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Progress and Policies in the Tunisian
Agricultural Sector, 1962-1971

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I. INTRODUCTION

Tunisia's first planned development decade, 1962-1971, resulted in substantial growth of real output and in the capacity for sustained economic development. Among major economic sectors, only agriculture did not keep pace. And agriculture's failure occurred despite massive public investments and other attention given to the problems of this sector.

An easy explanation is that in a developing economy, agriculture, the most primitive and traditional of man's productive activities, is inherently harder to move toward increased production and productivity than are the more recently developed economic sectors. It can also be argued that the experimentation with total cooperatization of economic activities during the 1960's was particularly disruptive in agriculture. This is true both because cooperatization under state management was pushed earliest and hardest in agriculture and because the natural dimensions of agricultural production are much more complex and unpredictable than they are in other economic sectors.

Unfortunately, these easy answers do not provide insights which might improve the government's ability to formulate policies necessary to an increased rate of economic growth and development in the agricultural sector. This study seeks to contribute to a more detailed analysis by examining in some depth changes in the agricultural sector during the 1960's -- changes in structure, in the resource base, and in resource use -- and by analyzing specific government policies enacted. Major emphases of the study are analyses of investment and resource use policies, agrarian reform, and price policies.

II. STATUS OF THE AGRICULTURAL SECTOR IN 1961

As Tunisia embarked on the 1962-1971 development decade a major emphasis was given to planning for both economic and social development of the rural-agricultural sector. And rightly so. In 1961 more than 70 percent of the economically active population was employed in agriculture and the 60 percent of the population classified as rural (2.54 million persons) received only about 25 percent of national income, less than 40 dinars per person. The plight of rural families in 1961 appears even more dramatic when we consider that a few thousand colon and wealthy Tunisian families controlled the most productive one million hectares (25 percent) of all croplable agricultural land. Median rural family income was substantially less than 40 dinars per person, probably no more than one-half of that level. By contrast urban nonprofessional worker families enjoyed an average income of more than 100 dinars per person.^{1/}

Furthermore, rural areas were far behind in terms of productive and social infrastructure. The bulk of the agricultural sector was saddled with traditional land tenure forms and production methods. Aside from a network of highways and railroads connecting major

^{1/} République Tunisienne, Secrétariat d'Etat au Plan et aux Finances, Perspectives Décennales de Développement, 1962-1971, Imprimerie Officielle, Tunis, N.D., pp. 15-75; Speech by Abdallah Farhat reported in La Presse, August 23, 1970; Herman Van Wersch and Thomas Daves, "Retrospective of Tunisian Agriculture 1962-1971, "A Guide For the Future", University of Minnesota in Tunisia, Tunis, December 1972, p. 14. (unpublished manuscript).

commercial centers, but not reaching into the hinterlands, infrastructure necessary to productive agriculture and modern rural life was nonexistent. Excluding the modern farms concentrated on the best lands of the coastal plain and the north, agriculture was functioning without machine power either for production or transport. Only about 3000 hectares were equipped with a modern irrigation distribution system. Modern production inputs; fertilizers, improved seeds, irrigation pumps were not available. Most agricultural output -- primarily cereals, olive oil, and animal products -- was for home consumption. And outlets for the marketable surplus were unorganized and regionally isolated. No market information system was in existence. Similarly lacking were credit institutions and government services such as location specific applied research, extension, education and manpower training. Infrastructure not directly related to production but essential to modern life and wellbeing also were rare in rural areas.^{2/}

Positive characteristics of the agricultural sector in 1961 included the production of ". . . 29 percent of gross domestic product, 28 percent of all goods and services for domestic consumption and 22 percent of exports."^{3/} Agriculture possessed a large, rapidly growing and underutilized labor force which offered massive problems but also opportunity if it could be educated, supplied with supporting inputs and mobilized for production.

^{2/} Van Wersch and Daves, op. cit., p. 76.

^{3/} Ibid.

III. AGRICULTURAL PROGRESS 1962-1971

As a general statement about change in Tunisian agriculture between 1962 and 1971 one can say that progress was made toward development of the infrastructure, institutions and trained manpower necessary to a productive sector. However there is scant evidence that progress was made in achieving either an improved level of agricultural production on a sustained basis or an improved level of living for the majority of the rural poor.

In 1971, a year with at least average production conditions, the gross value of output by agriculture was 133.9 million dinars,^{4/} only 19 percent more than the average achieved in the three years prior to the beginning of the development decade.^{5/} Income per person dependent on agriculture, about 3.2 million persons in 1971, was only 42 dinars. So, despite some increase in agricultural output and substantial migration from rural to urban

^{4/} The year, 1966, is the current official statistical base year for the Tunisian government, therefore most of the recent value of output information available is expressed in 1966 prices. All production, consumption, and investment figures used in this paper have been similarly converted to allow useful comparisons. The price and cost indices used to make these value conversions are the wholesale price indices given in the various issues of the Annuaire Statistique de la Tunisie, (République Tunisienne, Institut Nationale de la Statistique) and unpublished equipment and construction cost indices provided by the Ministère du Plan. Whenever possible disaggregated indices were applied to individual value estimates. Alternatively, actual 1966 average prices were applied whenever quantity estimates were available, e.g., estimates of the total value of output by the agricultural sector were obtained by applying the appropriate 1966 prices to the quantities of individual products or classes of products produced.

^{5/} Van Wersch and Daves, op. cit., p. 78; République Tunisienne, Ministère de l'Agriculture, Rétrospective Décennale de l'Agriculture 1962-1971, 1ère Partie, March 1972, p. 64.

areas, the average rural Tunisian was little better off in income terms in 1971 than he had been ten years earlier.^{6/} In fact, because of increased living costs he was perhaps less well off in real income terms, even granting that some progress was made toward extending modern social services to rural areas.

The aggregate economic data summarized in Table 1 below illustrate agricultural growth during the 1962-1971 decade. To reduce distorting effects of annual fluctuations, three year averages at both the beginning (base) and ending periods are used.

Referring to Table 1 we can see in succinct detail the failure of agriculture to grow during the 1962-1971 decade. Annual gross value of output by the sector increased by only 7.3 million dinars; value added by only 3.4 million dinars. Intermediate consumption, the utilization of purchased non-land and non-labor inputs, increased about 25 percent. However, in the three year period ending the development decade intermediate consumption was only 16 percent of the value

^{6/} Whether there was an increase in agricultural output between 1962 and 1971 can be debated. Depending upon the base period and set of output estimates used, calculations of output growth rates over the period range from -1.8 to +0.6 percent. In any case it is evident that agricultural output per capita declined. Total population is estimated to have increased from 4.24 million to 5.35 million persons, a compounded annual rate of 2.35 percent. (Rétrospective op. cit. 1ère Partie, pp. 59,66; République Tunisienne, Ministère du Plan, "La Situation de l'Agriculture Tunisienne de 1962-1971," December 1971, pp. 5, 8; Perspectives, op. cit., p. 15).

Table 1. Achievements of the Tunisian agricultural sector, 1962-1971.

Item	1959-1961	1969-1971	Change 1962-71
	<u>Million Dinars</u> ^{1/}		<u>Percent</u>
Gross Output	112.1	119.4	6.0
Value Added	97.1	100.5	3.5
Intermediate Cons. ^{2/}	15.0	18.9	26.0
Exports	25.4	22.0	(-)13.4
Imports (A) ^{3/}	22.5	43.2	92.0
(B)	6.9	11.1	61.0

^{1/} 1966 prices.

^{2/} The value of on-farm forage production is excluded from the estimated level of intermediate consumption.

^{3/} (A): Imports of agricultural products.
(B): Imports of inputs for agricultural production use; seeds, fertilizers, pesticides, live animals, machinery, tools and equipment, etc.

Sources: Perspectives, op. cit.; "La Situation de l'Agriculture Tunisienne," op. cit.; Rétrospective, op. cit., 1ère et 2ème parties; Annuaire Statistique, op. cit., 1959-1971; République Tunisienne, Institut National de la Statistique, Statistiques Du Commerce Exterior de la Tunisie, 1959-1970.

of gross output: it was 13 percent of gross output in 1959-1961.

Productive modern agriculture normally requires an average intermediate consumption level of between 30 and 50 percent of gross output.

Agricultural exports declined during the decade because of a combination of increased domestic demand for agricultural products

and stagnation or decline of production of most agricultural products, including the major export products, olive oil, citrus and wine.

For the same reasons the import of agricultural products increased by more than nine percent per year. Tunisia moved from a position of net self-sufficiency in agricultural products to a position as a net importer, importing an average 21 million dinars more of agricultural goods than were exported in 1969-1971. Furthermore, agriculture's contribution in terms of net foreign exchange earnings declined. Imports of non-capital agricultural inputs increased by 61 percent, while exports declined by 13 percent.^{7/}

Subsector Performance

A closer look at output performance of the agricultural sector between 1962 and 1971 can be had by disaggregating the output totals.

^{7/} Some imports, particularly for intermediate and long-term capital investment, are not included in the table because only very fragmentary data are available. (Among the categories of items excluded are fuels and lubricants, farm trucks, and construction materials). However, an estimate that 75 percent of total intermediate consumption by the sector was imported is probably not unreasonable. With this assumption, estimated net foreign exchange earnings by the sector become 14.0 million dinars per year in the 1959-1961 period, 7.8 million dinars in 1969-1971. In 1957, a year for which complete data are available, net foreign exchange earnings by the sector were 13.3 million dinars in 1966 prices. (Perspectives, op. cit., pp. 18, 20).

Table 2, below, gives a summary of land use and of value of output by major product subsector and by the important classes of vegetable and animals products. As shown by this table the animal products and fish subsectors registered some growth during the decade. However, growth in these subsectors was offset by a net decline in production of vegetable and forest products.

The only product classes for which growth over the period might be considered satisfactory are truck crops^{8/}, pulses, eggs and fish products. Increases in cereals, meats, milk, wool and hides, were too low to importantly affect either the total supplies of these individual products or the total value of agricultural output. It should be noted, however, that during the course of the decade there was increasing emphasis given to efforts to increase cereals output while at the same time diverting some cereals land to tree plantations and to production of truck crops, pulses and forages. That cereals acreage fell by 27 percent while value of cereals output increased by 11 percent is evidence of progress made in this direction.^{9/} Also

^{8/} Truck crops include vegetables -- primarily tomatoes, peppers, potatoes and artichokes--melons and watermelons, and strawberries.

^{9/} The increase in average cereals yields does not necessarily imply that effective yields in general or for any particular enterprise or land-climatic zone increased dramatically. Most of the land diverted from cereals was in Central Tunisia where in normal years rainfall is barely sufficient for very low cereals yields. Thus, though total cereals output did increase, yield increases on the lands remaining in cereals production were not as high as the average would indicate.

Table 2. Changes in land use and gross value of agricultural output, 1962-1971.

Product Group	Area		Value of Production ^{1/}	
	59-61	69-71	59-61	69-71
	1000 Hectares		1000 Dinars	
<u>Vegetable Products</u>				
Cereals	3387 ^{2/}	2486 ^{2/}	20059	22290
Tree Crops	942	1262	40245	27898
Truck Crops ^{3/}	24	60	10374	18340
Pulsas	67	79	748	1447
Industrial Crops	10	8	682	672
	<u>4430</u>	<u>3895</u>	<u>72108</u>	<u>70647</u>
<u>Animal Products</u>				
Meats			24276	27509
Milk			7449	7891
Eggs			1860	4278
Wool and Hides			1248	1517
Forages	56	110		
Open Grazing	7087	7447		
Forest Grazing	467	467		
	<u>7610</u>	<u>8024</u>	<u>34833</u>	<u>41195</u>
<u>Forest Products</u> ^{4/}	900	1021	2597	2283
<u>Fish Products</u>			2553	5228
Total	<u>12473^{5/}</u>	<u>12473^{5/}</u>	112091	119353

^{1/} 1966 prices.

^{2/} Includes fallow.

^{3/} Vegetables, melons and watermelons, strawberries.

^{4/} Cork, wood and alfa grass.

^{5/} Forest land is counted only once.

Sources: Perspectives, op. cit., Titre II, Ch. II; Belgacem Gaied, Production Agricole, Animale et Végétale, Rapport de Recherche en Economie Agricole, No. 7, BPDA, Ministère de l'Agriculture, République Tunisienne, February 1971; Rétrospective, op. cit., 1ère Partie; Annuaire Statistique, op. cit., 1959-1961.

area and production of the alternative annual crops increased, as did the area devoted to fruit and nut plantations.

Diversification

Another characteristic of change in agricultural production over the 1962-1971 period was a very slight tendency toward diversification of agricultural production, a major objective established by the government in 1961.

The major crop categories in 1959-1961, cereals and tree crops, accounted for 76 percent and 21 percent, respectively, of cropland in production. By 1969-1971 these totals had changed to 62 percent and 32 percent of cropland. Together these two crop categories used 97 percent of all cropland in 1959-1961, 94 percent in 1969-1971.

At yet a lower level of aggregation the amount of diversification achieved appears little better. Oil olives occupied 83 percent of tree-crop land in 1959-1961, 84 percent in 1971. Wheat and associated fallowed land used 61 percent of the cropland not in plantations in the base period, 60 percent in 1971.^{10/} Thus two crops, oil olives and wheat, occupied 67 percent of total cropland in 1971.

In terms of value of output, crop diversification did make some progress. Truck crops, occupying less than one percent of total cropland in 1959-1961 and only two percent in 1969-1971, produced 26 percent of total crop production in the latter period, up from 14 percent at the start of the decade. The combined value of cereals and tree crops declined from 83 percent to 72 percent of total crop value.

^{10/} Van Wersch and Daves, op. cit., p. 71.

There was also a minor shift toward greater production of animal products, reflected in the 96 percent increase in area devoted to forages and the one percent increase in the proportion that animal products contributed to total agricultural output. Though not necessarily requiring a shift of resources from other parts of the sector the increase in fish products production from 2.3 to 4.4 percent of total sectoral output does represent an increase in the range and quantity of products available.

Employment and Manpower Training

A critical need for agriculture foreseen in 1961 was a rapid expansion of employment possibilities to absorb the very large number of rural underemployed or unemployed existent at that time and to provide jobs for the rapidly growing population. It was also necessary to make a massive effort in basic education and manpower training to equip the rural labor force for productive employment in modern agriculture or in other sectors.

Reduction of Unemployment

As illustrated in Table 3 the first objective was far from achieved, even though progress was made toward balancing agricultural labor supply and labor demand.

Table 3. Agricultural labor supply and demand, 1962 and 1971.

	<u>Labor Force</u>			<u>Labor Supply^{1/}</u>			<u>Labor Demand^{1/}</u>
	Men	Women	Total	Men	Women	Total	
	<u>1000 Persons</u>			<u>1000 Man-Years^{2/}</u>			
1962	504	295	799	504	142	646	293
1971	384	225	609	384	108	492	321
Change 62-71	-120	-70	-190	-120	-34	-154	-72

^{1/} It is assumed that all of the available labor is offered at existing wage rates and that no additional work opportunities would be created by reducing wages within feasible limits.

^{2/} Days of work estimates in the original data were converted to man-years by dividing by 250 — an assumed full employment work year. The original data indicate that employed women work an average of only 120 days per year. Therefore 2.08 women are required to perform a man-year of work.

Source: Rétrospective, op. cit., 1ère Partie, pp. 66-68.

The amelioration of the unemployment situation in agriculture is largely a function of decreased supply, not increased demand—work availability. New work opportunities for only 28,000 man equivalents were created between 1962 and 1971. During the same period labor supply, i.e., the man-years (250 days) of labor available for agricultural employment, decreased by 154,000.

A closer look at the labor demanded in 1962 and 1971 (Table 4) reveals that the performance of the agricultural sector with respect to creation of new employment opportunities may have been somewhat better than the overall totals indicate.

Table 4. Agricultural employment, 1962 and 1971.

Subsector	Employment		Change
	1962	1971	62-71
	<u>Thousand Man-Years</u>		
Vegetable products	160.3	221.3	61.0
Tree crops	(81.3)	(134.8)	(53.5)
Truck crops	(31.1)	(43.1)	(12.0)
Field crops	(47.9)	(43.4)	(-4.5)
Animal products	59.8	62.1	2.3
Forest products	10.7	8.9	-1.8
Fishery products	7.5	8.8	1.3
	<u>238.3</u>	<u>301.1</u>	<u>62.8</u>
Conservation	34.5	4.9	-29.6
Forest expansion	20.0	14.4	-5.6
	<u>54.5</u>	<u>19.3</u>	<u>-35.2</u>
Total	<u>292.8</u>	<u>320.4</u>	<u>27.6</u>

Source: Rétrospective, op. cit., 1ère Partie, p. 68.

The positive change in agricultural employment between 1962 and 1971 is almost entirely a result of the 54 thousand man-year increase in employment in the tree crops subsector. And this increase was generated by the government supported effort to extend the tree crop area. Tree planting (other than replacement plantings) causes a temporary expansion in labor demand and will not be continued indefinitely. Similarly, the extensive programs in conservation and reforestation undertaken during the decade provided a large and temporary boost in rural (agricultural) employment. These programs, which had employment creation as a major objective, provided 19,000 man-years of work in 1971, an

average of 44,400 man-years over the decade.^{11/} Partly financed by assistance from the world food program, Programme Alimentation Mondiale (PAM), these programs offer only a short term and partial solution to the agricultural employment problem. Continuance of high levels of investment in soil conservation and reforestation would draw heavily on government resources and promise very low rates of economic return. Also, PAM contributions cannot be expected to continue indefinitely.

Nevertheless, when looking only at the production subsectors, there was a definite gain in employment opportunities. Assuming that employment per hectare will remain constant in the tree crops subsector, expansion of the tree crops area (see Table 2) should yield a long run increase in employment of about 27,600 man-years. Labor replacing technology is unlikely to reduce this total much in the near future. With this gain in employment the net employment gain by the production subsectors was about 36,900 man-years, not all of which is immediately available because of the gestation period for the tree crops.

Diminution of the supply of labor to agriculture can be explained by the cumulative effects of large migration to urban employment and unemployment; migration of unskilled labor to Western European countries, 32 thousand persons in 1971 as compared to only nine thousand in 1967;^{12/} retardation in the entrance of new workers to the labor force because of increased educational

^{11/} Retrospective, op. cit., 3^eme Partie, No. 7, pp. 18, B13.

^{12/} Van Wersch and Daves, op. cit., p. 40.

opportunities -- more people are spending a longer time in schools, and increased reluctance of women to work in the fields.

Manpower Training

Accomplishments in agricultural manpower training between 1962 and 1971 were substantial. However, a large deficit both with respect to the levels planned for 1971 and the need estimated in 1972 remains (Table 5).

Table 5. Agricultural manpower training achievements, 1962-1971.

	Target 1971	Achieved 1962- 1971	Estimated Deficit 1972
University Graduates	940	600	600
Agricultural School Grads.			
Superior	1200	720	3500
Basic	3700	2840	
Specialized Workers	5850	27860	40000
Total	11690	32020	44100

Sources: Perspectives, op. cit., Retrospective, op. cit., here and 2ndme parties.

To service the increasingly complex and demanding agricultural sector there is a need for additional trained workers in all categories, from skilled maintenance workers and orchardists to qualified extension personnel and research scientists to adapt and develop new technologies. Given the existing capacity of training centers and personnel achievement of current needs, as estimated in 1972, will require another ten years or so.

The existing capacity for training of these needed new workers consists of 46 farm worker training centers offering primarily short-courses in practical agriculture, nine four-year agricultural high schools, four specialized institutes offering two years of practical post-high school training for agricultural technicians. Also the national agricultural college, INSAT, offers a basic four year degree program, and, in conjunction with schools in France, an additional fifth and sixth year program for a select few students.

For all of the non-university programs, practical training and specialization -- by activity, enterprise and region -- is emphasized. At the university a standard general agriculture curriculum is offered. Specialization is given only to the few students who qualify for fifth and sixth year programs. For most students this specialization consists only of auditing courses at French agricultural colleges and writing a research paper.

The effective training capacity of these institutions is about 6,000 persons per year, 10 to 12 to the specialized professional level, 40 to the college graduate level, 800-1,200 to the agricultural technician level, and 5,000 to specialized farm worker levels.^{13/}

To compound the problem of meeting the needs for professionals and specialized workers in agriculture the deficit in agricultural education and training has a quality as well as a quantity aspect. Despite the real need for more trained workers only 40 to 45 percent of the

^{13/}Floyd L. Corty, "Development Planning in Tunisia" University of Minnesota in Tunisia, Tunis, December 1972, p. 64. (Unpublished manuscript).

workers completing training at the agricultural specialist centers during the 1960's are now employed.^{14/} Of those employed 20 percent are in non-agricultural jobs. Apparently many graduates of these schools are not well enough trained to perform the jobs for which they are needed or — and this is the case distressingly often — they are unwilling to actually do the job for which they are trained and have competence. Graduates of the various courses and schools, including the University, expect to supervise others who will perform the tasks for which they, the graduates, are trained. The result is a surplus of "administrators" at all levels and, where the law does not require that a position be provided for the graduate, unemployment.^{15/} Most work requiring any degree of technical skills continues to be done by persons who are not adequately trained.

Production and Marketing Agencies

During the decade 1962-1971 a very large number of institutions controlling and serving agricultural production and marketing activities were created, strengthened or given new functions. The more important of these institutions existing in 1971 included.

OFFICE DE MISE EN VALEUR DE LA VALLEE DE LA MAJERDA (OMVVM) - responsible for integrated development of the Medjerda Valley with special emphasis on extension of irrigation. (In 1972 the OMVVM's responsibilities were extended to all public irrigated lands not managed by three other similar but smaller offices, also created in 1972).

^{14/} Rétrospective, op. cit., 2ème Partie, p. 51.

^{15/} Although unemployment is concentrated among those individuals receiving the lower levels of training, underemployment of time and talent of professionals is widespread.

OFFICE DES TERRES DOMINIALES (OTD) -

responsible for management of public lands, state farms and cooperatives.

OFFICE NATIONAL DES PECHEES (ONP) -

responsible for fishery development and operation of the public fleet and fish marketing and processing facilities.

OFFICE DES CEREALES -

responsible for regulation of cereals and pulses sales; has an export and import monopoly.

OFFICE DU VIN -

monopoly for wines, including wholesaling, imports and exports.

OFFICE DE L'HUILE -

monopoly for olive oil, including wholesaling, imports and exports.

Each of these institutions has a broad range of functions in addition to those listed. Important functions performed by all are applied research, extension activities and assistance to private operators. The assistance provided includes technical advice, loans and rental of equipment, provision of credit in kind and marketing services.

Among the other important production-marketing organizations are: the Societ  Tunisienne des Industries Laiti res (STIL), a semi-public agency controlling the processing and marketing of milk and milk products and dates: the Societ  Tunisienne du Sucre (STS) which operates the domestic sugar industry (production and processing) and the Groupement Obligatoire des Agrumes which controls the export of citrus products. Also numerous semi-public central cooperative organizations (for cereals, olives, livestock, wine, fruits, etc.) provide services to cooperatives and cooperative members and exercise varying degrees of influence or control over marketing and prices.

Statutory marketing monopolies are enjoyed by cooperative type agencies dealing in tobacco, alfa-grass, and cork.

Agricultural inputs, including improved seeds, animals, fertilizers and prophylactic supplies, machinery and equipment, are provided by several semi-public cooperatives and companies. Variable inputs (seeds, fertilizers, etc.) are commonly advanced as credit in kind, machinery and equipment are loaned (to associated cooperative members) or are rented.

Agricultural Credit and Insurance Agencies

Agricultural credit, other than the credit in kind provided by many of the different agencies mentioned above, is available from two sources, the Banque Nationale de Tunisie (BNT) and 45 Caisses Locales de Crédit Mutuel (CLCM's) which are under administrative and financial control of the BNT. The CLCM's mission is to provide seasonal credit to small farmers. The BNT, which has 24 branch offices, is responsible for all medium or long term loans and all seasonal loans of more than 500 dinars.

Seasonal agricultural credit of the CLCM's and the BNT increased from 1.8 million dinars in 1961-1962 to 5.3 million dinars in 1970-1971. Medium and long term agriculture loans of the BNT increased from 589 thousand dinars to 6.7 million dinars over the decade. The distribution of agricultural loans between cooperative and private operators during the decade was 56 percent to cooperatives, 44 percent to private firms (see appendix Tables A.3 and A.4).

Insurance for agricultural and fishery activities is provided by a nationwide network of semi-public mutual insurance societies, operating

under loose administrative control of the nationalized (1964) agricultural insurance society, the CTANA. The CTANA serves to federate the various regional societies and underwrites the insurance which they extend. Types of insurance extended include, hail, fire, accident, animal loss, workers, and maritime.

IV. INVESTMENT, RESOURCE USE AND PRODUCTIVITY

Investments in agriculture during the 1962-1971 period reflected the government commitment to development of the sector. Over the decade 24.1 percent of total government investment in Tunisia was allocated to agriculture, which contributed only 21.2 percent of gross output (Table 6).

Table 6. Agricultural and non-agricultural output and investment, 1962-1971.

Sector	Gross Output	Investment		
		Total	Public ^{1/}	Private
		<u>Million Dinars^{2/}</u>		
Agricultural	1151.7	295.0	215.0	80.0
Non-agricultural	4287.8	946.5	676.3	270.3
Total	5439.5	1241.5	891.3	350.3
Percent Agric.	21.2	23.8	24.1	22.8

^{1/}Administration plus public enterprises.

^{2/}Current prices.

Source: Rétrospective, op. cit., 4ème Partie; Ministère du Plan.

Of total investments by both public and private investors, 23.8 percent, 295 million dinars, was agricultural. Government was the predominant investment agent in both the agricultural and non-agricultural sectors, though slightly more so in agriculture. Government made 74 percent of agricultural investments during the decennium, 71 percent of the investments in other sectors.

The sources of financing and distribution of investments made within the agricultural sector during the decade are listed in Table 7. As illustrated by this table, the government through its budget and administration of available foreign aid funds was the moving force behind extension of irrigation, forest development, conservation, livestock improvement, and employment creation and service related investment's -- work-relief, research and extension, and education. The initiative of private firms and individuals and of semi-autonomous or semi-public agencies (primarily the various offices and cooperatives) predominated in investments for: machinery and equipment, farm buildings; pasture, range and irrigated crops improvements; and fishery industry infrastructure. Substantial fruits and nuts plantation costs were borne by both the administration and by the other investors.

Among agricultural investment categories, irrigation received by far the largest share of the decennial investment budget, more than 27 percent (80.6 million dinars) as compared to the next highest categories, 15 percent allocated to equipment purchases and 14 percent to tree plantations. The focus of irrigation investments (Table 8) was on the development of large scale projects, the construction of dams and associated irrigation infrastructure and expansion of the lower Medjerda Valley system. The Medjerda system, Tunisia's first attempt at large scale irrigation development was initiated before independence with assistance from Tunisia's share of Marshall Plan aid given to France.

Table 7. Agricultural investments, 1962-1971, by investment category and source of financing.

	National Budget	Foreign Aid	Bank Credits (BNT)	Enterprise or Agency self- financing	Total	Percent
<u>Million Dinars^{1/}</u>						
Forest development	26.2	8.0			34.2	11.6
Conservation	17.0	8.1	0.4		25.5	8.6
Work-relief	9.2				9.2	3.1
Irrigation	62.8	15.7	1.1	1.0	80.6	27.3
Farm buildings			0.1	3.5	3.6	1.2
Equipment	2.1	2.4	8.4	30.0	42.9	14.6
Livestock	2.3	2.9	1.5	0.2	6.9	2.3
Tree plantations	14.7	2.7	7.9	16.5	41.8	14.2
Fisheries	0.1	0.9	0.5	3.7	5.2	1.8
Research and extension	12.4	10.4			22.8	7.7
Agric. educ., training	4.2	5.0			9.2	3.1
Rural hous., water sup.	5.2			2.6	7.8	2.6
Other	1.2		3.5	0.6	5.3	1.8
Total	157.4	56.1	23.4	58.1	295.0	99.9
Percent	53.4	19.0	7.9	19.7	100.0	

^{1/} Current year prices.

Source: Rétrospective, op. cit., 4ème Partie.

Table 3. Irrigation Investment, 1962-1971.

	Million Dinars ^{1/}	Percent
Dams	32.29	40.0
OMVM (major works)	3.07	3.8
Drilled wells	6.67	8.3
Dug wells	2.14	2.6
Floodwater spreading	0.94	1.2
Tertiary distribution systems	13.11	16.3
Drainage, land improvement	1.43	1.8
Irrigation equipment	9.73	12.1
Water studies	11.23	13.9
Total	80.61	100.0

^{1/} Current prices.

Source: Rétrospective, op. cit., 4ème Partie, Tableau VII.

Together with observed effects on output, the test of usefulness of investment is the changes affected in real productive or level of living enhancing capital stocks. Generally rough estimates of gross real capital formation for some of the more important investment categories or parts of categories included in Table 7 are listed below.^{16/}

Reforestation, etc. — 290 thousand hectares of new and improved forest, 291 thousand hectares of range improvement.

^{16/} These estimates were derived from a number of sources, most of which are a part of the set of agriculture retrospective documents (Rétrospective, op. cit.). Real capital formation which occurred in the 1962-1971 decade is difficult to estimate even for those investments which resulted in physical and thereby countable additions to the existing stocks of facilities, equipment, productive animals and trained manpower. Estimation problems to overcome include a lack of knowledge about initial stocks and depreciation rates, inadequate data with respect to numbers of things produced or acquired, and quality differences over time. Other categories, while adding to agricultural output and/or incomes, did not result in new productive resources and therefore did not increase agricultural capital stocks -- e.g. rural housing and water supplies, work relief, general studies.

Conservation	-- establishment of soil protection and floodwater spreading terraces and dikes on 650 thousand hectares, improved cultural practices on 20 thousand hectares.
Irrigation	-- water supplies for 40 thousand hectares, 47 thousand hectares equipped with improved permanent distribution systems or moveable pipe.
Farm buildings	-- 60 thousand square meters of equipment storage and animal housing, 230 thousand cubic meters of product storage.
Equipment	-- 8500 tractors and associated equipment.
Livestock	-- importation of 4700 head of improved cattle.
Plantations	-- 413 thousand hectares of fruit and nut trees.
Fisheries	-- 300-400 motorized fishing boats, eight ports with facilities, three new construction and repair facilities, 20 refrigeration centers, 1300 tons of storage capacity.
Agricultural Education & Training	-- addition of three years to the agricultural college curriculum, addition of eight new agricultural high schools, 606 university graduates, 3600 agricultural school graduates, 28 thousand specialized workers.

In addition to the specific capital formation items listed above, numerous other government investments in rural areas have enhanced the productive capacity of agriculture as well as the quality of rural life. Examples are: the construction of 15 thousand rural housing units; provision of improved domestic water supplies in most rural areas; the almost universal availability of primary education; establishment of high schools with boarding facilities in all population centers; extension of modern (though still grossly inadequate) health services to most centers; rehabilitation and extension of the highway system; provision of adequate public transportation services for both

people and goods throughout the country; improvement in radioreception in rural areas and introduction of programming emphasizing information, instruction and entertainment for rural people; and, finally, expansion of electrification to rural population centers.^{17/}

Resource Use Changes and Marginal Productivity

In contrast to the positive accomplishments of investment policy in terms of real capital formation, the capital expenditures during the 1960's obviously had little impact on current production or productivity of the agricultural sector. As shown by Table 1, gross annual output of the sector increased by only six percent between 1962 and 1971. Tables 9-11 below and the accompanying discussion examine the characteristics and productivity of the agricultural investments made and of the other two major categories of agricultural inputs, labor and land.

The estimates included in Table 9 should be interpreted with caution. Several conceptual and practical problems limit the strength and extendability of conclusions which might be drawn on the basis of these numbers. Probably most important, the several ratios presented were calculated independently: sufficient data were not available to allow simultaneous estimation of the output effects of the three resources. Therefore the output-resource ratios of columns 7-9 can only be said to indicate that observed changes in output were associated with the specified relative changes in resource inputs. No testable causal relationship nor distribution of output effects among the three resources are implied.

The investment data included in the Table are valued in current prices: Output is estimated in constant (1966) prices. The time sequence

^{17/}Van Wersich and Daves, op. cit., pp. 40-42.

Table 9. Gross investment (ΔK); changes in output (ΔO), employment (ΔE) and land use (ΔL); and marginal output-resource ratios in the agricultural sector 1962-1971.

Subsector	(ΔO) ^{1/}	(ΔK) ^{2/}	(ΔE) ^{3/}	(ΔL)	Output/Resource Ratios		
					$\frac{\Delta O}{\Delta K}$	$\frac{\Delta O}{\Delta E}$	$\frac{\Delta O}{\Delta L}$
					10 ⁶ Dinars	10 ³ Man- years	10 ³ Hec- tares
Vegetable products	2.5	166.4	61.0	-481	0.015	41.0	<u>4/</u>
Tree crops	(-12.3)	(58.9)	(53.5)	(320)	(-0.209)	(-119.9)	(-38.4)
Truck crops	(8.0)	(53.6)	(12.0)	(36)	(0.149)	(666.7)	(222.2)
Field crops ^{5/}	(6.9)	(53.9)	(-4.5)	(-837)	(0.128)	<u>4/</u>	<u>4/</u>
Animal products	2.4	10.6	2.3	360	0.226	1043.4	6.7
Forest products	-0.3	34.2	-7.4	121	-0.009	<u>4/</u>	-2.5
Fishery products	2.7	5.2	1.3	-	0.519	2076.7	-
Total	7.3	216.4	57.2	0	0.034	127.6	-

^{1/} Changes in average annual output 1959-1961 to 1969-1971, valued at 1966 prices.

^{2/} Total investment 1962-1971 in current prices.

^{3/} Changes in annual employment 1962-1971, excluding employment generated by make-work projects.

^{4/} These ratios are not given because ratios computed for negative changes in resource inputs can not be usefully interpreted.

^{5/} Includes changes attributable to forage production.

Sources: Table A2; *Rétrospective, op. cit.*, 1ère et 4ème Parties.

of substantial amounts of the investments are not known and no adequate price and investment cost indices are available to allow conversion of the investment totals to constant prices. Furthermore, the investment estimates used are gross investments. As stated in footnote 16, lack of knowledge about existing capital stocks at either the beginning or ending of the period, 1962-1971, and about depreciation rates do not allow calculation of net investment. The estimates of changes in employment and in land use are net figures, though even for these resources quality changes may have occurred.

Some of the investment base data, particularly for private investments, and the output, employment and land use data are estimates made by officials. They are not derived from sales records, census or sample survey sources.

With these reservations in mind, Table 9 still gives useful insights about the productivity of the major input categories. An examination of the subsectoral input-output changes from 1962 to 1971 reveals that for four of the six subsectors marginal factor productivity might be considered adequate although lower than desired. The two product groups for which current output performance was clearly unsatisfactory are the tree crops and forest products subsectors. Annual production from both of these subsectors declined during the decade, by 12.3 and 0.3 million dinars, respectively.

For each of the other subsectors performance was somewhat better in that marginal returns to increases in capital, labor and land resources use were positive. Marginal output-capital ratios for these other sectors ranged from 0.13 for field crops to 0.52 for fishery products.

Increased output per unit of new employment ranged from 567 dinars per man-year for truck crops to 2077 dinars per man-year for fishery products. Field crops output increased by 6.9 million dinars despite a 4.5 thousand man-year drop in employment in this subsector. Output per hectare of increased land use was 222 dinars for truck crops, 6.7 dinars for animal products. Field crops output increased in spite of a 837 thousand hectares decline in land allocated to their production.

At least partial explanation of the poor performance of agricultural input use changes during the decade in terms of increasing current production is implicit in some of the other information included in Table 9.

Capital

Investment during the 1962-1971 period did not produce increases in output at a level which would be expected on theoretical grounds or in comparison with the observed response to investment in the agricultural sectors of other economies. For the total sector each dinar of new direct investment was associated with only 0.034 dinars of new annual output.^{18/}

^{18/}Substantial investments are not included in this calculation, 78.5 million dinars, were allocated to conservation, work-relief (used mostly for repair of roads and other rural infrastructure), agricultural education, research and extension, rural housing and water supplies, and miscellaneous. The bulk of these non-assigned investments were necessary to maintain existing resources, or in the case of agricultural education, research and extension, to replace the management talent and technical knowledge lost when the French and Italian colons left early in the decade. The other excluded investments can be considered as having increased the amenities of rural life but not to have significantly affected output potential. Therefore, net productive investment in the sector was the total directly allocated investment minus depreciation. Although reliable estimation of capital stocks or of depreciation is not possible (see footnote 16) certainly a large portion of the new investment can be considered net as shown by the increased water supplies and irrigation infrastructure, the expansion in tree crop and forest areas, and, apparent increases in the amount of agricultural mechanization.

This ratio of output to capital can be compared to ratios of between 0.06 and 0.15 obtained in agricultural sectors of developed modern economies. In the United States, interest on agricultural loans during the 1960's ranged from a low of six percent or more for long term investments up to about 15 percent for equipment and animal purchases and other short and medium term capital needs. These interest rates represent the market determined minimum return on capital (output-capital ratio). One would normally expect the marginal output-capital ratio to be much higher for Tunisian agriculture, which is in the process of modernization and has a relative scarcity of capital in relation to other productive inputs.

Tunisia also fared badly in comparison with other developing countries. Of 18 countries for which agricultural output/capital ratios were estimated in a recent FAO study, Tunisia ranked fifteenth. The 1960-1965 weighted average marginal output/capital ratio for all countries included in the study was 0.58. Individual country ratios ranged from 0.15 to 3.33. The estimated ratio for Tunisia was 0.21.^{19/}

The estimated marginal capital-output ratio (the inverse of the output-capital ratio) for the sector indicates that each unit of new annual output capacity cost 30 dinars of investment directly allocated to the production subsectors.

^{19/}Edward F. Szczepanik, "The Size and Efficiency of Agricultural Investment in Selected Developing Countries," pp. 1-13, Monthly Bulletin of Agricultural Economics and Statistics, Vol. 18, No. 12, Food and Agricultural Organization of the United Nations, Rome, December 1969. The large difference between Szczepanik's estimate of the output/capital ratio for Tunisia and the 0.034 estimate given above is explained by the differences in agricultural growth rates in the two periods over which the estimates were made. Agricultural output growth was estimated by FAO to be 3.8 percent per year between 1960 and 1965. The average annual growth was only 0.6 percent over the 1962-1971 period used in this study.

	<u>$\Delta K/\Delta O$</u>
Vegetable products	66.6
Animal products	4.4
Forest products	-111.1
Fishery products	<u>1.9</u>
Total	29.6

Capital-output ratios estimated for the major subsectors range from 111.1, absolute value, for forest products—the minus sign reflects the production decrease in this subsector—to 1.9 for the Fishery products subsector. The capital-output ratio for the vegetable products subsector, 66.6 is comprised of ratios of minus 4.8 for tree crops, 6.7 for truck crops and 7.8 for field crops. Excepting only fishery products and perhaps animal products, all of these capital-output ratios are higher than desirable, when judged by an efficiency criterion requiring an eight to ten percent return on capital.

Labor

The data in Table 9 also give some indication of the effects which employment in the sector may have had on output and on the productivity of labor and of the other inputs. Total annual employment in agriculture increased by 57.2 thousand man-years: the bulk of this increase, 53.5 thousand man-years, was provided in the tree crops subsector.

The marginal output-employment ratio for the total employment increase was 128, i.e., each man-year of new employment created during the decade was associated with a 128 dinar increase in gross output by the sector. Obviously the increased output was insufficient to pay the legal minimum wage to the increased labor force. The official minimum wage for common agricultural labor, 0.6 dinars per day would result in an annual wage of

150 dinars for fully employed workers, those employed for 250 days. This annual wage, 150 dinars, is greater than the total income increase per worker achieved, 128 dinars. And, from the latter must be subtracted payments to other productive factors.

The subsector output-employment ratios (in Table 9) make clear, however, that only the tree crops subsector did not generate sufficiently more output per unit of new employment to cover payment of minimum wages. Nevertheless, insofar as total agricultural wages increased with employment and minimum wages were paid, a wage differential (minimum wage x employment increase > gross output - payment of non-labor factors) did exist and had to be made up by transfers from other sectors or from foreign donors. Some transfers of this nature were made as government wage and commodity payments to laborers involved in agricultural investment activities, primarily fruit (olives) and forest tree planting.^{20/}

In assessing the current output productivity of employment created during the 1960's it should be noted that the bulk of the new employment was in the tree crop subsector which experienced an expansion in area of 320 thousand hectares. And, since annual tree crop production declined by more than 30 percent, 12.3 million dinars, there could have been little if any increase in labor requirements for tree crop maintenance and harvesting. Therefore, it appears that a major portion of the observed annual employment increase in the tree crops subsector and for the agricultural sector as a whole was attributable to currently non-productive tree planting activity.

^{20/} Other transfers, some of which may have filtered down as wage payments were direct subsidies and low interest loans received by public and semi-public agricultural enterprises. These types of transfers were also made to similar enterprises in the non-agricultural economic sectors. See J. G. Kisse, The Financing of Investments in Tunisia 1961-1971, (Mimeo), UNDP, Tunis, September 1973, p. 28.

This implies that a significant part, perhaps most, of new employment opportunities created in the tree crops subsector during the 1960's are of a transitory nature and do not represent an increase in the long run agricultural employment base. Additional production employment, which can be considered permanent in that it does not have to be sustained by continuing new net investment, will not be forthcoming for the years necessary for gestation.

Analysis of the forest products subsector reveals a resource use and productivity pattern similar in some respects to that of tree crops. Despite 34.2 million dinars of gross investment and an increase in area of 121 thousand hectares in this subsector, both output and employment declined during the decade. Part of total forestry employment and part of the reason for its decline can be attributed to current forest product production. The decline in annual production which occurred can be considered as either a cause or an effect of the employment decline seen. Of the 7.4 thousand man-year decline in forestry employment between 1962 and 1971, 1.8 thousand man-years were attributable to reduced labor use in the forest production subsector, 5.6 thousand man-years were attributable to the decline in forest expansion (investment) activities.^{21/}

^{21/}One reviewer of an early draft of this section argued that for the tree crops and forestry subsectors only that labor expended for current production purposes is relevant in estimating coefficients of labor productivity. However, this procedure would obscure a most important point, that many of the resources allocated to the agricultural sector during the 1960's were not used for immediately productive purposes. Substantial current consumption and early pay-off investment possibilities were sacrificed to allow investments having a pay-off only far in the future, if ever. Also, particularly for the tree crops subsector, it is impossible to separate out the labor for tree planting (and removal) which was necessary to maintain or improve the orchards existent in 1961. Nor are available data adequate to allow determination of the amount of land planted to trees during the decade that did or should have become productive during that period.

As was the case for tree crops, almost all of the investment, all of the area expansion, and about 60 percent of total employment in the forestry subsector was for the establishment of new forest areas or for the rehabilitation of existing ones. This reforestation commitment has negligible positive impact on current production of the subsector. The payoff to these resources will come after 20 to 40 years, when the new trees are ready for harvest. And, as for tree crops, employment generated by forest tree planting is directly tied to new investment and will continue only so long as investment does.

Land

Although the total land resource committed to agriculture remained constant, the allocation of this resource among subsectors and consequently the intensity of land use did change in a manner that might tend to reduce at least temporarily the productivity of land.

The amount of land allocated to the production of vegetable products, a relatively intensive land use, declined by 481 thousand hectares. Land in pasturage and in forests increased by an equal amount. However, within the vegetable products subsector the direction of changes, in terms of land use intensity, was ambiguous. The land area allocated to truck crops and to tree crops increased by 36 thousand and 320 thousand hectares, respectively. These changes nominally represent a shift toward higher land use intensity (output per unit of land). But, the increased area in tree crops may in fact have resulted in a temporary decrease in average land use intensity insofar as the new areas have not yet come into production.^{22/}

^{22/} Between 1962 and 1971 average yields of all tree crops fell from 1.0 to 0.7 ton per hectare. Olive yields fell from 0.6 to 0.4 ton; citrus yields fell from 12.7 to 6.4 ton, and other fruit tree yields fell from 1.2 to 0.8 ton. The only type of tree crop for which yield increased was wine grapes, up to 4.6 tons per hectare from 4.4 tons. (Van Wersch and Daves, op. cit., p. 62).

Significant production from olive plantations, which accounted for 84 percent of the tree crop area expansion, occurs only about 15 years after planting: citrus and most other fruit trees begin producing in quantity five to eight years after planting. Furthermore, the change in area in tree crops indicated is a net figure. A considerable area of producing tree crops, largely olives, was destroyed during the decade because of declining production and because of a desire to divert some of the affected lands to vegetable and forage production. Thus the percentage and probably the total area of tree crops land which was actually producing declined during the decade.

Also, a large proportion of the trees planted were not properly maintained. Many died; many others were seriously retarded in coming into production, and most never reached their production potential. Citrus orchards established or expanded on the Cap Bon during the 1960's put increased demands on the limited and already overtaxed water supplies with the result that all citrus production in the region was adversely affected.

A similar situation was created in Central Tunisia where irrigated perimeters were established around newly drilled wells. For many of these wells the area developed for irrigation and planted to fruit trees or other intensive crops was too large for the water supply or for the capability of the pumping equipment. Young trees were inadequately watered and failed to grow or produce. Some nominally irrigated orchards of 8 to 10 year old apricot trees in this area have never produced a crop worthy of commercial harvest. (Apricot trees receiving adequate moisture should produce commercial quantities for about 15 years beginning 3 to 5 years after planting.)

Total Resource Use and Productivity

No data exist with respect to total productive capital stocks in agriculture at either the beginning or the end of the 1960's (see footnote 16). However, estimates of total employment of labor and land are available and sectoral aggregate output-employment, and employment-land ratios can be calculated. Comparison of these ratios for 1962 and for 1971 (Table 10) give additional information with respect to changes in the performance and resource use structure of agriculture over the period.

Gross output of the agricultural sector per unit of employment declined by more than 15 percent between 1962 and 1971, from 1.9 to 1.6 dinars per man day. This decline occurred as agricultural capital increased and total land allocated to agricultural uses remained constant. However, disaggregation reveals that output per man-day declined only in the tree crops subsector, where, as explained above, a major part of the new employment was allocated. And the employment expansion in this subsector is totally attributable to labor for new plantings.

It should be noted that in contrast to some other industries,^{23/} the gross value added by agriculture in 1971 was adequate to cover wage payments. The legal minimum wage in agriculture, 0.6 dinars per day, is higher than the average earning of agricultural workers. Therefore

^{23/} See Wolfgang F. Stolper, Investments, Employment and Output per Man in the Tunisian Economy, 1961-1971, (mimeo) September 1973.

the gross output of 1.6 dinars per man-day of employment leaves 1.0 dinars for payment of other productive factors and for capital formation. A similar result is obtained by subtracting the minimum wage cost of total agricultural employment -- the minimum annual wage (150 dinars) multiplied by total agricultural employment (301500 man years) -- from the value added by agriculture, 100.5 million dinars. The residual value available for nonlabor factors owned or produced within the agricultural sector is 55.3 million dinars, or 0.7 dinars per man-day of employment. This does not imply that value added by every enterprise in agriculture is sufficient to cover labor costs. Clearly, on many of the traditional cereals farms in low rainfall areas minimum wages could not be paid from gross farm receipts. There is also evidence that this is the case on some cooperatives and state farms.^{24/}

Two interesting facts stand out in an examination of the output-land ratios presented in Table 10: output per hectare (yield) of field crops increased by more than 65 percent; truck crop yields declined by 41 percent. The increase in field crop yields is explainable in terms of the land-use shifts which occurred during the decade. Marginal field crop land totalling 837 thousand hectares and located mostly in low rainfall and hilly areas was shifted to other uses -- primarily pasture, tree crops and forests. Another factor tending

^{24/} In 1967 the legal minimum wage for common agricultural labor was 385 millimes per day (Table A.7.), 96.25 dinars per year. Yet in this year the average annual income received by all cooperative members in Tunisia was 60 dinars. This total includes wage and share payments in cash, 50 dinars, and in commodities, 10 dinars. (Abdelkader Zghal, Changement de Système Politique et Réformes des Structures Agraires en Tunisie, Colloque de Tunisie, CERES, Tunis, October 1967, Annexe V). Unfortunately most cooperative members have no opportunities for outside employment to supplement their income from the cooperative. See also, Simek, et. al., "Cooperatives du Nord," Agriculture retrospective subcommittee report; n.d. (1972), p. 6.

Table 10. Total output-employment, output-land and employment-land ratios for the agricultural sector, 1962 and 1971.

Subsector	Output ^{1/} /Employment		Output ^{1/} /Land		Employment/Land	
	62	71	62	71	62	71
	<u>Dinars/Man-day</u>		<u>Dinars/Hectare</u>		<u>Man-days/Hectare</u>	
Vegetable products	1.9	1.4	17.2	19.9	8.9	13.8
Tree crops	2.0	0.8	42.8	22.1	21.6	26.8
Truck crops	1.3	1.7	518.5	305.7	388.5	176.3
Field crops	2.2	3.1	7.5	12.4	3.4	4.0
Animal products	2.0	2.1	4.1	4.1	2.0	2.0
Forest products ^{2/}	1.0	1.0	2.9	2.5	3.0	2.5
Fishery products	1.4	2.4	-	-	-	-
Total (without fishery prod.)	1.9	1.6	8.5	8.9	4.5	5.7
Total	1.9	1.6	-	-	-	-

^{1/}The base output data are averages for 1959-1961 and 1969-1971. These averages were used to reduce weather effects.

^{2/}Not included are employment used for reforestation and the net area of new forest planted between 1961 and 1971.

Source: Appendix Table A.3.

to increase field crop yields was the 54 million dinar investment in irrigation which was allocated to this subsector.

Not so easily explainable is the decline in per hectare truck crop production. One might expect that because the area in truck crops increased by more than 100 percent (see Table A.3) the average quality of land in this use declined. However, the large investment in irrigation allocated to this sector, 54 million dinars, should have compensated for some or all of the adverse effects of expanding truck crops into climatically less suited areas. The magnitude of the decline in output per hectare suggests that despite the large irrigation investment, the land in truck crop production was cropped less intensively in 1971 than had been the case in 1962. This surmise is supported by the observed decrease in employment per land unit from 388 man-days per hectare in 1962 to only 176 man-days per hectare in 1971.

Employment per hectare of field crops increased by 0.6 man-days between 1962 and 1971. This change is consistent with the observed reduction in marginal, and therefore less intensively cultivated, land committed to field crops in 1971. However, it is not consistent with an increase in mechanization which undoubtedly occurred during the period. Perhaps the increased employment per hectare resulted partially from the government's efforts to increase total agricultural employment by requiring state farms and state controlled cooperatives (occupying 16 percent of all cultivated land in 1971) to employ more labor than was normally employed by previous owners of this land.

As stated above, the observed increase in employment per hectare for the total agricultural sector (1.2 man-day) is largely explained by the growth in labor use, most of it not immediately productive, by the tree crops subsector.

Turning the focus back to investment, we can use the information presented in Tables 9 and 10 and Appendix Tables A.2 and A.3 to draw some conclusions, admittedly tentative, about the effects of investment on the resource use structure and productivity of agriculture during the 1960's. Marginal capital-labor ratios computed using the data in Table 9 indicate that for the total sector each unit of new employment was accompanied by gross investment of 3800 dinars — this total is 5200 dinars if non-allocable investments are included (see Table A.2). Among subsectors the minimum investment per unit of new employment was 1100 dinars in tree crops: the maximum for subsectors experiencing growth in employment was 4500 dinars per unit of new production in truck crops production.

Although total agricultural land area did not change during the decade, land use did shift. For the subsectors gaining in area, investment per hectare of new land ranged from 29 dinars for animal products (rangeland and improved pasture) to 1489 dinars for land in truck crops production. Total productive capital investment per total land area in agricultural use was 16 dinars per hectare (fisheries investments are not included). ^{25/} The highest investment

^{25/} This statement implies that all the agricultural investment was productive. Such was clearly not the case. Even at the end of the decade large numbers of machines were inactive because of a lack of fuel (or money to pay for it) on cooperatives and state farms, because spare parts

per hectare was in the truck crops subsector, with a total of 69 dinars per hectare.

Insofar as gross agricultural investment over the decade was not all necessary for maintenance of capital stocks, the apparent effect of the investment effort was to intensify nominal land-use and to induce capital-labor substitution in some subsectors. This latter effect is illustrated by the marginal capital-labor ratio, 3785 dinars per man-year, which is probably on the order of five to ten times as high as the average capital-labor ratio for the sector. Marginal productivity of capital may have been negative as evidenced by the fact that, despite the capital deepening which occurred with a fixed land supply, output per unit of total employment declined. However, probable changes in the quality components of labor and of land qualify this conclusion. Common labor can be considered homogeneous in quality, i.e. productivity, over time, but this is not necessarily the case for specialized labor of[^] for management.^{26/}

were not to be had, and because there were not enough qualified maintenance workers. Also, large amounts of the investment expenditures were for irrigation capacity which was never used.

^{26/}As explained in detail in the following section, land reform and institutional change policies during the 1960's caused the departure of the colon farmers and of a large number of agricultural management and technical personnel of foreign nationality. The resulting void has been only partially filled by Tunisian agricultural training programs. Therefore, the overall quality of the agricultural labor force has declined. Land quality may also have declined because of continued overgrazing, hillside farming, and monoculture agriculture (cereals), and as a result of the exceptional flooding in 1969. Conservation activities during the decade may have been sufficient to produce a zero net change in land quality but are unlikely to have reversed the trend toward declining quality of the natural land resource base.

Type of Investment and Productivity

A final and most important consideration in evaluating investment policy and its effects on resource use and productivity during the 1962-1971 period is the distribution of investments between uses having an immediate production impact and uses having no or delayed production effects. An attempt at identification of investments of these two types is presented in Table 11.

Of total decennial investment in agriculture only 30 percent went for uses which could be expected to have an immediate production and productivity enhancing effect. By subsectors the proportions of investments with a short-run pay-off were 100 percent of fishery investments, 94 percent of the animal products subsector investments, 41 percent of the vegetable products subsector investments, and only 18 percent of forestry investments.

A very large allocation, 27 percent of total investments, went to construction or upgrading of social infrastructure (rural housing and water supplies), to maintenance of the productive resource base (conservation and agricultural education and training), and to long-term pay-off support activities (research and extension). Long-term pay-off investment allocated directly to the production subsectors included development of irrigation water supplies and major distribution works, extension of fruit and nut and forest plantations and some pasture improvements. Investments tending to have short-run production increasing effects were for irrigated land improvements and tertiary water distribution channels, equipment and buildings and other productive facilities, fisheries equipment (primarily boats, docks, and storage) and some pasture development.

Table 11. Allocation of agricultural investment 1962-1971 between short-term and long-term pay-off uses.

Subsector	Short-term Pay-off	Long-term Pay-off	Proportion Short-term
	<u>1000 Dinars^{1/}</u>		<u>Percent</u>
<u>Vegetable products</u>			
Irrigation ^{2/}	24,265	56,330	30.1
Tree plantations		41,760	0.0
Equipment	42,856		100.0
Buildings	1,115		100.0
	68,236	98,090	41.0
<u>Animal products</u>			
Livestock	6,869		100.0
Pasture development	631	631	50.0
Buildings	2,513		100.0
Subtotal	10,013	631	94.1
<u>Forest products</u>			
Reforestation		27,953	0.0
Equipment, facilities	6,217		100.0
Subtotal	6,217	27,953	18.2
<u>Fishery products</u>			
Subtotal	5,240	—	100.0
Total (productive subsectors)	89,706	126,674	41.4
Other ^{3/}	—	78,584	0.0
Total	89,706	205,258	30.4

^{1/} Current prices.

^{2/} General studies, development of new water supplies and major distribution systems are considered long-term. Tertiary distribution systems, land improvement, drainage, and irrigation equipment are considered short-term.

^{3/} Agricultural education and training, research and extension, conservation, work-relief, rural housing and water supplies, miscellaneous.

Source: Rétrospective, op. cit., 4ème Partie.

Implications of the observed allocations are that the government investment policy during the 1960's gave a greater weight to the production and income needs of future generations than to the present one, or that the government failed to realize that many of the major investments being made would not have a production impact until long after completion.

Perhaps in the Tunisian context there are other, noneconomic, reasons for the apparent preference to make public investment for major infrastructure rather than for more immediately productive uses. Investments and other efforts of the latter type, i.e. those yielding immediate returns, are less readily turned over to foreign firms because of the necessity of dealing with local people and institutions. Allowing foreign firms to execute investment projects is desirable because these firms possess capabilities largely lacking in Tunisia. The projects can be administered by relatively few high-level bureaucrats and, perhaps most important, the foreign firms can be held accountable politically if the project is not a success.

Furthermore, infrastructure projects can yield successes even if they contribute nothing to national production or wellbeing. For example, even a casual reading of the numerous retrospective analyses of the 1960's made by the government reveals a striking tendency to list accomplishments in terms of numbers of trees planted, hectares treated by conservation works, numbers of dams built and wells drilled, numbers of tractors imported. Little or, more often, no reference is made to the number of trees which became productive or even survived, to the survival and erosion control or soil building effects of conservation

works completed, to the amounts of water being supplied (and used productively), or to the numbers of tractors in operating condition being used for agricultural production.^{27/}

Referring back to the errors in economic calculation which may have affected investment policy, the first possibility is almost certainly partly true and is an economic misconception which is held virtually worldwide. In fact, if perpetual reinvestment can be assumed, maximization of income streams at any time in the future obviously requires maximization of current returns on investment. Furthermore, if estimates of future costs and benefits are well or even honestly done, thereby reflecting the supply and demand conditions which will occur or are expected to occur in the future, any further bias of investment toward long-term pay-out projects, through administrative decision or through using lower than current opportunity cost interest rates, is not economically rational.

^{27/}Yet another reason for a preference for infrastructure type projects is the incentive provided by foreign donors who often insist that the aid they provide be used for readily visible and permanent capital structures. Of the foreign aid for specific project purposes received by Tunisia between 1961 and 1970 -- 177.5 million dinars or 45 percent of the total aid received -- the largest portions went for hydraulic infrastructure, 58.8 million dinars; transport and communications, 50.8 million dinars; industry and tourism (mainly plant and major equipment), 42 million dinars; and mining, 16.2 million dinars. Aid for agricultural machines and equipment totaled 13.2 million dinars. (Taken from an English translation [USAID/PRM - August 1971] of a report, "Balance Sheet and Perspectives of Development Aid to Tunisia," prepared by the Tunisian Ministère du Plan for presentation to the Consultative Group of aid donor nations in August of 1971). As said elsewhere many times, it is a bit embarrassing to cut a ribbon over a bag of fertilizer or a dozen chickens no matter how useful they may be. Furthermore, long after the fertilizer and chickens have been forgotten, a pile of concrete with a suitably dedicated and engraved bronze plaque remains as a reminder of selfless benevolence to citizens of both the donor and the recipient countries.

The second possibility -- that the government underestimated the time (and complementary resources) required to make investments productive -- was also apparently the case.

The Nebana Example

The third agricultural sector plan ^{28/} foresaw that by 1972 the Nebana dam, completed in 1967 at a cost of about 23 million dinars, would be serving established and producing irrigated crops on 5100 hectares. But, because of a failure to complete the necessary secondary and tertiary distribution systems and because of unforeseen difficulties in getting farmers to adopt irrigated agriculture, only about 1500 hectares were being partially irrigated in 1972.^{29/}

Thus the government expected an average delay of two and one-half years between completion of the major investment (the dam and primary distribution works) and productive utilization of the water diverted. The actual delay is still to be seen but it is sure to be at least twice and probably will be much more than twice as long as expected.

The economic consequences of this type of miscalculation -- which unfortunately has occurred on all the irrigation projects in Tunisia -- are significant. If future income streams are discounted at a rate of five percent and the average delay in effective water use is only twice as long as expected, the rate of return on capital,

^{28/} République Tunisienne, Secrétariat d'Etat au Plan et à l'Economie Nationale, Agriculture et Pêche, 2e. volume, Plan de Développement Economique et Social, 1969-1972, Tunis, 1969.

^{29/} Thomas E. Daves, Le Sous-secteur Irrigué en Tunisie, Etat Actual Et Potentialités, Rapport de Recherche en Economie Agricole, No. 13, BFDA, Ministère de l'Agriculture, République Tunisienne, July 1972.

initially estimated to be five percent falls to four percent. If more realistic coefficients are used, i.e. a delay of ten years and eight percent rate of discount, the expected rate of return on capital falls to only two percent. And this assumes that the expected full production value will ever be achieved which is doubtful given an undoubted tendency in Tunisia as elsewhere to overestimate benefits to projects of this type.^{30/}

Further lengthening of the delay can probably be avoided by recourse to supplemental investments and other expenditures necessary to a speed up (or even achievement) of adoption of irrigated farming in the Nebana project area. Such a program of supplemental expenditures is now under active consideration by the government and by outside donors, primarily the World Bank. However, the supplemental expenditures, if made, will add to the total cost of the project thereby decreasing the economic rate of return.

It appears clear that in final analysis the Nebana project will not prove to have been an economic use of Tunisia's limited capital resources. Nor will it even be a financial success. That is, after payment of other productive factors total production increases due to irrigation through the lifetime of the dam and irrigation facilities will be insufficient to repay the capital costs of construction. To make matters worse, extensive and unexpected repairs may push these costs even higher -- the dam has recently been found to be leaking and erosion of the natural stream channel next to the main transmission

^{30/}For a rigorous documentation of the probably deliberate over-estimation which occurs in the United States see Robert Haveman's, Water Resource Investment and the Public Interest, Vanderbilt University Press, Nashville, Tennessee, 1965.

conduit threatens to interrupt water delivery if extensive protective works are not quickly installed.

The Medjerda Example^{31/}

A similar example of the consequences of not rapidly achieving productive use of developed irrigation water supplies is provided by the earliest and largest public irrigation project in Tunisia, the Lower Medjerda Valley Project of the OMVVM. The water sources — the Nebeur dam (130 million cubic meters of useable capacity) and the El Aroussia diversion dam — and the primary delivery canal (13 cubic meters per second capacity) were completed by 1957. Excluding the initial investment which was attributed to flood control capacity at the Nebeur dam and to electricity generating facilities at the El Aroussia dam (2.8 million dinars), the cost of this part of the project was 5.5 million dinars. By 1967 irrigated areas comprising 13000 hectares (of a planned 35000 hectares) had been leveled, equipped with necessary distribution and drainage systems, and supplied with irrigation and agricultural equipment. The cost of these facilities and inputs was 9.5 million dinars. Thus, total public investment through 1967 was 15.9 million dinars. Through 1970 cumulative private irrigation related investment (equipment, livestock and fruit trees) in the developed irrigated areas was 1.3 million dinars. Total investment, public plus private, was 17.2 million dinars, 1323 dinars per hectare fully developed.

^{31/} Except where otherwise noted the sources of the data used in this section are the annex tables to: S.F. Pastma, Rapport Sur l'Irrigation en Tunisie, Draft final report of Project TUN/69/006, UNDP, Tunis, June 1973.

A measure of the underutilization of the developed irrigation capacity is that only 13000 of the 33000 hectares in the minimum plan for the Medjerda area were improved and available for irrigation in 1971, seventeen years after completion of the primary water source designed to serve the total area (the Nebeur dam was completed in 1954).

Furthermore, of the 13000 hectares completely developed and equipped, only 6300 hectares were even nominally irrigated in 1971. These 6300 hectares received water applications totaling 25.6 million cubic meters, slightly over 4000 cubic meters per hectare. In 1972, 3200 cubic meters per hectare were applied. These rates are not adequate for intensive irrigated agriculture. Even with one-third to one-half of the area in winter (wet season) crops and no double cropping, the average irrigation water need in the Medjerda Valley is 5200 cubic meters per hectare,^{32/} 30 percent more than was applied in 1971 and 62 percent more than was applied in 1972.

Important economic losses result from the failure to use all of the developed irrigation capacity intensively. In 1971 the value of output from the 13000 hectares of developed land was about 2.5 million dinars, 1.9 million dinars from irrigated crops (6301 hectares) and 0.6 million dinars from crops not receiving irrigation water (6722 hectares). About three times this level of output could be obtained by irrigating the fully developed land not now receiving water and by increasing the

^{32/}Water requirement per hectare was estimated as the area-weighted average need for the crops grown in these areas during 1971. Per hectare requirements for the various crops were taken from: Thomas E. Daves, Potentialities de Production et Besoins en Intrants d'une Utilization Complete des Ressources d'Irrigation Existants en Tunisie, internal document, Tunisian Ministry of Agriculture, (BPDA), 15 July 1973, Table A.6.

Table 12. Internal rate of return estimates for the part of the Medjerda minimum irrigation plan completed in 1971.^{1/}

Time to full production (yrs. from 1970)	Internal rate of return		
	100 ^{2/}	60 ^{2/}	30 ^{2/}
4	4.3	7.5	8.8
10	3.7	6.9	8.3
20	-3.0	1.3	3.7

^{1/}The time period of analysis is 1960 to 1990. Included are the monetary costs and benefits of the 13000 hectares of the Medjerda lands which were completely developed for irrigation in 1971.

^{2/}Opportunity cost of labor as a percent of the minimum wage.

Source: The data used in making these estimates are given in Postma, op. cit., Annexe 11.

application rates of water and other variable inputs -- a 50 percent increase in yields is possible.^{33/} No new capital investment would be required.

Looking at the project from 1960 to date and projecting to 1990, estimates of the internal rate of return to the already fully developed part of the Medjerda project range from minus 3 percent to about 9 percent.^{34/} The size of the estimates depends on the opportunity cost of labor and rate of achievement of full production assumptions used in making the calculations. Costing labor at 60 percent of the minimum

^{33/}Postma, op. cit., p. 51.

^{34/}Excluded from these estimates are the investments in water source and delivery capacity not needed for the 13 areas now fully developed, i.e., 4.2 million dinars.

wage^{35/} and assuming, quite optimistically, that potential production will be achieved in 4 years, the estimated internal rate of return is 7.5 percent. If achievement of full production takes 10 years the internal rate of return falls to 6.9 percent: if 20 years, the rate is 1.3 percent. These estimates can be compared with pre-project estimates that full production would be achieved within 3 years of completion of the physical facilities and that the rate of return would be 20 percent.

As 4.2 million dinars of irrigation investments -- for capacity not needed by the fully developed areas -- are excluded from the costs used in calculating the rates given in Table 12, the economic rate of return to the total project (33000 hectares) will be lower than that calculated for the initial phase. Capital cost of the currently unused capacity continues to accrue, and substantial public and private supplementary investments will be necessary before this capacity can be used.

^{35/}Justification for charging labor at less than 100 percent of the minimum wage (600 millimes per day) for economic analysis purposes is that there is high unemployment in rural Tunisia and that alternative employment opportunities for irrigation labor are either non-existent or would pay less than the minimum wage if based on the value of marginal output due to labor. That is, the opportunity cost of labor is less than the legal minimum wage. On the other hand some special skills and, more importantly, abilities are necessary for workers in irrigated agriculture. These workers might well earn premium wages -- based on productivity -- in other agricultural or non-agricultural jobs.

As illustrated by Table 12 the choice of unit labor cost has a large effect on the calculated internal rate of return. Although the Tunisian government's analyses of agricultural projects normally value (cost) labor at zero, for employment requiring even modest ability and skills a charge of 60 percent of the minimum wage is probably not unreasonable and may be conservative. Alternatively, charges for worker training would have to be included.

Analyzed in total and with hindsight the Medjerda irrigation scheme has almost certainly not been economic. Whether it is possible to salvage and/or economically complete the project now depends upon the commitment and ability of the government and of private participants to overcome the obstacles which continue to retard irrigation resource use and productivity. Some of the problems to be faced are discussed in the following two sections.

V. AGRARIAN REFORM

One of the major instruments used by the Tunisian government in its attempt to achieve rapid social and economic development during the 1960's was a broad program of agrarian reform affecting all activities within the agricultural sector. The central aspect of this program was the collectivisation and cooperatisation of all agricultural production units. Associated with this central focus was the development within the government of a capacity for central planning and management necessary to operation of the sector as a government enterprise. Also institutions serving agriculture were brought under government control -- many were new creations -- and were oriented toward service to the new management of agriculture. Some of the more important among these institutions are briefly described in Section 2. One final, though definitely not least important, aspect of the agrarian reform was the transfer of ownership and control of all foreign-held land and agricultural institutions to the Tunisian government. This was accomplished by purchases and by outright expropriation, for which compensation was later paid.

Institutional Effects

Implementation of the new agrarian structure envisaged by the Tunisian government as being complete and operational by the end of the decade was pushed with increasing intensity from 1961 up until late in 1969. Most of the collectivisation, cooperatisation, and institutional change objectives were nominally achieved. However, most of the new production cooperatives (collectives) created never became operational before the government decided (in September 1969)

that the political, social, and economic costs of the implementation process were too high, and the whole thrust toward agrarian reform precipitously dissolved.^{36/}

The Emerging Structure

To cite the demise of the agrarian reform movement is not to say that the changes affected by it were completely reversed by the policy changes in the fall and winter of 1969-1970. The reorientation of agricultural policy sought to re-establish a balance between the public, cooperative, and private sectors of the agricultural economy. The key element of this reorientation effort gave production cooperative members who had contributed land free choice either to regain their land and independent farmer status or to stay inside the cooperative. The resultant wholesale desertion of cooperatives is illustrated by Table 13.

Of 4.7 million hectares in productive cooperatives in August 1969, only 1.6 million hectares remained in October of that year. By mid 1971 the total area in cooperatives was further reduced to 324 thousand hectares, at which level it has stabilized.

Nevertheless, the total area under government control (cooperatives are state managed), remains at 764 thousand hectares, having grown from less than 100 thousand hectares in 1961. Although a decision has nominally been made to turn much of this land over to private farmers -- about 500000 hectares -- there has been little progress in this direction. Only 22000

^{36/} For a comprehensive description of the rise and fall of the cooperative movement in Tunisia see the two-part article by John Simons: "Agricultural Cooperatives and Tunisian Development," Middle East Journal, Vol. 24, No. 4 (Autumn 1970), pp. 455-465 and Vol. 25, No. 1 (Winter 1971), pp. 45-57.

Table 13. Land brought under State Control, 1962-1971

	Direct State Management		Other	Cooperative Management ^{1/}	Total
	OTD	OMV			
	<u>1000 Hectares</u>				
1964 ^{2/}	700	500	8	201	1409
1968 ^{3/}	60	206	8	1605	1879
1969 (Apr. 30)	n.a.	n.a.	4	2977	n.a.
1969 (Aug. 30)	"	"	3	4734	"
1969 (Oct. 31)	"	"	4	1584	"
1971	313	127	-	324	764

^{1/} Cooperative management differs from direct state management only in that the state cooperative manager is assisted by an elected -- but state approved -- cooperative council.

^{2/} End of 1962-1964 Plan period.

^{3/} End of 1965-1968 Plan period.

Sources: Rétrospective, op. cit., 2ème partie; Plan Quandiennal 1969-1972, Agriculture et Pêche, Deuxieme partie, Section V; Division de la Statistique Agricole, Informations Rapides, April, August 1969; Idem, Statistiques Trimestrielles, Oct. 1969.

hectares were sold or ceded to private farmers between May 1970 when the National Assembly authorized such transfers (Law No. 25-70) and January 1972.^{37/} It appears likely that if some strong commitment is not made and leadership provided soon, emerging vested interests within the OTD, which now administers the land, and within other government agencies will become sufficiently strong to enforce the status quo and effectively disable the program. This land retained by the government is the most productive land in the country -- including virtually all of the land originally controlled by the French and Italian colon farmers.

Also the planning and operational structure and orientation within the ministry of agriculture remains intact as does government control of all of the important agricultural service activities - credit, input and output marketing, research, resource development, etc.

Private Tenure Problems

Within the private sector the cooperatization of the 1960's had large effects on land ownership and control patterns. However, aside from the permanent expropriation of the colon farms, most of the effects were temporary. As a general statement one can say that the land tenure structure of the private Tunisian owned part of the agricultural sector has now returned to the structure existant in 1961.

However, there are some important exceptions to this generalization. With the acceleration of cooperative formation in the late 1960's some small farm owners sold their land rather than lose it to a cooperative

^{37/} République Tunisienne, Ministère de l'Agriculture, BPDA, "Coopération Tuniso-Américaine, Réponses au Questionnaire Présenté par l'USAID," mimeo, January 1972.

without receiving any compensation.^{38/} Similarly, many farmers, even those not selling land, sold their non-land capital (primarily production livestock and draft animals) to avoid its confiscation upon cooperatization. When the cooperatives were dismantled and their land was returned many of these farmers were unable to renew farming operations with their own resources.

The result of these events is that many previously independent farmers have become landless laborers or have leased their land to neighboring farmers with greater capital resources. Others work their own land but must pre-contract to pay up to two-thirds of the harvest to private lenders in exchange for the necessary capital and variable inputs.

Small Farms and Fragmentation. Currently agricultural land within the private sector (excluding forest land) includes about 2.5 million hectares in collective ownership, primarily tribal grazing lands in the South. Also included are 4.5 million hectares in 320000 to 325000 individual farm units concentrated in the North, along the coast, and in the South's oases. Of these individual farms about 40 percent are below 5 hectares and 83 percent are below 20 hectares in size. About 400 farms have more than 500 hectares.^{39/} Most of the very small farms, often composed of even smaller scattered plots, are in areas which have long been irrigated or otherwise intensively cropped.

^{38/} Ibid., p. 46. Although unknown, the number of farmers selling their land to avoid cooperatization is believed to be sizeable.

^{39/} W. F. Johnson, "Agricultural Sector Paper," Annex to Agricultural Development Loan Paper: Fiscal Year 1972, United States Agency for International Development, Tunis, February 1972, p. 85; Postma, op. cit., p. 29.

Two examples of extreme fragmentation of land ownership and control are given by the Nebhana and Youssef II irrigated perimeters.^{40/} The Nebhana project encompassing about 5000 hectares is divided into 13000 separate plots to which 8000 different persons have ownership rights. In the Sidi Bou Ali sector of this project the largest single-owner unit includes 22 hectares divided into 43 separate plots. The smallest individually owned plot contains 22 square meters. Within the Youssef II, perimeter on the Cap Bon 43 percent of the area (230 hectares) is in parcels of less than 0.5 hectare. Ownership rights are held by 507 persons. For both of these areas ownership patterns were established long before the public irrigation projects were conceived. Much of the land had not been irrigated prior to the coming of the projects.

Aside from the inherent inefficiencies of small farms and scattered plots within farms, the sizes and locations of ownership units within these and other irrigated perimeters developed or improved by the government present special problems. Water distribution and other facilities for these perimeters have been designed as if there had been total implementation of the land reform legislation enabling consolidation of farms, establishment of minimum and maximum farm sizes, and placement of ownership and operator units in a rectangular grid.

In fact this legislation has been implemented in only a few areas, altogether less than 8000 hectares of the approximately 45000 hectares which have been equipped with infrastructure by the government.^{41/} And

^{40/}See Postma, op. cit., pp. 29, 31.

^{41/}Ibid., Annexe 4, p. 4; Rétrospective, op. cit., 2^eme Partie, p. 10.

most of the land to which the reform has been applied, 6000 hectares of the Medjerda project area, is land which the state owned prior to establishment of the irrigated perimeter. Little to no accommodation to private interests was necessary.

As the government clearly recognizes,^{42/} reform of ownership patterns on most of the remaining land in existing and proposed new irrigated perimeters will not be easily or rapidly achieved. Meanwhile utilization of the developed irrigation capacity and repayment of irrigation investment costs remain at much lower rates than required if these projects are to be economically or financially successful.

Uncertainty and Insecurity of Tenure. Further complicating the problems due to small farms and plots are the lack of legally defined boundaries and clear ownership rights to the lands held in both irrigated and non-irrigated areas. The traditional landholding rights -- which are still predominate -- are based on continuous occupancy and use. This system in which no formal land titles are held has become increasingly inadequate. Among its adverse features are a lack of real estate equity which can be used as security for agricultural investment and production credit needs; land use lapses, confusion and conflicts resulting as large numbers of people migrate to urban areas but seek to maintain rights to agricultural land, and severe over-grazing of most pasture-land because these lands are held in common by a tribe or other group and/or because there are no clear and agreed upon use rights.

^{42/}See the discussion in the Rétrospective, op. cit., 2ème Partie, pp. 9-13.

The events of the 1960's delayed efforts to improve ownership or use rights to agricultural land. Determination of land ownership rights and central registration of clear titles was made mandatory by the National Assembly in 1964.^{43/} However, this legislation did not become effective until after September 1969 when the thrust to nationalize all land was terminated. By 1971 clear titles had been established and registered for all land in one and one-half of the 13 gouvernorats.^{44/}

These events also exacerbated the land ownership problems to be solved. Many of the small farms brought into cooperatives could not be readily returned to the previous owners in 1969 and later because natural and man-made boundaries which previously delineated individual farms had been destroyed by large scale farming operations. The massive removals of ancient olive trees to change land use or to renew the olive orchards obliterated many small farms which had been defined by numbers of and by specific trees. Also, there being few deeds or other land rights documentation, agreement as to who had held land within a particular area was not complete even among area residents.^{45/}

A Management Gap

In seeking to assess the effects of the agrarian reform effort of the 1960's, it is first necessary to admit the positive aspects of one of its major characteristics -- the Tunisification of the whole range

^{43/}Rétrospective, op. cit., 2ème Partie, p. 7.

^{44/}Ibid.

^{45/}In 1970 the author witnessed hearings in central Tunisia at which officials of the Direction des Affaires Foncières attempted to gain information for a fair disposition of land from a dissolved cooperative among previous owners and among landless laborers (some of the land had originally been under state control). They were not successful in identifying the previous land holding units or even in determining which or how many of the assembled villagers had lost land rights to the cooperative. On each point the debate was heated and inconclusive. No records were available to settle the issues.

of institutions in agriculture. Tunisia had taken what was perhaps the last major step toward removal of outright colonization. This in itself was a considerable accomplishment, justifying some slowdown in the rate of economic growth in the sector.

At the same time however, the negative consequences of the very rapid displacement of colon farmers and of technicians and administrators from agencies serving agriculture cannot be dismissed. In a period of only about five years, terminating in 1964, more than 6000 of the most experienced and best educated farm managers were lost to Tunisian agriculture. These managers, French and Italian colons, had been responsible for management of the best 20 percent of cropland in Tunisia. Lands under their control had produced more than 40 percent of total output from the agricultural sector.^{46/} During early years of the decade many of these displaced colons were urged by the government to stay on in management posts: few did so. There were virtually no trained Tunisians to fill these vital management slots, and certainly none with appropriate experience either in management or in agriculture. Nor was the capacity available for rapid training of the necessary cadre. It is still not.

To magnify the problem of loss of management talent, the increased centralized control of agricultural production and marketing -- which remains significant despite the sudden collapse of total cooperatization in 1969 -- made necessary massive amounts of new management and administrative talent to perform the tasks of structuring and control inherent

^{46/}Simmons, op. cit., pp. 456-457.

in a centrally planned and managed agriculture.^{47/} It must be stated again; these talents were not available. By 1971 only 500-600 Tunisian agricultural college graduates were available to do all of the many essential professional level tasks in agricultural administration, planning and control, research, extension, and education. They were aided by perhaps one hundred foreign technicians, primarily French and Italians. For the most part, neither the Tunisians nor their foreign counterparts had, nor have had, practical farm or management experience.

Furthermore, efficient and accurate information gathering and transmission systems which are essential to a centrally controlled economy or subsector, or even large farms, were not in existence and have not yet been developed. There was also no capacity, human or machine, for analysis of any data that may have been available. Even today there are no more than 25 or so persons working in Tunisian agricultural institutions, including the Ministry of Agriculture, with sufficient training in economics, statistics, financial management or accounting to do even a minimal job of enterprise, project, budgetary, or economic analysis.

Economic Effects

An article of faith among Tunisian officials is that the poor performance of the agricultural sector during the 1960's was caused by the abortive effort at total cooperatisation, that problems associated with that effort have now been corrected—the guilty have been punished, and that relative agricultural prosperity is in view.

^{47/} Although cooperatives might be expected or allowed to exercise independent decision-making, this has not been the case in Tunisia. Cooperative managers are appointed and paid by the state and have essentially no substantive decision-making powers not subject to prior review by higher government authority.

Historically they may be correct. Evidence which may be cited includes the differential growth rates achieved during the three distinctly different periods of the decade:

- 1) the years of the first plan, 1962-1964, during which cooperatisation and centralization of management of agriculture moved forward at a moderate rate and well-managed private lands were largely untouched (prior to the colon expropriation in May of 1964, which was too late to affect the 1964 crops);
- 2) the period of the second plan, 1965-1968, during which the government takeover and cooperatisation progressed more and more rapidly and the lack of management talent became more and more critical; and
- 3) the third plan period of 1969-1972 which covered the culminating total cooperatisation and almost immediate readjustment to a large degree of private control over land in 1969.

Respective annual growth rates of gross agricultural output for these three periods were +5.3 percent, -2.1 percent, and +10.4 percent.^{48/}

These growth rates cannot be explained by weather, although two very poor rainfall years, 1966 and 1967, occurred during the middle period (1964 was also a poor rainfall year) and good rainfall was available in each of the years of the last period (1971 was considered an exceptionally favorable year). The disruption associated with the colon expropriation and with the massive takeovers of private lands and livestock in 1968 and 1969 very clearly interfered with production activities.^{49/}

^{48/}Retrospective, op. cit., 1ère Partie, p. 59.

^{49/}Unfortunately no quantitative information are available for particular enterprises during this time. Few records were kept and those that were are not reliable because public accountability pressures required that the government prove that cooperatisation was working.

An examination of current performance and policy directions within the public part of the agricultural sector reveals that the production and productivity problems due to institutional factors have not been solved and are unlikely to be solved soon.

Mismanagement of Irrigated Agriculture

Perhaps the most important agricultural opportunity open to Tunisia is the possibility of expanding and stabilizing agricultural output through use of irrigation. Yet, of 45 thousand hectares of immediately irrigable land (water supplies are available and developed) which is under direct state control either in cooperatives, offices, or state farms, only 22 thousand hectares are now being cropped with irrigation (Table 14) and even the areas nominally irrigated are not adequately watered and utilized.

Table 14. Estimated useage of developed irrigated lands, 1972

Land Control	Area		Proportion Being used
	Developed ^{1/}	Currently in Use	
	<u>1000 Hectares</u>		<u>Percent</u>
Public	44.6	21.6	48
Private	<u>73.4</u>	<u>56.2</u>	<u>77</u>
Total	118.0	77.8	66

^{1/} Lands considered developed for irrigation purposes are those for which water supply and delivery systems and any major land leveling necessary are complete.

Source: Adapted from an unpublished table prepared by S. F. Postma, United Nations Development Program, Ministère du Plan, Tunis.

An additional 73 thousand hectares in private lands is only 77 percent utilized. And the state's influence on this latter area is in many cases as pervasive and important as on state lands. The state controls

water availability on most private irrigated land. The author has estimated that production on currently irrigated land could be increased by 108 percent if adequate water and other variable inputs were used, i.e. if management of these lands were good. Production of the irrigated sector could be tripled by bringing all of the developed land into production under good management.^{50/}

The problem of non-use and insufficient use of available water resource is one of planning at the central level and of management at both the local and central government levels. At the local level managers are often inexperienced in the handling of modern irrigated farming and are virtually always facing shortages of competent workers and of production inputs of all kinds. At the central level--where all major decisions including crop rotations, work hours, fertilizer application dates and levels, etc. are made--attention remains focused on projects which would expand irrigable area: problems of utilization of already developed areas get voice concern and are ignored. Resources available for irrigation development are largely allocated to new projects.

Explanation of the continued big project activity has two major aspects. Physical and economic analyses are completed and go or no-go decisions for irrigation projects are made independent of and prior to consideration of tenure and other social or administrative features of the projects. It is assumed implicitly that problems with respect to these latter features will and can be resolved after project initiation in a

^{50/}Daves, Potentialités de Production, op. cit., p. 9.

manner that will not retard the project completion or effectiveness. This assumption is patently incorrect as demonstrated by every project which has been completed in Tunisia.^{51/}

A second reason that expansion of irrigation capacity continues while more than one-third of the capacity already existent sits idle is implicit in the division of responsibility between the government agencies charged with developing capacity, with solving the tenure and other socio-political problems impeding utilization, and with management, direct or indirect, of the production capacity created.^{52/} The success or failure of any one of these agencies is not seen as reflecting on or entering into expenditure decisions with respect to the others. Under these circumstances the physical plant developers, HAR, have been blessed with praise and with funds; the managers, REPI, have been castigated and their funds, never adequate, cut to insignificance.

The one agency with some responsibility for all phases of irrigation development within its limited area, the ONVM, has unfortunately made the same divisions of responsibility internally that exist among the other agencies. It has maintained its image (now somewhat tarnished as seen by some aid donors) and its funding largely by proclaiming the success of its physical development division and by ignoring and hiding the failures of its operating and managing division.

^{51/} Also assumed (for the economic analysis) and equally implausible is that construction and utilization schedules will be met and that production levels approaching experimental results will be attained quickly, i.e., that ideal conditions free from human or other problems will prevail.

^{52/} The major agencies involved are, respectively, the Direction de l'Hydraulique et des Aménagements Ruraux (HAR) and the Direction des Affaires Foncières et de Législation within the Ministry of Agriculture; and the Régie des Périmètres Irrigués (REPI), a semi-autonomous agency attached to the ministry.

Mismanagement of the Cooperative Sector

Another illustration of the problem yet to be solved in achieving high production on the public land holdings is given by the performance of production cooperatives in the north during the 1971-1972 production season. This year was a much better than average year for both amount and distribution of rainfall and no exceptional events, either climatic or political, occurred. Therefore, production during this season can be considered to be representative of better than average production to be expected with existing management.

During the 1971-1972 season the average yield for all cereals on production cooperatives in the north was 12 quintals per hectare. The average production from all farms in the north was 11 quintals per hectare.^{53/} Thus the production cooperatives obtained yields only 9 percent higher than the average of all farms in the north--a classification which includes the state operated land (about 350,000 hectares), but also thousands of private farms (500,000 hectares) most of which are small traditionally farmed plots.

A survey taken in one northern gouvernorat, Jendouba, found that the average yield of improved variety "Mexican" soft wheats on 21 cooperatives was 18 quintals per hectare. One of the two state farms, agro-combinats, in the gouvernorat reported a yield of 37 quintals.^{54/} Data were not obtained from the second agro-combinat. In the same year the experimentation and demonstration fields of the joint Government of Tunisia - CIMMYT/Ford

^{53/}République Tunisienne, Ministère de l'Agriculture, "Rapport du Sans-groupe B--Cooperatives du Nord," (mimeo), 1972; Corty, op. cit., p. 75.

^{54/}"Cooperatives du Nord," op. cit., p. 4.

Foundation cereals improvement project produced average soft wheat yields of 37 quintals per hectare for the improved varieties, 24 quintals for the unimproved local varieties.^{55/}

These data serve to illustrate the problems which remain to be solved if production cooperatives are to fulfill their assigned role as demonstration farms or are to be major producing units for agriculture. The failure of cooperatives either to outperform the private sector or to attain output closer to potential levels--illustrated by the cereals improvement project results--is particularly significant when we consider that the remaining cooperatives (and state farms) are located on the most productive lands in the country and that they have available to them the best of the government's management talent that had previously been spread among the many cooperatives now dissolved. These cooperatives (and state farms) have all been established for more than five years; all are mechanised, and all have relatively better purchased input, transportation, and financial resources than do most private farms. Their poor performance can only be the result of poor management.

Among possible causes of the apparent deficiencies in management is the tendency of cooperative managers--and their superiors--to view the management job as being purely administrative. All substantive decisions are made at the central government level where knowledge of local conditions and quite often technical competence is least. Most managers are young technical school graduates with general, and generally superficial, agricultural training who see their position either as a tenured sinecure or as

^{55/}Corcy, op. cit., p. 80.

a short-term stepping stone to higher position in the government, with the constraints on their freedom of action relieving them of responsibility to produce good results.

Managers are paid by the state at the rate appropriate to their civil service grade, usually quite low, and receive "productivity" bonuses. The bonuses are normally uniform and unrelated to the output obtained per unit of resources managed. A cooperative manager of one of the larger and more productive cooperatives in 1972 received an income of about 2000 dinars, salary plus bonus.^{56/} This was for management of a farm of about 1500 hectares with a total investment (land plus buildings and equipment) of several hundred thousand dinars. It is not difficult to understand why better qualified and more experienced men are not found working as cooperative or state farm managers.

^{56/}"Cooperatives du Nord," op. cit., p. 6.

VI. PRICES AND PRICE POLICIES

The decade 1962-1971 saw extensive government intervention in the pricing of agricultural products and inputs. The objectives of this intervention were to encourage increased production of all agricultural products (with special attention given to some), to assure low retail prices for essential food items, and to control and reduce farm to retail price margins. Broader objectives to which price policy was expected to contribute included the attainment of national self-sufficiency in food production and an increase in the volume of agricultural exports; primarily olive oil, citrus and vegetables.

Achievement of the multiple price policy objectives was to be accomplished by establishment of legal minimum farm or wholesale level prices for some products and by providing some inputs at subsidized prices; by setting fixed or maximum retail prices for strategic items in the common diet; and by regulating price margins for marketing activities. A non-price policy related to the fixing of marketing margins was the replacement of private middlemen with public and semi-public marketing monopolies or near-monopolies for trade in many products.

Agricultural products for which producer price regulations were in effect during part or all of the decade include cereals, olive oil, wines, tobacco, flax, sugar beets, pulses (broadbeans, horse beans and chick-peas) alfa grass, cork and fish products. Citrus and other tree fruit crops and vegetables were not subjected to direct controls although semi-public marketing, exporting and/or processing monopolies affected prices prevailing for most products in these categories. Retail price controls were in effect for cereals and cereal products, dairy products, pulses, olive oil, wines, meat products, sugar, and fishery products. With the exception of those for fishery

products, for which the government marketing monopoly and price controls were ended in 1970, all of the price controls listed remain in effect.

The state controls the sale of virtually all agricultural inputs other than land, labor and animal power. It subsidizes, directly or indirectly, the bulk of agricultural inputs of both the annual and of the investment type. For the annual, or variable, inputs such as chemical products, improved seeds, and irrigation water the state's subsidy is usually in the form of fixed prices which are below cost of supplying the input or below the price which would prevail in a free market.

In Tunisia, little information about the formation and rationale of price policies is available. Nevertheless price policies between 1962 and 1971 for some of the major agricultural products and inputs can be evaluated. The bases for the evaluation presented below are whether policy implementations which can be identified were consistent with overall price policy objectives and whether observed changes in resource use and output in the sector were consistent with the price policies implemented, i.e., whether the policies were effective. Also the overall policy objectives are reviewed to determine if they are desirable from an efficiency and public welfare viewpoint.

Product Prices

Wheat and Related Crops^{57/}

Wheat price policies of the 1960's were established with the stated objective of achieving self-sufficiency in wheat production, subject to the

^{57/}Some of the analyses in this section are derived from or are extensions of earlier work by Hyslop and Dahl (John D. Hyslop, The Tunisian Cereals Sector: An Examination of Production, Prices, and Some Alternatives for the Future, International Agriculture Series, No. 12, Institute of Agriculture, University of Minnesota, n.d.; J.D. Hyslop and R.P. Dahl, Wheat Prices and Price Policy in Tunisia, Staff Paper 70-10, Department of Agricultural and Applied Economics, University of Minnesota, June 1970).

constraint that retail prices of wheat and wheat products not be "excessive." Early in the decade most interest was directed to meeting an expanding domestic demand for both hard (durum) and soft (bread) wheats. It was also desired to maintain a hard wheat export capability to take advantage of high internal price supports in France for hard wheat. Tunisian exports had access to this market at the supported prices through special concessional agreements. Later, after termination of the French concessions in 1964, and in response to a continuing demand shift toward soft wheat products, price policy was reoriented to encourage increased soft wheat production at the expense of hard wheat and other competing crops. Also contributing to the motivation for increased domestic soft wheat production was a gradual stiffening of the price and payment terms under which most of the country's soft wheat imports had been obtained.^{58/}

To stimulate domestic production wheat prices in Tunisia have been maintained at a level about 60 percent above world market prices; however, the premium in Tunisia is lower than for most other wheat importing countries. The premium for hard wheat has been maintained at a higher relative level than has the premium for soft wheat.^{59/} This reflects the special place of hard wheat (the base for couscous) in the Tunisian diet.

T (69)
 50-97
 (only)
 U.S.

^{58/} Almost all of the wheat imports by Tunisia during the early and middle 1960's were soft wheat. These imports, averaging 215000 metric tons per year from 1961 to 1967, filled about 85 percent of Tunisia's total soft wheat consumption needs during the period. And most of the import volume was obtained under the relief, soft currency and other concessional provisions of the United States' PL480 and the United Nations' World Food Programs (Hyslop and Dahl, op. cit., pp. 12, 17; U. S. Department of Agriculture, FAS, Foreign Agriculture Circular, Grains, FG10-74, USDA/FAS, Washington, April 1974, p. 97).

^{59/} Hyslop and Dahl, op. cit., pp. 10, 18.

USDA & FAS for 7/63-11/64
 show T.I. = 26%
 of soft wheat imports

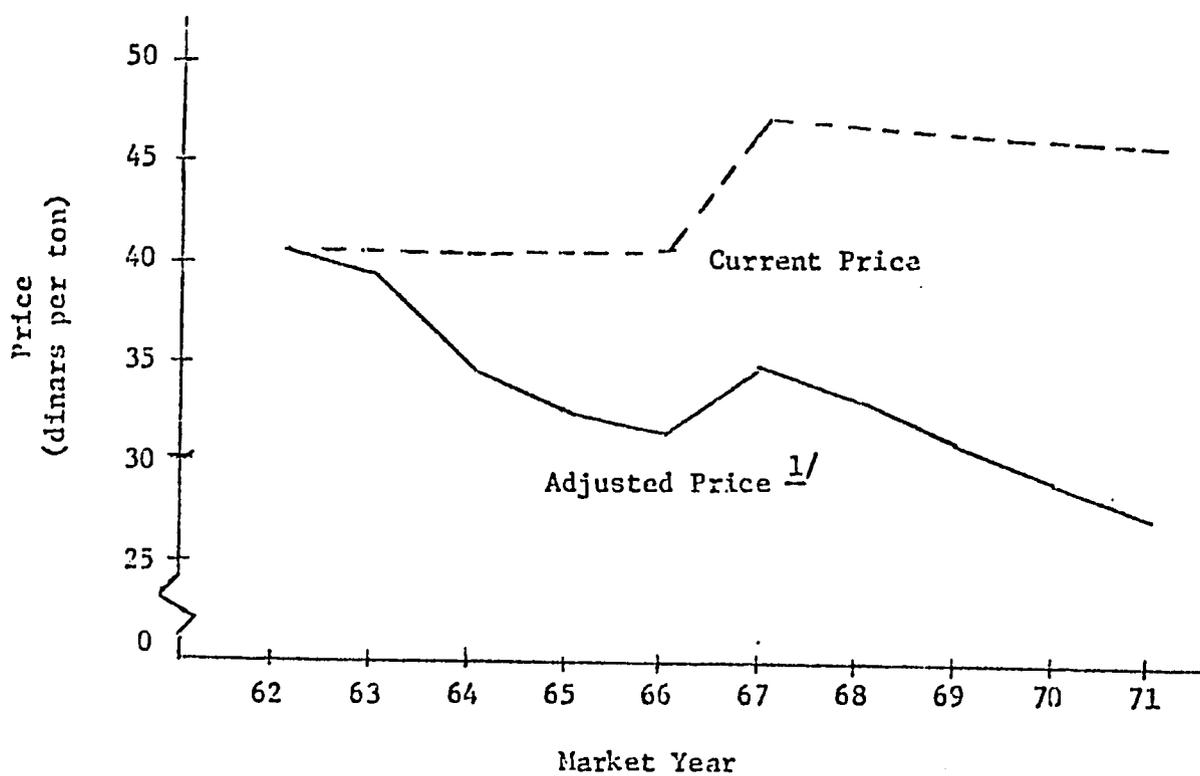
The following discussion of wheat price policy is based on Figures 1-3 below which suggest that actual wheat price policy is somewhat different from the announced policy. Whether the reality of policies enacted is perceived by policymakers or even by farmers is not known.

The real price of wheat. Figure 1 illustrates that the fixed prices for wheat, which are nominally intended to encourage increased wheat production, have failed to keep up with the rising general price level. When deflated by the index of wholesale prices the average wheat price declined from 40.59 dinars per ton in 1962 to 27.74 dinars per ton in 1971. This is a 32 percent decrease in the real price (roughly the market exchange value) of wheat. Wheat prices, being fixed maximum as well as minimum prices, have actually given fairly strong disincentives to wheat producers.

The general wholesale price index and wheat prices relative to it indicate both the increasing cost of living faced by all Tunisians and the increase in wheat production costs relative to the unit value of wheat produced. A focus on the latter component is presented by Figure 2 which shows price relatives with a 1962 base for wheat, three important inputs to wheat production -- nitrogen and phosphorus fertilizers and basic agricultural labor, and the index of wholesale prices of industrial products. While not inclusive of all wheat production costs, these items do indicate the general rise in costs relative to wheat prices.^{60/}

^{60/}For a thorough evaluation of shifts in terms of trade between agriculture and industry see: Robert J. Blake, Jr., Important Controls and Production in Tunisia (mimeo), The University of Michigan, October 1973, pp. 13-19. Blake found that between 1962 and 1969 agricultural products (aggregated) declined in purchasing power relative to industrial products despite some increase in domestic agricultural prices both absolutely and relative to world prices.

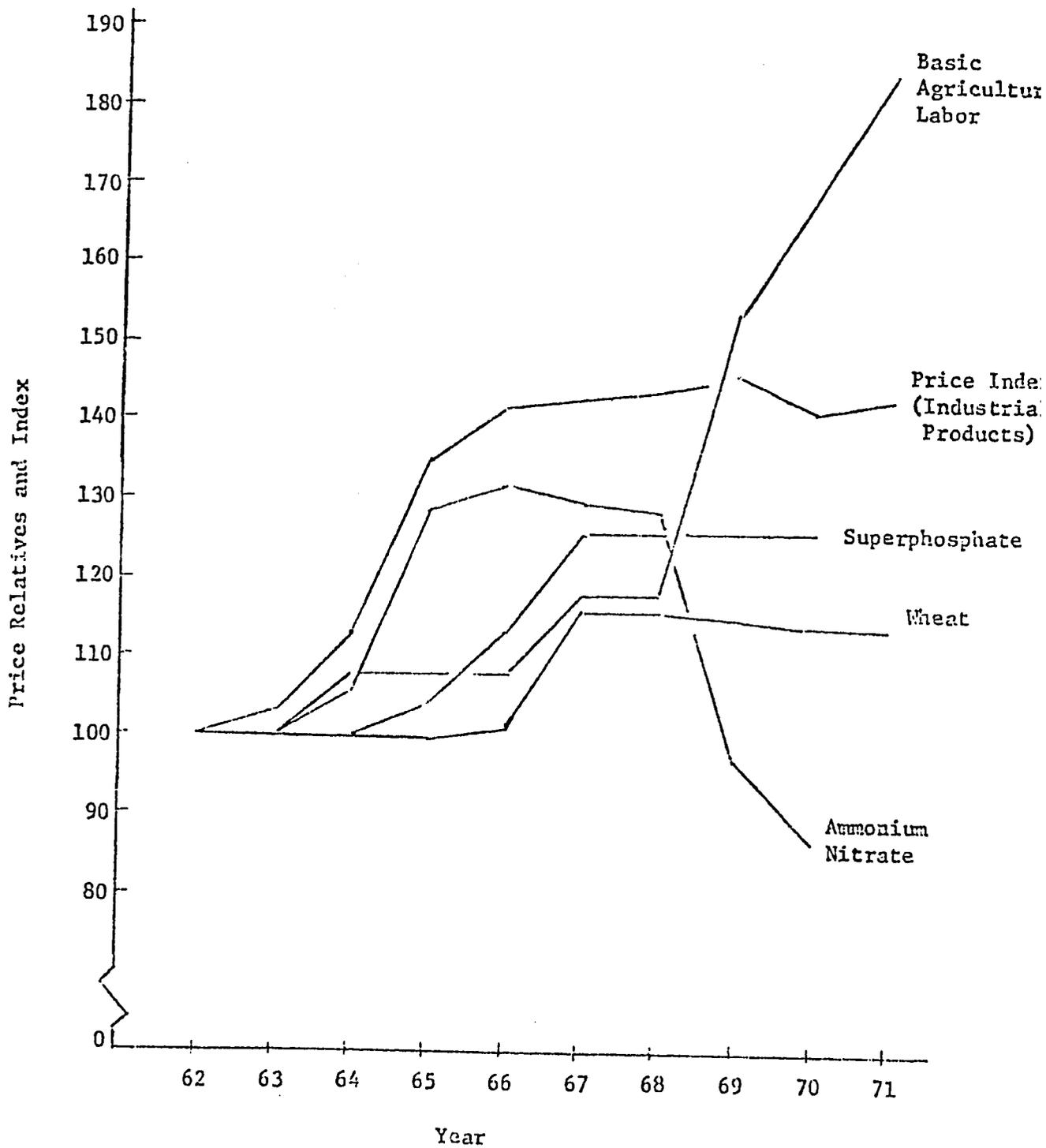
Figure 1. Current and adjusted prices of durum and bread wheat, 1962-1971.
(quantity weighted averages)



^{1/} Deflated by the wholesale price index.

Source: Appendix Table A.6.

Figure 2. Price relatives 1962-1971 for wheat and selected agricultural inputs (1962 = 100)

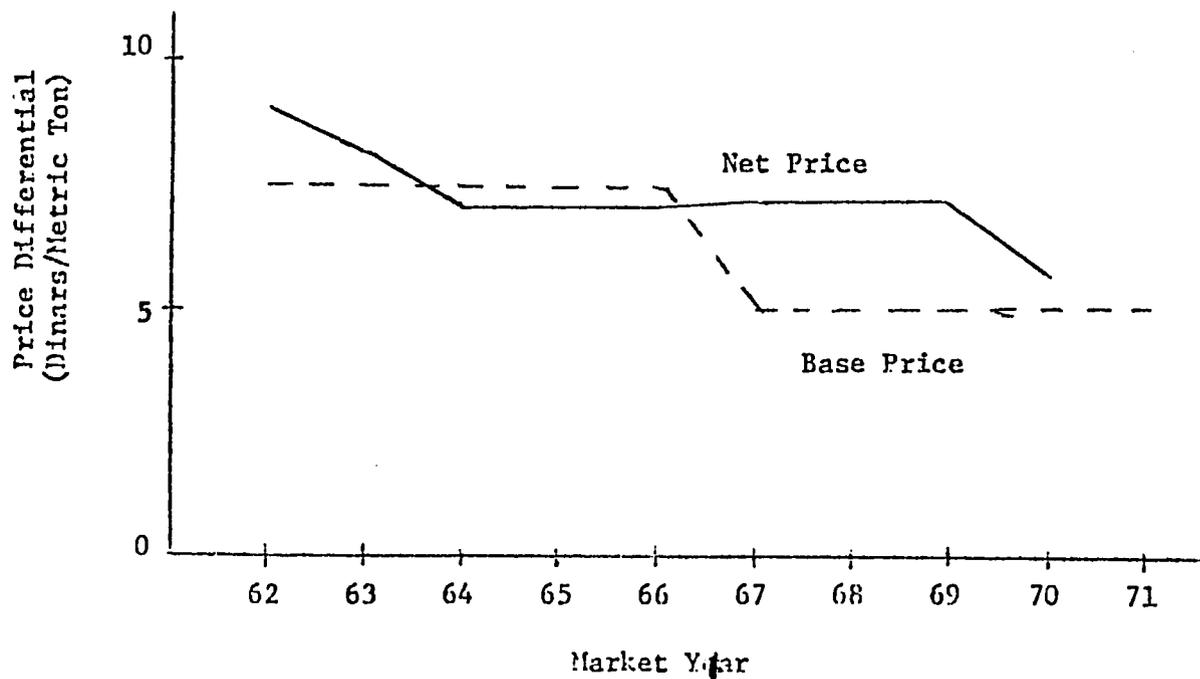


Source: Appendix Table A.7.

Of the cost items illustrated only nitrogen fertilizer (ammonium nitrate) had a price relative in 1970 (87) lower than the price relative for wheat in that year (114). The decline in nitrogen fertilizer price occurred because of decreasing world market nitrogen fertilizer prices and because of a government decision to increase the price subsidy on this product to stimulate its use. The price relative of superphosphate in 1970 was 126: that of labor was 169 (185 in 1971). Over the same period (1962-1971) the industrial products price index rose to 143. This index can be considered a proxy for new equipment costs. Thus government price fixing for wheat and wheat production inputs resulted in a decrease in economic incentives for purchased input use and wheat production by narrowing producers' net profit margins.

Hard wheat versus soft wheat prices. Another ambiguity in wheat price policy is illustrated by Figure 3. It was the government's announced intention in 1967 to stimulate a shift of wheat production from hard to soft wheats by reducing the price differential favoring hard wheat. However, because of the taxes and subsidies attached to the sale of the two wheats, the differential in net price received by farmers actually increased in that year and remained higher than previously through the 1969 season. The differential in base prices dropped from 7.5 dinars per ton in 1966 to 5 dinars per ton in 1967. However, the net price (price minus tax plus subsidy) differential increased from 7 dinars to 7.2 dinars per ton. This occurred because in conjunction with the base price increases favoring soft wheat, value added taxes were increased relatively more for soft wheats and a 2.5 dinar per ton subsidy was paid for hard wheat (See appendix Table A.3). Only

Figure 3. Base and net^{1/} price differentials between hard and soft wheat, 1962-1971.



^{1/} Net price is equal to the base price minus value added tax plus subsidy.

Source: Appendix Table A.3.

in 1970, when a subsidy was authorized for soft wheat, did the net price differential fall to a level lower than it had been prior to the announced policy change in 1967.

It is hardly conceivable that wheat policy makers could fail to see the relationship of taxes and subsidies to base prices for wheat. Nevertheless, the Ministry of agriculture sub-committee evaluating price policy of the 1960's preparatory to the 1973-1976 agricultural plan were still pointing to the soft wheat production incentive implicit in the 1967 wheat price adjustments.^{61/}

Wheat and competing crops. Another perspective on pricing policies for wheat and the major competing crops can be obtained by looking at changes for all of these crops together. As stated earlier, the only change in wheat prices during the decade occurred in 1967. Barley, horse beans and corn prices were also increased in that year. Barley prices had already been raised once in 1967. Sorghum grain prices were raised in 1968. In 1970, higher prices were established for broadbeans, chick-peas, and again for horse beans.^{62/} The prices of these products in 1961 and 1971 are listed in appendix Table A.9: percentage price increases over the decade are listed in Table 15.

^{61/} Abdelmajid Sahnoun and Abdelmajid Slama, Rapport du S/Comité - Ecoulement des Produits et Politiques des Prix, République Tunisienne, Ministère de l'Agriculture, January 1972, p. 28.

^{62/} Abdelmajid Sahnoun, Mongi Kamoun and Rachid Ben Abdelfatteh, Prix à la Production des Produits de l'Agriculture et de la Pêche, 1965-1971, BPDA, République Tunisienne, Ministère de l'Agriculture, September 1962, p. 5; Hyslop, op. cit., p. 18.

Table 15. Changes in prices, areas and yields of wheats and competing crops, 1961-1971.

Crop	Percent Change 1961-1971		
	Base Price	Area	Yield
Hard wheat	14	-16	45
Soft wheat	25	39	32
Barley	40	-47	73
Corn-sorghum	25	245	88
Chick-peas	32	7	48
Broadbeans	61		
Horse beans	58	21	80

^{1/}Area and yield estimates are based on 1959-1961 and 1969-1971 averages.

Source: Appendix Table A.9.

Prices of all the products listed in Table 15 are set by the national cereals marketing monopoly, the Office de Cereals. Therefore, it can be assumed that the prices established reflect the price policy intentions of the government. With this assumption it is noteworthy that none of the product prices were increased over the decade by an amount equal to the increase in the wholesale price index over the same period (67 percent). This fact may not have been known or thought important by policy-makers. Nevertheless, these price policy decisions did result in an adverse turn (decrease) in the terms of trade between this part of the agricultural sector (22 percent of gross agricultural output in 1971) and the rest of the economy. One must presume that the cumulative effect of these decisions was a disincentive to the allocation of private resources for agricultural production purposes. They also reduced the ability of agricultural enterprises to make gains in production and productivity or even to survive without subsidies.

The price changes for the crops listed in Table 15 indicate an effort to shift resources from the production of the traditionally most important field crop -- hard wheat -- to the production of the other cereal and pulse crops.^{63/} A partial explanation for this policy direction for wheats was given earlier -- a shift toward relatively greater soft wheat production was desired because of an increase in the demand for bread and pastries and because concessional arrangements favoring soft wheat imports were reduced or terminated. Another influence tending to reduce the hard wheat-soft wheat price differential in the late 1960's was a reduction of the differential between these wheat prices on the world market.^{64/} Among possible explanations for the other price relationships are a desire to: 1) increase production of livestock feeds (corn, sorghum, beans, barley);^{65/} 2) diversify field crops, and 3) increase the intensity of land use through increased use of leguminous crops in rotation with cereals and elimination of some fallowing in areas with adequate rainfall.

Reasons for the variations in the price increases registered by the three pulse crops are not clear. However, perhaps higher increases for the bean crops might be explained by the increased use of these crops as cattle feed and the government's desire to increase production of livestock products.

^{63/}Despite the conflicting testimony of the hard wheat-soft wheat case it is assumed that taxes and subsidies for all of these crops (no data are available) were adjusted in such a manner that net price changes were not substantially different from base price changes.

^{64/}Hyslop and Dahl, op. cit., pp. 15-16.

^{65/}These crops have traditionally been food crops in Tunisia but recently they are being used more and more as animal feed concentrates.

Effectiveness of cereals and pulses price policy. The area and yield columns of Table 15 give some indication (admittedly tenuous) of the resource use and productivity effects of the cereals and pulses price policies followed in the 1960's. First, the effect of decreasing the price differential between hard and soft wheats (in 1970) and the increase in all other prices relative to the price of hard wheat could explain the decrease in hard wheat area and the increases registered by all other crops except barley.

The decline in barley area may be explained in two ways. Barley production is relatively most important in the dry Center and South of Tunisia and was therefore adversely affected by the diversions of pasture and marginal cropland to tree crops during the 1960's (approximately 300,000 hectares in total were taken for new plantations--Table 2). The price increase for barley was insufficient to move barley from last place in the ranking of these crops in terms of gross receipts per hectare (see appendix Table A.9).

The relatively low area expansion response of the pulses to increases in their prices relative to cereals prices may be because the price increases for these crops occurred later than the cereal price increases and the full effects of the new price ratios have not yet been seen.

In view of the decline in product prices relative to input prices it is likely that the yield increases observed between 1961 and 1971 can not be attributed to increased prices. However, for those farmers who were not using fertilizers or many other purchased inputs in 1961, product

price increases, however illusory, may have stimulated increased input use resulting in increased yields.^{66/}

As a more general statement, it appears that in-so-far as the negative effect of the cereals and related crops price policies on agriculture's terms of trade was deliberate — and not due to lack of knowledge or understanding — it was probably ill advised. Extraction of savings from agriculture to finance expansion in other sectors may have been an objective of this policy. If so, because of poor production results in this sector, it clearly did not work. And, in view of the extremely low levels of income and of capital stocks in agriculture at the beginning of the decade such a result was to be expected. Agriculture could not provide a surplus until its own large and ever growing needs for capital and for incentives to its workers had been met.

Among the problems which farmers face in seeking to make land and other resource adjustments in response to cereals and pulses price policies is uncertainty resulting because the government sets prices for each year during the harvest season. Thus the element of price certainty normally associated with price fixing when prices are established before planting is not available to Tunisian field crop farmers. The magnitude of this uncertainty should not be overstated -- prices have not been lowered since price fixing began. Nevertheless, the lag in farmers' responses to price changes is more than it would be were prices and price changes known in advance.

^{66/}Use of nitrogen fertilizers by Tunisian agriculture increased from 2400 tons in 1962 to 13200 tons in 1971. Phosphorous fertilizer use increased from 6500 tons to 19300 tons in the same period (Rétrospective, op. cit., 2^{ème} Partie, p. 26).

Olives

Price policy for olives in Tunisia is one element of a total olive oil marketing policy which has the objective of maintaining and stabilizing olive oil exports. The latter policy function is necessary in order to assure exportable quantities (and hold export markets) during years of low production. Olive oil, traditionally Tunisia's major export in terms of foreign exchange earnings,^{67/} was surpassed in 1970 and subsequent years only by products of the expanding petroleum industry. In order to maintain olive oil exports despite expanding domestic demand for edible oils and essentially no growth in production, increasing quantities of other oils have been imported for blending with domestic olive oil --- primarily soybean oil imported under the United States PL480 program.

The Mechanics and Effects of Price Controls. The mechanism for price controls in the Tunisian olives sector is the fixing of prices for various qualities of processed oil at both wholesale and retail levels. Prices are set annually by the national oils monopoly (Office de l'Huile) and are announced prior to the production season. Since the 1967-1968 season a supplement to the base minimum price(s) has been paid at marketing.^{68/}

In recent years the wholesale price of olive oil has been set at 260 to 280 dinars per ton for oils of the highest quality. The lowest quality

^{67/}Over the 1962-1971 decade olive oil exports averaged 40000 tons per year and had an average annual foreign exchange value in constant (1966) prices of about 12.5 million dinars (Rétrospectiva, op. cit., I, p. 65; II, p. 66).

^{68/}Osama A. Al-Zand, Exploration and Analysis of Producer Prices of Olives in Tunisia--A Case Study of Pricing Imperfection, Staff paper P 73-6, Department of Agricultural and Applied Economics, University of Minnesota, January 1973, p. 39.

of marketable oil has been supported at 220 to 240 dinars per ton. In addition supplements of from 5 to 30 percent of the base prices have been paid. The net wholesale price of oil has fallen within a range of from 240 to 350 dinars per ton, depending upon the quality of oil produced.^{69/}

Table 16 illustrates some interesting aspects of olive oil pricing policy. A comparison of the first three columns reveals that the fixed wholesale price for super quality oil is less than both the retail and world market prices for this quality of oil by amounts which are substantially above marketing margins that might be expected on the basis of costs.^{70/} During the years for which data are available the retail-wholesale margins averaged 87 dinars: the world market or export-wholesale margin averaged 76 dinars.

Although marketing cost data are not available, even very liberal assumptions about the magnitudes of retail and export marketing costs are unlikely to equal the margins observed. An explanation for these excessive margins would seem to be that not only is olive oil an important source of foreign exchange for Tunisia, it is also an important source of government revenue collected by the Office de l'Huile (NOH) marketing monopoly. Although the money collected (taxed away) in this fashion is no doubt useful to pay for operation of the Office and to support government subsidies for new plantations, it does dampen potential price incentives for processors and olive producers.^{71/}

^{69/}Sahnoun and Slama, op. cit., p. 38.

^{70/}This conclusion is supported by Blake's findings that the rate of effective protection for Tunisian olive oil is -14.79 percent (Blake, op. cit., p. 25).

^{71/}Though not a justification for an excessive retail-wholesale price margin, it should be noted that an important reason for maintaining a high retail price for pure olive oil is to reduce the quantity of this product demanded and to encourage consumers' acceptance of olive oil blended with cheaper imported soybean oil, which sells at retail for one-half the pure olive oil price. (Sahnoun and Slama, op. cit., p. 37).

Table 16. Olive oil prices at various levels in the marketing chain, 1962-1971.

Year	Oil Prices ^{1/}				
	World Market ^{2/}	Retail ^{3/}	Wholesale		Producer ^{5/}
			Super	Average ^{4/}	
	<u>Dinars/Ton</u>				
1962	292	-	205	202	-
1963	402	-	220	208	-
1964	309	-	208	195	-
1965	348	300	240	226	180
1966	347	350	249	236	190
1967	362	400	307	279	225
1968	358	400	295	275	220
1969	350	400	290	272	220
1970	367	400	350	315	250
1971	-	400	308	290	230

^{1/}Including all supplements.

^{2/}Export price of super quality oil (1.0% free fatty acid) F.O.B. Spanish ports, converted to dinars at the International Monetary Fund exchange rate.

^{3/}Price of super and extra quality oil.

^{4/}Quantity weighted average price of all oil qualities.

^{5/}The farm level price of raw olives converted to oil value assuming a 20 percent oil yield.

Sources: Sahnoun and Slama, op. cit., pp. 37-38; Sahnoun, Kamoun and Abdelfatteh, op. cit., p. 7; Food and Agriculture Organization of the United Nations, Production Yearbook, Vol. 25, Rome, 1971, p. 576.

The last two columns of Table 16 reveal that the wholesale-producer or farm level price margin is also large, an average of 54 dinars for the years 1965-1971. This margin compares with a transformation cost of 15 dinars estimated by Al-Zand.^{72/}

^{72/}The basic farm level price for olives is the price received when the olives are sold on the tree. Al-Zand's estimate includes 6.0 dinars of harvesting cost, 1.5 dinars for transportation, 5.0 dinars for processing, and 4.0 dinars of tax levied on processors but legally shifted as processing cost to the olive producers. Olive by-products (grignons), with a value of 1.5 dinars per ton of olives, serve to offset the transportation cost. (Al-Zand, op. cit., pp. 9, 22).

Imperfect Competition. The large wholesale-producer price margin is not necessarily a result of the existence or method of price fixing at the wholesale level. Rather it reflects the structure of the olives industry which consists of: the government wholesale monopoly (NOH); a few oil processing plants; a few traders who purchase olives from farmers, pay for their processing (10 dinars per ton), and sell oil to the NOH; and a very large number of producers, most of whom have very small olive groves.^{73/}

The existence and perpetuation of the market system where relatively few traders act as intermediaries for the marketing (and often harvesting) of olives for the basic producers results from several unique features of the olives industry. First, olives are highly perishable in that quality of oil derived from the olives is inversely related to the length of time between harvesting and processing. Second, small-farm olive producers do not have adequate capital, facilities, transportation, or management inputs to allow them to perform the marketing function through to the wholesale level for their own crop. The nature of tenure arrangements on many large holdings also encourages the use of middlemen. Absentee owners of share-cropped lands -- the usual arrangement for large private farms -- do not care to involve their management talents or their resources in marketing. They rely on traders. Large communally held farms lack the organization and capital pooling necessary to perform the marketing function.

Even the large state farms and cooperatives have usually relied on outside traders to handle the marketing of their olive crops, perhaps primarily because major management decisions on these farms are made by central government

^{73/}Al-Zand has characterized the primary olives market as monopsonistic, with each olives trader -- many of whom are also processors -- having only nominal, if any, competition in any olive purchase transaction. (Al-Zand, op. cit., p. 36).

bureaucrats who do not want to be bothered with marketing -- for their own reasons. Reliance on traders has caused dissension on some cooperatives. Members' desires to harvest and market the olive crop, thereby capturing most of the wholesale-producer marketing margin for themselves, have been overruled by OTD administrators.

A final feature of the olive industry affecting marketing is the fact that often the primary source of production credit and other services available to olive farmers is the olive trader. Thus a large part of the total olive harvest is committed to traders, who by setting the timing of repayment dates insure their ability to obtain raw olives instead of cash repayment after the olives are processed. This does not imply that the trader's actions are necessarily bad or exploitative; the traders are unquestionably performing a useful function, given the abilities of and opportunities open to olive farmers. But the absence of alternative markets and of credit sources does allow traders to earn monopoly profits through performance of the marketing function.

Other deficiencies in the marketing and pricing of olives and olive oil in Tunisia are illuminated in a series of studies by Al-Zand.^{74/} He found no correlation between oil yield and quality and price of olives at the farm level, olive price dispersions among market regions which are higher than transportation costs, and excessive wholesale-producer price margins for all qualities of olives (oil content).

^{74/}Al-Zand, op. cit.; Osama Al-Zand, Olive Oil Price Policy in Tunisia, Staff Paper P70-11, and Producers Prices for Olives and Olive Oil in Tunisia, Staff Paper P71-21, Department of Agricultural and Applied Economics, University of Minnesota (June 1970 and October 1971).

The Results of Olive Pricing Policy. This discussion suggests two aspects of the pricing arrangements for olives in Tunisia which should be carefully reviewed by policymakers. The taxing of olive production (both through official taxes and through government profits in excess of normal profits), even if compensated for by subsidies for plantation expansion, result in a production disincentive to farmers who bear the incidence of the taxes. In the average farmer's mind there is no connection between the low price of olives and the subsidies, which in any case are usually given to someone else -- e.g., to state and cooperative farms. The huge efforts to expand olive production through increasing plantations area (320000 hectares in the 1960's) may have a much less than expected effect on total production as existing plantations deteriorate or fail to produce at their potential because of lack of price incentives.

Although fixing of wholesale prices does not necessarily cause excessive wholesale-producer price margins, excessive margins do inevitably result from the structure of the industry. As long as this structure is not modified, government efforts to encourage production through price incentives are destined to be largely ineffective. It is difficult to visualize any important changes in the current system without government intervention in the raw olive production and marketing process. A feasible government role might include the supplying of credit and other services now extended by private traders -- including harvesting, transportation, and marketing facilities and financing. The government might also establish a sampling procedure and facilities for determining the oil content and quality of olives so that raw olive pricing can be directly linked to the market value of the final product, olive oil.^{75/}

^{75/} See the price computation scheme designed by Al-Zaad (Producers Prices For Olives, op. cit.).

A conclusion which may result from consideration of these points is that elimination of the middleman monopoly position might allow the government to achieve its basic objectives -- i.e., increasing and stabilizing export supplies of oil, satisfying domestic demand, and improving farm incomes -- without any explicit price policy or price intervention at all. If farmers were allowed and enabled to capture the current excess profits at both the wholesale and retail or export levels, they might well have sufficient incentive and resources to eliminate the need for government subsidies for area expansion while at the same time increasing the production and productivity of existing plantations.

Meats

Price fixing for meats has been in the form of maximum wholesale and retail prices for various types of meats. The intent of meat price policy has been to keep retail prices relatively lower than free market levels for the benefit of poor consumers, many of whom cannot afford meat except for religious holiday occasions. Meat price controls have been notoriously difficult to enforce, with meat ceasing to be available in many butcher shops when enforcement efforts were increased.

The government faces a dilemma in trying to establish a viable price policy for meats. Higher farm level prices are needed to stimulate production, yet higher prices and/or shortages of meat at the retail level are very unpopular and perhaps even politically dangerous. A measure of the lack of a clear decision is the sporadic enforcement of established policies. The government is attempting to solve the problem by meat imports concentrated during periods of peak demand, by increased emphasis on livestock production

on state farms and cooperatives, and by non-price incentives to private producers. Non-price incentives proposed and implemented to a limited extent include subsidies for livestock improvement and pasture development.

Input Prices

Water

One of the most critical needs in the Tunisian government's attempt to improve production and productivity in the agricultural sector is effective use of available irrigation water supplies. The importance of water pricing in achieving increased water use is recognized, but after considerable experimentation no effective policy has been devised. The price of water from government water supplies (about 75 percent of the total) has varied from two to ten millimes per cubic meter over the past several irrigation seasons. In general, the price has been set at the same level throughout the country. The pricing objective has been to encourage water use, while at the same time earning sufficient revenues to cover operating costs and amortization of government investments.

Water use has not increased in proportion to water development^{76/} and in some areas new developed water supplies are not being used at all because of government price and water sale policies. A number of government wells in central Tunisia, though fully developed, have remained unused for a period of two to five years. Several times the government has varied the price demanded of potential water users (peasant farmers), however, it has always maintained a requirement that the cost of fuel necessary to operation of the pump be paid in advance by water users. The potential users, illiterate and

^{76/}In 1971 only 287 million of 529 million cubic meters available from developed sources were being used (Daves, Le Sous-Secteur Irrigué, op. cit., p. 12).

extremely poor farmers with no knowledge from experience of the potential gains from irrigation, refuse or are unable to pay.^{77/}

One can understand both sides of the stand-off, however from a practical viewpoint, the government must modify its policy if the already sunk investment in pumping plants is to be used. A policy which asks poor farmers to bear the risk (real or only perceived) of switching from traditional low cost dryland farming to irrigated farming is unlikely to get full water use in an acceptable amount of time.

A similar example is presented by water sales policy in some of the Mejerda valley irrigated areas created and settled under government auspices. In early years of the 1960's water was priced at levels necessary to cover water costs. Payment was deferred until harvest. However, after continuous problems in collecting water costs, the OMVVM^{78/} changed policy to require monthly water payments. This policy was effective in reducing collection problems but it also was effective in reducing water use.

Tunisian officials have recently begun to discuss the possibility of changing water pricing policies to reflect the value of the additional production resulting from irrigation instead of pricing to cover costs. That is, the new policy, if adopted, will base the price which water users pay on the additional revenue they can expect to receive from its use. For some projects, water supply cost (including amortization) is too high ever to be paid by the value of increased production due to irrigation -- e.g., the

^{77/}This information was obtained by the author in interviews of officials and farmers in central Tunisia during the fall of 1970.

^{78/}Office de Mise en Valeur de la Vallée de la Majerda -- the semi-autonomous state agency responsible for integrated development and management of the Majerda Valley with special emphasis on extension of irrigation.

Nebana project with a per hectare investment for major infrastructure of 5000 dinars. Therefore, pricing on the basis of the value of marginal product due to irrigation, or some other method not based on the total cost of delivered water is necessary if losses from non-use of the developed water resource are to be minimized.

Labor

Minimum legal wages in agriculture have been raised several times during the past decade. The basic laborers rate was increased from 325 millimes in the period 1956-1964 to 600 millimes in 1971 (Table A.7). Skilled workers receive a premium of up to 75 percent of the base rate.

It should be noted however, that the bulk of the agricultural labor force, has not benefited from this legislation. Members of production cooperatives are considered to be shareholders entitled to a share of cooperative profits in lieu of part of their wages. Unfortunately, because of the poor profit performance of some cooperatives and because of the needs for reinvestment, for all practical purposes many cooperative members are laborers receiving less than the minimum wage. (See Footnote 24.)

Furthermore, because of lack of enforcement the wage received by most laborers in the private sector is set by local labor market conditions. And, these conditions are generally depressed both because of large labor supplies and because of the possibilities for capital substitution which for many jobs becomes economic before the current legal minimum wage level is reached.^{79/} Exceptions occur (higher than the legal minimum wage may be

^{79/} It should be recognized that overvaluation of the Dinar, direct and indirect subsidies (e.g. subsidized interest rates) are important elements making capital attractive relative to labor.

received) with seasonal and localized high labor demand situations where mechanization cannot be readily introduced, e.g., the olive harvest in the Sahel. Also, again reflecting specific supply and demand conditions, the relatively small number of skilled workers such as tractor operators, tree pruners and maintenance personnel usually receive at least the minimum rate for their skill categories. Thus, the only worker class clearly benefiting from minimum wage legislation are workers on state farms and on some cooperatives.

VII. CONCLUSIONS

The Tunisian agricultural sector stagnated during the 1960's. Depending upon the base period and set of output estimates used, calculations of the growth rate of agricultural production between 1961 and 1971 range from -1.8 to +0.6 percent. Agricultural exports declined by 13 percent. Average real incomes of farm families declined as did agricultural and food output per capita.

The lack of growth of agricultural output occurred despite 216.4 million dinars of new investment, employment of 57200 additional man-years of labor (rural unemployment remains high) and some shifting of land from low to high intensity uses. The estimated marginal output-capital ratio for new agricultural investment during the decade is 0.03 (a capital-output ratio of 29.6). The estimated marginal output-employment ratio is 127.4, less than the legal minimum agricultural wage (150 dinars) in force at the end of the decade. Expressed as changes in total resource productivity, gross sectoral output per man-year of employment declined from 475 to 400 constant (1966) dinars; output per hectare of land increased from 8.5 to 8.9 dinars, and employment per hectare increased from 4.5 to 5.7 man-years.

Some subsectors experienced special problems during the decade. In the tree crops subsector value of output declined 12 million dinars (31 percent) as area was expanded by 320000 hectares (34 percent). The value of truck crops (vegetables) output increased 8 million dinars as area expanded from 24 to 60 thousand hectares. However, output per hectare declined by 41 percent and employment per hectare declined by 55 percent. This reduction in land productivity and labor use intensity occurred even as nominally irrigated area, much of it allocated to truck crops, increased by about 100 percent, to 118000 hectares. The

decreased labor use cannot be explained by capital-labor substitution as little mechanization occurred other than a substitution of machine for animal power in pumping water from dug wells.

Performance of the agricultural sector was clearly inadequate during the 1960's. Nevertheless the future outlook is not necessarily bleak. One of the key explanations of the poor production record achieved in the 1960's was the trauma associated with expulsion of colon farmers and commercial and administrative personnel in agricultural support activities. This Tunisification of agriculture -- the last major step essential to real Tunisian independence -- is now accomplished. As the new young Tunisian cadre gain experience it will have long run positive effects on the nature and (one hopes) productivity of the agricultural sector. Also, substantial capital and Tunisian manpower improvements increasing the potential production capacity of the sector were made.

Obstacles to a dynamic and productive agriculture which remain include a too rapidly increasing rural population, the strong big-project bias of agricultural investment policy, some personnel problems and structural elements in government-controlled agricultural institutions, inefficiency and uncertainty with respect to land tenure, and some aspects of price and related policies affecting private farmers.

Suggestions for alleviating some problems examined in this study are briefly summarized below.

1. The continuing bias in agricultural investments toward purposes with long pay-off periods should be reversed. One of the important factors explaining poor agricultural growth during the 1960's was the concentration of investments, and government attention in general, in the development of major irrigation water sources and infrastructure, in forest and olive

tree planting and in conservation works. A major new focus designed to make the new (and old) developed infrastructure and improved lands immediately productive is needed. If many more resources, including secondary and tertiary investments, and much more attention are not allocated to follow-up utilization and maintenance efforts there is a real danger that a significant part of the investments made in the 1960's will be lost without ever becoming productive. Special emphasis should be given to increased utilization and maintenance of existing irrigation developments. A very high and rapid pay-off could be obtained from such efforts.

2. The Ministry of Agriculture, which developed during the central planning and collectivization era of the early and middle 1960's still retains its orientation toward direct management of the agricultural sector. If viable private and cooperative sectors are to evolve as foreseen by the decisions of 1969-1970 this orientation must be changed. Ministry officials must become aware that production planning is largely a sterile exercise in goal setting now that they no longer have control of agriculture's resources. The emphasis of ministry activities should be shifted toward provision of services -- such as information, education, applied research, infrastructure development (particularly markets), and credit.

Furthermore, the planning for agricultural projects must be changed to include the early, active, and continuing participation in the planning process of all individuals or groups who will be importantly affected. Heretofore, many projects have failed because project area inhabitants were not consulted during the planning phase and were indifferent or even hostile to the project. Project planning must also be strictly limited within bounds set by existing land tenure and cultural patterns in the project

area or by patterns that might reasonably be expected to exist prior to project implementation.

3. Agricultural cooperatives and state farms must improve productivity and production if they are to serve their assigned functions as important producing units and as demonstration farms for modern agriculture. It is also essential that they reduce their demands on the limited credit and other resources available to agriculture. Rapid improvements in the productivity of cooperatives might be achieved by making cooperative managers accountable to members of the cooperatives which they manage. Members would not retain or reward managers who consistently make production and marketing decisions resulting in losses to them. A less radical solution would be decentralization of decision making by allowing cooperative managers and councils to make decisions not subject to prior approval by far-away non-agricultural bureaucrats. Decentralization could also benefit state farms. Concurrently, production bonuses for managers could be made substantial enough to attract and hold good managers on both state farms and cooperatives. Production incentives to all workers on these farms might also improve productivity.

4. Current efforts to establish land ownership and to issue legal titles to agricultural land throughout the country should be completed as rapidly as possible. Also the equitable distribution of the public lands not necessary for state activities should be given high priority as should renewed attempts to rationalize land holding patterns which are restraining use of many developed irrigation resources. Security of tenure with farm units of economically viable sizes is the minimum requirement for a productive private agriculture.

5. Agricultural price policies should be reoriented to give a strong productive incentive to private farmers and to managers of the state controlled farms. If farm level prices continue to decline relative to the prices of productive inputs and relative to consumer goods prices agricultural production is unlikely to increase significantly even if non-price production incentives are offered. A commitment to increased farm prices implies increased consumer prices and/or absorption of the reduction in the retail-farm level price differential by the government. Alternatively the government could assist low income consumers directly instead of through price controls. In the long run increased production resulting from farm-level price incentives might well result in retail prices which are lower than current controlled levels.

It is also essential that all price policies for agriculture be made consistent with each other. No agricultural price fixing for either inputs or outputs should be allowed without verification that the proposed prices will be consistent with overall price policy objectives and will not reallocate resources to or from a competing purpose -- if such a result is not desired. This probably implies a single price making authority or review board for agriculture.

6. The 1960's efforts to reduce marketing margins through setting legal maximum margins and by replacing private middlemen with government monopolies may well have increased retail-farm level price margins. There is little evidence that government marketing agencies are more efficient than private ones, and there has been a tendency in Tunisia to obtain government revenue through increasing price margins allowed the government marketing organizations. Other methods of taxation which do not give production disincentives should be substituted.

7. Similarly taxes and charges on productive inputs -- such as irrigation water -- should be replaced by other taxes which do not discourage input use. In the case of irrigation water it might be advisable to allow free water to farmers, and to levy taxes on farm incomes. If it is politically possible taxation of land developed for irrigation according to potential productivity could give additional incentive to increase water use and production on irrigated lands.

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A P P E N D I X

Table A.1 Agricultural production and value of production, averages
1959-1961 and 1969-1971; percentage changes 1962-1971.

Sub-Sector	Production		Value of Production		Change	
	59-61	69-71	59-61	69-71	61-71	
	1000 Metric Tons		1000 Dinars ^{1/}		Percent	
<u>Vegetable Products</u>						
<u>Cereals</u>						
Hard wheat	326.3	306.7	13705	12881	-	6
Soft wheat	75.5	140.7	2612	4854	+	86
Barley	140.9	128.8	3522	3220	-	8
Other	8.8	57.0	220	1337	+	508
Sub-Total	551.7	633.2	20059	22290	+	11
<u>Tree Crops</u>						
Olives (oil)	484.7	283.3	16964	9916	-	42
Citrus	82.3	95.3	3045	3526	+	16
Grapes (wine)	197.0	101.3	4531	2330	-	48
Dates	57.0	34.3	3447	2092	-	40
Other	116.9	106.7	12228	10034	-	18
Sub-Total	937.9	620.9	40245	27898	-	31
<u>Truck Crops</u>						
Potatoes	36.8	71.4	1178	2285	+	94
Tomatoes	56.7	162.7	1077	3091	+	187
Peppers	37.5	92.8	1238	3062	+	147
Artichokes	9.8	9.5	353	342	-	3
Melons-water-melons	89.2	105.2	2854	3366	+	18
Other	126.7	213.6	3674	6194	+	68
Sub-Total	356.7	655.2	10374	18340	+	77
<u>Pulses</u>						
Dry beans	8.8	19.3	370	811	+	119
Peas, chick-peas	5.7	9.3	342	558	+	63
Lentils	0.6	1.3	36	78	+	117
Sub-Total	15.1	29.9	748	1447	+	93

Sub-Sector	Production		Value of Production		Change 61-71
	59-61	69-71	59-61	69-71	
	1000 Metric Tons		1000 Dinars ^{1/}		Percent
<u>Industrial Crops</u>					
Sugar beets	33.0	30.8	214	201	- 6
Tobacco	1.7	2.4	264	380	+ 44
Cotton	0.5	0.0	68	0	- 100
Flax	1.7	1.1	136	91	- 33
Sub-Total	36.9	34.3	682	672	- 1
<u>Forages</u>					
Crops	330.0	593.3	4950	8900	+ 80
Crop residue	879.0	833.3	13185	12500	- 5
Sub-Total	1209.0	1426.6	18135	21400	+ 18
<u>Total (Vegetable Products)^{2/}</u>					
	3107.3	3400.1	72108	70647	- 2
<u>Animal Products</u>					
Meats	84.0	95.9	24276	27509	+ 13
Milk	191.0	199.8	7449	7891	+ 6
Eggs	6.0	13.8	1860	4278	+ 130
Wool and Hides	4.0	4.4	1248	1517	+ 22
Total (Animal Products)	285.0	313.9	34833	41195	+ 18
TOTAL (All Products) ^{2/}	2186.3	2287.4	106941	111842	+ 4

^{1/} 1966 prices

^{2/} Excluding the production and value of forages--which are used as inputs to animal products production.

Sources: Perspectives, Titre II, ch. II; Annuaire Statistique, 1959-1961; Gaied, Production Agricole; Retrospective Decennale de l'Agriculture, 1ère Partie.

Table A.2 Gross investment in the agricultural sector 1962-1971,
by type of investment and by subsector.^{1/}

	Vegetable Products				Animal Products	Forest Products	Fishery Products	Total	Percent
	Tree crops	Truck crops	Field crops	Sub- total					
	<u>Million Dinars</u> ^{2/}								
Irrigation	11.1	53.3	16.2	80.6	0	0	0	80.6	37.2
Tree plantations	41.8	0	0	41.8	0	0	0	41.8	19.3
Equipment	5.9	0.3	36.7	42.9	0	0	0	42.9	19.8
Farm Buildings	0.1	0	1.0	1.1	2.5	0	0	3.6	1.7
Livestock	0	0	0	0	6.9	0	0	6.9	3.2
Pasture development	0	0	0	0	1.3	0	0	1.3	0.6
Reforestation	0	0	0	0	0	34.2	0	34.2	15.8
Fisheries	0	0	0	0	0	0	5.2	5.2	2.4
TOTAL	58.9	53.6	53.9	166.4	10.7	34.2	5.2	216.5	100.0
Percent	27.2	24.8	24.9	76.9	4.9	15.8	2.4	100.0	

^{1/}Investments which can be attributed to the production subsectors: not included are overhead investments such as conservation, agricultural education, etc. (See Table 4).

^{2/}Current prices.

Source: Retrospective Décennale de l'Agriculture, 4ème Partie.

Table A.3 Total agricultural output, employment and land use, 1962 and 1971.

Sub-sector	Output (O)		Employment (E)		Land (L)	
	59-61	69-71	62	71	62	71
	10 ⁶ Dinars		10 ⁶ Man-Days		10 ⁶ Hectares	
<u>Vegetable products</u>	77.06	79.55	40.07	55.31	4.49	4.00
Tree crops	(40.24)	(27.90)	(20.32)	(33.70)	(0.94)	(1.26)
Truck crops	(10.37)	(18.34)	(7.77)	(10.78)	(0.02)	(0.06)
Field crops ^{1/}	(26.44)	(33.31)	(11.98)	(10.84)	(3.52)	(2.68)
<u>Animal products^{1/}</u>	29.88	32.30	14.94	15.53	7.55	7.91
<u>Forest products^{2/}</u>	2.60	2.28	2.67	2.22	0.90	0.90
<u>Fishery products</u>	2.55	5.23	1.88	2.20	-	-
Total (without Fishery prod.)	109.54	114.13	57.68	73.06	12.94	12.81
Total	112.09	119.36	59.56	75.26	-	-

^{1/}Changes attributable to forage crop production are included with field crops.

^{2/}Employment associated with reforestation and the net amount of new forest planted are excluded from the forest product resource totals.

Sources: Table 2; Rétrospective Décennale de l'Agriculture, 1ère et 4ème Parties.

Table A.4 Seasonal credit of BNA-BNT and the CLCM's, 1961-1971

Crop Year ^{1/}	BNA-BNT		CLCM'S	Total
	Private Sector	Cooperative Sector	Private Sector	
<u>1000 Dinars</u>				
1961-62	1808	46		1854
1962-63	2094	11		2105
1963-64	1717	1136		2853
1964-65	1719	1294		3013
1965-66	1571	1956	1171	4698
1966-67	1569	3034	1532	6135
1967-68	1302	5791	2055	9148
1968-69	909	7472	1932	10313
1969-70	1275	2799	3728	7802
1970-71	1967	1420	1934	5321
TOTAL	15931	24959	12352	53242

^{1/}Data for the CLCM's is on a calendar year basis and is tabulated here as being for the season beginning with that calendar year.

Source: Rétrospective, op. cit., 2ème Partie, p. 23.

Table A.5 Medium and long term credit of BNA-BNT, 1962-1971

Year	Private Sector	Cooperative Sector	Total
<u>1000 Dinars</u>			
1962	589	-	589
1963	777	-	777
1964	325	1553	1878
1965	361	1709	2070
1966	830	1831	2661
1967	455	2571	3026
1968	491	5624	6115
1969	225	2988	3212
1970	1845	2878	3724
1971	2954	3706	6660
TOTAL	8853	22860	31712

Source: Rétrospective, op. cit., 2ème Partie, p. 38

Table A.6 Current prices and production of durum and bread wheat;
current and adjusted real prices of all wheat, 1962-1971

Harvest Year	Durum Wheat		Bread Wheat		Average Price (Quantity weighted)	Wholesale Price Index 1962=100 ^{1/}	Adjusted Price
	Price	Quantity	Price	Quantity			
	mil/qx	1000 tons	mil/qx	1000 tons	mil/qx		mil/qx
1962	4200	321	3450	72	4059	100	4059
1963	4200	530	3450	125	4057	103	3939
1964	4200	350	3450	81	4059	117	3469
1965	4200	420	3450	100	4056	125	3245
1966	4200	300	3450	49	4095	130	3150
1967	4800	240	4300	42	4726	135	3501
1968	4800	310	4300	73	4705	141	3337
1969	4800	220	4300	80	4667	150	3111
1970	4800	300	4300	142	4639	159	2918
1971	4800	400	4300	200	4633	167	2774

^{1/}The wholesale price index of the Annuaire Statistique (1940=100) was converted to a 1962 base by division.

Sources: Annuaire Statistique; Sahnoun and Slama, Rapport du S/Comite' - Ecoulement des Produits et Politiques des Prix, Rep. Tun., Ministère de l'Agriculture, January 1972; Abdelmajid Sahnoun, Mongi Kamoun and Rachid Ben Abdelfatteh, Prix à la Production des Produits de l'Agriculture et de la Pêche, 1965-1971, Rep. Tun., Ministère de l'Agriculture, BPDA, September 1972; Retrospective Décennale de l'Agriculture, 1ère Partie, p. 8.

Table A.7 Farm level prices and price relatives for wheat, superphosphate, ammonium nitrate, agricultural labor; and the index of wholesale prices for industrial products.

Year ^{1/}	Current Prices				Price Relatives (1962=100)				
	Wheat ^{2/}	Super-phosphate ^{3/}	Ammonium Nitrate ^{3/}	Labor	Wheat	Super-phosphate	Ammonium Nitrate	Labor	Ind. Prod. Index (1962=100) ^{4/}
	mill/qx	mill/qx	mill/qx	mill/day					
1962	4059	1245	3496	325	100	100	100	100	100
1963	4057	1245	3496	325	100	100	100	100	103
1964	4059	1248	3696	350	100	100	106	108	113
1965	4056	1296	4521	350	100	104	129	108	135
1966	4095	1408	4620	350	101	113	132	108	142
1967	4726	1568	4554	385	116	126	130	118	143
1968	4705	1568	4521	385	116	126	129	118	144
1969	4667	1568	3390	500	115	126	97	154	146
1970	4639	1568	3044	550	114	126	87	169	141
1971	4633			600	114			185	143

^{1/}Prices are for the crop season terminating in the year indicated.

^{2/}Quantity weighted average base prices for durum and bread wheats.

^{3/}Prices paid per unit of plant nutrient.

^{4/}The industrial products wholesale price index of the Annuaire Statistique (1940=100) was converted to a 1962 base by division.

Sources: Annuaire Statistique; Production Yearbook, Vols. 21-25, Food and Agriculture Organization of the United Nations, (FAO) Rome, 1967-1971; Annual Fertilizer Review, 1971, FAO, Rome, 1971; Table A.7; Ministère du Plan.

Table A.8 Farm level prices, value added taxes and subsidies for wheat, 1962-1970.

Market Year	Soft Wheat			Net Price	Hard Wheat			Net Price
	Base Price	Tax	Subsidy		Base Price	Tax	Subsidy	
	<u>Dinars/Metric Ton</u>							
1962	34.500	2.437	2.000	34.063	42.000	2.891	4.000	43.109
1963	34.500	3.637		30.863	42.000	2.891		39.109
1964	34.500	2.437		32.063	42.000	2.891		39.109
1965	34.500	2.646		31.854	42.000	3.145		38.855
1966	34.500	2.646		31.854	42.000	3.145		38.855
1967	43.000	4.212		38.788	48.000	4.544	2.500	45.956
1968	43.000	4.212		38.788	48.000	4.544	2.500	45.956
1969	43.000	4.212		38.788	48.000	4.544	2.500	45.956
1970	43.000	4.212	2.000	40.788	48.000	4.544	3.000	46.456

Source: Sahnoun and Slama, op. cit., p. 31.

Table A.9 Price, area, yield and per hectare gross receipts data for competing field crops, 1961 and 1971.

Crop	Base Price		Area ^{1/}		Yield ^{1/}		Gross Receipts	
	1961	1971	1961	1971	1961	1971	1961	1971
	<u>Dinars/Ton</u>		<u>1000 Hectares</u>		<u>Tons/Hectare</u>		<u>Dinars/Hectare</u>	
Hard wheat	42.0	48.0	1046	683	0.31	0.45	13.0	21.6
Soft wheat	34.5	43.0	162	225	0.47	0.62	16.2	26.7
Barley	20.0	28.0	640	337	0.22	0.38	4.4	9.5
Corn-sorghum	28.0	35.0	34	116	0.26	0.49	7.3	17.2
Chick-peas	64.0	84.5	21	22	0.27	0.40	17.3	33.8
Broad beans	46.5	75.0			0.20	0.36	9.3	27.0
Horse beans	33.0	52.0	43	52	0.20	0.36	6.6	18.7

^{1/}Averages 1959-1961 and 1969-1971.

Sources: Rétrospective Décennale de l'Agriculture, 1ère Partie; Van Wersch and Daves, op. cit., pp. 71-72; Sahnoun and Slama, op. cit.; Sahnoun, Kamoun and Abdelfatteh, op. cit.; Hyslop, op. cit.

Table A.10 Agricultural sector exports and imports, 1962-1971 (million dinars)^{1/}

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
	<u>EXPORTS</u>									
Vegetable Products										
Olive Oil	17.8	9.6	17.0	15.2	13.4	7.3	11.0	9.6	8.0	16.2
Cereals	1.1	5.0	4.4	0.3	4.3	0.1	0.0	0.0	0.2	0.5
Wine	4.1	5.4	4.9	2.3	4.4	3.6	2.4	2.3	2.8	0.5
Fruits & vegetables	6.1	5.2	7.7	6.7	7.9	8.1	6.4	6.4	6.3	5.8
Subtotal	<u>29.1</u>	<u>25.2</u>	<u>34.0</u>	<u>24.5</u>	<u>30.0</u>	<u>19.1</u>	<u>19.8</u>	<u>18.3</u>	<u>17.3</u>	<u>23.0</u>
Animal Products										
Live animals	6.5	0.8	0.8	1.3	0.9	1.3	1.1	0.7	1.3	0.3
Meats & eggs	0.0	0.0	0.0	0.2	0.6	0.7	0.6	0.7	0.4	0.0
Subtotal	<u>6.5</u>	<u>0.8</u>	<u>0.8</u>	<u>1.5</u>	<u>1.5</u>	<u>2.0</u>	<u>1.7</u>	<u>1.4</u>	<u>1.7</u>	<u>0.3</u>
Fishery Products	1.4	1.3	1.3	0.7	0.8	0.9	0.4	1.0	0.9	0.8
Forest Products	<u>1.3</u>	<u>1.2</u>	<u>1.5</u>	<u>1.3</u>	<u>1.0</u>	<u>1.1</u>	<u>1.1</u>	<u>1.1</u>	<u>1.2</u>	<u>1.1</u>
TOTAL EXPORTS	38.3	28.5	37.6	28.0	33.3	23.1	23.0	21.8	21.1	25.2
	<u>IMPORTS</u>									
Vegetable Products										
Edible oils	0.3	4.8	2.5	2.3	4.0	6.4	4.0	6.7	7.8	9.4
Cereals	14.9	6.8	3.4	8.4	8.2	16.6	11.2	15.8	16.8	13.8
Fruits & vegetables	0.8	0.6	0.5	0.3	0.6	0.9	0.4	0.8	0.7	1.2
Other ^{2/}	8.1	7.7	9.5	5.6	7.2	8.2	8.7	7.7	8.9	12.3
Subtotal	<u>24.1</u>	<u>19.9</u>	<u>15.9</u>	<u>16.6</u>	<u>20.0</u>	<u>32.1</u>	<u>24.3</u>	<u>31.0</u>	<u>34.2</u>	<u>36.7</u>
Animal Products										
Live animals ^{3/}	2.2	2.4	0.8	0.3	0.5	0.3	1.4	3.2	3.9	7.0
Meat & eggs	0.1	0.0	0.2	0.2	0.1	0.1	0.0	0.1	0.1	0.2
Dairy products	2.5	2.0	2.2	1.9	1.9	8.7	3.0	4.4	4.0	4.5
Subtotal	<u>4.8</u>	<u>4.4</u>	<u>3.2</u>	<u>2.4</u>	<u>2.5</u>	<u>9.1</u>	<u>4.4</u>	<u>7.7</u>	<u>8.0</u>	<u>11.7</u>
Fishery Products	0.3	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Forest Products	<u>2.6</u>	<u>2.4</u>	<u>3.9</u>	<u>3.0</u>	<u>4.0</u>	<u>4.1</u>	<u>2.5</u>	<u>2.6</u>	<u>4.3</u>	<u>NA</u>
TOTAL IMPORTS OF AGRI. PRODUCTS	31.8	26.8	23.1	22.0	26.5	45.4	31.3	41.4	46.6	48.5

Table A.10 Continued

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Agricultural Inputs										
Fertilizers	0.6	1.0	1.1	0.6	0.8	0.9	1.0	1.6	0.6	0.7
Insecticides	0.4	0.4	0.5	0.4	0.4	0.7	0.3	0.4	0.4	0.5
Machinery	<u>1.5</u>	<u>3.4</u>	<u>2.4</u>	<u>2.7</u>	<u>2.2</u>	<u>0.7</u>	<u>2.4</u>	<u>1.7</u>	<u>1.9</u>	<u>4.4</u>
TOTAL	2.5	4.8	4.0	3.7	3.4	2.4	3.5	3.7	2.8	5.6

^{1/} 1966 prices.

^{2/} Sugar, coffee, tea, tobacco.

^{3/} Some of the live animal imports were improved breeding animals. Most, however were for slaughter.

Sources: Rétrospective, op. cit., 1ère Partie, p. 65; Food and Agriculture Organization of the United Nations, Trade Yearbook, Vol. 26-26, Rome 1967-1972.