 | 9.3 |
| Other Cereals | 25,200 | 6.3 |
| Fallow | 130,000 | 32.5 |
| Forage Crops | 14,400 | 3.6 |
| Grain Legumes | 15,200 | 3.8 |
| Dry Plantations | 31,200 | 7.8 |
| Natural Pastures | 24,800 | 6.2 |
| Irrigated Vegetables | 2,000 | 0.5 |
| Irrigated Plantations | 800 | 0.2 |
| TOTAL | 400,000 | 100.0 |

Source: Credits pour l' Intensification de la Grande Culture privée du Nord (Ière Tranche) Republique Tunisienne, Minister De l' Agriculture, Bureau du Plan et du Developpement Agricole, page 2.

of a rotation with cereals, and, consequently should be considered in cereals usage. When fallowed land is added to land in cereals, 78 per cent of the total agricultural land of these farmers was devoted to cereals production. It is also of interest to note that only 3.6 and 3.8 per cent of the land was devoted to forage crops and grain legumes, respectively. This would indicate, as far as the private sector is concerned in Northern Tunisia, that very little change has occurred in crop rotations which would induce more diversification in production and a shift in emphasis on cereals.

Comparable data concerning land usage in the public sector such as that discussed above for the private sector are not available. However, indications are that such data would probably show some decline in land used for cereals. As previously discussed, data for the country as a whole show a decline in area planted to both durum and barley since 1960. This may have resulted in large part from agricultural diversification plans and changes in crop rotations on the Cooperative Production Units and other public lands.

While Tunisia's development plans have emphasized the shifting of some cereals land into other uses, cereals will probably continue to be very important in Tunisia for the following reasons. First, the bulk of Tunisian agriculture will remain dry land agriculture. Of the approximately 3.2 million hectares of cultivatable land in the country, only about 100,000 hectares are now irrigated. Prospects for expanding further irrigation are limited. In dry land agriculture, cropping alternatives are also limited.

Cereals may produce the largest net returns per hectare on much of the better arable land in the North under dry land farming. Second, considering the low incomes of most of the population, cereals will continue to occupy an important place in the diets of the people. Currently, cereals provide more than one-half the calories for the average Tunisian diet and account for about one-third of the total consumer expenditures on food. The income elasticity of demand for cereals in Tunisia is estimated to be .35 which means that if we assume per capita consumer income will increase 3 per cent per year, cereal consumption per capita can be expected to increase about 1 per cent. Adding this to the current annual population growth of 2.8 per cent, results in a growth in total domestic demand for cereals of 3.8 per cent per year.

Since the cereals sector looms so large in Tunisian agriculture and the diets of the people, technological progress in this sector should be emphasized. A good start has been made under the Accelerated Cereals Production Program with the cooperation of USAID and CIMMYT. To date, it has been applied mainly to bread wheat, the least important of the three cereals, on the larger state-owned and commercial wheat farms in Northern Tunisia. It can be argued that the program should be extended to durum and barley both of which are more important than bread wheat in terms of both quality produced and area. Small farmers using traditional methods rely heavily on durum and barley. Since a sizeable amount of the production of such farmers is for home consumption, it is questionable whether they can be induced to shift to bread wheat varieties. Durum wheat has different physical properties than bread wheat and in semalina

products which are so common in Tunisian diets it has not good substitutes. Durum prices are also higher.

Barley is very important in Central and Southern Tunisia where agricultural resources are very limited as is income of farmers. Barley is the only cereal that can be produced in much of these areas because of low rainfall. Improved varieties and cultural practices for barley may offer good prospects of helping Tunisian farmers who are in the greatest need of help.

Agronomic research has also shown the possibility of complementary relationships between cereal production and forage production, particularly in areas where rainfall is sufficient to include forages in cereals rotations as was discussed earlier in this paper. Technological progress in Tunisia's livestock industry has been limited because forage production has not increased in accordance with development plans. Attempts have been made to upgrade the genetic potentials of indigenous cattle through the importation of breeding stock from Europe and the establishment of an artificial insemination center. Such efforts, however, must be simultaneously accompanied by improved livestock feeding, particularly through forages if larger milk and meat production are to be realized.

## Structural Reform

The transformation of Tunisian agriculture was to occur through structural reform or changes in systems of land tenure and farm organization. Production cooperatives were to become the principal means of "modernizing" small traditional farms and achieving the benefits of scale economies associated with large farms.

Structural reform has overshadowed other agricultural development policies in Tunisia during the decade of the 1960's. The Government's attempts to induce "modernization" of the agricultural sector through shifts in systems of land tenure and farm organization created a climate of uncertainty and confusion that seriously interferred with incentives. The period was also characterized by increased involvement of the Government in both factor and product markets. Administrative direction of the agricultural sector increasingly was substituted for free markets and prices in the direction of economic activity. These changes were motivated by economic, political, and ideological considerations, hence, they are complicated and outside observers risk oversimplifying any discussion of "Les Reformes des Structures". Nevertheless, an attempt will be made to outline some of the principal reforms that have occurred since independence. "Les Reformes des Structures" were really the heart of Tunisia's agricultural development strategy.

At the time of independence in 1956, French and Italian "colon" farmers occupied 850,000 hectares of the best land in Tunisia, mostly in the North. Although this represented only one-tenth of the total cultivatable land area, the European sector which accounted for one-sixteenth of the total population produced 95 per cent of the wine and 40 per cent of the cereals and accounted for one-third of the total cash farm income. So the Tunisian agricultural economy possessed the characteristics of a dual economy with a small modern sector and a large traditional sector.

The modern sector consisted of 4,000 European families owning and operating farms of an average size of 200 hectares, and about 5,000 Tunisian families owning farms averaging 70 hectares each. The great bulk of the rural population, however, was in the traditional sector which comprised 450,000 families owning an average of 7 hectares each (14). The traditional farmers relied heavily on subsistence crops such as cereals, particularly durum wheat and barley, and sheep was the most common livestock species raised.

The first agrarian legislation of the new Government involved land reform and transferred the public and private habous lands to the Government. Habous was an ancient system of land tenure under Moslem Law in which title of land was not registered. These lands were subsequently sold or given to small peasants or other private individuals by the Government which, at that time, encouraged private property. The period from independence until 1961 was also marked by the Government's encouragement of agricultural cooperation through assistance in the formation of service cooperatives through which small farmers, with individually owned farms, could voluntarily participate in service cooperatives to purchase farm supplies and market their produce.

The early period after independence was characterized by an emphasis by the Government on problems in Central and Southern Tunisia which were poverty stricken areas with high unemployment and had been neglected areas under the French Protectorate. A National Bank for the Development of the Center and South was created in 1956 to deal with problems in these areas. This bank devised a concept known as the "exploitation unit", an area

centered around an available water irrigation source (18). It is of interest to note that the first major capital loan made to Tunisia by USAID was for the construction of the Nebhana Dam in Central Tunisia in accordance with developmental objectives at that time. It was soon recognized by Tunisian authorities, however, that to develop the meager resources of the Center and South would require a huge investment. Hence, in 1961 the Government adopted a policy of economic planning in which the emphasis was to shift from social problems in the poorer regions to increasing production in the North which possessed better agricultural resources. Subsequently, a greater distinction was to be made between the modern and traditional sectors in agriculture and less on differences between poor and rich farming regions (18, p. 32).

Few would argue with a strategy of concentrating agricultural investments in regions with the best resources if increased productivity is the primary goal of development policy. Many of the problems in Central and Southern Tunisia are social problems that must be dealt with by other programs. The population in these regions remains very high relative to land productivity and capital resources. This continues to be one of Tunisia's principal social problems.

The shift in emphasis to the agriculture of the North was undoubtedly influenced by the gradual takeover of the lands of European colon farmers from independence to 1961. More than one-half of these lands, which totaled 850,000 hectares, were appropriated in some form by the Tunisian government by 1961. The remaining colon-owned lands were nationalized in 1964 (14, p.6).

Tunisia embarked on a large scale program of economic planning in 1961 with the publication of the Perspectives Decennales, 1962-1971, (Ten Year Plan) in which the overall objectives of agricultural development were specified. As discussed previously, one of those objectives was diversification and intensification of agricultural production to increase agricultural output. The chosen means of achieving this was structural reform through a program of cooperative farming. The Three Year Plan, effective January 1962, which was to implement the objectives set forth in the Ten Year Plan provided for the Cooperative Producing Units (CPU's). Their advantages over service cooperatives were said to be, 1) easier application of new cropping systems and new techniques, 2) the formation of large farms to take advantage of economics of scale, and 3) greater facility for achieving a higher savings level.

The new cooperatives were to be formed only after a socio-economic survey of the area had been completed and future members were consulted. Small farmers within the boundaries of a proposed cooperative were to have the option of becoming members or exchanging their land for a plot outside the cooperative. Larger landowners could rent or sell their land to the cooperative or join. The basic principal was that of transferring individual ownership into share ownership and that the individual characteristic of a holding disappears as it becomes a part of an overall cultivation plan (14, p. 12).

In most cases, state-owned lands mainly former colon-owned lands, became the nuclei for the first production cooperatives that were created

in 1962. Moore and Lewis report that the formation of new production cooperations received another push in May 1964 when the remaining colon-owned lands were nationalized and the state found itself in the possession of an additional 460,000 hectares of land. This, together with other lands previously acquired, involved total holdings of some 700,000 hectares of the best land in the country. On September 30, 1964, the Office des Terres Domaniales (OTD) was established with its functions being to assume the management of all state lands; to maintain current output levels on these lands; to direct their cultivation; to establish experimental farms and testing stations; and to administer over an eight year period, the distribution of the state lands, primarily to agricultural cooperatives (14, p. 14).

By December 1965, 213 production cooperatives were in operation in Northern Tunisia, on some 185,000 hectares. In the Center and South, 77 polyculture cooperatives had been organized on some 240,000 hectares. The Four Year Plan, 1965-1968, visualized another 750,000 hectares would be placed in cooperatives by the end of 1968, and another 1.2 million hectares in the Center and South (14, p. 14).

It was soon evident that the new cooperatives were not achieving the operating results that planners had hoped for. One of the problems was that they were obligated to take on more poor peasants and workers than could be supported from their gross income. The cooperatives could offer only 150 to 180 work days annually to each cooperator and often times less. In addition, there were a number of other problems such as: (1) Lack of trained personnel for managerial positions. Often times the manager was a high school graduate or had even less formal education with little practical

farm experience, particularly on large mechanized farms. (2) A cumbersome bureaucratic system through which production decisions came from above with final authority often resting in the Ministry of Agriculture in Tunis. This often resulted in costly delays. (3) Lack of experience of the members in operating and maintaining farm machines that had come, in large part, from the farmer colon-owned farms. Often times tractors and other farm machinery were inoperable because of an incapacity to make repairs or a lack of spare parts. (4) Absence of production incentives of the members who were paid entirely on the basis of hourly wages. Consequently, the members did not associate their work efforts with the output of the cooperative. (5) Heavy short term debt structures and a lack of long term capital to implement intensified production programs such as livestock enterprises. (6) Finally, nature did not offer any assistance because there was a series of successive poor cereal crops due to low rainfall in the four years 1965 through 1969.

Hopes of solving the finance problem on the cooperatives were raised when in 1967 the World Bank made a commitment to Tunisia for an $18 million loan for the agricultural production cooperatives in the North. A substantial share of the proceeds of the loan were budgeted for machinery purchases, building construction, and livestock purchases. It was predicated on the reasoning that the main way the cooperatives could be made economically viable and support the large number of workers on them was through agricultural production methods that were more intensive than biennial rotations of wheat and fallow. The World Bank subscribed to the idea that if rotations were changed and more emphasis was placed on forages and livestock, the income of the cooperatives could be increased.

A quote from the report of the World Bank agricultural technicians serves to summarize the changes in cropping practices and intensified livestock production recommended on the cooperative producing units. "The potentials for increased fodder production in the Northern zone are very good. Most of the 800,000 odd hectares of first class arable land is still farmed on a pattern developed by French settlers of a rotation of wheat, fallow, wheat. In view of the unsoundness of such a farming procedure from the viewpoint of both productivity and fertility maintenance, output could be substantially improved by a simple introduction of forage crop production including legumes, into the rotation so that the cropping pattern would become wheat, forage, wheat. Full exploitation in this direction would find the Northern zone with insufficient livestock to fully utilize the forage produced. This deficiency could be far more sensibly met by transferring stock from the Central zone to the Northern for fattening, the immediate objective being to add an additional 10-15 kilos per sheep and 50-100 kilos per cattle beast to the animals consumed" (13).

Despite the problems and relatively poor operating results of the production cooperatives, the Government was undaunted in its efforts to form more cooperatives. It was felt that their problems could be resolved and enthusiasm among technicians remained high. It has also been argued that the financial assistance of the World Bank to the cooperatives may have contributed to that enthusiasm (6).

A. U.N. Report indicated that on June 30, 1968 the distribution of land in Tunisia was as follows (11):

1). Cooperatives had been extended to 1.5 million hectares of which more than half (880,000 hectares) were in producers

cooperatives and the remainder in pre-cooperatives. Of the 880,000 hectares, the great majority of the land (665,000 hectares) and 40,000 cooperators were concentrated in the North. Most of this was former colon-owned land that had been combined into production cooperatives with small, neighboring peasant properties, often of poor quality.

2). About 3,000 private Tunisian landowners with an average holding of a little more than 200 hectares each owned an equivalent amount of land to the production cooperatives in the North. The U.N. Report points out "Many of these landowners were absentee farmers who leased away their land, and who lived more or less comfortably from the rents often combined with incomes from other activites". It is of interest to note that at the time of independence, 5,000 Tunisian farmers in the modern sector owned farms averaging 70 hectares each. This indicates total land ownership of the private, modern Tunisian sector had expanded from about 350,000 hectares to over 600,000 hectares and concentration of ownership had increased substantially since 1956.

3). In addition to the 40,000 members of production cooperatives, and 3,000 larger private farmers, there were 64,000 peasants on an equal amount of land in the North, but of much inferior quality.

4). A few production cooperatives, and the majority of pre-cooperatives were in the semi-arid and southern parts of

the country where efforts had been made to introduce irrigation combined with extensive dry-land farming and cattle breeding on the previously collectively owned tribal lands.

5). Small and medium private sized farms in the Sahel, the 300 miles of coast running from Bizerte to Gabes including the Sfax olive orchards.

The observation made in point (2) above concerning the expansion of land and concentration of ownership in the private, modern Tunisian sector is significant because it went relatively unnoticed during much of the decade of the 1960's. The public's attention was focused on the formation of production cooperatives out of former colon-owned lands acquired by the State. However, private individuals also acquired a sizeable amount of the state land through purchase during this period. Some of these lands may have been previous public and private habous lands that were transferred to the state shortly after independence. The expanded and more concentrated modern, private sector that had emerged by mid 1968 is significant because it was to provide organized opposition to the cooperative movement which was a primary factor leading to its downfall in late 1969.

The U.N. Report also makes the interesting observation that farming methods and land use in the private modern sector, which had expanded with more concentrated ownership, had changed little since 1961. Little progress had been made in this sector on agricultural diversification and intensification as visualized in Economic Plans. The Report goes on to point out "Instead the majority of the larger private landowners were perfectly happy

to gon on as before the existing situation gave them no reason to be disatisified from a private point of view. This left the state and the cooperatives with almost the whole burden of making the necessary investment in the transformation of Tunisian agriculture. At the same time, they had to contend with the continued existence and even expansion of the larger private properties, which severely restricted the possibilities of effective action on an important portion of the land most suitable for agricultural diversification and intensification. Rural employment remained unchanged and the total agricultural production of the country showed little increase" (11, p. 7).

Thus, the stage was set for the big push for the formation of production cooperatives at a more rapid rate in 1969. A hint as to what was to come was contained in President Bourguiba's speech on October 28, 1968 in which he made the following point:

> "When we selected the cooperative system some years ago, our technical studies were incomplete and we were not in a position to envisage a wholesale application of cooperation. We, therefore, agreed that farmers should be reorganized in service cooperatives.
>
> "Later on these became a means of escape from production cooperatives. Saying that they had been given a choice, some people held on to the service cooperatives and would not budge. This happened at Jerid, where we had great difficulty in persuading people that setting up service cooperatives was only a stage to enable them to get used to working together leading eventually to production units" (3).

This was the first official statement that Tunisia intended to implement a single land tenure system in agriculture that did not include private owner-operated farms. During the first months of 1969 the Government made it clear that it intended to include all agricultural land in producers cooperatives.

Difficulties mounted in pushing the cooperative movement, however, as efforts were directed to the small, independent farmers in the Sahel who resisted. Opposition also came from the larger private farmers in the North and their political allies who had a vested interest in a "moderate" approach to social change. Faced with these difficulties, Mr. Ben Salah, Minister of Plan and National Economy, prepared a draft bill for submission to the Party Congress in the Fall of 1969 which called for cooperatives as being the only way of cultivating the soil. This bill received strong opposition from other influential members of the party and was never adopted. Subsequently, there was a sweeping administrative reshuffling in the Government which was to be followed by an abrupt change in "Les Reformes des Structures".

On September 22, 1969, the Tunisian Parliament passed a law which outlined the Government's commitment to promote the coexistence of three sectors in agriculture--state owned, cooperative, and private. Subsequently, farmers who had joined production cooperatives against their will were given the option of leaving the cooperative to farm their land as they had in the past. Most chose this option. Many cooperatives were completely liquidated and indications are that those that are still operating are the early ones that were formed out of the former colon-owned farms in the North.

Mr. Abdallah Farhat, Minister of Agriculture reported on August 23, 1970, that Tunisia's agricultural land was distributed as follows (10):

| | |
|---|---|
| Private Farms | 4,500,000 hectares |
| State Land | 725,000 hectares |
| Forestry | 1,240,000 hectares |
| Collective and Pasture Land | 2,550,000 hectares |

The production cooperatives still functioning probably exist on part of the state land in the above tabulation.

An indication of how far the "cooperative" collectivization of Tunisian agriculture had proceeded is revealed by the data below on the number and area covered by production cooperatives on July 31, 1969 (16).

| | Number of Production Cooperatives | Area (hectares) |
|---|---|---|
| North | 1180 | 1,812,000 |
| Center | 460 | 1,642,000 |
| South | 345 | 1,214,000 |

Many of the cooperatives that were organized during the big push in early 1969 never became operational. However, the mere fact that they were organized even though on paper only, served as a disruptive influence on Tunisian agriculture and adversely affected production.

As experience has shown in other countries that have initiated sweeping land tenure reforms, agricultural production often declines during and immediately after such reform is undertaken. Unquestionably, the uncertainties and confusion associated with "Les Reformes des Structures" in

Tunisia, have been important contributing factors to the poor performance of Tunisian agriculture during the past decade. The livestock sector was particularly hard hit by the cooperative push. Many small farmers slaughtered their livestock or sold them at very low prices for fear that such animals would be confiscated when they were forced to join production cooperatives. After the change in policy in September 1969, farmers attempted to acquire livestock for breeding but since many animals had been eaten or exported, prices on the limited supply were bid up to high levels. Meat shortages followed in 1970 and 1971 as farmers withheld livestock from markets while building up their herds. This was reflected in retail meat prices at record high levels. The Government has installed a system of price controls on meat, but does not have effective machinery for administering such controls. It is ironic that Tunisia's livestock industry, which was to be a principal beneficiary of agricultural diversification and intensification plans implemented through the production cooperatives should be the sector which may have benefited the least and where formidable production problems are carried over from the reform.

Reforms in the Marketing Sector

The philosophy of cooperative socialism that prevailed in Tunisia during the decade of the 1960's was also extended to the agricultural marketing, processing, and distribution sectors. Government supervision and participation in these sectors became increasingly evident during most of the decade culminating in January 1969 with the creation of the Union Nationale De La Cooporation which was to coordinate all "cooperative" activities in the country. It established four central cooperative unions for agricultural marketing, namely, major cereal crops, olive oil, fruits

and vegetables and wine. Each central union was granted a monopoly on both domestic and foreign marketing of their respective crops.

Back in 1962 the Government had taken a large step in abolishing private trade in cereals when it created the Office of Cereals. The principal functions of the Office of Cereals are:

1. To organize, control, and improve the production of cereals, cotton, and nutritional legumes.
2. To maintain a balance between supplies and needs of these commodities through purchasing and selling operations.
3. To organize and control the marketing of these commodities.
4. To organize and control the production and distribution of livestock feed.

The Office of Cereals is reported to have "defeated the middleman", abolished the private trade in cereals, and dissolved the Societe Tusesienne de Prévoyance (9). Prices and marketing margins for wheat are controlled by the Office of Cereals from the farm price through to the price of bread at retail.

The Government also created an Office of Olive Oil in the early 1960's which was to function for vegetable oils along somewhat similar lines as the Office of Cereals did for wheat and other cereals. However, more private trade was allowed in olive oil until January 1969 when the central cooperative union for oils was created.

The change in the Government and its policy in September 1969 was marked by the dissolving of the Union Nationale De La Cooperation and the four Central Cooperative Unions for the marketing of various commodities.

The Offices of Cereals and Olive Oil remained intact and were allowed to continue functioning as they had in the past. Some concessions to private trade were made, particularly in the case of olive oil, but the marketing of those commodities still involves extensive involvement by the Government.

When the changes in the Government's role in marketing, processing, and distribution were superimposed on the land reform program in the 1960's, a state of flux was created in which there was considerable confusion. The substitution of an ineffective administrative system for markets in the direction of economic activity impaired incentives and production suffered. So the young government that had adopted an ambitious program planning for agricultural development in 1961 witnessed the close of the first decade with unimpressive results as measured by agricultural productivity. Further, it had returned to the land tenure system that had existed a decade earlier, but with an expanded private, modern, Tunisian sector with somewhat greater concentration of land ownership.

## Development of Water Resources

Shortly after the Government was reorganized in the Fall of 1969, Mr. Ladgham, Tunisia's first Prime Minister, stated that since the beginning of its planning efforts in 1960, the Government had visualized agriculture as being the base sector to facilitate expansion in the rest of the economy. In accordance with this development strategy, the Government made investments totaling 143 million dinars (about $290 million) in agriculture from 1962 to 1969. This has accounted for about 20 per cent of total Government investment in the economy.

One study on the size and efficiency of agricultural investment in developing countries showed that from 1960-1965, Tunisia's agricultural investment was 19.9 per cent of gross domestic fixed investment. Of the eighteen developing countries studied, only one country exceeded Tunisia in its ratio of agricultural investment to total investment. Indications are that Tunisia has placed a greater relative emphasis on the agricultural sector in development policy than almost any country in the developing world. The same study points out that Tunisia has a very high agricultural capital/output ratio (4.7:1 in 1960-65). Since the structure of the agricultural investment has been biased in favor of "slow-gestating" capital goods, the capital/output ratio in agriculture has been higher in agriculture than in the economy as a whole. This study optimistically concludes that "This type of investment policy, although presumably beneficial in the long run, is likely to cause strains in the economy, but it can be justified in the circumstances of Tunisia which requires considerable capital outlay on agricultural infrastructure, particularly if largely financed by foreign aid" (19, p. 7).

Since its independence in 1956, Tunisia has placed a heavy emphasis on investment in water resources, both surface and underground, to expand the amount of irrigated agricultural land. The importance of irrigation investments in total agricultural investment is illustrated by the Four Year Plan 1969-1972. During this four year period, the planned total agricultural investment was 128 million dinars. Of this amount, 48 million dinars or 38 per cent was to be devoted to irrigation projects in agriculture. Of

the latter amount, 30.5 million dinars was to be invested in new irrigation projects while 17.5 million was to be devoted to the completion of projects already underway (16).

The relative importance of investments in irrigation to those in dry land agriculture can be gauged by the planned investment on the cooperative producing units. The new Four Year Plan visualized an investment totalling 37.4 million dinars for dry land agriculture on the production cooperatives from 1969-1972. It was previously pointed out that by June 30, 1968, cooperative producing units had been extended to 1.5 million hectares of which 665,000 hectares was in the most productive dry land areas of the North. The amount of irrigated land that would result from previous and new irrigation projects is estimated at about 100,000 hectares. Consequently, the 1969-72 Plan provided an investment of 48 million dinars on 100,000 hectares for irrigation and 37.4 million dinars on 1.5 million hectares in production cooperatives under dry land farming. This would indicate that while Tunisia's agricultural development strategy of agricultural diversification and intensification was to be implemented largely through the installation of modern farming methods on the production cooperatives, the cooperatives were to receive a small amount of investment funds relative to irrigation projects which covered a much smaller area.

A comprehensive analysis of returns to investments in irrigated agriculture in Tunisia has not been made. The University of Minnesota Team in Tunisia is currently making a study of water resource development in

Tunisia to determine the technical, economic, and social factors involved in the success or failure of irrigation projects. Until the results of this study are available, one must rely primarily on qualitative information in making preliminary appraisals. Such information indicates that to date the returns to investments in Tunisia's water resources have been disappointing. The expansion in irrigated land was to facilitate primarily an increase in production of high value fruit and vegetable crops for both domestic and foreign markets. The data in Table 4 do not show significant increases in exports of fruits and vegetables, either fresh or canned, with the possible exception of citrus. Even in the case of the latter, exports totaled only 3.6 million dinars in 1969. It is recognized, however, that some of the production of fruits and vegetables on irrigated land has undoubtedly gone into increased domestic consumption as a result of increases in population and per capita incomes.

While many of Tunisia's irrigation projects are relatively new and sufficient time has not lapsed to realize full productivity, Tunisia's largest project, the Office de Mise en Valeur de la Valleé de la Medjerda (OMVVM) has been in operation for more than a decade. This irrigation project on the Lower Medjerda River was started by the French after World War II. The two major dams on the Medjerda that were planned by French technicians were completed by late 1957.

Moore and Lewis point out in their excellent analysis of the development of this project and its operations, that French technicians had originally envisaged a transfer from dry land cereal and wine cultivation to more intensive, irrigated farming with high-yielding, labor-intensive fruit, vegetable, forage, and industrial crops on newly irrigated land in the Medjerda Valley.

These authors also call attention to some of the problems that arose with the implementation of such a program. Cultivation under irrigation was new to many Tunisian farmers and water costs were high. Some landowners were reluctant to change old farming habits. There also were objections to the trouble involved in learning to grow strange crops when, with increased mechanization, the labor required for producing grain was reduced (14, p. 7).

Much of the land in the OMVVM irrigation area was subdivided and distributed to carefully chosen landless peasants who were judged to be the most capable. Subsequently, the OMVVM established service cooperatives in which these farmers were required to become members. Through these cooperatives the farmer members were to receive technical advice and marketing services both for farm supplies and the commodities grown.

The first and largest of such cooperatives, El-Habibia, was established in 1959. This cooperative became a prestige project that was to serve as a symbol of Tunisian agrarian reform, even though the cooperative producing units, where the emphasis was considerably different, were destined to become the dominant farm agricultural cooperation in the country.

A Dutch consulting firm employed by the OMVVM in 1966 to make an economic feasibility study, concluded that the El-Habibia Cooperative's operating results compared unfavorably with certain norms. Moore and Lewis conclude that these results together with their own analysis indicate that the low production of the cooperative could be attributable either to low productivity or a large amount of clandestine marketing. In the case of the latter, members were required to sell their produce through the

cooperative, but there were greater incentives to market produce illegally outside of such channels to realize better prices. They conclude that the poor operating results of the cooperative are probably attributable to a combination of both low productivity and illegal marketing of the members (14, p. 11).

Even though the operating results of the El-Habibia Cooperative in the OMVVM are unimpressive, it would probably compare favorably with the productivity realized to date on other irrigation projects in Tunisia. More complete information on the relative productivity of various irrigation projects will be available when the results of University of Minnesota study are complete.

In summary, investment in water resources has figured high in Tunisia's agricultural development strategy with about 40 per cent of total government agricultural investment going to water projects. These investments have been concentrated on a relatively small area, but returns to date have been low according to certain gross measures and several studies that are available. Economic studies to analyze the potential returns to further investments in water resources relative to investments in dry land farming would be valuable to government planners and policy makers. Tunisia's water resources are limited relative to the total land base. Further, their development is expensive and the quality of the water is low because of a high saline content. With present available technology, the bulk of Tunisian agriculture will probably remain under dry land farming.

## Summary and Conclusions

Agricultural development has played an important role in Tunisia's economic development plans over the past decade. Agriculture was viewed as being the sector from which progress in the rest of the economy could be facilitated. About one-fifth of the Government's investment has been devoted to agriculture. Performance in this sector, however, has not met expectations. Per capita food production has declined necessitating increased food imports, particularly of cereals, to meet consumption requirements. The poor performance can be attributed in part to a series of successive poor crops due to droughts in 1965 through 1969. Low and variable rainfall are limiting factors to agricultural productivity increases making planning and development extremely difficult. The problems associated with implementing agricultural development policies, particularly structural reform, also were contributing factors.

Three principal policies were chosen to achieve Tunisia's agricultural development objectives: (1) Agricultural diversification and intensification, (2) Structural reform (shifts in systems of land tenure), and (3) Development of water resources for irrigation.

Tunisian agriculture has long been heavily dependent upon cereals with close to two-thirds of the arable land devoted to cereals in 1960. The Ten Year Plan emphasized crop diversification to reduce the dependence on cereals. New crops and crop rotations were recommended that were more land and labor intensive than the land-extensive biennial rotations of wheat and weed fallow. The new crop rotations were triennial with or without fallow depending on the annual rainfall and included legumes and forage crops which would permit more intensive livestock enterprises. In addition, new cropping systems

emphasized the shifting of poor lands not suited to cereals into fruit tree crops and permanent pasture. This development strategy was well-chosen on both technical and economic grounds. It was based on adaptive agronomic research that had been completed in the country. Also, it provided for an expansion in labor intensive crops such as livestock and fruits in a labor surplus economy for which demand would increase with income growth. Little information is available, however, on the budgeted income effects of new crop rotations and cropping patterns on farms. Farm management research involving the budgeting of various types of farms at a given point in time and over time is needed.

Some progress has been made in implementing crop diversification plans as evidenced by sizeable declines in the area planted to durum wheat and barley. Evidence supports the conclusion that the changes have occurred mainly on public lands through the cooperative producing units. The private sector continues to rely heavily on traditional rotations with durum wheat and barley being the main cereals.

Tunisian planners' hopes of increasing cereal production on a reduced area have not been realized. This was to occur through the application of modern technology to cereal production and the shift of a sizeable area from durum to higher yielding bread wheat. Bread wheat area has remained relatively stable, but yields have declined. An attempt to reverse this trend was started in 1967 when the Accelerated Cereals Production Program was started and the new Mexican bread wheat varieties were introduced. Results have been encouraging, but the new varieties have been planted mainly on the larger, mechanized farms in the North.

Their performance relative to indigenous varieties has varied considerably with the amount of rainfall.

Bread wheat has been planted on only about 10 per cent of the cereal land in Tunisia. Durum and barley account for 60 per cent and 30 per cent of the cereal land, respectively. Small private and traditional farmers continue to rely heavily on durum and barley. Hence, the Cereals Program should be extended to these cereals if it is to have a significant impact on aggregate production. It is questionable whether bread wheat, even with better yielding varieties, will displace much durum acreage. The latter commands better prices, has different physical properties, and semolina products have been a staple in Tunisia diets for many years.

Technological change in the cereals sector should have high priority in Tunisia's development plans because the bulk of the country's agriculture will remain in dry land farming with cereals as the main crops. The introduction of forage coops in rotation with cereals should also facilitate increased livestock and meat production. When crops are grown in rotation, the relevant goal is the maximization of net income per hectare of land over time and not maximum yields of the main crop. Sometimes a rotation which gives the highest yield per acre of the main crop, wheat for example, may not give the greatest net farm income. Consequently, it may not be in Tunisia's best interests to pursue a production policy which maximizes wheat production to achieve self-sufficiency in this commodity.

Structural reform of land tenure and farm organization was chosen as the principal means of transforming Tunisian agriculture and implementing agricultural diversification and intensification plans. The first production cooperatives established in the early 1960's were formed with former

colon-owned lands as nuclei. Private and traditional farmers could join on a voluntary basis by accepting share ownership for private operation. At this time, the Government also encouraged service cooperatives through which private farmers could purchase farm supplies and market their produce on a voluntary basis.

In the late 1960's, production cooperatives became the only system of farm organization and private farmers were forced to join cooperatives against their will. The resistance of the small, independent farmers of the Sahel together with the better organized political opposition of the larger private farmers in the North caused an abrupt change in September 1969. The Parliament passed a law which committed the Government to guaranteeing the coexistence of three tenure systems--private, cooperative, and state owned farms. Private farmers who were forced to join cooperatives were given the choice of returning to individual owner-operatorship. Most of the production cooperatives were dissolved except for some of the earlier ones that had been formed out of the former colon owned farms in the North.

The decade of the 1960's closed with Tunisia returning to a land tenure system that it had in the early part of this period, but private ownership of land in the modern sector had expanded and become more concentrated. At the time of independence, 5,000 Tunisian farmers in the modern sector owned 350,000 hectares averaging 70 hectares per farm. In mid 1968, 3,000 private farmers owned 600,000 hectares averaging 200 hectares each.

An enlarged private, modern, sector together with the traditional sector which still comprises the largest area, but on poorer land with more people,

has implications for future extension efforts to facilitate technological change. To date, very little attention has been given to improving productivity in the modern and traditional private sectors of Tunisian agriculture.

While the Government of Tunisia was attempting to transform agriculture through structural reform during the 1960's, a substantial share of its investment in agriculture was devoted to the development of water resources to expand irrigated land. About 40 per cent of government investment has gone to irrigation projects. Since full productivity has not yet been realized from these investments, Tunisia has a very high agricultural capital/output ratio.

Investments in irrigation have been concentrated on a relatively small area. Estimates of irrigated land vary, but a frequently used average is 100,000 hectares. Several factors can be cited for the disappointing return to date on Tunisia's investments in agricultural water resources. Among them are (1) the lack of experience of Tunisian farmers with irrigated crops, (2) the high cost of water, (3) the inability of the young Government to coordinate the development of irrigation projects, (4) the shortage of technical personnel, and (5) uncertainties and confusion associated with structural reforms of farm organization.

As the Government of Tunisia enters a new decade after the tumultuous 1960's, an important question confronting it is how to divide its investments between water resource development and dry land agriculture. Substantive research and analysis of the rates of return to further investments in water resources relative to investments in dry land farming are essential.

## Appendix

Table 1. Imports of Food Products, Other Agricultural Products, and Total Agricultural Imports, Tunisia, 1957-1969

| Year | Food Products | Other Agricultural Products1/ | Total Agricultural Imports |
|---|---|---|---|
| | | (millions of dinars) | |
| 1957 | 16.1 | 2.2 | 18.3 |
| 1958 | 12.3 | 3.0 | 15.3 |
| 1959 | 12.5 | 2.6 | 15.1 |
| 1960 | 15.2 | 3.2 | 18.4 |
| 1961 | 23.8 | 3.4 | 27.2 |
| 1962 | 20.9 | 4.0 | 24.9 |
| 1963 | 15.5 | 6.5 | 22.0 |
| 1964 | 17.1 | 7.3 | 24.4 |
| 1965 | 17.9 | 7.7 | 25.6 |
| 1966 | 19.5 | 11.3 | 30.8 |
| 1967 | 29.4 | 14.3 | 43.7 |
| 1968 | 22.4 | 9.6 | 32.0 |
| 1969 | 27.3 | 12.2 | 39.5 |

1/ Includes soybean oil, other vegetable oils, tobacco, wood, wood products, and cotton.

Sources: Evolution Du Commerce Exterieur De La Tunisie, 1956 à 1965, République Tunisienne, Secrétariat d' Etat au Plan et à l' Economie Nationale, Service des Statistiques du Commerce, Mars 1966.

RAPPORT ANNUEL, 1968, 1969, Banque Centrale de Tunisie.

Table 2. Exports of Food Products, Other Agricultural Products, and Total Agricultural Exports, Tunisia, 1957-1969

| Year | Food Products | Other Agricultural Products | Total Agricultural Exports |
|---|---|---|---|
| | | (millions of dinars) | |
| 1957 | 26.5 | 5.4 | 31.9 |
| 1958 | 37.9 | 4.4 | 42.3 |
| 1959 | 35.9 | 4.9 | 40.8 |
| 1960 | 28.3 | 4.7 | 33.0 |
| 1961 | 25.5 | 3.7 | 29.2 |
| 1962 | 29.3 | 4.0 | 33.3 |
| 1963 | 32.3 | 4.0 | 36.3 |
| 1964 | 33.8 | 4.3 | 38.1 |
| 1965 | 25.7 | 6.1 | 31.8 |
| 1966 | 33.3 | 6.6 | 39.9 |
| 1967 | 25.2 | 6.9 | 32.1 |
| 1968 | 25.1 | 6.9 | 32.0 |
| 1969 | 25.0 | 7.7 | 32.7 |

Sources: Evolution Du Commerce Exterieur De La Tunisie, 1956 à 1965, République Tunisienne, Secrétariat d' Etat au Plan et à l' Economie Nationale, Service des Statistiques du Commerce, Mars 1966.

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