USAID/MOROCCO

THE AGRICULTURAL SECTOR OF MOROCCO: A DESCRIPTION

by

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ANNEX C: COUNTRY DEVELOPMENT STRATEGY STATEMENT

United States Agency for International Development

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FORWARD

This Annex to USAID/Morocco's FY 1987 Country Development Strategy Statement is a USAID document. However, it is the work of principally two individuals. Dr. Malcolm Purvis, Chief of USAID's Agriculture Division, provided direction to the organization of the report and to the interpretation of much of the data. Paul R. Crawford, USAID/Morocco Agricultural Economist, undertook the bulk of the research, drafting, and editing of the report, including the synthesis of information contained in an enormous array of documentation. USAID is certain that this Annex will be of great value to the Agency for International Development and others concerned with the development of Morocco's agriculture.

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GLOSSARY OF ACRONYMS AND DEFINITIONS

ADB	African Development Bank
CLCA	Caisse Locale de Crédit Agricole
CMA	Coopérative Marocaine Agricole
CMV	Centre de Mise en Valeur
CNCA	Caisse Nationale de Crédit Agricole
CNERV	Centre Nationale d'Etudes et de Recherche sur la Vulgarisation
COMAPRA	Compagnie Marocaine de Commercialisation des Produits Agricoles
COMAGRI	Compagnie Marocaine de Gestion des Exploitations Agricoles
CRAFA	Centre Régional d'Animation et de Formation Agricole
CRCA	Caisse Régionale de Crédit Agricole
CRSP	Collaborative Research Support Project
CT	Centre des Travaux
DA	Development Assistance (Funds)
DE	Direction de l'Elevage
DPA	Direction Provinciale de l'Agriculture
DPAE	Direction de la Planification et des Affaires Economiques
DPV	Direction de la Production Végétale
DVRA	Direction de la Vulgarization et de la Réforme Agraire
EEC	European Economic Community
EIB	European Investment Bank
ENA	Ecole Nationale d'Agriculture
ENFI	Ecole Nationale Forestière d'Ingénieurs
ESF	Economic Support Funds
FADES	Arab Fund for Social and Economic Development
FERTIMA	Fertilizants Marocains
FY	Fiscal Year
GDP	Gross Domestic Product
GOM	Government of Morocco
IAV	Institut Agronomique et Vétérinaire, Hassan II
IBRD	International Bank for Reconstruction and Development (World Bank)
IFAD	International Fund for Agricultural Development
IMF	International Monetary Fund
INRA	Institut National de la Recherche Agronomique
KfW	Kreditanstalt Für Wiederaufbau
MARA	Ministère de l'Agriculture et de la Réforme Agraire
OCE	Office de Commercialisation et d'Exportation
OCP	Office Chérifien des Phosphates
ONICL	Office National Interprofessionel de Céréales et Légumineuses
ORMVA	Office Régional de Mise en Valeur Agricole
SCAM	Société Coopérative Agricole Marocaine
SCE	Société Cherifiene d'Engrais et de Produits Chimiques
SNDE	Société Nationale de Développement de l'Elevage
SODEA	Société de Développement Agricole
SOGETA	Société de Gestion des Terres Agricoles
SONACOS	Société Nationale de Commercialisation des Semences
USAID	United States Agency for International Development
WFP	World Food Program

c.i.f.	cost, insurance, freight to point of destination included
Dh	dirham
f.o.b.	free on board - the includes delivery and other charges
FU	forage units (the nutritional equivalent of 1 kg of barley)
ha	hectare
kg	kilogram
MT	metric ton
qx	quintal (100 kilograms)

I. INTRODUCTION

The purpose of this document is to provide a comprehensive description of the agricultural sector in Morocco - its performance, problems, and potentials. It was prepared as a background document for the Mission's FY 1987 Country Development Strategy Statement. This document is intended for use by AID staff and its consultants. Officials of the Government of Morocco were not directly involved in its preparation, nor did individuals outside of USAID review and comment upon it prior to its completion.

This report presents a synthesis of information available from a number of primary and secondary sources. As such, it should be useful as an introduction to Moroccan agriculture for individuals who are unfamiliar with it, and as a reference work for individuals needing additional information on specific aspects of that sector.

To the extent possible, USAID has attempted to ensure that the information presented in this report is the "best available data". Nevertheless, it should be noted that, as is the case in many developing countries, there is a general lack of reliable information, particularly statistical information, on Morocco's agriculture sector. That information which is available is often inconsistent, dated, and incomplete. For example, the last agricultural census was in 1973/74; the last nutrition survey was in 1971; there have been no recent household budget surveys; and the only information available on rural employment comes from a 1975 report. Further, published reports rarely indicate the basis upon which the statistics that they present are developed. Given the apparent speed at which the agricultural sector in Morocco is changing, caution should be used in drawing conclusions from this data. To the extent of its ability, USAID has attempted to note weaknesses in the data base, and present the most current, complete and accurate data available. It has attempted to reconcile inconsistencies in that data and, when this has not been possible, point out inconsistencies and their implications.

In preparing this report, USAID has relied heavily on a number of documents, in particular the 1985 World Bank Appraisal Report for the Agricultural Sector Adjustment Loan and a 1985 report, prepared jointly by the Ministry of Agriculture and a team of AID-funded consultants, which examined the structure of prices and incentives within the sector. We have also relied on reports by several teams of consultants to USAID that have recently examined subsectors within the agriculture sector, e.g. fertilizer and seed distribution, fisheries, forestry, and extensive livestock production.

II. THE MOROCCAN ECONOMY: SITUATION AND OUTLOOK

Morocco, in the mid-1980s, is in an economic crisis. Growth in per capita income in the first half of the 1980s has been negative. In 1985, Morocco's foreign debt exceeded its annual GDP. To meet this crisis, Morocco, with the encouragement of the international donor community, has launched an ambitious program aimed at economic stabilization and structural adjustment. This combination of objectives presents Morocco with an extremely difficult policy challenge, and will have repercussions throughout its economy. [See USAID/Rabat, Economic Policy Analysis Support Project, Project Paper, August 1985; and USAID/Rabat, FY 1987 Country Development Strategy Statement, 1986].

1. Income and Unemployment Trends

Between 1967 and 1977, Morocco's real GDP grew at a respectable 6.5 percent per year. Since 1977, however, the economy has grown at barely 2.9 percent annually, only slightly ahead of population growth (estimated at 2.7 percent per year). According to World Bank estimates, the growth rate in per capita GNP fell from an average of 3.1 percent in 1970-75 to 1.8 percent in 1975-80 and to -0.2 percent during 1980-85 [World Bank, Agricultural Sector Adjustment Loan, Annex 1, p. 4]. In other words, during the first half of the 1980s, Morocco's real per capita income actually declined, from a peak of US-870 in 1980, to US-$760 in 1983. The World Bank has estimated that per capita GNP will increase by only 0.1 percent per annum between 1985 and 1990.

Data for 1985 put the overall unemployment rate in Morocco at 11.5 percent (for both males and females), up from 10.7 percent in 1982. Unemployment has affected entrants into the labor force and the young in particular. Some 44 percent of all first-time job seekers, and 25 percent of young adults in the labor force (age 15-24) were unemployed in 1982. In addition, some 18 percent of the employed population were underemployed (worked for less than two-thirds of the workyear). Thus, about one-third of the labor force is either unemployed or underemployed. This percentage appears to have been increasing slowly but steadily over the last decade.

Population projections prepared by the Ministry of Plan suggest that some 252,000 new job seekers will join the labor force each year over the next five years. These estimates, however, suggest that the economy will generate only 161,000 jobs a year during this period, or less than two-thirds of the net additions to the labor force.

2. Growth of Morocco's Savings-Investment Gap

Events beyond Morocco's control, including a long-lasting drought, worldwide recession, and the fall of the value of Morocco's currency vis-a-vis the dollar, account for much of the country's disappointing economic performance in the first part of this decade. The impact of these factors were exacerbated, however, by economic policies that created both a "savings-investment" gap and a "foreign exchange" gap. [1]

Until the mid-1970s, Morocco pursued a reasonably cautious economic policy. Gross investment in the late 1960s and early 1970s hovered around 15 percent of GDP. Beginning in 1974, Morocco's foreign exchange earnings quadrupled due to a sharp rise in world market demand for phosphates. In response to this windfall gain, the GOM embarked upon an ambitious investment program. The result was a rapid increase in investment as a percentage of GDP, reaching a peak of 27.6 percent in 1977. (See Table 2-1).

Unfortunately, the phosphate boom was shortlived. Toward the end of the 1970s, policy makers realized that the economy could not sustain this pace of investment. Investment as a percentage of GDP dropped, but not to pre-1975 levels. Instead, it has remained in the range of 21 to 23 percent since 1978. Even the austerity budgets since 1983, which have entailed sharp cuts in public investment expenditures, have proved unable to lower this share appreciably.

Morocco's domestic savings were inadequate to finance this investment program. Even when remittances of Moroccan workers in European countries are taken into account, total national savings are only approximately 15 percent of GDP, far short of total gross investment. The investment-savings gap was estimated to be about 6 percent of GDP or, in 1984, nearly US-$630 million (in 1984 prices and at the 1984 exchange rate).

Exacerbating the situation has been the low productivity of the investments that were undertaken. The incremental capital-output ratio (ICOR), for example, rapidly deteriorated from a "respectable" value of 3.5 in the mid-1970s to a poor 7.0 in the early 1980's. In the private sector, generous investment incentives and the subsidized price of capital have favored capital-intensive projects. In the public sector, the limited ability of government departments to carry out adequate economic and financial analyses of investment projects and a preference for large-scale projects have combined to lower the overall productivity of investments.

1/ According to preliminary data, the performance of the economy as a whole improved in 1984, with GDP growing at an estimated 4.8 percent rate in real terms, reaching 124 billion dirhams. Agriculture accounted for much of that improvement, registering a 14 percent increase in value added. Value added in the industrial sector grew by only 2 percent in 1984, the service sector by 3 percent, public administration by 6 percent, and construction and mining remained at their 1984 levels.

Table 2-1: Savings and Investment as Percent of GDP (Selected Years)

	1960	1970	1980	1983	1984	1985[1]	1990[2]
Gross National Savings	11.0	14.8	14.6	14.0	13.8	15.0	15.9
Gross Investment	10.3	18.5	22.6	20.6	23.0	20.3	14.7
Public Capital Expenditure	(3.8)	(5.7)	(12.2)	(8.4)	(6.8)	(5.4)	----
Private Investment	(6.5)	(12.8)	(10.4)	(12.2)	(12.0)	(14.9)	----
ICOR (5-yr. average up to year)	-----	3.1	4.1	-----	-----	8.3	5.7

1/ Provisional

2/ Projection

Source: IBRD Report to the Consultative Group for all years except 1985. Provisional GOM estimates for 1985.

3. Growth of Morocco's Foreign Exchange Gap

The development of the foreign exchange gap mirrors that of the savings-investment gap. Again, the country pursued a rather prudent policy until the mid-1970s. The trade deficit remained small and manageable. In 1974, a quadrupling of foreign exchange earnings from phosphates almost doubled total export earnings. An increase in imports followed, which continued even after the phosphate boom fizzled and export earnings declined. Exports grew only moderately in 1977 and 1978. Since then, export performance has been satisfactory. With the exception of 1982, export earnings (in current dirhams) have increased at annual rates of between 18 and 30 percent.

Export growth has, however, been continually outpaced by increases in imports. Since 1973 imports have been growing at double-digit annual rates, reaching an increase of one-third in 1984. The only exceptions to this trend were in 1978, the first year of a three-year stabilization plan adopted in response to the crisis, and in 1983, when the government clamped down on imports by requiring licenses for any imports and granting such licenses only after long delays. As part of the Moroccan government's agreements with the World Bank and the International Moretary Fund (IMF), imports have now been liberalized to a degree that will prevent the future control of imports by the GOM through licensing.

The performance of the economy under the liberal import regime is encouraging. In 1984, with the relaxation of the 1983 import controls, imports increased sharply (by 34.4 percent), significantly outpacing exports (which grew by 29.8 percent). However, this increase was due almost entirely to food and energy imports. Increases in the importation of consumer goods have been lower than feared. Moreover, roughly half of the increase in the cost of imports in 1984 was attributable to higher prices. (Approximately one-half of Morocco's imports are paid for in dollars, the value of the which appreciated significantly vis-a-vis the dirham in 1984. Though the average price of exports also increased, it did so by a smaller margin.)

The growth in exports for 1985 fell short of expectations (and will probably be zero in real terms), principally due to a slackening world demand for phosphoric acid. However, import growth in 1985 was contained to only 6.6 percent in dirhams. As a result of the import contraction, the the coverage of imports (c.i.f.) by exports (f.o.b.) increased to 58 percent, the highest ratio in recent years.

4. External Borrowing/Debt Service

To finance the foreign exchange gap, Morocco has relied heavily on external borrowing and, increasingly, it has had to turn to private lenders. As a result of this trend and generally worsening financial conditions worldwide, average loan terms have hardened considerably -- meaning higher interest rates and shorter maturities. At the end of 1984, total outstanding and disbursed debt amounted to US-$10.5 billion, nearly equal to the total GDP for that year. Undisbursed debt accounted for another US-$3.3 billion in 1984. In 1985, Morocco's external debt grew to 108 percent of GDP, or approximately US-$13.25 billion, and is projected to grow to US-$14 billion by 1989, before beginning to decline.

Unable to sustain its debt service, Morocco sought and received a rescheduling of its external debt. Official debt falling due in 1983-84 was rescheduled by the Paris Club in late 1983. Negotiations for the rescheduling of commercial bank debt were completed in early 1984. Morocco has also rescheduled (September 1985) official and commercial debt due in 1985 and 1986. This debt rescheduling will reduce debt servicing from $5.6 billion to about $3.6 billion in 1985 and 1986.

In 1983, Morocco negotiated an IMF Stand-By Arrangement providing SDR 300 million (US-$317 million) for an 18-month period. Another IMF Stand-By Arrangement covering the period April 1984 to February 1987, for an amount of US-$238 million, was negotiated in September 1985.

5. Economic Policy Reform

Until mid-1983, Morocco relied on stringent controls, particularly of prices, and direct intervention to manage its economy. In an attempt to stimulate economic growth, the government acquired some 47 percent of total equity in manufacturing. It also created an incentive structure that made investments in import substitution activities 50 percent more profitable than investments in export industries. Sheltered by protectionist policies Moroccan industry remained inefficient and often unable to respond to the needs of the market. When the economic environment worsened in the early 1980's, Morocco's economic structure proved unable to cope.

In responding to the crisis which emerged in 1982 and 1983, the government initially attempted direct intervention -- a virtual cutoff of all imports in early 1983. Subsequently, the GOM developed the outlines of a sweeping economic policy reform program, in consultation with the IMF and the World Bank. This reform program, covering virtually all sectors, seeks to redress existing disequilibria, eliminate distortions of market signals and incentives, reduce the role of the public sector, and improve the formulation and implementation of economic policies. The main thrust of the structural adjustment efforts is two-fold: to reduce the role of the state in favor of a more market-oriented economy and to encourage exports as the engine of economic growth. The basic components of this structural adjustment are discussed below.

Fiscal Reform

The reform of fiscal policies reflects two concerns: (1) the need to to bring the budget deficit under control, and (2) the need to to simplify the tax structure and remove any inherent distortions. The GOM has made considerable progress with respect to the budget deficit. This has been accomplished by slashing the investment budget and restraining the growth of the operating budget. In 1982, the budget deficit represented 12.3 percent of GDP. By 1984, the share of the deficit in GDP had been reduced to 6.1 percent (thereby meeting the target of the Stand-By Agreement). In the first part of 1985, the GOM exceeded its investment budget by a vast margin, triggering delays in a new Stand-By Arrangement and necessitating major mid-year budget cuts. According to preliminary information, the final 1985 budget deficit slightly exceeded the IMF program target of 6.5 percent of GDP.

On the revenue side, Morocco has not done as well, even though Morocco's current relative tax burden seems to be lower than in other countries in its income category. The deficit reduction in 1984 was accomplished primarily by slashing the investment budget, while tax revenues fell far short of projections. In late 1985, the Moroccan parliament voted to replace a complex sales tax by a value-added tax, and to simplify the income tax system. However, the designers of the new tax system expect, at best, marginal increases in revenues.

Planning and Budgeting

Fiscal reform is closely linked to the reform of planning and budgeting. In principle, the GOM has been guided by a series of multi-year plans. More often than not, these plans were revised substantially or virtually abandoned during implementation. Even so, they remain important elements of the process of formulating the GOM's investment policies. They map out the activities of the various technical Ministries in charge of specific sectors, and provide a framework for the investment portion of the annual budget, the Loi de Finances.

Past plans have suffered from both overambition and indiscriminate acceptance of any investment project proposed. Moreover, investment projects were authorized as part of the annual budget cycle without regard for the availability of financing. As a result, the GOM was carrying a huge "overhang" of authorized projects for which financing was unavailable. Efforts to cull projects from this overhang encountered many problems.

Cutting the project overhang and devoting sufficient time to the preparation of the next Plan offer the opportunity to assure adequate financial and economic analysis of all elements of that Plan and subsequent annual budgets. At the Consultative Group Meeting in January 1985, the GOM pledged to develop its capabilities in economic analysis and investment appraisal. In addition, efforts are underway to streamline the budgeting process and strengthen the links between planning and budgeting.

Public Enterprise Reform

A good portion of Morocco's industrial development was achieved by protecting new industries from the competition of imports. Thus, import substitution accounts for a major portion of the industrial growth, and public investment has fueled the growth of these industries. Overall, the public sector accounted for 47 percent of total equity in manufacturing in 1978. This percentage reaches 90 percent in energy, 53 percent in the mining sector, and 32 percent in construction. On the other hand, with the exception of phosphate products, enterprises in the export growth sectors (including agro-industry, textiles, clothing and leather goods, and electrical and mechanical industries) are predominantly privately owned.

As a group, public enterprises represent a drain on the Treasury. If the profitable phosphate operations are excluded, public enterprises have required more than 2 billion dirhams in subsidies a year (in four of the five years 1977-1981) to stay afloat.

Given this dismal performance, the GOM has adopted the rehabilitation of public enterprises as one of its economic policy reform priorities. The diagnosis is fairly clear: public enterprises have little or no incentive to pursue efficiency. Part of the problem is poor management. Managers of state-owned enterprises go virtually unrewarded for good performance, and typically do not have to answer for poor results. Further, information and control structures within the public enterprises are often so rudimentary that effective management becomes all but impossible. In addition, price controls may make it impossible to earn sufficient revenues to finance modernization investments. Another problem is that major clients of public enterprises (particularly the administration and other public enterprises) have been slow in paying their bills, running up sizeable arrears. For example, the national electricity utility in 1982 was owed some 550 million dirhams by the state and other public enterprises (net of its own debts).

A Committee has been established in the Ministry of Public Works to supervise the rehabilitation of public enterprises. It has introduced management rules aimed at cost containment and is working with the World Bank to develop ways to reduce the mutual arrears and establish better management and information systems. Furthermore, it is looking for ways to increase the role of the private sector by licensing private operators to provide public services (e.g. public transit in Casablanca), or by having private companies operate state-owned installations under contract (e.g. hotels and tourism complexes). Options to sell off public enterprises have been discussed. However, few state-owned enterprises show the kind of financial performance that would arouse the interest of private investors. Morocco also lacks the financial markets capable of handling divestiture effectively. Consequently, much of the attention has focused on taking the steps needed to create the conditions for privatization.

Trade Policy Reform

Protectionist measures favoring import substitution activities have been identified as the major structural weakness of the Moroccan economy. Structural adjustment efforts under the World Bank's Sector Adjustment Loans have therefore focused on reorienting the economy toward export markets and dismantling the system of incentives policies favoring investments in import substitution.

These efforts include a gradual reduction of protectionist tariffs and non-tariff barriers. The maximum import duty has been reduced to 60 percent and is scheduled to move to 45 percent (1986) and finally 25 percent (1988). Import licensing requirements have also been substantially lightened. Finally, restrictions on imports of most goods have been lifted. Only a few items remain prohibited. These measures have undoubtedly contributed to a faster growth of imports.

At the same time, several steps have been taken to make export-oriented activities more attractive. The GOM had made progress in cutting back on the paperwork for exporters, including that needed for the temporary importation of items scheduled for processing and re-export. The GOM is also in the process of making it easier to obtain financing for export activities, providing additional support in the form of export credit insurance, and

assuring preferential treatment of exporters in other areas. While it is too early for many of these measures to have taken hold, initial results are encouraging.

Financial Sector Reform

Excessive regulation and protection of markets for financial institutions have harmed efforts to mobilize domestic savings and impeded the efficient allocation of financial resources. For example, interest rate ceilings and floors are set annually, but the current spread allows no room for real price competition among financial intermediaries. This system has resulted in credit rationing and less than efficient use of financial resources. State-owned enterprises and large private enterprises have, as a result, been able to capture a lion's share of commercial bank lending, reducing credit availability to small and medium enterprises.

The GOM has begun to take the necessary steps to improve the performance of the financial sector. These include a partial deregulation of interest rates for depositors and borrowers and a partial removal of administrative controls on the allocation of credit. The government will no longer be able to borrow at preferential rates.

Efforts to mobilize additional resources through government bonds have been surprisingly successful. Two issues offering very attractive terms in 1984 and in 1985 were substantially oversubscribed.

Housing and agriculture will play particularly important roles in the restructuring of the financial sector. Private investments in housing remain one of the most effective forms of saving. Such investments are encouraged through subsidized interest rates for housing loans and special tax treatment. With respect to agriculture, the GOM has been seeking ways to improve the performance of financial intermediaries serving small- and medium-size farms.

6. Prospects of Economic Adjustment and Growth

Morocco's per capita income is projected to remain nearly constant for the remainder of this decade. This will undoubtedly create social tensions. However, the employment picture may be the key to political stability. The growth of labor-intensive exporting industries will have to be sufficiently rapid to make up for the loss of jobs in inefficient industries which cannot meet external competition as tariff barriers fall. The net result in terms of employment cannot be assessed on the basis of existing data. Whatever the outcome, it is clear that Morocco will continue to require significant donor support and annual or bi-annual debt rescheduling for at least another five years as the austerity programs and restructuring take effect.

III. THE ROLE OF THE AGRICULTURAL SECTOR IN THE MOROCCAN ECONOMY

1. Social Importance of the Agriculture Sector

Agriculture is critical to Morocco. Nearly 2 million households are dependent on agriculture. Of these, approximately 51 percent relies on rainfed crop production (often associated with livestock husbandry); 18 percent depends solely on livestock production; and 26 percent depends on irrigated agriculture (the remaining 5 percent depends on forestry and other miscellaneous activities). Between 75 and 80 percent of the income of this rural population comes from agriculture [World Bank, Sector Loan, p. 10-11]. According to the 1973-74 agricultural census there are some 1.5 million farms in Morocco. [Recensement Agricole 1973-1974, p. 5].

About 40 percent of the total labor force is employed in agriculture. This is a decrease from 1970, when agriculture employed over 55 percent of the population. Total employment in agricultural should increase at a relatively slow rate, 1.1 to 1.7 percent per year (compared to 4.6 - 5.9 percent per annum for industry and 3.6 - 4.9 percent per annum for the service sector). For agriculture, this amounts to an estimated increase of around 27-28,000 jobs per year, roughly 15 percent of total job creation. [World Bank, 1980 Basic Economic Report, p. 147]. The movement of labor out of agriculture will continue, as the economic structure changes over time. Nevertheless, agriculture will remain the largest employer of labor in Morocco into the 21st century. (See Section III-5 for a discussion of the importance of agriculture in rural employment).

Rural to urban migration is a major problem facing Morocco. The rural population (11.7 million persons) constitutes roughly 57 percent of Morocco's total population. Nearly half of the country's population will still live in rural areas in the year 2000. Due to emigration from the countryside to Moroccan towns and cities, the rural population is growing at only 1.4 percent per year, compared to an urban growth rate of 4.4 percent. This is in spite of the fact that the fertility rate in rural areas is substantially higher than in urban areas (7.02 as opposed to 4.46).

2. Economic Importance of the Agriculture Sector

The relative importance of agriculture in the Moroccan economy has declined during the past 20 years. In 1983, agriculture accounted for slightly less than 11 percent of the GDP, down from 20 percent in 1972. (See Table 3-1). At the same time, the share of industry in total output rose from 28.5 to almost 32 percent from 1971 to 1982 while the share of the service sector (including public administration) increased from 48.5 to 51 percent. The value added per agricultural worker (i.e. its contribution to total GDP divided by the number of workers in the sector) is only one fourth that of workers in the mining and manufacturing sector and only one sixth that of workers in the service sector.

Though Morocco's GDP (in 1969 dirhams) has been increasing at 4 to 5 percent per year, the growth of the agriculture sector has been both slow and erratic. During the 1960s, Moroccan agriculture grew at more than 4 percent per annum. In the late 1970s and early 1980s, however, the sector's

Table 3-1: Contribution of Agriculture as a Percentage of GDP (in millions of 1969 Dirhams).

Year	Total GDP	Agriculture GDP		
		Total Value	Net Change (Percent)	Percent of Total GDP [1]
1969	17,990	3,545	--	20
1970	18,894	3,740	+ 6	20
1971	19,991	4,087	+ 9	20
1972	20,408	3,999	- 2	20
1973	21,187	3,673	- 8	17
1974	22,416	4,041	+10	18
1975	23,920	3,450	-15	14
1976	26,986	3,854	+12	14
1977	28,934	3,508	- 9	12
1978	29,580	4,138	+18	14
1979	30,998	4,067	- 2	13
1980	32,127	4,317	+ 6	13
1981	31,712	3,328	-23	10
1982	33,876	3,991	+20	12
1983	34,637	3,808	- 5	11
1984	35,461	3,883	+ 2	11
Average Annual Growth				
1960 to 1969	4.5 %	4.1%		
1970 to 1975	4.9 %	-1.4%		
1975 to 1984	4.1 %	1.3%		

1/ When measured in current dirhams, agriculture represented 16.6 percent of GDP in 1984.

Source: MARA/AIRD, La Politique des Prix, p. 4.

growth rate averaged only 1.3 percent. (See Table 3-1). As a result, the agricultural sector has been a drag on overall economic growth.

Agricultural exports earned just over 3.7 billion dirhams in 1983, roughly 25 percent of total exports. However, the growth of Moroccan agricultural exports (in volume) has been stagnant or declining over the past 15 years. Similarly, domestic food production has not kept pace with the increased demand, necessitating steady increases in food imports to cover the gap. Morocco became a net importer of food in 1974, and is now heavily dependent on imports to meet consumption needs for basic foodstuffs, including wheat, vegetable oils, and milk products. In 1983, food imports cost nearly 3.8 billion Dh, nearly 15 percent of total imports. As a result of these adverse trends, the agricultural trade balance has gone from a surplus in 1974 to one of major deficits (nearly U.S.-$428 million in 1984), thus exacerbating Morocco's foreign exchange gap.

3. Domestic Food Consumption

In Morocco, rapid population growth, a high rate of urbanization, and stable real food prices has resulted in a steady increase in aggregate demand. Total grain consumption more than doubled between 1960 and 1982 with bread wheat consumption increasing by over 350 percent during that period. Population increase alone is currently adding 135,000 tons to the total domestic demand for cereals each year. Increasing incomes will result in a further increase in the demand for food, particularly for those products for which the income elasticity of demand is high (e.g. meat, milk, eggs, sugar, and vegetable oil). As indicated in Table 3-2, the demand for cereals is expected to increase by 2.5 percent per year, beans by 4.5 percent, vegetables by 3.5 percent, red meat by 1.6 percent, dairy products by 2.4 percent, and poultry and eggs by 5.6 and 5.1 percent, respectively. Increases in aggregate demand are expected to exceed increases in domestic production in all categories except sugar and eggs.

Table 3-3 presents the best available data on changes in per capita food consumption between 1970 and 1980 by rural and urban inhabitants. These statistics indicate that overall consumption of cereals remained steady during the 1970s. However, per capita consumption of wheat increased by 12.5 percent while that of barley decreased by 20 percent. The figures also indicate that barley is consumed primarily by rural inhabitants. Other foods for which per capita consumption declined between 1970 and 1980 include red meat (12.7 percent), fresh vegetables (19.5 percent), citrus (21.4 percent), and fats (27.3 percent). On the other hand, per capita consumption of beans increased by 57.7 percent, dairy products by 26.9 percent, and chicken by 127.3 percent). In most categories, per capita consumption by urban inhabitants improved, relative to that of rural inhabitants. The exceptions were red meat, fresh fruit, and sugar. In the case of red meat, for example, urban consumption declined by 30 percent while rural consumption increased slightly.

Table 3-2: Demand and Production Projections for Food Products in Morocco (1980-2000)

	Demand ('000 MT)			Production ('000 MT)			Self-sufficiency Ratio (%)	
	1980	2000	%	1980	2000	%	1980	2000
Cereals	6027.6	9893.7	2.5	4400.3	5009.5	0.7	73.0	50.6
- Wheat	3148.5	5634.4	3.0	1912.8	2235.3	0.8	60.8	39.7
- Rice	30.4	69.5	3.5	24.1	20.5	-0.8	79.2	33.9
- Corn	536.5	1454.4	5.1	343.0	388.2	0.6	63.9	26.7
- Barley	2304.3	2731.9	0.9	2097.7	2349.0	0.6	91.0	86.0
- Other Cereals	7.9	12.5	2.3	22.8	16.5	-1.6	288.5	132.3
Beans	159.3	387.2	4.5	370.7	400.7	0.4	232.8	103.5
Vegetables	1132.9	2249.9	3.5	3074.4	3183.2	0.2	271.4	141.5
Sugar	614.2	1102.5	3.0	376.8	973.4	4.9	61.3	88.3
Citrus	247.9	300.9	1.0	980.6	1057.8	0.4	397.0	351.5
Other Fruits	910.6	1810.9	3.5	554.3	765.2	1.6	60.9	42.3
Vegetable Oils	156.9	281.6	3.0	43.2	63.7	2.0	27.5	22.6
Meat	273.5	645.0	3.5	299.0	401.9	5.3	114.2	104.7
- Beef	117.6	174.0	1.6	124.5	176.2	1.4	105.8	101.3
- Lamb	58.3	87.0	1.6	63.0	81.2	1.0	108.1	93.3
- Chicken	97.6	384.0	5.6	111.4	401.9	5.3	114.2	104.7
Dairy Products	1404.3	2571.7	2.4	937.2	1365.7	1.5	66.7	53.1
Eggs	23.3	81.3	5.1	27.1	99.7	5.3	116.3	122.7

Source: Naanani, Mokhtar, "Les Besoins en Produits Alimentaires de Base de la Population Marocaine a Long Terme", Séminaire sur les Besoins de la Population à Long Terme, Rabat, October 23-25, 1985, p. 11. Figures are estimates by the Group d'Etude de la Strategy Alimentaire. The production estimates are based on historical trends and do not take into account changes in cropping patterns that may occur as a result of policy changes currently being implemented by the government.

Table 3-3: Per Capita Consumption of Principal Foods in Morocco
(kilograms/person/year)

Products	1970 Rural	1970 Urban	1970 National	1980 Rural	1980 Urban	1980 National	Total 1980 as a % of Total 1970
Cereals	268.9	135.8	222.3	262.9	162.2	221.2	99.7
- Wheat	105.7	105.1	105.5	113.2	126.5	118.7	112.5
- Barley	108.8	5.6	72.7	95.2	5.1	58.1	80.0
Beans	5.9	4.8	5.2	7.0	9.8	8.2	157.7
Dairy Products	33.2	25.5	30.5	33.5	46.2	38.7	126.9
Fats	12.1	15.1	13.2	8.2	11.6	9.6	72.7
Meat	15.0	22.9	17.9	17.1	21.4	18.9	105.6
- Red Meat	13.4	19.6	15.7	14.0	13.7	13.9	88.5
- Chicken	1.6	3.3	2.2	3.1	7.7	5.0	227.3
Fish	1.8	6.7	3.5	1.6	6.8	3.8	108.6
Fresh Vegetables	68.2	106.9	81.7	61.8	71.6	65.8	80.5
Fresh Fruit	46.9	45.3	46.4	54.9	41.8	49.5	106.7
- Citrus	5.4	17.9	9.8	3.3	13.9	7.7	78.6
Sugar	32.3	26.0	30.1	38.1	23.2	31.9	105.9

Source: Naanani, Mokhtar, "Les Besoins en Produits Alimentaires de Base de la Population Marocaine a Long Terme", Séminaire sur les Besoins de la Population à Long Terme, Rabat, October 23-25, 1985, p. 2.

Compared to other developing countries, Moroccans are relatively well nourished. This conclusion is not well documented, however, since the last nutrition survey was carried out 15 years ago, in 1971. [1] That last nutrition survey indicated that, on average, the calorie and protein intake of Moroccans was good, though low in animal protein and fats. For example, cereals and sugar predominate in the Moroccan diet, especially in rural areas. The average Moroccan consumes 2.6 times more cereal than the average European, but only one-fifth the meat. [Naanani, Les Besoins en Produits Alimentaires, p. 3]. Percapita consumption of milk in Morocco is 26 percent less than the average for other countries in North Africa. Further, Moroccans consume an average of 31 eggs per capita per year, as opposed to 80 per capita in Tunisia, 150-250 in Europe, and 300 per capita in the U.S.

Moreover, nutrient intake varies considerably by income group and geographic area. For example, calorie intake averages 110 percent of requirements for affluent groups in urban areas, 75 percent for those living in shanty towns, and 81 percent for those living in rural areas in the south. At the time of the 1970/71 nutrition survey, 46 percent of the population consumed fewer than the 2,300 calories per day recommended by the World Health Organization. Only 67 percent of the population met the minimal daily requirement of 1800 calories. [Etude de la Strategie Alimentaire. p. 3].

Inadequate consumption of proteins and calories is a serious problem among low-income groups. Farm workers and the unemployed, for example, average less than 66 percent of requirements. Seasonal food shortages result in serious protein-calorie malnutrition and vitamin deficiencies in mountainous and semi-desert areas. At the time of the 1971 Nutrition Survey, 45 percent of children under four years of age in rural Morocco suffered from moderate protein-calorie malnutrition and 5.6 percent (3 to 13 percent depending upon the province) suffered from severe malnutrition. In urban areas, these figures were 33 percent for moderate protein-calorie malnutrition and 2 to 4 percent severe malnutrition. [Etude de la Strategie Alimentaire. p. 3]. The nutritional situation markedly improved in the mid-seventies with increases in incomes and per capita food production. According to the World Bank, however, there is reason to believe that the situation has deteriorated somewhat since 1980. [World Bank, Staff Appraisal Report, Kingdom of Morocco, Health Development Project, p. 4-5.].

Consumer subsidies to maintain food prices below domestic production costs (and below import prices in the case of wheat) amounted to Dh 1.5 billion (US-$190 million) in 1984 (compared to only Dh 850 million in 1982/83). Most of these subsidies pertain to flour and edible oils. Consumer subsidies on sugar, butter, and milk have already been eliminated. The intense competition among major food exporters, has enabled Morocco to import

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1/ The GOM is currently examining food consumption needs and alternative long-term supply scenarios. This information will be supplemented by the results of a major household consumption and expenditure study (14,000 households) currently underway with U.N. assistance. The results of the study will be available in late 1986, and will form the basis for further analysis and policy reformulation. In addition, a more directed child health/nutrition study is planned, based upon the results of the household survey.

wheat at CIF prices that are 20 to 30 percent below world market prices. This, complemented by an overvalued currency, has enabled to government to keep some urban food prices down. For example, consumer prices for wheat products are 50 percent below international prices. These low flour price, combined with the increased imports and the ineffectiveness of the producer price support system, has discouraged domestic cereals production. [World Bank, Agriculture Sector Support Loan, p 20].

4. Rural Poverty

Morocco's GNP per capita, measured in dollars, is currently $760, according to the most recent World Bank estimates. The absolute poverty level (that income level at which a minimal nutritionally adequate diet, plus essential non-food requirements, is not affordable) is estimated to be $389 for urban areas and $238 for rural areas. Using these criteria, the World Bank has estimated that 28 percent of the urban population and 45 percent of the rural population are "absolutely poor", that is, have incomes below the absolute poverty levels. Assuming a current population of 21 million, with 57 percent rural, this would imply that nearly 8 million Moroccans fall below the absolute poverty level (almost 5.4 million of these from rural areas). The size of this poor population group exceeds the total population of many subsaharan African countries. [World Bank, Morocco's Agricultural Sector Loan, Annex 1].

Data drawn from the 1971 national household survey (the most recent survey available) illustrates the strongly skewed distribution of income (as measured by expenditures) in Morocco. In urban areas, the poorer two thirds of the households account for less than one third of total household expenditures. The distribution of expenditures in rural areas appears to be only slightly more evenly distributed than that of urban areas. Households headed by farmers and farm workers (35.4 and 11.3 percent of households, respectively) have expenditures only half as great as households linked to other sectors (e.g. industry, commerce, and civil service,), even when home consumption of farm output is taken into account. Similarly, rural areas in general sustain an average expenditure level only half that of the urban areas. The largest concentrations of Morocco's rural poor are found in the highland and more arid regions of the country. [Eighmy, p. 2, 9, and 13-18] The poorest 44 percent of Moroccans spend over 82 percent of their income on food (the average for the average Moroccan family is 57.2 percent). [Etude de la Strategie Alimentaire. p. 117].

A comparison of the household budget surveys for 1961 and 1971 indicates that the real per capita income of lower income Moroccan farm families declined during the period. The poorest 40 percent of rural households accounted for 21 percent of total rural consumption in 1959/60, but only 14 percent in 1970/71. The standard of living of these households declined by about 10 percent in real terms during this period. For the wealthiest 40 percent of households, the standard of living increased by about 40 percent during this same period. Within the agricultural sector, there is evidence that income in the irrigation command areas and in the higher rainfall areas has been increasing, relative to that of lower rainfall areas. Further, there is evidence that the incomes of the farm population receiving agricultural credit from the CNCA has increased relative to the rest of the agricultural population. [World Bank, Morocco's Agricultural Sector (1980), p. 17].

5. Employment in Rural Areas

Since independence, Morocco's investment policy has been oriented primarily to the development of the modern sector of the economy, particularly in urban areas. This has led to low levels of employment-generation in rural areas. Table 3-4 presents the distribution of rural employment by activity and by region (based on data from the 1971 census, the most recent available). According to this table, the distribution of the employment among activities varies only slightly among the different provinces. Agricultureal activities (including fisheries and forestry) represented 75 percent of rural employment in 1971. Agro-industry represented one-half of one percent. Mining and industry accounted for 8 percent, while administration, transportation and services accounted for 9.5 percent of total rural employment.

Table 3-5 presents information on the absolute size and growth of the rural workforce by employment category. According to these data, agriculture employed over 2 million people (65 percent of the rural workforce) in 1977. Industry employed another 335,000 people (10.7 percent of the rural workforce) and administration and services for 391,000 jobs (12.6 percent). The relative importance of agriculture in rural employment was projected to decrease to 57.8 percent by 1982, while industry and administration/services were projected to increase slightly in relative importance during this period.

According to the projections in Table 3-5, the rural workforce will increase by 73 percent between 1982 and the year 2000 (a growth rate of 4.3 percent per year, slightly higher than the 1971-82 growth rate). The share of agriculture in rural employment is projected to decline, however (to 36.7 percent) while those of industry and administration/services are expected to increase (to 23.2 and 23.7 percent, respectively). Industrial employment in the rural areas, which grew at 6.7 percent per year during the 1960s and 10.5 percent during the 1970s, is projected to grow at 14.4 percent per year between 1982 and the year 2000. Similarly, rural employment in administration and services, which grew at 1.9 percent during the 1960s and 11.4 percent during the 1970s, is projected to grow by 13.1 percent per year between 1982 and the year 2000.

Table 3-6 presents a breakdown of employment growth within agriculture, itself. Overall, the annual growth of employment in the agricultural sector (including fisheries and forestry) has been very low (0.75 percent per year between 1960 and 1971, and 0.51 percent between 1971 and 1977). According to these figures, agricultural employment grew at 1.15 percent per year between 1977 and 1982 and 0.55 will grow by percent between 1982 and the year 2000.

The figures presented in Table 3-6 also indicate that the absolute number of crop producers, which remained fairly constant between between 1960 to 1977, will remain stable through the year 2000. (The increased mechanization of crop production is probably a major factor contributing to the low level of employment generation in crop production). Employment in livestock production, on the other hand, is expected to increase by almost 50 percent between 1982 and the year 2000. (See Section VIII-1 for additional information on agricultural labor).

Table 3-4: Distribution of Rural Employment by Activity and Region, 1971 (percent)

	Geographic Region [1]					Weighted
	South	Center	East	West	North	Average [2]
Crops	61.68	63.39	52.08	63.02	54.36	60.00
Livestock	16.30	14.12	15.63	11.00	12.20	14.00
Fisheries	0.44	0.03	0.01	0.23	0.73	0.30
Forestry	0.50	0.74	0.69	0.77	1.11	0.70
Activities related to Agriculture [3]	0.58	0.87	0.86	1.36	1.83	1.00
Agro-Industry	0.49	0.65	0.33	0.66	0.49	0.50
Energy & Mining	0.77	0.84	2.07	0.45	0.69	1.00
Other Industry	3.07	2.36	7.16	3.03	6.16	4.00
Textile/Leather/Wood	2.69	3.04	3.39	3.17	2.40	3.00
Transportation	0.75	0.57	0.65	1.09	0.89	1.00
Commerce	3.63	2.40	2.79	3.56	3.19	3.00
Administration	2.03	2.65	4.79	2.15	4.84	3.00
Other Services	2.42	2.40	2.06	2.66	2.96	2.50
Undefined	3.15	3.17	4.09	3.61	4.98	3.50
Unemployed	1.50	2.77	3.40	3.24	3.17	3.00
Total	100.00	100.00	100.00	100.00	100.00	100.50

1/ Distribution of Provinces within the geographic areas: South: Agadir, Azilal, K.Esraghna, Essaouira, Marrakech, Safi, Tarfaya, and Tiznit; West: Settat, Casa, Rabat, El Jadida, Kenitra; East: Errachidia, Figuig, Oujda, Taza, Ouarzazate; North: El Hoceima, Chaouen, Nador, Tanger, Tetouan.

2/ Weighted to take into account different sizes of the labor pool in the various provinces.

2/ Includes commercial and service activities dealing directly with agriculture.

Source: Data from the 1971 Census.

Table 3-5: Distribution and Growth of the Rural Working Force ('000 persons)

Employment Category	1960 No.	1960 %	1971 No.	1971 %	1977 No.	1977 %	1982 [1] No.	1982 [1] %	2000 [1] No.	2000 [1] %
Agriculture	1793	78.8	1928	74.8	2027	64.8	2167	57.8	2381	36.7
Industry	117	5.1	203	7.9	335	10.7	437	11.0	1508	23.2
Admin. and Services	176	7.7	212	9.4	391	12.6	477	12.7	1536	23.7
Undefined	64	2.8	71	2.7	124	3.9	182	4.9	242	3.7
Unemployed	126	5.6	133	5.2	250	8.0	487	13.0	822	12.7
Total	2276	100.0	2577	100.0	3130	100.0	3750	100.0	6489	100.0

1/ Projected Levels.

Source: MARA, Emplois dans le Milieu Rural, 1977, p. 179

Table 3-6: Distribution and Growth of the Agricultural Workforce [1] ('000 persons)

	1960 No.	1960 %	1971 No.	1971 %	1977 No.	1977 %	1982 [2] No.	1982 [2] %	2000 [2] No.	2000 [2] %
Crop	1565	87.3	1550	80.4	1589	78.4	1664	76.8	1648	69.0
Livestock	192	10.7	326	16.9	386	19.0	451	20.8	676	29.0
Fish/Forest	36	2.0	52	2.7	52	2.6	52	2.4	57	2.0
Total Ag.	1793	100.0	1928	100.0	2027	100.0	2167	100.0	2381	100.0

1/ Note that the growth rates and annual job creation in agriculture implicit in these figures are substantially lower than those estimated by the World Bank (See section III-1). It is also unclear to what extent these estimates take into account underemployment.

2/ Projected Levels.

Source: MARA, Emploi dans le Milieu Rural, 1977, Table 5.

IV. THE STRUCTURE OF MOROCCAN AGRICULTURE

1. Morocco's Land Resources

Only 8.3 million hectares (12 percent) of Morocco's 69 million hectares of land (excluding the Sahara) have adequate soils and sufficient rainfall for crop production. (See Table 4-1). Another 41.6 percent of Morocco's land (28.7 million ha.) consists of semi-arid and forest regions, suitable only for grazing. Between 40 and 50 percent of the cultivable land receives an erratic rainfall averaging less than 400 mm. Roughly 75 percent of the agricultural population is fully dependent upon rainfed agriculture. Even farms with access to irrigated land are often partially dependent upon rainfed farming.

The degradation of Morocco's land resources, while not well documented and statistically evaluated, is undoubtedly one of the most serious problems threatening the future productive potential of Moroccan agriculture. Cereal production is expanding onto lands that are marginal, if not totally unsuitable, for cultivation. Sustainable forage production is no longer meeting the nutritional needs of Morocco's livestock population, resulting in severe overgrazing. As a result, palatable perennial vegetation is giving way to annuals and unpalatable perennials. The remaining vegetative cover has been grazed to the ground, and bare soil is exposed and eventually washed away to expose bare rock. An estimated 29,000 hectares are deforested per year (i.e. over and above GOM reforestation efforts) due to excessive animal and human pressure on forests. Sustainable wood production in Morocco is estimated to cover only 30 percent of annual fuelwood consumption. The remaining 70 percent of annual demand is met by the "mining" of the resource base. The massive soil erosion which is resulting from this heavy pressure on the land is permanently reducing the amount of topsoil available and, by siltation, decreasing the capacity of Morocco's reservoirs, upon which its vital irrigated sector depends. Ultimately, the continued degradation of Morocco's land resources will seriously reduce the productive potential of the entire agricultural sector.

2. Rainfall Distribution

Morocco has an essentially arid or semi-arid climate, with moderate winters and dry summers. Most of the precipitation occurs between October and April, with very little falling between June and September. In the absence of irrigation, the crop year is limited to the winter-spring period, when rainfall is adequate and evaporation rates are low. The rainfall that occurs varies significantly from season to season. In one out of every 10 years, the amount of precipitation received falls to only 60-79 percent of normal. In 3 out of every 10 years, it falls to 80-99 percent of the average. In addition, the distribution of rains during the agricultural cycle varies such that aggregate production levels fluctuate significantly - at least 35-40 percent around the long term average.

Table 4-1: Summary of Land Use (1982/83 Crop Year)

	Total Area ('000 ha)	Percent of Total Area All Grains	Percent of Total Area in Morocco [1]
Total Cropped Area	8339		12
Total Cereals	4703	100.0	
Durum Wheat	1286	27.3	
Bread Wheat	690	14.7	
Barley	2151	45.7	
Maize	435	9.2	
Other Grains	141	3.0	
Fallow	2137		
Other Crops [2]	1499		
Forest	5,194		8
Rangeland	20,900		30
Alfa grass areas	2,581		4
Non-Agricultural [3]	31,986		46
Total (Excl. Sahara)	69,000		100

1/ Excluding the Sahara.

2/ Includes vegetable crops (143,000 ha), legumes (411,000 ha) oil crops (43,000 ha) industrial crops (107,00 ha), forage crops (99,000 ha), fruit trees (516,000 ha) and others (180,000 ha).

3/ Primarily desert, unvegetated mountains and urban areas.

Source: Ministry of Agriculture: Enquetes Agricoles, Principales Productions Vegetales: Campaign 1982/83 (1983), and U.S. Embassy/Morocco, Agricultural Attache's Report (MO-8502).

The arable rainfed land in Morocco can be classified into four zones based on average annual rainfall:

(1) In areas with less than 200 mm of rainfall only very small amounts of grain can be grown without irrigation. Such land has very limited potential for crop production, even under very good management.

(2) Areas with 200-300 mm of rainfall may be considered arid. In this zone, barley is the most commonly cultivated cereal where soils and microclimates permit, and sheep and goats are grazed on scrub range.

(3) Areas within the 300-400 mm Rainfall Zone are classified as semi-arid. Barley cultivation predominates, except in areas receiving 350-400 mm of rainfall, where durum wheat is grown.

(4) The Northern Atlantic Plains region (an area north of a line drawn from Casablanca to Oujda, bordered on the east and north by the Atlas and Rif Mountains) receives over 400 mm of rainfall per year. This zone includes the most favorable rainfed agricultural land in the country. [USAID/Morocco, FY 1984 CDSS, Agriculture Sector Strategy, Annex 1, p. 5-6].

3. Irrigation

It is estimated that Morocco receives between 105 and 225 km^3 of precipitation per year. In an average year (i.e. one with 150 km^3 of precipitation), around 6.6 percent of this precipitation will contribute directly towards cereals production and 4.0 percent to the cultivation of other crops. Another 34.7 percent of the precipitation will fall on rangeland and 14.7 percent on forests. Currently, more than half of the runoff is captured in 23 major reservoirs and used to supply domestic water needs, irrigation requirements, and hydroelectric power needs. When precipitation is adequate, the hydroelectric power generated at these reservoirs supplies approximately one-third of the electricity needs of Morocco. The construction of dams has steadily increased the amount of water available for development in Morocco. Since 1955 the capacity of the dams has increased from 1.9 to 10.0 km^3/year. [R. Ambroggi, "Eau et Developpement", Academie du Royaume du Maroc, March 1985, p. 13-14.]

Irrigation accounts for 88 percent of the water use in Morocco, compared to 8 percent for domestic use and 4 percent for industry. Irrigated agriculture, which accounts for only 10 percent of Morocco's arable land, contributes about 45 percent of the agricultural value-added and produces 65 percent of the agricultural exports.

Average yields in irrigated areas have increased steadily as a result of increased use of improved varieties, fertilizers, and other inputs. This increase in yields, together with the increase in irrigated land, has resulted in substantial increases in the production of major irrigated crops. The output from irrigated areas grew at about 7.9 percent per year between 1960 and 1983. The most significant production increases have been in dairy and meat products (27 percent), vegetables (17.5 percent), cereals (17.4 percent), citrus (17 percent), and sugar (6.2 percent).

In Morocco, approximately 1.3 million hectares are potentially irrigable, including 880,000 ha in the large-scale irrigation systems and 410,000 ha in small- and medium-scale irrigation areas. Table 4-2 presents data on current and potential irrigation capacity. Only an estimated 760,000 ha of land (60 percent of the potential) is currently under irrigation. About half of the remaining potential is economically irrigable at the present time. These data indicate that the potential for expanding small-scale irrigation capacity is limited, especially in low rainfall zones. An estimated 20 percent of the irrigation potential already developed is not used due to a lack of complementary infrastructure. In addition, improved maintenance and rehabilitation would significantly increase output from existing capacity. According to World Bank estimates, full utilization of existing capacity over the next decade, together with an expansion of the amount of land irrigated (to the economic potential) and improvements in irrigation system maintenance and rehabilitation, could effectively double the amount of land irrigated. [World Bank, Agricultural Sector Loan, Technical Support Volume p. 1]

Nine regional irrigation authorities (ORMVAs) are responsible for managing the large irrigation schemes (about 400,000 ha) as well as the smaller-scale schemes within their jurisdiction (about 150,000 ha or 40 percent of small-scale irrigation capacity). The remaining 210,000 ha of small-scale irrigation are under the jurisdiction of DPAs. The nine large-scale irrigation perimeters include: Loukkos in the high rainfall zone; Moulouya and Gharb in the medium rainfall zone; and Doukkala, Tadla, Haouz, Souss, Tafilalet, and Ouarzazate in the low rainfall zone. Table 4-3 presents information on the growth and size of the ORMVAs. Figure 4-1 presents a map of the northern provinces of Morocco, showing the location of the ORMVAs. Counting small-scale irrigation systems, about two-thirds of existing irrigation schemes is located in low rainfall areas. Irrigation in low rainfall areas is necessary to grow summer and spring crops and highly profitable for growing winter crops, such as cereals and legumes. Table 4-4 gives a distribution of the crops cultivated under irrigation.

The GOM has invested heavily in developing its irrigation system. (See Section V-1). Large scale irrigation system development accounted for over half of annual GOM investment in agriculture prior to 1980. When dam construction is included, the figure rises to 60-75 percent of total public sector agricultural investment. The marginal productivity of these investments has been declining over the last decade, however, due to the excessive protection of irrigated agriculture. (See Section V-2). In recent years, GOM policy objectives have shifted away from dam and main system development and towards investment in areas already commanded by existing dams and in smaller scale irrigation systems. This is because of the lower development cost per hectare involved and the more rapid return on investment. In addition, the GOM is attempting to obtain a more efficient use of water by rehabilitating existing schemes and improving system operation and maintenance. Given the GOM's financial constraints and this shift in objectives, recent investments in irrigation have been almost exclusively devoted to completing projects which have external financing and which are well underway. Implementation of new irrigation development has substantially decreased. [World Bank, Agricultural Sector Loan, Technical Support Volume p. 5]

Table 4-2: Irrigated Area by Rainfall Zone [1]

Irrigation Category	Rainfall Zones: High '000 ha	High %	Medium '000 ha	Medium %	Low '000 ha	Low %	Total '000 ha	Total %
Potential								
Large Scale Irrig.	35	(4)	315	(36)	530	(60)	880	(100)
Small Scale Irrig.	40	(10)	115	(28)	255	(62)	410	(100)
Subtotal	75	(6)	430	(33)	785	(61)	1290	(100)
Existing								
Large Scale Irrig.	20	(5)	140	(35)	240	(60)	400	(100)
Small Scale Irrig.	35	(10)	80	(22)	245	(68)	360	(100)
Subtotal	55	(7)	220	(29)	485	(64)	760	(100)

1/ High = over 600 mm, medium = 400 to 600 mm, and low = less than 400 mm of rainfall.

Source: World Bank, Agriculture Sector Adjustment Loan, Technical Support Annexes, p. 1.

Table 4-3: Development of the Major Irrigation Systems in Morocco (hectares)

ORMVA	1957	1967	1972	1977	1980	1984	Goal
Lower Moulouya	2,350	20,190	37,576	50,718	58,273	65,400	65,400
Gharb	11,200	24,210	37,410	65,410	75,110	83,250	230,200
Doukkala	6,900	12,200	22,800	31,800	43,300	56,400	101,000
Haouz	-	11,000	18,730	38,018	38,018	38,018	189,500
Tadla	33,000	66,400	87,700	104,100	109,400	109,400	109,400
Tafilalet	-	-	18,067	22,497	36,223	36,223	37,000
Ouarzazate	-	-	6,200	11,400	14,950	26,000	26,000
Souss Massa	-	-	-	19,500	25,670	25,670	38,500
Loukkos	-	-	-	1,500	15,565	16,700	28,500
Total	53,450	134,000	223,483	344,943	416,609	457,061	825,300

Source: MARA/AIRD, La Politique de Prix, p. 47.

Figure 4-1: Location of the Major Irrigation Command Zones (Offices des Mise en Val[illegible] Agricole)

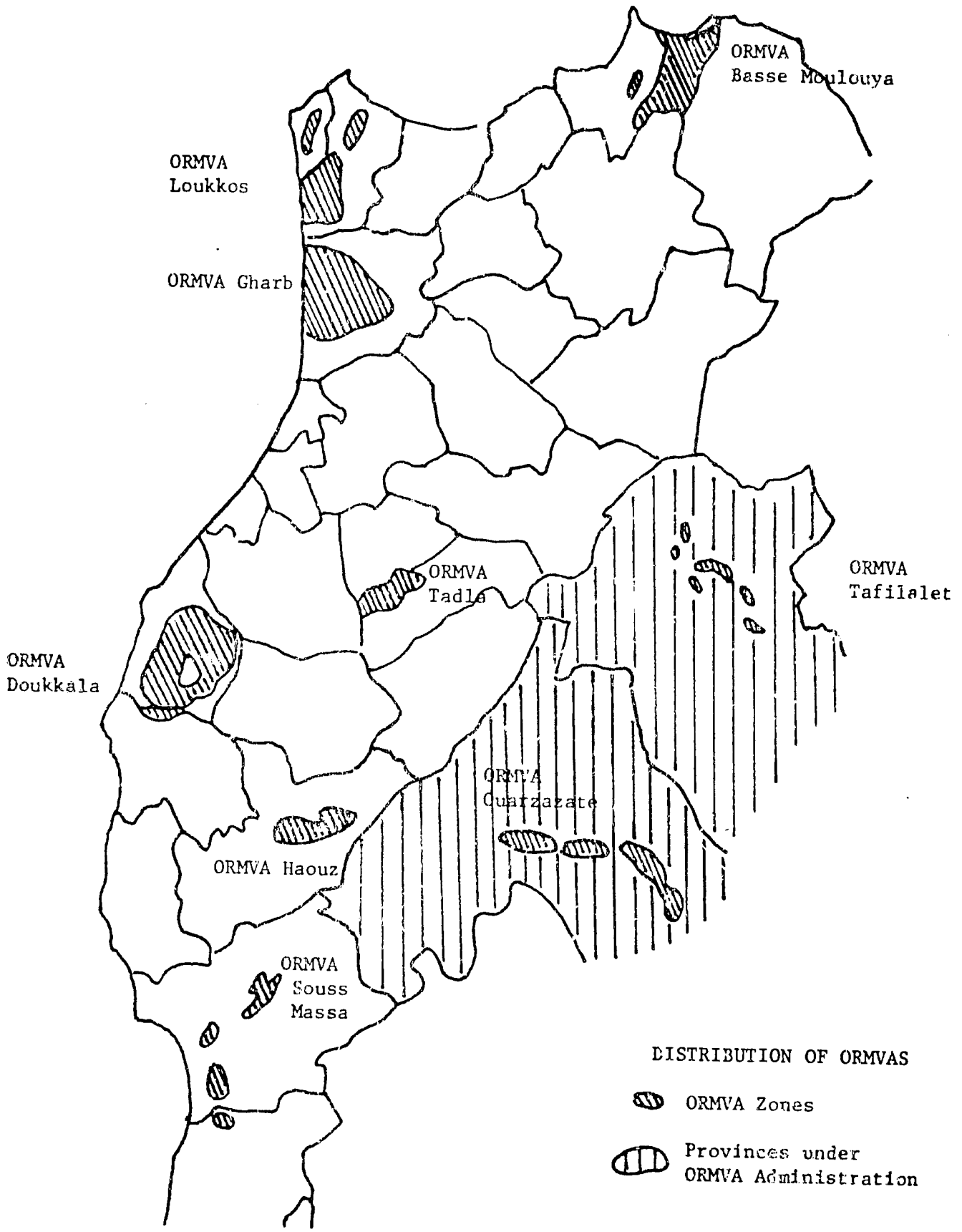


Table 4-4: Present Cropping Pattern in Irrigated Areas

Crops	Area [1] ('000 ha)	Percent of Total Irrigated Land
Cereals:		
- Winter (Wheat)	138.5	
- Summer (Maize)	9.8	
	148.3	38
Industrial Crops:		
- Sugar Beet	43.8	
- Sugar Cane	14.7	
- Cotton	9.1	
	67.9	18
Vegetables	34.5	9
Forages:		
- Alfalfa	16.2	4
- Other	37.9	10
Fruit trees:		
- Citrus	30.0	
- Others	30.4	
	60.4	16
Other Crops	24.8	5
Total	389.3	100

Source: World Bank, Agricultural Sector Loan, Technical Support Volume, p. 9.

Irrigated agriculture in Morocco has benefitted disproportionately from price supports and subsidies. It is estimated that 80 percent of GOM producer subsidies have benefitted farmers in irrigated areas. In addition, most of the services provided to farmers in irrigated areas (e.g. input delivery, custom mechanisation, and artificial insemination and veterinary services) are provided free or at below cost. While 60-70 percent of public investments in agriculture have gone to the irrigated sector over the past two decades, efforts to recover that investment have been meager. Until recently, water charges did not cover the operation and maintenance costs of the irrigation infrastructure. The collection rate with respect to water charges is still low (43 percent in 1984). As a result of these factors, it is estimated that farmers in irrigated areas are receiving subsidies totalling about 2 billion Dh per year, or about 30 percent of the GDP generated by the irrigated sector. [World Bank, Agricultural Sector Loan, Technical Support Volume p. 7-8, 242.]

As is discussed below (see Section V-3, Effective Protection of Moroccan Agriculture), these policies have led to an imbalance within Moroccan agriculture, both in terms of resource allocation and in terms of equity. Recognizing this, the GOM is attempting to reduce, as part of its agriculture sector adjustment program, the excessive protection of irrigated agriculture. This will be done by gradually bringing factor costs closer in line with their true economic value. This will include: (1) eliminating fertilizer subsidies by the start of the 1988/89 crop year; (2) fully recovering water charges; (3) charging the real cost of the various commercial services provided by ORMVAs; and (4) phasing out price controls on animal feed (e.g. sugarpulp and bran). These actions should lead to significant shifts in cropping patterns within the irrigated sector and halt the decline in the marginal productivity of irrigation investments that has been occurring. [World Bank, Agriculture Sector Loan, Technical Support Volume, p. 242. For a discussion of water rights, irrigation policies, and cost recovery in Morocco, also see Carruthers, et. al., "Irrigation Pricing and Management: Annex 3.]

4. Land Tenure and Distribution

Table 4-5 indicates that private ownership is the dominant form of landholding in Morocco, accounting for almost 75 percent of cropland. Many farmers do not have clear title to the land that they use, however. The vast majority of rangeland, on the other hand, is held collectively (dominial land, for example, only accounts for 1 percent of rangeland). Although specific tribes and subtribes have specific rights to particular pastures, these rights often overlap and conflict. The use of this land suffers from all of the familiar problems associated with common property ownership. In particular, the absence of any mechanism to control stock numbers on collective pastures has led to their serious degradation. The GOM has attempted to address this problem through the creation of publicly-managed range management perimeters, but with limited success. In addition, the area and quality of the land under collective ownership has been decreasing in recent years, as rural inhabitants scramble to gain private ownership of the higher potential lands by sowing them to cereals.

Table 4-5: Land Tenancy (1973-74)

Type of Tenancy [1]	Total Area ('000 ha)	Percentage of Total
Private Ownership (melk)	5,384	74.4
Owner Operated	4,760	65.8
Rented or Sharecropped	624	8.7
Collective [2]	1,009	13.9
Guiche	315	4.4
Habous	76	1.1
State Land	446	6.2
Other	4	-
Total	7,234	100.0

1/ "Guiche" lands are hereditary lands permanently conceded by the state to a individuals within a tribe (although the state has the power to tranfer control of the land to other individuals within the same tribe). "Habous" lands belong to religious foundations and are generally leased out as a means of generating income to support the religious group.

2/ Refers to cropped land only. In addition, most of the rangeland in Morocco is collectively owned.

Source: The 1973-74 Agricultural Census, Statistical Table No. 8.

Table 4-6 provides a distribution of cropland by farm size. According to this data, approximately 23 percent of rural households do not have arable land. Average farm size is 4.9 hectares. At least double this amount of land is generally considered the threshold for viability in rainfed agriculture. Some 73.8 percent of rural households with less than 5 ha of arable land (counting only those households that possess arable land) control only 24.5 percent of the total arable land available. The largest 11.3 percent of farms control 54.7 percent of the land.

A number of reasons suggest that the land distribution breakdown presented in Table 4-6 needs cautious interpretation. The data probably over-estimates the number of small farms (0-5 hectares) and underestimates the number of mid-size farms (10-30 hectares). First, one must make a distinction between land ownership and land use. Inheritence patterns result in the distribution of small parcels to numerous heirs as legal owners. However, studies to date indicate that the minimal area generally farmed by any one active dryland farmer is over seven hectares. A very substantial number of supposed farmers appear to be actually working outside agriculture and sharecropping, renting, or assigning its use to another family member. For example, preliminary results from socio-economic research being carried out in the Safi region under the Dryland Agriculture Applied Research Project indicate that a large proportion of dryland farmers augment the size of their production unit by sharecropping land in addition to cropping that which they own. (Apparently, few farmers sharecrop all of the land that they cultivate). While the amount of land owned might average 5 hectares in that area, the average size of the production unit appears closer to 9 hectares. Second, the land distribution in Table 6 is based on old tax records which, in turn, are based upon self-declared taxable landholdings and assets. Since, until 1984, tax liability began at an "assessed value" of 1521 Dirhams, extended rural families may avoid tax liability by disbursing official ownership among their members.

Farms of less than 5 hectares appear to be totally subsistence-oriented and produce little in the way of a financial surplus. A survey undertaken by the Ministry of Agriculture and Agrarian Reform (MARA) estimated the financial surplus generated by different farm categories, and thus the amount available for investment, in 1974. The results are shown in Table 4-7.

Farms in Morocco have an average of 6 parcels each, and an average size per parcel of 0.64 ha. The reasons for this fragmentation of landholdings appear to include: adherence to Islamic laws regarding inheritance; large family sizes; and the desire of many people to maintain a rural foothold for the sake of economic survival, family unity, psychological orientation or productive investment, regardless of the actual worth of the land in question. In addition, a number of widely scattered plots enables a farmer to spread the risk of crop loss over various microclimatic zones.

The extent to which land fragmentation is a problem is uncertain. A comparison of census and agricultural survey statistics appears to indicate that, while the number of farms has increased by only 19 percent between 1960-61 and 1973-74, the amount of land cultivated more than doubled, from 3.4 million hectares to 7.23 million. (See Table 4-8). Since then, the number of farms has decreased by 5.3 percent, while the land cultivated has continued to increase (to 7.95 million hectares in 1981). Moreover, the greatest growth has been in the number of farms between 5 and 20 hectares. The number of

Table 4-6: Distribution of Farm Sizes [1]

Size Category	Number of Rural House-Holds ('000)	Percent of Rural House-Holds	Percent of Total Rural Households with Arable Land (ha)	Total Arable Land ('000 ha)	Percent of Total Arable Land	Average Farm Size
Without [2] Arable Land	450.3	23.4	-	-	-	-
0-5	1,089.5	56.5	73.8	1,776.2	24.5	1.6
5-10	219.9	11.4	14.9	1,500.0	20.8	6.9
10-20	114.1	5.9	7.7	1,529.7	21.1	13.3
20-50	44.0	2.3	3.0	1,218.0	16.8	27.7
50-100	7.7	0.4	0.5	514.8	7.1	66.4
Over 100	2.6	0.1	0.1	703.3	9.7	278.0
Total/Average	1,928.1	100.0	100.0	7,250.0	100.0	4.9 [3]

1/ Excludes collectively owned land.

2/ Total rural households without arable land may include households that are not directly engaged in agriculture.

3/ Based on 1,477,800 rural households with arable land.

Source: World Bank, Agricultural Sector Adjustment Loan, p. 5. (data taken from the 1973-74 Agricultural Census).

Table 4-7: Financial Surplus Generated by Various Sized Rural Households [1]

Size Category	Number of Households ('000)	Disposable Income per Family (Dh)	Minimum Consumption (Dh)	Financial Surplus per Family (Dh)	Total Financial Surplus (Dh million)
Without Arable Land	345.6	782	782	-	-
0 to 5	834.5	1,251	1,251	-	-
5 to 10	168.4	3,873	3,246	627	105.6
10 to 20	87.1	6,970	4,870	2,100	182.9
20 to 50	34.0	12,580	6,490	6,090	207.1
50 to 100	5.9	28,525	12,985	15,540	91.7
over 100	1.5	115,735	19,475	96,260	144.4
Total/Avg	1,477.0	2,260			731.7

1/ These statistics should be considered as indicative. Note that the number of farms in each category does not agree with the that presented in Table 4-6.

Source: "Evaluation de la capacité de financement du développement par l'agriculteur", Ministry of Agriculture and Agrarian Reform, 1977. Cited in the World Bank, Staff Appraisal Report, Kingdom of Morocco, Fifth Agricultural Credit Project, November 22, 1983, p. 7.

Table 4-8: Changes in Land Distribution Over Time [1]

	1961-63 [2]		1973/74 [3]		Percent Change	
	Number of Households ('000)	Arable Land ('000 ha)	Number of Households ('000)	Arable Land ('000 ha)	Households ('000)	Land ('000 ha)
Non-cultivator	543,284	-	450,240	-	-17.1	-
< 1 ha	446,412	236,120	439,710	195,248	-1.5	-17.3
1-4 ha	439,113	942,056	557,660	1,178,718	+27.0	+25.1
4-10 ha	165,464	1,087,691	311,510	1,887,395	+88.3	+73.5
10-20 ha	40,916	586,888	114,050	3,246,899	+178.7	+453.2
>20 ha	14,860	537,756	2,520	723,140	-83.0	+34.5
Total/Avg [4]	1,650,049	3,390,511	1,967,250	7,231,400	+19.0	113.3

	1974-75 [5]		1981/82 [6]		Percent Change	
	Number of Households ('000)	Arable Land ('000 ha)	Number of Households ('000)	Arable Land ('000 ha)	Households ('000)	Land ('000 ha)
0-5 ha	1,089,500	1,776,200	963,500	1,861,000	-11.6	+4.8
5-20 ha	334,000	3,037,700	374,600	3,528,000	+12.2	+16.1
> 20 ha	54,300	2,436,100	61,300	2,562,900	-12.9	+5.2
Total/Avg	1,477,800	7,250,000	1,399,400	7,951,900	-5.3	+9.7

1/ Given probable differences in data collection methods, the conclusions drawn from these comparisons should be considered tentative. Note, for example, the differences in the total number of farmers (excluding non-cultivators) and arable land for the two 1973/74 sources.

2/ 1961-63 Census, cited in Pascon, Les Paysans sans Terre au Maroc, p. 129.

3/ Recensement Agricole 1973-74 cited in Pascon, Les Paysans sans Terre au Maroc, p. 129.

4/ Excluding non-cultivators, the total number of farms is 1,106,765 in 1961-63 and 1,517,010 in 1973/74, a growth of 37.3 percent.

5/ Data for 1973/74 taken from Table 4-6.

6/ Data taken from a MARA survey and cited in Pascon, Les Paysans sans Terre au Maroc, p. 138.

farms of less than 5 hectares and over 20 hectares has been declining during the 1970s. A survey of farmers in the Haute Chaouia area conducted over the 1977-1985 period did not find evidence of extensive land sales or ownership transfers, even given the drought conditions that prevailed during the period. [Zagdouni and Benatya, La Cerealiculture en Haute Chaouia, p. 3].

The GOM has made little headway in decreasing the level of land fragmentation, e.g. by limiting the partition of land below a minimum size, consolidating land, creating privately owned holdings on collective land, and the formalizing tenant contracts. However, legislation is now being considered that should simplify the process of land registration. To date, this reconsolidation process has been limited to major irrigation areas and rural development projects supported by the World Bank. As a result, farms in the major irrigation districts average 5.6 ha in size, with an average of 1.3 parcels (as opposed to the national average, which includes irrigation districts, of 4.9 ha in 6 parcels). The distribution of farm sizes, however, varies significantly from one irrigated zone to the next. (See Table 4-9).

In 1966 the GOM began organizing small farmers into Agrarian Reform Cooperatives on state, collective, and expropriated lands. This program continued until 1982. A total of 354,599 hectares was included in the Agrarian Reform Program during this period (almost exclusively from state lands). The number of cooperatives reached 739 in 1982, and included almost 25,000 farmers (with an overall average of 14.3 hectares per Agrarian Reform beneficiary). In rainfed areas the land was divided into farms of between 16 and 22 ha each. In irrigated zones the land was divided into farms of approximately 5.8 ha each. These farm sizes were considered adequate to provide their operators with annual incomes of 4000 Dh per family. By 1982 the average income of farmers in Agrarian Reform Cooperatives reached Dh 12,360 (U.S $2,010 at the 1982 exchange rate). In part, the increase was due to the greater use of cash inputs and the diversification of production by these farmers.

Under Moslem law, land can be inherited by women. Such land is usually farmed and managed by the male relatives (e.g. uncles and brothers) until a woman marries, and then by her husband. Women, however, apparently can decide whether or not land they own should be sold. Widows who inherit land will either have their sons farm and manage it, or let it out for sharecropping, lease it, or sell it. For example, although credit through the Caisse Nationale de Crédit Agricole (CNCA) is available to producers regardless of gender, very few of the CNCA's clients are women. Presumably, this is because male relatives usually apply for the credit on a woman's behalf. When young women marry, they generally move into their husbands households, and come under the authority of their mothers-in-law. The mother-in-law will allocate tasks to the daughters-in-law within the house and, together with the head of the household, on the farm. Divorce rates in Morocco are high, a factor exacerbated by the increasing migration of males to urban areas. Divorced women under Muslim law have no residual rights to property at inheritance. This probably provides an incentive to have large families, so children, who can inherit, will support a subsequently divorced mother in her old age. Male migration means that large numbers of rural households are run by women for much of the year. However, even when the husband has migrated semi-permanently, retaining his rights to the land, many women remain dominated by the male members of their family and are unlikely to make independent farm management decisions.

Table 4-9: Distribution of Land in the Major Irrigation Areas (ORMVAs)

Perimeter	Farm Size (in percentage of total)		
	0-5 ha	5-20 ha	Over 20 ha
Draa	96	4	-
Haouz	85	13	2
Tadla	80	17	3
Souss	78	19	3
Gharb	75	20	5
Moulouya	63	27	10
Loukkos	40	60	-
National Average	74.0	22.5	3.5

Source: MARA/AIRD, La Politique de Prix, p. 48.

V. INVESTMENT, SUBSIDIES, AND THE EFFECTIVE PROTECTION OF MOROCCAN AGRICULTURE

The GOM's investment and subsidy programs in agriculture over the past 15 years have been heavily directed towards the development of the irrigated sector, at the expense of rainfed agriculture, even though the latter accounts for the bulk of domestic food production and supports the majority of the rural population. These policies have led to an imbalance within Moroccan agriculture, both in terms of resource allocation and equity. As a result, output from rainfed agriculture has stagnated, while the marginal productivity of investments in irrigation and the marginal productivity of input use in the irrigated sector has been declining. Under its major agriculture sector adjustment program, the GOM is attempting to correct this imbalance by reducing subsidies and redirecting resources towards the rainfed sector.

1. Trends in Public Sector Investment in Agriculture

Public investment in agriculture, as a percentage of total public investment, has been declining since the period 1968-72. Investment in agriculture (excluding multi-purpose dam construction) reached almost 27 percent of total public investment during that period. Between 1981 and 1985, however, it is estimated to have fallen to less than 17 percent of the total. See Table 5-1.

Much of this public investment in agriculture has gone to the development of irrigation and to the development of irrigated cash crops, such as vegetables and citrus for export. Prior to 1980, the construction of dams and irrigation system represented between 60 and 75 percent of total GOM investment in agriculture. Even when the costs attributed to multi-purpose dam construction are excluded, the development of large scale irrigation systems still accounted for over half of the GOM's agricultural investment during this period.

In the late 1960s, the GOM's dam construction program began to run ahead of the government's ability to provide the complementary infrastructure and necessary services. The backlog of land waiting to be irrigated from already existing dams increased. On the eve of the 1981-85 Plan, this backlog was estimated to be around 100,000 hectares, or one fifth of the land within the command zones of the 13 completed agricultural dams. To address this problem, the 1981-85 Five Year Plan placed greater emphasis on small- and medium-scale irrigation. A third of the investment in irrigation under that Plan was to be directed towards small- and medium-scale works. Drought conditions have limited the extent to which this redirection has taken place, however.

A second major objective of the 1981-85 Five Year Plan was the development of the rainfed sector. Around 40 percent of investment in agriculture under the 1981-85 Plan was earmarked towards rainfed agriculture. (See Table 5-2). That goal was later reinforced by the "Plan Cerealier", which was developed by MARA with FAO assistance. The Plan Cerealier envisioned a wide range of actions aimed at increasing cereal production. These included land reform, the provision of credit, inputs, and extension services, and the construction of rural roads, warehouses, and distribution facilities.

Table 5-1: Distribution of Public Resources by Sector 1981-85.

Category	Actual				Planned
	1965-67	1968-72	1973-77	1978-80	1981-85
Agriculture [1]	27.4	42.9	24.3	26.7	21.7
Non-irrig. Invest.	(8.3)	(13.6)	(8.9)	(7.0)	(10.4)
Dams	(4.4)	(16.1)	(6.5)	(9.3)	(4.8)
Irrigation	(14.7)	(13.2)	(8.9)	(10.4)	(6.5)
Other Productive Sectors	28.2	18.6	15.7	11.8	16.2
Infrastructure	21.8	21.5	19.6	19.6	17.7
Educ & Training)			11.6	17.6	17.9
Housing and Soc. Serv.)			8.1	5.9	9.2
Regional Devel)	22.5	17.0	9.9	11.5	8.3
Gen Admin & Others)			10.8	6.8	8.9
Total	99.9	100.0	100.0	99.9	99.9
Total Expenditures [2]	2,132	5,478	17,923	15,960	61,440

1/ Percentage of Agriculture going to dams and irrigation: 1965-67: 70%; 1968-72: 23%; 1973-77: 63%; 1978-80: 74%; 1981-85: 52%.

Total Agriculture (excluding dams) as a percentage of investment: 1965-67: 23%; 1968-72: 26.8%; 1973-77: 17.8%; 1978-80: 74%; 1981-85: 16.9%

2/ In millions of current dirhams; actual releases in 1965-80, open credits in 1981-85.

Source: World Bank, Morocco: Priorities for Public Sector Investment (1981-85), p. 24.

Table 5-2: Irrigation's Share in Public Investment (percentages)

Subsector	1973/77 Actual Inv. Expenditures	1978/80 Actual Inv. Expenditures	1981/85 Planned Inv. Expenditures	1981/84 Actual Inv. Expenditures
Irrigation	69.8	75.2	60.0	63.0
Large Scale Irrig.	(63.2)	(67.8)	(50.4)	(53.0)
Small Scale Irrig.	(6.6)	(7.5)	(9.6)	(10.0)
Rainfed	30.2	24.8	40.1	37.0
Total Agriculture	100.0	100.0	100.0	100.0

Source: World Bank, Agriculture Sector Adjustment Loan, Technical Support Volume, p. 3.

Redirecting GOM investment resources to rainfed agriculture has been more difficult than expected for several reasons. First, irrigation projects have a momentum of their own. Once large upstream investments have been made, as much of the downstream network as possible must be completed, in order to increase the return on sunk capital. Second, the project implementation capability of the Provincial Agricultural Directorates (DPAs), who have administrative responsibility for rainfed agriculture, has been inadequate. Third, additional technology needs to be developed that is appropriate to Moroccan dryland agriculture, before the large number of farmers in the dryland sector can be effectively assisted.

A final factor limiting the Ministry of Agriculture's options for reallocating resources to rainfed agriculture has been the severe financial difficulties faced by the GOM. These have necessitated large cuts in development and operating budgets throughout the government. For example, the global amount actually allocated for agricultural investment in the 1982 budget was 30 percent below the level indicated in the 1981-85 Plan. Major cuts were seen in livestock activities (40 percent), integrated rural development projects (30 percent), extension and agrarian reform activities (40 percent), training (60 percent), and research (70 percent). The program for the irrigated perimeters, however, was only reduced by 13 percent, relative to that projected in the Five Year Plan. Even given these problems there has been some shift in investment. Rainfed agriculture now accounts for 37 percent of investment, up from less than 25 percent during the 1978/80 period. (See Table 5-2). In addition, the yearly construction rate of new irrigation schemes has slowed to only half that during the 1970s.

At best, it can be said that the 1981-85 Five Year Plan provided an outside envelope of feasible projects and investment levels. [1] Anything not in the plan was effectively excluded from any further consideration once austerity started to be enforced. This appears to have been the case with the Plan Cerealier, which came into being in 1982, after the Five Year Plan had been approved by Parliament. As a result, no separate budget line was created for it and no quantified inputs, outputs or timeframes were established for it. Plan Cerealier "activities" were, until recently, limited to on-going programs in research, extension, rural infrastructure development, land consolidation, and so forth. In 1985 the GOM developed, under the "umbrella" of the Plan Cerealier, an integrated rural development project in the Settat Province. The African Development Bank (ADB) is partially funding this project. While questions have been raised (by USAID) as to the adequacy of its design and analysis, the Settat Project is the first project which brings together, in a unified manner, all of the components of the Plan Cerealier. Other projects are being proposed to donors, including a rural development project in the Abda area, which is being developed with the International Fund for Agricultural Development.

1/ The current 1981-85 Five Year Plan expires on December 31, 1985. The GOM has not yet developed a follow-on multi-year Plan. Instead, 1986 is being treated as a transitional year during which a new multiyear plan will be developed. With respect to agriculture, there will be no major departures from the old Plan during this transitional year.

2. Public Sector Subsidies to Agriculture

In order to stimulate agricultural production, the GOM has created a system of support prices for selected crops, as well as subsidized inputs, services, and investment credits. As with public investment in the sector, the bulk of these subsidies have benefitted irrigated agriculture.

Output price supports entailed a subsidy to farmers of around Dh 900 million (US-$95 million) in 1984. (See table 5-3). Around 80 percent of this subsidy benefitted sugar producers and the remainder benefitted primarily soft wheat and milk producers. Roughly 90 percent of output price subsidies benefitted farmers in irrigated areas. [World Bank, Agriculture Sector Loan, Technical Support Volume, pp. 235-6.].

The use of critical agricultural inputs is also subsidized. These include fertilizer, improved seed, irrigation water, agricultural machinery and animal feeds. The price of fertilizer to the Moroccan farmer incorporates a 45 percent subsidy, while improved seed prices have a 20-60 percent subsidy element. In terms of animal feed, the prices charged to the farmer by the government for sugarbeet pulp and wheat bran are 30 and 40 percent below market prices, respectively. Though water charges are now high enough to cover most irrigation system operation and maintenance costs, they only cover 30 percent of investment costs. Moreover, collection rates are low (averaging only 43 percent in 1984). As a whole, input subsidies amounted to Dh 1,150 million (US-$118 million) in 1984. Table 5-4 presents rough estimates of the distribution of these subsidies by input. Farmers in irrigated areas have received around 70 percent of the benefit of these input subsidies, partly because of cropping patterns and partly because of their greater levels of input use. For example, sugarbeet producers receive an average annual fertilizer subsidy of Dh 570 per hectare, while rainfed cereal producers receive, on the average, annual subsidies of fertilizer of only Dh 50-70 per hectare. In addition, since larger farmers tend to use greater quantities of inputs per hectare, they have tended to benefit more than smaller farmers. [World Bank, Agriculture Sector Loan, Technical Support Volume, pp. 255].

Farmers also receive a number of services, especially from the irrigation offices (ORMVAs), at little or no charge. These include veterinary and breeding services and custom mechanization. The subsidy on these services was around Dh 180 million (US-$19 million) in 1984. Another Dh 200 million (US-$21 million) in subsidies are available for on-farm investments. In recent years, however, the actual release of these investment subsidies has been limited, due to budgetary constraints.

Thus, Morocco spends an average of Dh 2 billion (US-$210 million) per year on producer subsidies (and another Dh 1.5 billion is spent on consumer food subsidies). In recent years, these producer subsidies have represented between 8 and 12 percent of agricultural GDP. These subsidies do not appear to have stimulated agricultural production, however. Rather, production increases in rainfed areas have been negligible, while the marginal productivity of land, labor and fertilizer in irrigated areas appears to be declining.

Table 5-3: Agricultural Subsidy Levels in 1984 by Category

	Amount (dh)
Producer Price Subsidies	900
Subsidies on Agricultural Inputs	1,150
Subsidized Services	180
Total	2,230

Source: Percentages given in World Bank Agriculture Sector Loan, Technical Support Volume, pp. 235-6. Does not include investment subsidies, not all of which were released.

Table 5-4: Distribution of Input Subsidies

	Subsidy Level as a Percentage of the Total Input Subsidy
Fertilizer	30
Irrigation water (including development costs)	37
Animal feed (wheat bran and sugarbeet pulp)	18
Agricultural machinery	5
Improved seed	6

Source: Percentages given in World Bank Agriculture Sector Loan, Technical Support Volume, pp. 235-6. Note that they do not add up to 100 percent.

3. Effective Protection of Moroccan Agriculture

These GOM investment and subsidy policies have had a significant impact on the incentives in the agricultural sector. In order to measure their significance, a recent USAID-supported study [MARA/AIRD, La Politique de Prix et d'Incitations dans le Secteur Agricole, January 1986] examined prices and incentives in the agriculture sector and estimated coefficients of nominal and effective protection for the major agricultural crops of Morocco. [1]

This study concluded that the terms of trade of the agriculture sector have not been deteriorating relative to other sectors in the economy. For example, the output weighted average effective protection to the agriculture sector was estimated at 1.20, as compared to nearly 1.30 for industry. This average conceals a major disparity within the sector, however. While average effective protection in the agriculture sector has been 1.20, average protection to irrigated agriculture (particularly to industrial crops) has been about 1.50. The rainfed sector, on the other hand, has received no protection (EPC = 1.00), while net effective protection of cereals has been negative (e.g. 0.80 - 0.90 during 1984/85). Thus, rainfed crops faced a 50 percent protection differential, relative to irrigated crops. Table 5-5 presents effective protection coefficients for various crops. [Tuluy, Internal Memorandum on the Effective Protection of Moroccan Agriculture, pp. 1, 11-12].

There are several reasons for this disparity. First, consumer food subsidies on cereals and edible oils have primarily affected rainfed agriculture. In 1984, for example, farmers in the rainfed sector lost an estimated Dh 830 million in producer surplus, mostly due to the subsidization of these foodstuffs. Second, the GOM's price support/procurement system has been unable to protect rainfed farmers. Though official producer prices for cereals have been close to world market levels at the official exchange rates, the actual prices received by most farmers have been 30 to 40 percent below the official prices. Larger, more modern farmers in irrigated and high rainfall areas have benefitted most from the official prices. Producer price support programs for irrigated crops such as sugar have been more effective. Finally, irrigated agriculture has received the bulk of the input subsidies provided by the government, an estimated Dh 1,600 million (US-$180 million) per year in recent years. [World Bank, Agriculture Sector Adjustment Loan, p. 20-21].

Thus, modern, intensive, and irrigated crop production has benefitted from significant effective protection, while the rainfed sector has been penalized. This has led to distortions in resource allocation within the agricultural sector and worsened income distributions.

1/ The Nominal Protection Coefficient (NPC) is the output price of a good on the internal market, divided by its equivalent price on the external (international) market. An NPC greater than 1.00 indicates that internal market prices are greater than external market prices for the good and it is benefiting from protection as a result of interventions (subsidies or taxes) by the state affecting the internal market price for that product. The Effective Protection Coefficient (EPC) is similar to the NPC, except that it also takes into account the effect of public sector interventions on the prices of inputs that go into a given product. When the EPC is greater than 1.00, the product is benefitting from protection by price interventions (subsidies or taxes) by the State which affect the internal market prices for the good and the inputs that go into making it.

Table 5-5: Effective Protection Coefficients for Various Crops

Crop	Technological Level			
	Traditional	Semi-Modern	Modern	Irrigated
Durum Wheat	.89	.89	.91	1.06
Bread Wheat	.86	.91	.87	0.91
Barley	.81	.80	.81	
Maize	1.10	1.07	1.07	
Broad Beans	.60	.59	.60	
Lentils	.88	.88	.90	
Chickpeas	.85	.85	.87	
Sugarbeet			1.59	1.70
Sugarcane				1.78
Clementines			.83	
Oranges			.84	
Tomato (greenhouse)			.80	
Tomato (open field)			.81	
Potato				.78
Cotton				.82

Source: Tuluy, Internal Memorandum on the Effective Protection of Moroccan Agriculture.

VI. CLIMATIC VARIABILITY AND THE EFFECTS OF THE 1981-85 DROUGHT [1]

Water resources and agriculture in Morocco are closely linked. Most of Morocco's agriculture takes place in a semi-arid climatic zone. Hence, water availability is a key constraint to crop production. Precipitation levels in Morocco have fluctuated widely over the decades. However, overall precipitation has been decreasing since 1974, with a rapid decrease beginning in 1980, resulting in serious drought conditions in the 1981-85 period. During the three agricultural years ending in 1981, 1982 and 1983, the cumulative precipitation deficiency was 33 percent below normal, equivalent to the loss of normal precipitation for an entire year.

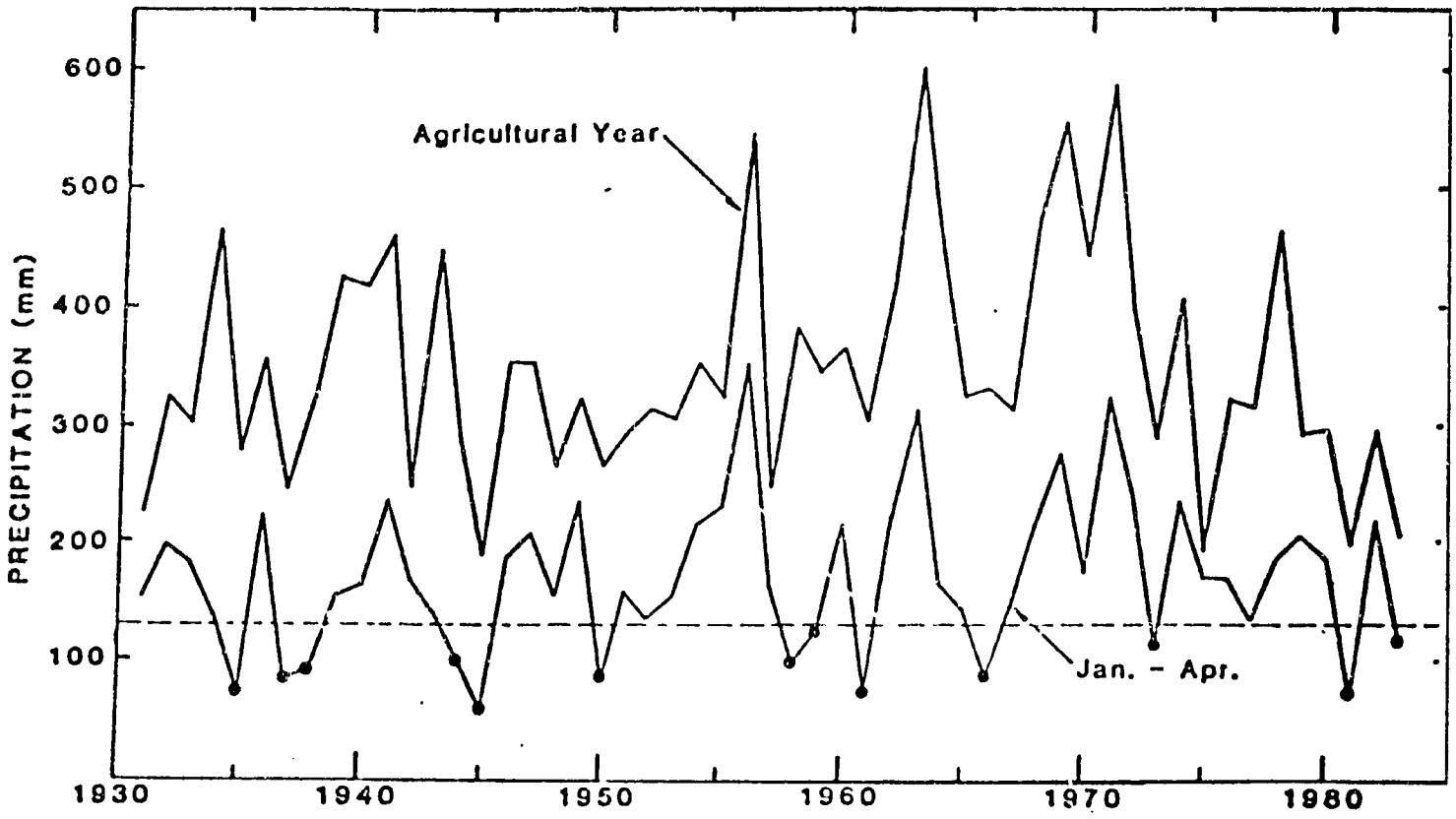
Drought is a frequent occurrence in Morocco. Historical data show that periods of drought (and, conversely, periods of higher than average rainfall) have occurred for centuries. For example, there is evidence of wetter than present conditions during parts of the eleventh, twelfth and fifteenth centuries. Preliminary dendrochronological (tree ring) analysis carried out in 1985 also indicates that drought has occured frequently in Morocco over the last 900 years. A number of multi-year droughts have been documented in this century, e.g. 1905-08, 1935-38, 1944-45, and 1958-61. Therefore, although the present 1980-1985 drought has certainly been severe, it is not inconsistent with the historical patterns of rainfall in Morocco. [Nicholson and Wigley, Drought in Morocco: The General Climatology of Drought, p. 14-15].

For agriculture, the distribution of rainfall is as important as overall precipitation levels. Figure 6-1 shows average precipitation for the region between Marrakech and Casablanca (a major rainland cereal production area) for the last 50 years. The upper curve gives data for the whole agricultural year. The lower curve gives data for the months of January to April, inclusive. This is the most critical period for vegetative growth. The data indicate that, based on a January-April rainfall threshold of 130 mm (just sufficient to classify 1982/83 as a drought year), 13 of the past 53 years have been drought years. [Wigley and Nicholson, Drought in Morocco: Statistical Analysis of Precipitation Data, p. 14-15]

An example of how critical rainfall in the months of January-April is to cereals production in Morocco is afforded by the 1983/84 crop year. Though the rains in that year began late, widespread and abundant rainfall in November and December briefly held out the promise of an improvement in the weather pattern over that of previous years. As a result, the acreage planted to cereals was only slightly less than normal. However, in January and February, a critical period for plant growth and development, rainfall was only 37 percent of normal. Good rains in late-March, April, and May came after much of the land sowed to barley and wheat, especially in the dryer, southern regions, had already been harvested or abandoned.

1/ At this writing (February 1986), the drought which started in 1981 shows some signs of ameliorating. The 1984/85 crop year was adequate in terms of overall production and the rains, so far, have been reasonably satisfactory.

Figure 6-1: "Average" Precipitation for Marrakech to Casablanca Region: Annual and Between January and April, 1930-85



1/ Average precipitation as measured in Marrakech, El Jadida, Safi, and Casablanca stations.

Source: T.M.L. Wigley and S.E. Nicholson, "Drought in Morocco", Part III: Statistical Analysis of Precipitation Data" Report to the Conseil Superieur de l'Eau, Maroc, May, 1984

As the drought continued, reservoir levels dropped. In March 1984, for example, reservoir levels were only 22 percent of normal (51 percent in the north of the country, 19 percent in the east, 11 percent in the central region, and 14 percent of normal in the south). Hydro-electric power generation plummetted as a result. Prior to 1980, Morocco's hydroelectric production met 30 percent of the country's energy needs. By 1984, hydro-electric production was meeting only 6 percent of the Morocco's needs. As a consequence, Morocco was forced to increase its imports of fossil fuels, thereby exacerbating its balance of payments deficit.

The fall in reservoir levels also led to the rationing of water among domestic, industrial and agricultural uses. The availability of potable water declined in both quantity and quality, resulting in rationing in inland and coastal cities. In November, 1983, for example, Marrakech had only half of the amount of drinking water normally available and large sections of Casablanca had water for only 2 hours per day. [US Dept. of the Interior, "Weather Modification Assessment, Kingdom of Morocco, p. 5].

Agricultural production fell as a result of the drought, leading to decreased agricultural exports and increased food imports, further exacerbating the foreign exchange deficit. Even output from irrigated areas fell, since less water was available for irrigation. The average operating capacity of Morocco's 15 major irrigation systems was only 24 percent of normal in May 1984. The lack of available surface water forced farmers with wells to increase their pumping rates and the depth. Farmers without wells invested in both well construction and pumps. In some areas, water tables fell by 10 to 30 meters. [US Dept. of the Interior, "Weather Modification Assessment, Kingdom of Morocco, p. 5].

Cereal production over the period 1981-84 averaged 3.475 million tons. Given a long term average of 3.987 million metric tons, lost production due to the drought equalled 0.5 million tons each year, or 12.5 percent of production. In the more marginal cereal producing regions of the country, the difference was much more marked. In Settat Province, for example, yields between 1981 and 1985 averaged only 40 percent of those for the previous 7 years (and only 42 percent of those for the country as a whole during 1981-85). The 1982/83 season, in particular, was one of catastrophic drought for Settat province, with the average yield dropping to only 0.7 kg/ha, barely 8 percent of the national average for that year. (See Table 6-1).

The drought also led to a major drop in livestock numbers, as many animals died or were slaughtered (see Table 10-2). Many livestock owners held onto their animals hoping that they would survive until the rains returned. As a result, large numbers of animals died before they could be slaughtered. The loss of productive assets, such as livestock and tree crops, will lead to reduced output for years to come.

One consequence of the recent drought has been a greater sensitivity on the part of Moroccan decision makers to the fragility of the country's agricultural sector and to the fact that periodic drought is, and will be, a continuing phenomenon which must be planned for and managed.

Table 6-1: Morocco: Average Cereal Yields in Settat Province Compared to National Levels, 1974-85. (qx/ha) [1]

Year	Morocco	Settat Province [2]
1974	10.7	11.6
1975	8.8	7.9
1976	12.4	9.1
1977	6.0	7.6
1978	10.1	11.6
1979	9.4	12.9
1980	10.2	9.5
1981	4.8	1.8
1982	11.5	7.1
1983	7.6	0.7
1984	8.3	4.1
1985 (est.)	10.0 [1]	6.0

1/ Estimate by the Ministry of Agriculture (area harvested 4,613,000 ha, total cereals production 4,611,600 MT). Note that the U.S. Embassy Agricultural Attache estimates 1985 cereals production to be 3,720,000 MT, giving a national yield of 8.06 qx/ha.

2/ Settat province produces, on average, about 10% of national cereal production. Its average rainfall is about 350mm.

Source: MARA, Enquete Agricole, Principales Productions Vegetables.

Drought should not be viewed as just a deficiency in precipitation. Rather, it is an excess in demand over supply. The demand for water in Morocco has grown significantly in recent years, as a consequence of rapid population growth, increasing urbanization and industrialization and large investments in irrigation systems. Together, these factors have increased water usage by more than 200 percent since the prior multi-year drought in the late 1950s. In audition, soil erosion, due to the cultivation of steep or marginal land, overgrazing, and heavy deforestation, has brought about increased reservoir siltation. The lost capacity of most reservoirs ranges from 0.5 to 3 percent per year. Some of the major reservoirs constructed before 1960 have lost at least half of their original capacity. This situation has severely reduced Moroccan water supplies for all purposes. [US Dept. of the Interior, "Weather Modification Assessment, Kingdom of Morocco, p. 4-5].

The necessity of long-run planning for the conservation and use of Morocco's limited water resources is now being perceived in some quarters of the Moroccan government as an ever more urgent necessity. In particular, the drought has also raised questions about the relative importance of rainfed, versus irrigated, agriculture. On the one hand, as reservoir levels have fallen, questions have been raised about the sustainability of current surface water irrigation and cropping patterns. On the other hand, it is evident that irrigated areas have been an important "buffer" in times of drought. They have sustained an important part of national production of cereals, sugar, vegetables and export crops, and have provided a vital reserve of animal feed (e.g. green forage and sugar by-products).

Recently, the Moroccan Royal Academy sponsored a major national water resource conference. This conference brought together a significant number of U.S. and other international experts on water resource management and was attended by representatives of all of the GOM agencies concerned with water resources. The principal recommendation of this conference was the need for a national water policy. Nevertheless, given its multi-sector nature, improving the management of Morocco's water resources will be a complex and long-term task.

VII. CROP PRODUCTION

Crop production in Morocco is narrowly focused. In 1983, for example, cereals were planted on over 56 percent of the cultivated land (including irrigated land), another 25.6 percent of the land was in fallow, and all other crops together accounted for only 18.0 percent of total cropped area. Barley accounted for almost half (46 percent) of the area cultivated in cereals; durum wheat for 27 percent; bread wheat for 15 percent; and maize for roughly 9 percent. All other grains together constituted only 3 percent of the area planted in cereals. In more favorable, irrigated regions fruits, vegetables, forage crops, and industrial crops are grown. Cereals and pulses accounted for 36 percent of agricultural GDP in 1978-80, followed by citrus fruit and vegetables (11 percent each), and industrial crops and forestry products (6 percent). Animal husbandry contributes about one-third of the value added in the sector.

1. Morocco's Comparative Advantages in Agricultural Production

USAID recently supported a major study on prices and incentives in the agriculture sector [MARA/AIRD, La Politique de Prix]. Among its other tasks, this study examined the comparative advantage of Morocco in agriculture by calculating Domestic Resource Cost Ratios (DRCs). [1] This study concluded that Morocco has a strong comparative advantage in agriculture in general, as well as in cereals, pulses, citrus, vegetables, and cotton. (See Table 7-1). On the other hand, the study concluded that sugar production was an inefficient user of resources. From the point of view of import substitution, the domestic production of sugar is an inefficient means of saving foreign exchange, since the domestic resource cost ratios of sugar production exceed those of alternative irrigated crops. In addition, Morocco appears to have little comparative advantage in oil crops, such as sunflowers. Finally, given its low labor and capital requirements, it is logical to assume that Morocco also has a comparative advantage in livestock production (though this was not analyzed by the study).

2. Production of Cereals

Aggregate production of the four major cereals averaged almost 4 million metric tons between 1974 and 1984 (1.29 million MT for durum wheat, 0.47 million MT for bread wheat, 1.88 million MT for barley, 0.34 million MT for maize). There does not appear to be any discernable long-term trend in terms of total area planted, yields or production of major cereals as a whole. The area planted to cereals has remained relatively constant over time, at approximately 4.35 million hectares. The area dedicated to bread

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1/ Domestic resource cost is equal to the amount of labor and capital required to produce a unit for foreign exchange generated either through exports or by import-substitution. A domestic resource cost ratio exceeding unity indicates that the country has little comparative advantage in the cultivation of a given crop. In the Moroccan case, the comparative advantage should lie with its labor force. Consequently, DRCs should be lowest when the ratio of capital to labor used in production is lowest. [World Bank, Morocco: Industrial Incentives and Export Promotion, p. 36].

Table 7-1: Estimated Domestic Resource Cost Ratios for Various Crops, 1984/85.

Crop	Technological Level			
	Traditional	Semi-Modern	Modern	Irrigated
Durum Wheat	.55	.49	.53	.47
Bread Wheat	.66	.71	.49	.50
Barley	.61	.45	.48	
Maize	.80	.54	.39	
Broad Beans	.26	.19	.19	
Lentils	.35	.25	.21	
Chickpeas	.38	.32	.33	
Sugarbeet			1.61	2.01
Sugarcane				1.23
Clementines [1]			.81	
Oranges [1]			.53	
Tomato (greenhouse)			.43	
Tomato (open field)			.26	
Potato				.53
Cotton				.78

1/ Figures are for the Gharb and Souss Massa areas, respectively. Citrus production in the Souss is less efficient due to higher costs of water delivery services.

Source: Tuluy, Internal Memorandum on the Effective Protection of Moroccan Agriculture, pp. 1, 11-12].

wheat, however, has increasing dramatically in the last four years from 481,000 ha in 1981 to 733,000 ha in 1984 (an increase of 52 percent). The total production of bread wheat rose, from a 1978-80 average of 468,400 MT to an average of 775,700 MT for 1982-84, an increase of almost 66 percent. The average area harvested, yields, and aggregate production, for both major and minor cereals is presented in Table 7-2. For the two most widely grown cereals, durum wheat and barley, average production levels in the 1970s were greater than those in either the 1960s or the 1980s. Production of major cereals has varied radically from year to year. The variability of aggregate production levels is illustrated in Table 7-3.

A preliminary analysis indicates that around 50 percent of the land planted in cereals is located in low rainfall zones (less than 400 mm of rainfall). Higher rainfall areas account for another 28 percent of the land in cereals, and irrigated areas for 22 percent. In terms of aggregate output, however, the relative importance of the cereal production in lower rainfall areas varies from year to year depending upon precipitation (see Table 7-4). In better years, such as 1979/80, production in lower rainfed zones will account for nearly 50 percent of total production. In drought years, however, the cereals harvest from the lower rainfall areas can drop by to less than a third of total production (as was the case in 1983/84).

The major increases in bread wheat production appear to be coming primarily from the irrigated sector. The amount of irrigated land planted in soft wheat in the ORMVAs has increased by over 128 percent since 1976, from around 46,000 ha to over 105,000 ha. At the same time, bread wheat yields on irrigated land increased by 40 percent (reaching an average of almost 26 qx/ha in recent years. As a result of these two trends, total bread wheat production on irrigated land in the ORMVAs has more than tripled since 1976, to an estimated 257,000 MT in 1984. Consequently, irrigated bread wheat, while accounting for an average of 15 percent of the total area planted in bread wheat in Morocco, has been producing an average of 36 percent of total breadwheat production (in the 1981 drought year it accounted for 71 percent of bread wheat production).

On the other hand, the irrigated area planted to durum wheat has been declining since 1980 (from 80,300 to 42,000 ha). Since yields for irrigated durum wheat have remained fairly steady (averaging 17.8 qx/ha), changes in total irrigated durum wheat production has reflected primarily the changes in area planted. In 1984, total durum production from irrigated areas was only 56 percent of 1980 levels. Irrigated durum wheat production, while accounting for around 4.8 percent of national hectarage in durum wheat, still produced an average of 9 percent of total durum output.

Thus, it appears that bread wheat is replacing durum wheat on irrigated lands. In 1976 bread wheat represented 41.5 percent of the total irrigated wheat, while durum wheat accounted for 58.5 percent. In 1984, bread wheat accounted for 72 percent of the land in irrigated wheat, and durum wheat only 28 percent. Further research is needed to determine whether this is due to changes in productive technology, relative prices, or both.

Table 7-2: Area Harvested, Yields and Production Data for Cereal Crops

Crop	Years	Average Area Harvested ('000 ha)	Average Yield (qx/ha)	Average Production (quintals)
Major Cereals				
Bread Wheat	1961-70	464.1	8.5	3919.4
	1971-80	482.6	9.3	4506.3
	1981-84	620.8	10.5	6522.3
Durum Wheat	1961-70	1401.6	8.7	12145.2
	1971-80	1370.4	10.1	13805.0
	1981-84	1170.5	9.5	11066.3
Barley	1961-70	1938.4	8.8	16972.2
	1971-80	2087.9	10.1	20892.2
	1981-84	2138.0	7.1	15012.8
Corn	1961-70	504.4	7.4	3742.1
	1971-80	439.8	7.9	3447.1
	1981-84	395.0	5.4	2147.5
Total Major Cereals	1961-70	4308.5	8.5	36778.9
	1971-80	4380.7	9.8	42650.6
	1981-84	4324.3	8.1	34748.8
Minor Cereals				
Sorghum	1968-75	64.5	11.1	729.1
	1976-80	44.6	5.2	212.2
	1981-84	34.7	6.4	222.8
Rice	1968-75	5.2	43.8	250.6
	1976-80	5.7	41.3	237.2
	1981-84	2.4	30.6	78.8

Source: Calculated from data in Annex 1.

Table 7-3: Cereal Production as a Percentage of the Long-term Average

Percent of Normal Harvest	Years in which that Level of Production Occurred (Year of Harvest)
40-50	1961
51-60	1966, 1981
61-70	
71-80	1973, 1977
81-90	1967, 1983
91-100	1964, 1965, 1975, 1984
101-110	1962, 1963, 1969, 1970, 1979
111-120	1974, 1978, 1980
121-130	1972, 1982
131-140	1971
141-150	1976
150+	1968

Source: Calculated using data from Annex 1.

Table 7-4: Distribution of Cereal Production between Low Rainfall, High Rainfall and Irrigated Zones [1]

	Low Rainfall Amount	%	High Rainfall Amount	%	Irrigated[2] Amount	%	Total
			Area Planted ('000 ha)				
Drought Year [3]							
Durum Wheat	358	31.9	565	50.3	200	17.8	1122
Bread Wheat	226	30.8	253	34.5	255	34.7	733
Barley	1338	63.0	327	15.4	461	21.7	2126
Maize	249	65.0	42	11.1	92	23.9	384
All Cereals	2201	49.2	1250	27.9	1026	22.9	4478
Normal Year [3]							
Durum Wheat	451	35.3	556	44.3	260	20.4	1267
Bread Wheat	205	35.0	113	43.3	128	21.8	445
Barley	1318	63.0	374	15.6	448	21.4	2140
Maize	258	62.9	30	7.3	122	29.8	410
All Cereals	2231	51.1	1073	28.7	958	21.9	4262
			Average Yield (qx/ha)				
Drought Year							
Durum Wheat	4.7	-	12.8	-	14.0	-	10.4
Bread Wheat	4.2	-	14.8	-	13.7	-	11.2
Barley	4.8	-	14.0	-	6.5	-	6.6
Maize	6.0	-	8.4	-	8.5	-	6.9
All Cereals	4.8	-	12.5	-	9.8	-	8.2
Normal Year							
Durum Wheat	8.9	-	10.9	-	12.6	-	10.5
Bread Wheat	8.6	-	14.2	-	11.5	-	11.1
Barley	9.9	-	11.2	-	11.0	-	10.6
Maize	6.5	-	6.9	-	11.6	-	10.0
All Cereals	9.2	-	11.2	-	11.6	-	10.0
			Production ('000 quintals)				
Drought Year							
Durum Wheat	1667	14.2	7255	61.9	2791	23.8	11713
Bread Wheat	956	11.7	3751	45.8	3475	42.5	8182
Barley	6454	46.0	4582	32.6	3010	21.4	14046
Maize	1506	57.0	357	13.5	777	29.4	2640
All Cereals	10583	28.9	15945	43.6	10052	27.4	36581
Normal Year							
Durum Wheat	4023	30.1	6060	45.4	3278	24.5	13361
Bread Wheat	1759	35.5	1600	34.8	1471	29.7	4957
Barley	13010	58.9	4174	18.9	4913	22.2	22097
Maize	1664	50.5	207	6.3	1423	43.2	3295
All Cereals	20457	46.9	12041	27.6	11084	25.4	43582

1/ Calculated based on MARA data disaggregated by DPA and ORMVA. The low rainfall zone includes the following provinces: Agadir, Al Hoceima, Azilal, Beni Mellal, Ben Slimane, Boulmane, El Jadida, El Kelaa, Essaouira, Figuig, Guelmim, Khouribga, Marrakech, Nador, Oujda, Safi, Settat, Tata, and Tiznit. The high rainfall zone includes the following provinces: Casablanca, Chefchaouen, Fes, Ifrane, Kenitra, Khemisset, Mhenifra, Meknes, Rabat, Tanger, Taounate, Taza, and Tetouan.

2/ Note that the figures for irrigated cereal production represent levels reported by the ORMVAs. There is substantial rainfed land within the jurisdiction of ORMVAs, however.

3/ The 1979/80 crop year was selected as representative of a "normal" year. The 1983/84 crop year was chosen as a "drought" year. This comparison does not take into account long-term changes in crop mix, productivity, input use, and so forth.

Source: Data from MARA/DPAE, Enquete Agricole: Principales Productions Vegetales Campagne Agricole 1979-80, and Campaigne Agricole 1983/84.

Corn is planted in Morocco as a spring food crop and fodder source. It is also planted as a means of reducing weed population and the resulting competition with the wheat and barley crop which follows. Corn yields in lower rainfall areas, however, are extremely low. Research, supported by USAID, is underway to identify improved corn production systems, as well as possible replacement crops for rotations. Production of sorghum in Morocco has been declining since 1968 and during the 1981-84 period was only 30 percent of 1968-75 levels. A major cause of this drop has been the preference of farmers for corn, barley and subsidized by-products (sugarbeet pulp, bran, etc.) over sorghum, as an animal feed.

The area planted and production of rice has also fallen significantly since 1968. Between 1981 and 1984, the production of rice averaged only 31 percent of 1968-75 levels. Reasons for this decline include the availability of cheap rice imports and increases in water charges to levels which more closely reflect the true cost of irrigation water.

3. Production of Other Crops

Table 7-5 presents average area harvested, yield, and total production for various crops.

Food legumes. Food legumes, primarily broad beans, peas, chickpeas, and lentils, are grown in a traditional cereal/pulse/fallow or forage rotation in rainfed areas. Production of food legumes appears to be profitable at the farm level and economically profitable for the country as a whole. Nevertheless, the area planted and total production of peas, beans, and chickpeas has decreased significantly since the late 1960s and early 1970s. Between 1981 and 1984 production of peas, beans, and chickpeas averaged only 30, 45, and 47 percent of 1968-75 levels, respectively. Though the area planted in lentils almost doubled, yields decreased proportionately, resulting in little growth in total lentil production. Three factors have caused these trends: 1) infestations of "orobanche" an important parasitic plant for food legumes which has significantly reduced yields, 2) substantial increases in the price of food legume seed, and 3) increasing labor costs of non-mechanized food legume cultivation. In addition, little work has been done to adapt food legume varieties to Moroccan growing conditions. Research is currently underway, under the USAID-funded Dryland Agriculture Applied Research Project, on chickpeas. This research involves screening varieties for disease resistance and drought tolerance, as well as evaluating winter sown, versus spring sown, chickpea varieties.

Vegetables. Fresh vegetables, primarily tomatoes and potatoes, are cultivated along the coastal strip from Agadir to the Gharb, and in pockets along the Mediterranean coast. Vegetable cultivation covers some 150,000 hectares, with 1,000 hectares under greenhouses. Production techniques are well developed and involve the intensive use of improved seeds, fertilizers, and insecticides. Yields are consequently high. For example, open field tomato yields may reach 40-45 tons per hectare, while greenhouse production can yield upwards of 80 tons. Production of tomatoes, potatoes and fresh vegetables increased by 56 percent between 1970-75 and 1980-83. Production of tomatoes and potatoes has risen to about 400,000 and 500,000 tons per year, respectively, in the last four years compared to levels of

Table 7-5: Area Harvested, Yields and Production Data for Selected Crops

Crop	Years	Average Area Harvested ('000 ha)	Average Yield (qx/ha)	Average Production (qx)
Food Legumes				
Peas	1968-75	85.9	7.0	613.8
	1976-80	91.0	6.4	565.1
	1981-84	43.7	4.0	181.2
Lentils	1968-75	34.4	6.1	206.6
	1976-80	40.3	4.7	199.6
	1981-84	54.9	3.9	216.4
Beans	1968-75	204.6	11.2	2214.4
	1976-80	193.0	7.6	1474.2
	1981-84	150.5	6.7	1005.0
Chickpeas	1968-75	108.3	7.4	833.1
	1976-80	67.6	6.0	414.8
	1981-84	54.4	5.9	353.7
Vegetables				
Tomatoes [1]	1968-75	20.6	263.4	5398.6
	1976-80	20.1	234.2	4714.6
	1982-84	16.0	282.0	4537.0
Potatoes [1]	1968-75	26.8	145.0	3917.5
	1976-80	31.7	130.5	4178.4
	1982-84	38.0	143.8	5460.3
Forages				
Canary Grass	1973-80	29.2	5.8	149.3
	1981-84	7.7	6.0	44.9
Oats	1973-80	25.0	7.4	193.7
	1981-84	56.2	8.3	474.7
Industrial Crops				
Sugarbeets	1963-70	22.1	212.0	5123.3
	1971-80	61.5	310.0	19083.7
	1981-84	63.4	380.0	23857.9
Sugarcane	1973-80	2.44	662.0	1693.6
	1981-84	9.08	750.0	6754.0
Cotton	1973-80	14.5	13.7	192.6
	1981-84	10.5	17.5	185.5

Continued.

Table 7-5: Area Harvested, Yields and Production Data for Selected Crops (cont.)

Crop	Years	Average Area Harvested ('000 ha)	Average Yield (qx/ha)	Average Production (qx)
Citrus				
Oranges	1961-70	n.a.	n.a.	5395.0
	1971-80	n.a.	n.a.	6455.0
	1981-84	n.a.	n.a.	6992.5
Clementines	1961-70	n.a.	n.a.	728.0
	1971-80	n.a.	n.a.	1949.0
	1981-84	n.a.	n.a.	2720.0
Oilcrops				
Sunflower	1968-75	20.4	7.0	146.7
	1976-80	25.9	7.9	192.5
	1981-84	19.1	6.3	124.5
Peanuts	1970-75	10.8	7.3	84.2
	1976-80	22.4	9.8	221.9
	1981-84	29.2	11.1	313.8
Olives [1]	1969-75	252.3	12.4	3070.0
	1976-80	288.4	11.7	3210.0
	1982-84	326.2	10.6	3445.2
Miscellaneous				
Grapes [1]	1968-75	59.0	43.1	2521.3
	1976-80	54.4	42.8	2318.0
	1982-84	57.8	29.0	1674.8
Dates [1]	1969-75	73.0	30.0	2190.0
	1976-80	30.0	30.0	909.8
	1982-84	25.8	16.2	421.6

1/ Data for 1981 for these crops is not available.

Source: Calculated from data in Annex 1.

output about half as great in the 1960's. Vegetable production is both privately and socially profitable. Indeed, the social profitability of vegetable production to Morocco exceeds the level of profitability to the farmer.

Forages. For canary grass (alpine) both area planted and production have decreased significantly since 1968. Between 1981 and 1984, the production of canary grass averaged only 30 percent of 1973-80 levels. With respect to oat production, the area planted doubled and production increased by almost 150 percent.

Sugarbeets and Sugarcane. Morocco's per capita consumption of sugar is one of the highest in the world, ranking third in family food consumption, after bread and meat. In order to increase Morocco's self-sufficiency in sugar, the GOM has been giving priority to increasing sugarbeet and sugarcane production and has constructed sugar processing facilities in major producting areas. As a result, sugar production has increased significantly, from zero in 1962 to 435,000 tons in 1983, and domestic production now meets 60 percent of Morocco's sugar consumption.

The area planted to sugarbeets grew from 12,000 ha in 1962-67 to nearly 60,000 ha in 1980-84. Nearly two-thirds of this beet acreage is irrigated, producing about 80 percent of the total sugarbeet output. Sugarbeet production is concentrated in the ORMVAs of Gharb, Loukkos, Tadla, Doukkala, and Moulouya. Sugarcane was introduced in the mid-1970s and, by 1984, covered 15,000 hectares, principally in the Gharb and Moulouya ORMVAs. National sugarcane production reached 800,000 MTs in 1984.

The production of sugar crops is carefully supervised by ORMVA staff. The ORMVAs provide inputs, technical assistance, and advances to contract farmers. Fertilizer, improved seeds, and pesticides are used intensively on sugar crops. In addition, sugar producers have generally benefitted from subsidized irrigation. Sugar refineries purchase the production in collaboration with the ORMVA. Payments are then made to the ORMVAs which, after deducting advances, compensate the farmer. Sugar production appears to be profitable for farmers. However, given the heavy use of subsidized inputs and services, the social profitability of sugar production for Morocco, with the exception of the Doukkala, as reported by the to be negative. [Tuluy, Internal Memorandum on the Effective Protection of Moroccan Agriculture, p. 19].

Cotton. In Morocco, cotton is principally cultivated for its fiber, rather than for its grain. The area planted to cotton has declined from nearly 19,000 hectares in 1970-71 to about 10,500 hectares in 1983-84, all of which is irrigated. Around 90 percent of this production is from the Tadla region. Yields have fluctuated widely over this period, due to disease infestation and insufficient producer incentives.

Citrus. Citrus orchards occupy approximately 70,000 hectares. In general, citrus groves are fully irrigated during the hot summer months, when there is usually not enough rain. Most areas depend on rainfall during the winter months, however. The Souss-Massa ORMVA accounts for 30 percent of the land in citrus, the Gharb for 25 percent, and the Tadla, Moulouya, and Marrakech ORMVAs for 10-12 percent each. Clementines account for 37 percent of the area planted, Maroc-Late for 30 percent, and Navel oranges for

22 percent. Yields are generally low because of the age of the plantations. Citrus production is entirely irrigated, with large doses of fertilizers and insecticides. Citrus fruit production has stabilized at about 1 million MTs annually in the last six or seven years. Export levels have also leveled off at about 600,000 tons. Nevertheless, citrus production appears to be both privately and socially profitable. Once again, social profitability exceeds private profitability.

Oil Crops. The profitability of domestic oil crop production has been adversely affected by the availability of subsidized oils and oil meals (including low cost imports of soy and colza grains). In particular, the competition has priced olive oil, Morocco's traditional source of vegetable oil, out of the market.

About one-fifth of the 250,000 hectares under olive production are cultivated intensively, with yields of 30 kg/tree (or 3 tons/ha). The extensive sector, with yields of 15-18 kg/tree, accounts for another 30 percent of the total area. The remaining 50 percent is not tended, and harvests average 3-5 kg/tree. A 1978 MARA study estimated that nearly 70 percent of the country's olive trees were past productive age.

Sunflowers are grown as a spring crop on 20,000 hectares, essentially in the rainfed zones of the Gharb and Tadla ORMVAs. Although fertilizers, improved seeds, and mechanization are used on sunflowers, yields in recent years have been low due to adverse weather conditions and the fact that sunflowers are a second season crop, generally in rotation with cereals or sugar beets. As a result, sunflowers may not be planted on a timely basis.

Grapes. Grape and wine production has dropped considerably from the levels reached in the 1960's and wine exports of 500,000 hectoliters are one third of what they were in those earlier years. This drop in production is the result of the disappearance of the export market for wine and grapes, due to import restrictions by the EEC.

Dates. Date production during 1982-84 was only 19 percent of levels reached in the early 1970s. The principal reason for this decline is a serious infestation of bayoud, which has destroyed more than two-thirds of Morocco's date palm plantations. The disease is moving eastward and has killed trees in Algeria and Tunisia, as well as Morocco.

4. Agricultural Productivity and Potential

Moroccan agricultural production has not been keeping pace with the country's expanding population. Per capita food production in Morocco has been declining since 1974. (See Table 7-6). Although the production of some crops, particularly irrigated crops such as citrus, sugarbeet and sugarcane, has increased, the production of many dryland crops has actually been declining. Crops for which aggregate production levels have fallen include corn, sorghum, rice, peas, beans, chickpeas, tomatoes, and grapes. Production of the two most important cereals, durum wheat and barley, has apparently stagnated. Since the early 1970's, yields per hectare for each of the major food legumes produced by Morocco (peas, lentils, beans, and chickpeas) have declined significantly.

The GOM's projections assume relatively slow growth for for domestic food production. (See Table 3-2). Cereals production is expected to increase by only 0.7 percent per year, reaching just over 5 million MT by the year 2000 (demand for cereals is, on the other hand, projected to increase by 2.5 percent, reaching nearly 9.9 million MT). Bean and vegetable production are expected to increase by only 0.4 and 0.2 percent per year, respectively. Conversely, sugar production is projected to increase at 4.9 percent per year. These estimates are based on historical trends, however, and do not take into account possible changes in cropping patterns as a result of policy changes now underway.

The potential of Moroccan agriculture is far from being realized. In particular, the productivity of rainfed agriculture, which accounts for the bulk of the country's basic food supply and supports most of the agricultural population, is very low. According to the FAO/MARA Cereals Master Plan, cereals output could be increased by 80 percent, from 4 to 7 million MT per year, by employing only the technological knowledge already available. Although USAID agrees that significant potential exists for increased crop production, it is far from certain that such a production increase can be accomplished using technology that already exists, particularly in the case of lower rainfall areas. The World Bank argues that most productivity increases can be expected to occur in the medium to high rainfall areas. Table 7-7 compares average yields obtained for various rainfed crops with those achieved by better farmers and by demonstration farms.

Table 7-6: Index of Total and Per Capita Food Production, Morocco, 1974 to 1983

Year	Index of Total Food Production (1969-71 = 100)	Index of Per Capita Food Production
1974	108	97
1975	93	81
1976	114	96
1977	94	77
1978	120	96
1979	119	92
1980	122	92
1981	98	72
1982	123	88
1983	109	75

Source: Martin, Production and Marketing of Horticultural Commodities: p. 62.

Table 7-7: Potential for Increasing Yields in Rainfed Areas

	Average	Better Farmers	Demonstration Farms
Durum Wheat	1.0	1.8	2.1
Bread Wheat	0.9	2.0	2.4
Barley	1.0	1.4	1.2
Maize	0.7	1.5	1.7

Source: World Bank, Agriculture Sector Loan, p. 13.

VIII. AGRICULTURAL INPUTS

Rainfed agriculture in Morocco has continued to rely on traditional cultivation practices. The use of modern inputs, such as selected seeds, chemical fertilizers and pesticides is limited and concentrated primarily to irrigated areas. In particular, a number of problems have been identified with the supply and distribution of inputs. Farmers who lack access to inputs obviously do not benefit from the subsidies on inputs provided by the government (which amounted to over 1 billion Dh in 1984). These subsidies have included irrigation water made available at below cost, subsidies on fertilizer, seed, and animal feeds, custom mechanization services, and on low cost breeding and health services for livestock.

1. Labor

The situation with respect to agricultural labor is evolving rapidly in Morocco, with changes occurring in labor relationships as well as in the amount of labor employed under various cropping systems. Much of the agricultural labor is provided by farmers (fellah) and their families working their own land or land that they rent or sharecrop. Salaried agricultural workers first appeared during the colonial period. The traditional agricultural labor system, with its origins in more feudal times, involved the employment of permanent agricultural workers (khammes) who were reimbursed for their labor with one-fifth of the harvest. Though the khammes does not receive a salary, he enjoys benefits accruing from the patron-client relationship, including greater employment security than that accorded salaried workers. The khammes system is disappearing, however, as increasing numbers of agricultural workers choose salaried employment, even though there is less security.

The mechanization of cereals production, together with the increasing diversification of Moroccan agriculture, is leading to major changes in seasonal labor use in Morocco. Traditionally, the peak period demand for seasonal workers occurred at cereal planting (October-November) and at the cereal harvest (May-June). Peak labor demands now vary greatly by region. In the southern and eastern portions of the country, the demand for labor still peaks during the cereal harvest. In the central region (i.e. north of Safi and along the coast to Larache), on the other hand, the peak labor demand is from March to June, when beans and potatoes are harvested (by hand) and corn is planted (by animal traction). In the Fes/Meknes area, the harvest of apples in October and November involves a high labor demand. In Agadir, the demand for labor increases during the citrus harvest between November and January.

During peak periods, the cost of labor may double. The high cost seasonal labor has encouraged the trend towards greater mechanization of agriculture. (See section VIII-5). Due to the highly seasonal demand for labor, however, there is considerable underemployment in agriculture, especially in dryland areas of Morocco. It is estimated that crop production requires only 100 to 150 days of labor per year. As a result, many farmers seek employment away from the farm on a seasonal basis, often emigrating to urban areas. Data on the extent of this off-farm employment is currently unavailable.

A large portion of agricultural labor needs are met by family members. According to one source, 95 percent of the jobs created in agriculture between 1960 and 1982 (an average of 18,500 per year) was family labor. A survey carried out in 1974/75 indicated that 84 percent of family labor was employed in farms of less than 10 hectares, and 15 percent on farms of between 10 and 15 hectares. [Benrida, Seminaire sur les Besoins de la Population à Long Terme, p. 30]. Statistics indicate that agricultural heads of households are relatively elderly, averaging about 55 years old (a result of increased lifespans and limited opportunity for the young to obtain arable land to farm). Thus, as a general rule, young adults must continue to work as unpaid family labor until a relatively advanced age, or migrate to urban areas. [World Bank, Education and Training Survey, p. 4].

Moroccan women appear to be have a more limited role in agriculture, particularly in terms of decision making, than is the case in many other developing countries. (See Section IV-5). Moreover, the decision making role that women do have (including on the ultimate disposition of the income generated) appears to decline as the scale and profitability of the production system increases. Nevertheless, women are directly involved in agricultural activities, particularly the care of livestock. The most common activities carried out by women include collecting weeds from the fields for fodder, cleaning stables, watering the animals, milking and caring for poultry and other small animals and, most importantly, gathering firewood and water. Although women do sometimes work in the hand harvesting of cereals, this tends to be limited to poorer households, and only when paid workers who are strangers to the family are not involved. Women glean the fields after hand harvesting and may be involved in carrying hand harvested grain to be threshed. In some cases, women may be paid as agricultural workers. However, they generally work only for members of their kinship group. The wages earned are usually given to the household head (as are the wages earned by male dependents in the household). When they are paid, women receive somewhat less than men for the same tasks.

2. Improved Seeds [1]

Varietal Development

Developing improved seed varieties is the responsibility of the Institut National de Recherche Agronomique (INRA). INRA's efforts have been primarily directed at developing improved cereals. Given the climatic conditions and geography of Morocco, the emphasis has been on the development of early varieties and those resistant to the principal diseases indigenous to the country. With respect to bread wheat, five varieties are currently available to farmers, of which one, Nesma, accounted for 75 percent of the certified bread wheat seed sold in 1983/84. There are nine varieties of durum wheat. One of these varieties, Cocorit, is the most important, accounting for 53 percent of certified durum seed sales in 1983/84. For barley, six varieties are available.

1/ The information in this section is drawn from: Suisse Guillaud, "Rapport des Semences de Cereals", December 1985, prepared for USAID/Rabat; and the World Bank, Agriculture Sector Adjustment Loan, Technical Support Volume, p. 54-67.

The development and introduction of new cereal varieties in Morocco has been slow. As a result, principally older varieties are being used by Moroccan farmers. For example, older varieties account for 93 percent of the certified bread wheat seed that is sold, 91 percent of the barley seed, and 50 percent of the certified durum wheat. One reason for this problem has been the lack of incentive for INRA to increase its output of foundation seed (G0 to G4). Though INRA is primarily a research organization, 30 to 40 percent of the its budget and 40 percent of its cultivated land, had been going to the multiplication of foundation seed, rather than research. Further, seed multiplication was not included as an essential function of INRA in the laws and decrees defining its responsibilities. This situation is currently improving. INRA will now receive royalties from the seed multiplication agencies for the production of new varieties. In addition, responsibility for the multiplication of foundation seed is being transfered from INRA to SOGETA and to the private sector (through SONACOS).

Seed Multiplication

The Societe Nationale de Commercialisation des Semences (SONACOS), a parastatal, is charged with coordinating, organizing, and controlling certified seed production, distribution and marketing. SONACOS does not directly produce seed itself. Rather, it contracts for seed production with: (a) state companies, such a SOGETA, SODEA, COMAGRI (27 percent of the total area); approximately 490 private farmers (57 percent of the total area); and (c) 55 cooperatives (16 percent of the area). Contractors receive foundation seeds purchased from INRA by SONACOS and carry out two stages of multiplication, R1 (registered seed), or R2 (certified seed). The state companies are more heavily involved in the multiplication of R1, while the private farmers are more heavily involved in R2 multiplication. In addition, SONACOS collects seed from farmers, treats it, bags it, and sells it as "bon à semer".

In 1983/84, around 42,780 MT of certified cereal seed was produced. [1] Of this, 51 percent was bread wheat seed, 35 percent was durum wheat seed, and 14 percent was barley seed. (See Table 8-1). The World Bank has estimated that, given the area currently planted to various crops, some 119,100 MT is needed (46,000 MT of durum wheat seed, 31,200 MT of bread wheat seed, and 41,900 MT of barley seed). This would imply that 1983/84 cereal seed production covered 32 percent of durum wheat needs, 70 percent of bread wheat needs, and 14 percent of barley seed needs.

A number of problems have been identified with respect to the multiplication of certified seed (R1 and R2). One problem has been the limited number of farmers serving as seed multiplication contractors. This has been largely due to overly strict regulations governing seed multiplication. For example, these regulations required multiplication plots to be larger than 20 hectares in rainfed areas and larger than 10 hectares in irrigated areas. They also required farmers to either own or have a long-term lease on the land they use for multiplication and have seed treatment

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1/ Both SONACOS AND SOGETA are trying to develop their production capability for potato seeds, since current potato seed requirements (24,000 MT) are covered by imports. SOGETA is also producing limited amounts of seeds for forage, edible legumes, and sunflower. All other seeds are imported and distributed by the private sector.

Table 8-1: Production of Certified Seed

	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Amount Produced (MT)						
Durum Wheat	28,870	28,860	6,660	15,370	16,330	14,760
Bread Wheat	17,370	24,840	13,630	27,160	30,170	21,940
Barley	1,390	2,710	1,870	4,530	3,010	6,080
Total	47,630	56,410	22,110	47,060	49,510	42,780
Percentage						
Durum Wheat	60.6	51.2	30.1	32.7	33.0	34.5
Bread Wheat	36.4	44.0	61.6	57.7	60.9	51.3
Barley	2.9	4.8	8.4	9.6	6.1	14.2
Total	99.9	100.0	100.1	100.0	100.0	100.0

Source: SONACOS, "Production et Commercialisation des Semences Certifiées de Cereales: Strategie de Developpement", p. 26, and Suisse Guillaud, "Rapport des Semences de Cereals", p. 7.

Table 8-2: Sales of Certified Seed and "bon à semer" (MT)

	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85
Certified Seed	27,590	28,610	50,180	32,540	35,040	50,080	36,530
Durum Wheat	17,250	17,630	26,850	12,040	11,650	13,490	n.a.
Bread Wheat	9,600	10,600	20,840	18,460	22,350	31,450	n.a.
Barley	740	380	2,490	2,040	1,040	5,140	n.a.
Bon à Semer	7,190	13,400	6,600	46,470	1,210	28,700	15,300
Durum Wheat	-	-	-	4,900	-	-	-
Bread Wheat	-	-	-	6,970	790	600	7,500
Barley	7,190	13,400	6,600	34,600	420	28,100	7,800
Total	34,780	42,010	56,780	79,010	36,250	78,780	51,830

Sources: Suisse Guillaud, "Rapport des Semences de Cereals", p. 29. and MARA, Le Secteur Semencier au Maroc.

capacity. These regulations have been modified. For example, farmers will now be able to multiply cereals on 10 hectare plots in rainfed areas and 5 hectare plots in irrigation schemes.

In addition, the fixed prices paid to farmers under seed multiplication contracts have not always adequately reflected changes in the prices of common seed. These prices have been set based upon careful analyses of yields and production costs, adding a 20 percent margin. At times, particularly in drought years, cereal prices have risen above official prices, encouraging farmers to divert their certified seed production to the consumption market, despite contracts with SONACOS. Statutory limits on the price SONACOS could charge farmers for certified seed prevented SONACOS from paying higher prices to its multipliers to match increases in overall cereals prices. The GOM has recently decided to change its pricing structure to overcome this problem. In the future, the prices fixed by the government will be floor prices which will be revised upwards, if necessary, to keep them equal to, or slightly higher than, the market price for seeds. In addition, subsidies on certified cereals seeds will be reduced (see below).

Sales and Distribution

The actual sales of certified cereal seeds was somewhat higher in 1983/84, at 50,080 MT. Of this, nearly two thirds was for bread wheat. (See Table 8-2). It is estimated that the demand for certified cereal seeds (i.e. sales) will increase to between 87,000 and 97,000 MT by the 1989/90 crop season and up to 120,000 MT by the year 2000. (See Table 8-3).

The fixed prices SONACOS has charged farmers for certified cereal seed have historically been lower than the cost to SONACOS of producing that seed. (See Table 8-4). The financial burden of this subsidy, which reached Dh 35.9 million in 1983/84, limited the size of the seed production program. The GOM reduced the level of seed subsidies in both 1984/85 and 1985/86 (by a total of 25 percent for barley and 37 percent for bread wheat and durum wheat). As a consequence of these changes, the total subsidy decreased to 27.1 million Dh in 1984/85. In the future, the GOM will not permit the level of subsidy on certified seeds to exceed 1983/84 levels. This will, of course, entail a reduction in the subsidy per unit, as seed production and sales increases. The GOM will also maintain certified seed prices at levels above the market price for common seed.

Currently, seed cleaning and storage capacity appears adequate. Given annual sales of around 52,000 MT of certified cereal seed and average losses of 15 percent, an estimated 60,000 MT of seed cleaning capacity is necessary. Current seed cleaning and treatment capacity is estimated at 75,000 MT (55,000 MT for SONACOS and 20,000 MT for SOGETA). This capacity is not optimally distributed on a regional basis, however. Moreover, given the predicted increases in the annual use of certified cereal seeds (to 120,000 MT by the year 2000), investment in additional seed cleaning capacity will be needed in coming years.

Table 8-3: Demand for Certified Seeds, 1989/90

	1983/84 Sales	Alternative Estimates of 1989/90 Demand		
		SONACOS [1]	MARA [2]	MARA [3]
Durum Wheat	13,490	35,000	42,000	40,000
Bread Wheat	31,450	42,500	39,000	45,000
Barley	5,140	10,000	14,000	12,000
Total	50,080	87,500	95,000	97,000

1/ Figures taken from SONACOS, "Production et Commercialisation des Semences Certifiées de Cereales: Strategie de Développement", p. 49-51.

2/ Figures prepared for the 1986-90 Five Year Plan.

3/ Figures taken from MARA, "Le Secteur Semencier au Maroc", April 1985.

Source: Suisse Guillaud, "Rapport des Semences de Cereals", p. 14.

Table 8-4: SONACOS Processing Costs and Subsidies (Dh/quintal)

	Durum Wheat (High Yield)	Durum Wheat (Low yield)	Bread Wheat	Barley
Production Cost at The Farmgate	177.0	211.0	173.0	160.0
Profits for Contract Seed Multiplicators	35.0	42.0	35.0	32.0
SONACOS Purchase Price	212.0	253.0	208.0	192.0
SONACOS Overhead	19.7	19.7	19.7	19.7
SONACOS Total Cost	231.7	272.7	227.7	211.7
SONACOS Selling Price				
To Farmers	185.0	190.0	180.0	130.0
To Cooperatives	175.0	180.0	170.0	120.0
Net Subsidy [1]				
To Farmers	46.7	82.7	47.7	81.7
To Cooperatives	56.7	92.7	57.7	91.7

1/ Difference between SONACOS Total Cost and SONACOS Selling Prices.

Source: [World Bank, Agriculture Sector Loan, Technical Support Volume, p. 65].

Total storage capacity for certified seed is estimated to be over 81,000 MT (60,800 MT for SONACOS, located in 13 regional centers, and another 20,500 MT of capacity for SOGETA). This is adequate to cover annual sales, but does not allow for the accumulation of stocks to cope with the wide fluctuations that occur in seed production and demand due to changes in annual rainfall. An alternative approach for securing an adequate supply of certified seeds would be to increase the amount of seed production coming from irrigated lands, either through increasing the annual number of multiplication contracts with farmers owning irrigated land, or by increasing the amount of irrigated land available to SOGETA for seed multiplication.

Another major problem facing the seed production and distribution subsector, is the lack of basic knowledge concerning actual demand for, and use of, certified cereal seeds and future potentials. Without a more solid information base, decisions concerning prices, investment needs, and so forth are more difficult to make.

SONACOS holds a legal monopoly on the marketing of certified seeds. It distributes 30 percent of its seed through 11 regional centers (serving cooperatives and large farmers). The remaining 70 percent of the seed is distributed through the network of Centres des Travaux (CTs) and Centres de Mise en Valeur (CMVs). Reliance on CTs and CMVs has not been conducive to promoting the sale of certified seeds. The MARA agents at the CTs and CMVs do not have the expertise needed or incentive to promote certified seed sales and to guide farmers in its effective use. The training of venders and the promotion of certified seeds cannot be undertaken within the existing structure. Moreover, it is unclear how the efforts underway to move the extension service away from input delivery and towards extension will affect seed delivery in the future.

The Moroccan farmer's willingness and ability to use certified seeds is adversely affected by a general lack of knowledge concerning alternative varieties and their potentials. Moreover, farmers are often reluctant to pay more for certified seed than common seed (especially prior to planting when the amount of cash available is limited). Ultimately, these problems can only be addressed by farmer education, either through the extension system or via the seed distribution system, itself.

The major reforms within the seed production subsector called for in the GOM's Agriculture Sector Adjustment program involve primarily seed production. Little has been done, to date, to come to grips with the distribution problem. This will ultimately involve encouraging greater participation of the private sector or other parastatals, such as FERTIMA, in certified seed distribution.

3. Fertilizer Distribution and Use [1]

Consumption Levels

Fertilizer consumption in Morocco has more than doubled since 1972, from 141,500 tons of nutrients in that year to over 287,000 tons in 1983. Fertilizer use is expected to increase by around 6 percent per year between 1984 and the year 2000. The growth of fertilizer use has been very uneven, however, with wide variations in consumption by crop, nutrient, and region (see Tables 8-5 and 8-6). Nearly half of all of the fertilizer used in Morocco is applied on sugar, cotton, vegetables, and citrus, which together account for only 6.3 percent of total cultivated area (though for about 80 percent of irrigated area and 26 percent of agricultural value-added). The remaining 50 percent of the fertilizer used is placed on cereals, grain legumes, and forage, which represent nearly 90 percent of the cultivated land.

Morocco's consumption of fertilizer is higher than in other North African countries but lower than in most other Mediterranean countries. Morocco's overall fertilizer consumption is close to the average for developing countries as a whole. The rate of fertilizer application on irrigated and cash crops are close to recommended levels. On the other hand, the rate of fertilization on cereals, grain legumes, and forage is far below recommended rates and often insufficient to replace the nutrients removed by crops during a season. Even in higher rainfall areas (i.e. over 400 mm of precipitation), the amount of fertilizer used is low. For example, only 35 percent of the area under cereals is fertilized, and that at less than half the recommended rates. Only 5 percent of cereal crops in the low rainfall areas (less than 400 mm of precipitation) are fertilized, and then only at a third of the level recommended. It should be noted, however, that crop responsiveness to fertilizer lower rainfall areas is subject to considerable risk, due to climatic variability and the possibility that needed complementary inputs will not be available on a timely basis.

Lack of Information on Fertilizer Requirements

The poor understanding of the fertilizer nutrient composition of Moroccan soils appears to be a constraint on the effective use of fertilizers in Moroccan agriculture. In particular, knowledge about the availability, or nonavailability, of the three principal elements (nitrogen, phosphorus, and potassium) in their natural state is weak. One consequence of this lack of information is the plethora of different chemical fertilizer formulations in Morocco. There are twenty-two different fertilizer formulations and prices available in Morocco. In contrast, India is reported to manufacture and distribute only four fertilizers on a national scale. With little technical knowledge upon which to choose a fertilizer, farmers will often go for the least expensive option, even though its nutrient content is incomplete or totally inappropriate for their needs. Similarly, little information is

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1/ Sources for information on this section include: Pattinson, Ian, "Potential USAID Activities in the Fertilizer Sector of Morocco", December 1985; World Bank, "Agriculture Sector Adjustment Loan, Technical Support Volume", p. 89-133 and 250-256; and Hill, "Projet de Distribution d'Engrais", May 1983].

Table 8-5: Fertilizer Consumption by Crop (1981/82)

Crop	Relative Importance of the Crop in Terms of Area [1] ('000 ha)	(%)	Relative Fertilizer Use in Terms of Nutrient Consumption ('000 MT)	(%)
Primarily Irrigated Crops				
Sugar beet and cane	80	1.6	23.4	11.5
Cotton	11	0.2	1.9	0.9
Vegetables	157	3.1	39.0	19.1
Citrus	72	1.4	28.8	14.1
Other Fruits	296	5.9	12.8	6.3
Subtotal	616	12.2	105.9	51.9
Primarily Rainfed Crops				
Grain Legumes	309	6.1	3.6	1.8
Oilseeds	14	0.3	2.2	1.1
Forage Crops	120	2.4	6.0	2.9
Cereals	4,000	79.0	86.3	42.3
Subtotal	4,443	87.8	98.1	48.1
Total	5,059	100.0	204.0	100.0

1/ Excluding fallow land.

Source: Morocco Fertilizer Sector Memorandum, Report No. 4526-MOR. Cited in World Bank, Agricultural Sector Loan, Technical Support Volume, p. 92.

Table 8-6: Fertilizer Consumption by Rainfall Zone

	% of Total Fertilizer Use	Arable Land	
		Million Ha	% of Total
Irrigated land	50	0.8	9
Over 400 mm of rainfall	35	3.3	43
Under 400 mm of rainfall	15	3.7	48

Source: World Bank, Fertilizer Sector Memorandum, Report No. 4526-MOR, as cited in World Bank, Agricultural Sector Loan, Technical Support Volume, p. 93.

available to the farmer on the most economical amounts of fertilizer to use, or on management practices that would maximize fertilizer use efficiency. For example, traditional application methods for urea, the most commonly used form of nitrogen, undoubtedly result in substantial volatilization loss. As a result of factors such as these, Moroccan farmers spend large amounts of money each year in applying unneeded nutrients, while the actual fertilizer requirements remain unmet.

While research has been carried out to establish a universal fertilizer recommendation for major cereal crops in Morocco, this effort has not been very successful, primarily because of the varying soil types within the country. Current research under the USAID-funded Dryland Agriculture Applied Research Project aims to develop a fertilizer "calibration" for each major soil type. This would permit recommendations based on the calibration according to crop, soil type, previous crop, and residual fertility.

Fertilizer Production and Distribution

In 1982, approximately 48 percent of the total fertilizer consumed in Morocco (51 percent of nutrients) was produced locally from domestic phosphates and imported raw materials and intermediate goods (e.g. ammonia, potash, sulfur). The balance was imported in the form of final products. Prior to 1970, the importation and distribution of fertilizer products was handled entirely by the private sector. In 1974, after an increase in petroleum prices caused international fertilizer prices to jump and supply shortages to develop, the government began playing an increasingly important role in fertilizer production and distribution.

Currently, the public sector is responsible for all fertilizer imports, manufactures over two-thirds of locally produced fertilizer, and distributes at the wholesale level approximately one-half of all fertilizer consumed in the country. There are only two domestic fertilizer producers in Morocco. The first, and by far the larger of the two, is Maroc Chimie, a subsidiary of the Office Cherifien des Phosphates (the government-owned holding company that is responsible for developing the country's phosphate resources). The second is a relatively small private firm, Société Cherifienne d'Engrais et de Produits Chimiques (SCE). SCE produces about 25 percent of locally produced fertilizers.

Fertilizants Marocains (FERTIMA), another parastatal, has a legal monopoly on fertilizer importation. FERTIMA also acts as domestic sales agent for OCP/Maroc Chimie, maintaining a distribution network at both the wholesale and the retail level. FERTIMA accounts for over 50 percent of total wholesale sales of fertilizers, while SCE accounts for another 30 percent. The remainder of the wholesale fertilizer market is divided among another eight private companies. In general, these other companies distribute a range of agricultural inputs in addition to fertilizer. Fertilizer distribution at the retail level is primarily in the hands of the private sector.

Effects of Fertilizer Pricing Policies and Regulation

Wholesale and retail prices are controlled though a system of reference prices and fixed distribution margins and allowances. Fertilizer prices are set by the GOM at a level favorable to the farmer. Indeed, ratios of fertilizer and output prices in Morocco are among the most favorable in the world. Moreover, these ratios have been declining, as the support prices of major crops have increased more rapidly than the price of fertilizer.

The GOM compensates FERTIMA for the difference between the set price and the real price that it pays for imports or local production. Over time, the size of this subsidy has grown dramatically, reaching Dh 334 million (US-$36 million) in 1984. This amounts to roughly 45 percent of total public investment in agriculture.

On cost effectiveness, efficiency, and income distribution grounds, it does not appear that subsidizing fertilizer is the most appropriate way to promote fertilizer consumption in Morocco. Low fertilizer use in the country is primarily due to technical and distributional constraints, rather than to the price of fertilizer, itself. With this in mind, the government has taken steps to greatly reduce fertilizer subsidies, starting with a 25-30 percent increase in reference prices, effective September 1983. Nevertheless, because of increased levels of consumption and exchange rate adjustments, fertilizer subsidies are are expected to rise to Dh 450 million (US-$48 million) in 1985, over five times the level of 1979.

The price structure of fertilizer has involved fixed distribution margins and fixed costs for transportation, handling, blending, bagging, and so forth that, until recently, did not reflect true factor costs or changing market conditions. This considerably reduced incentives for private sector participation in fertilizer distribution. Moreover, the control of the fertilizer pricing structure has discouraged fertilizer wholesalers from investing in the modernization of existing plants and from expanding the network of blending, storage, and distribution facilities. Consequently, fertilizer storage facilities are inadequate, outdated, and geographically concentrated (in the Casablanca and Fes-Meknes-Kenitra areas). In periods of peak demand, the consequent strain on transport, storage, blending, and bagging operations creates short-term regional supply difficulties and, in some cases, temporary cut-offs of supplies at the retail level.

Currently, Morocco has a storage capacity for fertilizer estimated at 300,000 MT, of which the two principal distributors (FERTIMA and SCE) provide 220,000 MT. Storage for some 400,000 MT is needed to meet the demand during peak periods. Consequently, upwards of 60 percent of the fertilizer produced must be stored in the open during the crop season. Protection from sun, rain, and surface water is generally ineffective. A Fertilizer Sector Assessment, undertaken by the IBRD in 1983, drew attention to the qualitative and quantitative losses occurring under those conditions, including degradation of the nutrient composition of the fertilizer, physical coagulation of fertilizer inside bags, and the dissolution of the contents of bags resulting in the subsequent collapse of stacks. An estimated 20-25 percent of Morocco's fertilizer output is damaged by moisture and requires rebagging. Rebagged products, however, do not have the same nutrient or physical quality of the original product, and are high in moisture and of poor consistency. The IBRD

estimated that product losses and rebagging due to poor storage conditions had cost FERTIMA alone some Dh 10 million in 1981/82.

The low fixed margins, required to keep down fertilizer prices to the producer, have also discouraged retailers from expanding their distribution network or from storing fertilizer. Consequently, the vast majority of fertilizer supplies are sold in larger market towns, with only an estimated 15 percent of total fertilizer supplies being sold in weekly souks. Few merchants deliver fertilizer to farms. Consequently, distance between the farm and the supply point is a major constraint to fertilizer use. Moreover, there is virtually no storage at the local level. Local suppliers have no incentive to build up stocks to respond to sudden demand, or to carry over unsold stocks from one year to the next, while farmers rarely have the facilities necessary to store fertilizer for extended periods of time.

Policy Reforms

The GOM has introduced major policy reforms as part of its Agriculture Sector Adjustment aimed at overcoming the constraints faced by the fertilizer sector. These include (1) strengthening the storage and distribution system, (2) encouraging the participation of the private sector and cooperatives in storage and distribution, and (3) progressively eliminating fertilizer subsidies through increases in the reference price. In general, progress towards the attainment of these objectives has been good.

Part of the program involves revisions of the domestic fertilizer price structure to reflect real costs. As a result of these changes, the fertilizer industry is now examining proposals to increase storage and blending capacity in additional areas of Morocco. The additional storage capacity planned for construction within the next two years (130,000 MT) will still, however, be insufficient to satisfy medium-term needs, given the expected fertilizer growth rate of 6 percent per annum. Therefore, it is anticipated that additional facilities will be required before 1990.

4. Pest Control and Pesticide Use

Crop losses to insects and plant diseases can be serious, and in some years, devastating for Moroccan agriculture. Hessian fly, for example, is the most serious insect pest in cereals in Morocco. In a survey conducted in 1984, over half of the wheat fields sampled were moderately to heavily infested with the pest [Hatchett, et. al., "Assessment of Cereal Pests in Morocco, 1985]. Hessian fly can reduce yields to zero and, while damage is normally considerably less, little is known about the insect and its habits to predict when and where it will cause the greatest damage. USAID is supporting research on a number of fronts aimed at combatting this pest. At the Aridoculture Center in Settat and in the U.S. research is underway (as part of the USAID-supported Dryland Agriculture Applied Research Project) to develop wheat that is resistant to the biotypes of fly present in Morocco. The specific genes which provide resistance to the Hessian fly in Morocco have already been identified. Work is now underway by Moroccan plant breeders studying in the U.S. to make crosses which will transfer resistance into adapted Moroccan varieties. This will be a 7 to 10 year research effort, however. Concurrently, tests will begin in 1985-86 on a U.S. spring wheat variety that has resistance to Morocco fly biotypes. Finally, research is underway to develop crop management strategies that will reduce insect

damage. [MIAC, Annual Report 1983/84, p. 2-3, and INRA/MIAC, 1985-86 Integrated Work Plan, p. 7-9].

When weather conditions and other conditions are right, plant diseases can seriously lower the yields of susceptible varieties. Important barley diseases include powdery mildew, net blotch, barley stripe, barley yellow dwarf virus and fusarium. Diseases affecting wheat include septoria and spot blotch and fusarium. Drought stress may so weaken plants that diseases attack the crop and spread rapidly. Much of the barley crop in the Settat area was lost in the 1983 and 1984 drought years to powdery mildew and net blotch, long before all the soil moisture was exhausted. Research is also currently underway, under the Dryland Agriculture Research Project, to address these problems. In particular, efforts are being made to incorporate disease resistance into the overall varietal development program for cereals, as well as to evaluate the economic impact of important diseases under various soil and climatic conditions.

Inadequate weed control is also a serious limitation on crop yields. Substantial reductions in cereal yields result since the weeds, prior to being pulled, use moisture and nutrients necessary to the crop. However, weeds provide farmers with a forage source during a part of the crop year when alternatives are limited. Researchers at the Aridoculture Center have demonstrated the efficacy of good weed control in increasing cereal yields. Data from over 20 on-farm trials showed average yield increases of 22 percent, with some increases in excess of 50 percent in fields with high weed infestations. In addition, though the use of "weedy fallow" in rotation with cereal crops, provides some forage during the crop season, it does so at the expense of moisture loss for the subsequent crop.

Morocco does not manufacture insecticides, herbicides, and other pesticides. The compounds that are imported may be marketed in the form (and containers) in which they are imported, or they may be repackaged (or diluted and repackaged) by the importer. Pesticides are registered and regulated by the Division des Controles Techniques et Phytosanitaires in the Direction de la Protection des Vegetaux, des Controles Techniques et Repression des Fraudes.

Over 2000 different pesticides are presently registered for marketing in Morocco. About 25 firms sell pesticides in the country. Several of these firms are national in scope and apparently repackage chemicals purchased in wholesale lots and/or bulk. In general, however, the sales force of these companies does not "know" its products, and therefore cannot impart technical and practical information to farmers. Unlike other inputs, pesticide use is not subsidized by the Government, though small farmers can purchase pesticides and rent backpack sprayers from CTs and CMVs.

The use of pesticides by Moroccan farmers is limited. Most of that used is used on irrigated crops, especially horticultural crops, which are exported. The real returns to pesticide use are probably in irrigated agriculture, where the micro-climates encourage pests and the value of the crop is high enough to warrant the expense. Only a fraction of the land in cereals, legumes, forages, and pulses is treated with pesticides, primarily because of the need for weeds as a fodder source. In addition, the relatively low output and the subsistence orientation of rainfed agriculture, apparently limits the demand for pesticides in rainfed areas.

The weakness of the extension system makes it difficult to train farmers in safe, effective application techniques, dosages, and timing of usage. Often, not knowing the products, small farmers opt for the cheapest product available, often not getting the results desired. Consequently, farmer confidence in pesticides has been undermined by unknowingly using pesticides that are outdated and no longer effective.

5. Mechanization

The mechanization of farming practices has been expanding at a very rapid rate in Morocco and much of the country's cereal production is now mechanized. For example, in the Settat area, 80 percent of the land is tilled at least once per year by tractor drawn implements. In the drier areas, mechanical traction may account for 90-95 percent of land preparation. In addition, 85-80 percent of the cereal harvest is now done by combine. [INRA/MIAC, Dryland Farming Applied Research Project, "Integrated Work Plan 1985-1986", p. 13-14].

The GOM has encouraged mechanization through government-equipped work centers (Centres des Travaux - CTs), mechanization credit to farmers, and reduced import duties on tractors, combines and other farm equipment. In 1978, Morocco's use of tractors and combine harvesters was very limited, totaling only 23,000 tractors (330 cultivated hectares per tractor) and 2,100 combines (3,685 cultivated hectares per combine). This was a very low rate, even in comparison with neighboring countries with similar climatic conditions. In 1982, the GOM began to actively stimulate mechanization as a means of increasing cereal production (more timely seeding, better seedbed preparation). Access to credit to purchase farm machinery was increased, machinery repair shops were made eligible for CNCA credit, and duties and taxes on tractors, combines and other agriculture equipment were eliminated (in effect reducing the price of tractors by 30 percent). At the present time there are some 40,000 tractors and 5,000 combines operating in the country.

Other factors that have encouraged the expansion of the use of agriculture machinery have been the level of seasonal wages vis-a-vis custom charges and the need to ensure the timeliness of cultivation activities. It is estimated that about 60 percent of the total mechanized work is carried out by contract, with more than 80 percent of contract work carried out by private farmers.

Due to its highly seasonal demand, the local cost of labor in many areas remains high, encouraging the trend towards mechanization. For example, it costs four times as much to harvest grain by hand as by combine and, in the former case, the grain still must be threshed separately after the harvest. Farmers with small landholdings can particularly benefit from custom mechanization. Many find it less expensive to hire tractors and operators to do primary tillage than to maintain draft animals year round.

In addition, the importance of timing of cultivation practices under Moroccan farming conditions has been a factor favoring increased mechanization. Because of Morocco's relatively short rainfall period (October-April) it is extremely important that land preparation and planting be carried out at the most opportune time. If planting under semi-arid conditions is not carried out immediately after the first rains, a substantial

part of the limited growing season is wasted. Since ploughing with the use of animal traction can only commence after some 150 mm of rain has fallen to loosen the soil, sowing in areas using animal traction usually occurs later than in the mechanized areas. This late sowing results in lower yields because less moisture is available for use by the plant and because the growing season is shorter. Tractors, on the other hand, can prepare the land before the rains start, and generally do a much better job of seedbed preparation, which allows better infiltration and moisture storage. Applied research in Morocco indicates that, as a result of timely land preparation carried out by tractors and early sowing, cereal yields can be increased by as much as 0.3 metric tons/ha. The importance of timely land preparation was demonstrated to farmers by the 1980-81 drought. At that time, the farmers that received an adequate yield were those who prepared the land and seeded it on a timely basis.

Unfortunately, the demand for custom work often exceeds local supply. While local CTs offer custom work services, they suffer from bureaucratic inertia, poor equipment maintenance, lack of spare parts, and inadequate amounts of equipment to meet local demand. For example, of the 773 mechanized units at CTs in 1984, around 30 percent were out of use. Also, available service agents do not wish to service CT equipment, since there are very long delays in payment. In the end, CT tractors are grossly underutilized (about 200 hours/year in 1982/83). [World Bank, Agriculture Sector Adjustment Loan, Technical Support Volume, p. 29]. Under the GOM's Agriculture Sector Adjustment Program, farm mechanization services by CTs will be completely phased out by 1987.

Though large numbers of tractors have been introduced into Morocco, the country's unique combination of soils and climate makes it difficult to directly transfer equipment and practices from other locations. In addition, the primary tillage, cultivation, and seeding equipment needed to complement these tractors is lacking. Consequently, the major benefits from mechanization (improved tillage, better seedbed preparation, water conservation, better seed and fertilizer placement, etc.) are not being realized.

The adaptation and development of appropriate farm equipment will, therefore, play an important role in the long term improvement of the country's agriculture. The need to test and adapt field equipment has been the focus of research efforts of the USAID-funded Dryland Agricultural Applied Research Project. Priorities for research under that project include: the design pf tillage, planting, and small harvesting machines and systems, and the dissemination of technical information to the field.

6. Supply and Demand for Credit

In Morocco, agricultural credit is provided by informal sources, by commercial banks, and by the Caisse Nationale de Credit Agricole (CNCA). Agricultural credit is well integrated into the farm production system. Nevertheless, agriculture has consistently received a smaller share of credit in terms of its contribution to GNP than the other sectors of the economy. The share of total credit going to agriculture declined between 1977 and 1982, from 11.8 percent to 7.8 percent. The amount of institutional credit available to agriculture has increased in recent years, however, due to an expansion of activities by the CNCA. According to data available in 1979, the

CNCA provided 65 percent of short-term institutional credit and 95 percent of medium- and long-term credit to agriculture [World Bank, Financial Sector Study, p. 103-5].

Informal credit exists in the form of loans between private parties and in the form of production through association (arrangements whereby each party contributes some factor of production -- land, labor or capital -- and the proceeds are distributed based upon prior agreement). No statistics are available on the number of farmers who use informal credit. Nor is much known about the amount, terms and adequacy of credit available from informal sources. It has been estimated that the effective compounded interest rate on small production loans (e.g. to buy ordinary seed and a few bags of fertilizer) from private creditors may range from 20 to 30 percent. The relative importance of direct private lending of funds, however, seems to have significantly decreased, especially in recent years. This is attributed to the availability of institutional credit, more attractive alternative uses of private investment capital, and the continuing drought conditions, which have reduced privately available resources. [Drought Recovery Credit Project Paper].

There are, at present, no commercial banking institutions in Morocco that provide significant amounts of medium- and long-term credit to the agricultural sector. Almost all commercial credit financing in agriculture (as well as in other sectors) is short-term. Commercial bank lending to agriculture is limited because: (1) commercial banks try to avoid making small loans with relatively high transaction costs; (2) they lack adequately trained agricultural specialists; (3) their lending is usually restricted to borrowers keeping sizeable deposit balances and offering significant guarantees; and (4) their branches are mostly located in urban centers along the Atlantic coast (a quarter of the banking offices in Morocco are located in Casablanca). Commercial banks do participate, under the strict control of the Ministry of Finance, in the syndicated financing of the production and marketing operations of the state-owned agricultural enterprises. [World Bank, Fifth Agriculture Credit Project, p. 11-12].

The principal source of institutional credit for the agricultural sector is the CNCA. The CNCA consists of a head office, 38 regional branches (Caisses Regionales de Credit Agricole - CRCAs) and 99 local branches (Caisses Locales de Credit Agricole - CLCAs). An additional 146 seasonal and/or mobile branches of CLCAs are in operation.

The CNCA's head office primarily conducts business with state-owned production and marketing companies, private agro-industrial enterprises and the ORMVAs. The regional offices service medium- and large-scale farmers (in rainfed areas these would those with farms averaging 15-45 hectares). The regional offices account for almost 58% of the CNCA's total loan volume and service about 18.5 percent of the total number of CNCA clients. The local offices service smaller-scale farmers.

Approximately 55 percent of the institutional credit extended to agriculture is short-term. It is primarily used to purchase seed, fertilizer, and animal feed, and to pay for costs of hiring labor or tractors for land preparation and harvesting. Medium-term credit is used to purchase livestock, equipment, construct stables and other farm buildings, develop tree crops, maintain irrigation systems, dig wells and purchase motor pumps. Four types of investment represented more than 75 percent of total term lending by the

CNCA in FY 1983: livestock (34 percent), construction (9 percent), mechanization (25 percent), and draft animals (9 percent).

The weighted average of interest rates on CNCA loans granted between during the 1983/84 crop year (Sept. 1, 1983 to Aug. 31, 1984) was 11.0 percent. Given an estimated inflation rate in Morocco of about 7 percent, this interest rate is positive in real terms. [World Bank, "Sixth Agricultural Credit Project, Initiating Project Brief (FY 87), Management Summary", p. 3].

Loan repayments were very respectable prior to the severe and widespread 1980/81 drought (e.g. the repayment ratio was 84 percent in 1979). Repayment rates dropped significantly after the drought, however. They were 56 percent in 1981 (the rate increased to 76.7 percent after some loans were extended or rescheduled). In 1984 repayment rates were 53.6 percent prior to extension and rescheduling and 72.2 percent after. [USAID, Drought Recovery Credit Project Paper, p. 43, 46].

By late 1984, the prospect of increasing default rates due to the drought seriously threatened the long term financial viability of the CNCA. Therefore, the CNCA established a program to reschedule the overdue loans to farmers in drought stricken regions. The rescheduling program extended the period over which these farmers had to repay their overdue loans, thus reducing the size of their periodic payments and making it easier for them to meet these payments from future income. USAID provided a $13.5 million loan to finance the rescheduling program for CRCA clients. The EEC provided another US-$20 million to enable the CNCA to reschedule the overdue loans of CLCA clients. The USAID assistance also included a $1.5 million grant to finance technical assistance, training, and commodities aimed at strengthening the CNCA as a sound financial institution.

In spite of the drought, CNCA lending operations have expanded greatly in recent years, as is demonstrated in Table 8-7. In particular, lending to small-scale farmers (through CLCAs) has been increasing rapidly. The average annual growth rate of lending by CLCAs was 28 percent during 1970-74, 22 percent during 1975-80, and 30 percent during 1981-85. [CNCA, "Experience in Financing Small Scale Farmers, p. 15.] The CNCA has estimated that, in the next four years, its disbursements for short-term credit will almost double, while disbursements for medium-term credit will increase by over 140 percent. [Caisse Nationale de Credit Agricole, "Sixieme Projet de Credit Agricole, June 27, 1985]. Given the slow growth of the volume of resources mobilized on the domestic market, the CNCA's loan expansion program has had to rely on external, concessional sources of financing (IBRD, IFAD, KfW, EEC, and USAID). In 1982, these sources accounted for roughly 35 percent of the CNCA's total resources.

Despite this rapid expansion, the World Bank estimates that only about 500,000 farmers have access to credit through the CNCA. According to the World Bank, this is only 35 percent of "potential" borrowers. Figures available indicate that the 38 existing regional offices are reaching 80 percent, and the local offices 25 percent of their "potential" clients. The expansion of CNCA lending has been partly constrained by difficulties in physical access by farmers to CNCA outlets, and by borrowing limitations imposed by the CNCA on farmers who are CLCA clients that do not hold legal

title to their land (about 95 percent of the total). [World Bank, "Sixth Agricultural Credit Project, Initiating Project Brief (FY 87), Management Summary", p. 3].

Determining whether lack of credit is a serious constraint to increased aggregate agricultural production is problematic. Much of the projected expansion of CNCA credit, especially short-term credit, is aimed at the smaller, more marginal farmer. However, such farmers face a number of constraints to increased agricultural production and productivity, apart from lack of credit. These farms are often too small to achieve economies of scale, possess less fertile lands, and generally have little or no access to improved seeds, fertilizer, and other needed inputs and government services. The emphasis of these small farmers is often on risk avoidance, rather than on maximizing production. Risk avoidance entails a minimization of cash investment and, hence, credit. Thus, the production benefits of extending credit to farmers at the lower end of the spectrum may be relatively low, while the cost of lending will increase as credit is extended to a large number of smaller clients. [Project Paper, Drought Recovery Credit Project, Annex 2: Social Analysis].

Table 8-7: Growth of CNCA Lending, 1968-1985 (in millions of dirhams) [1]

Years	CLCAs			CRCAs/Headquarters			Total		
	Short Term	Medium Term	Total	Short Term	Medium Term	Total	Short Term	Medium Term	Total
Avg 67/68-69/70	3.0	20.1	23.2	165.1	37.1	202.2	168.2	57.2	225.4
Avg 70/71-74/75	9.8	52.7	62.4	261.9	80.8	342.6	271.6	133.4	405.1
Avg 75/76-79/80	24.4	156.3	180.6	407.9	190.1	598.0	432.3	346.4	778.7
1980-81	64.0	190.5	254.5	515.7	181.3	697.0	579.7	371.8	951.5
1981-82	126.1	303.6	429.7	691.3	378.1	1069.4	817.4	681.7	1499.1
1982-83	97.0	307.7	404.7	772.2	564.8	1337.0	869.2	872.5	1741.7
1983-84	109.6	365.8	475.4	771.6	480.6	1252.2	881.2	846.4	1727.6
1984-85	161.6	678.1	839.7	997.0	821.2	1798.2	1138.6	1499.3	2637.9

1/ Totals may not add up due to rounding.

Source: CNCA, "The Experience of the Caisse Nationale de Crédit Agricole in Financing Small Scale Farmers by Local Credit Offices", paper presented at the Regional Conference on Agricultural Credit and Supporting Services to Low-income Farmers, Rabat, Morocco, Oct. 22-25, 1985, p. 20.

IX. PRODUCER PRICES

1. Cereals

The Office National Interprofessionnel des Céréales et Legumineuses (ONICL), a central cereal marketing board, is responsible for ensuring adequate grain supplies and stable prices throughout the country. ONICL is the sole contractor for government importation of cereals and pulses. ONICL is also responsible for setting official cereal prices and for enforcing those prices by intervening in the market. Official bread wheat prices are obligatory, in the sense that no bread wheat can be sold legally outside the official ONICL marketing system, except in small quantities to satisfy household needs.

The GOM has attempted to insulate producers from the effects of subsidized consumer prices [1] by setting floor prices for cereals and creating a cereals procurement system. In the past, Morocco's official cereal producer prices were well below their border price equivalents. Over the last three years, however, the GOM has substantially increased producer prices for cereals (and announced these price increases prior to the planting season), as a means of stimulating increased domestic production. Table 9-1 details the recent changes in official producer prices for Morocco's major cereals. Official domestic support prices for wheat and barley have generally been above world prices in recent years. (See Tables 9-2 and 9-3).

Nevertheless, even with official prices equal to or above world prices, Morocco's cereals pricing and procurement system has not been sufficient to encourage domestic production and adequately compensate cereal producers. Nor have the benefits of this system been equitably distributed among domestic cereals producers (the more modern and larger-scale farmers in irrigated and higher rainfall areas have benefitted disproportionately).

For a number of reasons, official floor prices are rarely, if ever, available to farmers. First, smaller-scale producers generally cannot meet the quality and delivery standards required in order to receive the official price. In addition, the number of government purchasing centers is limited and, since cereal prices are set at the marketing/collection center and not at the farmgate, it is the farmer which must bear the transportation costs.

Further, official output prices are based on model crop budgets and primarily compensate for increases in input costs. These official prices do not take into account seasonal or regional variability in costs. For example, domestic grain price levels may fall below official prices right after the harvest, when many farmers must sell their output.

Finally, due to institutional and budgetary constraints, ONICL's procurement of grain from the domestic market, with the exception of breed wheat, has been minimal. Table 9-4 gives the level of ONICL purchases

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1/ Consumer prices for wheat products are 50 percent lower than international prices. Moreover, in 1984/85 the price of flour, at 112 Dh/quintal, represented only 55 percent of its real price from a decade ago.

Table 9-1: Changes in Official Producer Prices for Cereals

Crops	1982/83 (Dh/MT)	1983/84 (Dh/MT)	1984/85 (Dh/MT)	1985/86 (Dh/MT)	% Change from 82/83 to 85/86
Durum Wheat	1400	1500	1800	2000	29
Bread Wheat	1400	1500	1800	2000	29
Barley	1000	1100	1600	1650	50
Corn	1000	1300	1600	1800	60

Source: USAID/Rabat, "Update on Moroccan Cereal Production and Producer Prices", Cable - RABAT 0074, January 4, 1985.

Table 9-2: Bread Wheat: CIF and Support Prices, 1981-85

year	CIF Casablanca (Dollars/MT)	Exchange Rate (Dh/Dollar)	GOM Support Price (Dollars/MT)	Percent Difference Domestic over World Prices
1981	191	5.7	237	24
1982	164	6.0	233	42
1983	148	7.1	197	33
1984	155	8.7	172	11
1985	160 (est)	9.2	196	22

Source: USAID/Rabat, "Update on Moroccan Cereal Production and Producer Prices", Cable - RABAT 0074, January 4, 1985.

Table 9-3: Barley: CIF and Support Prices, 1981-85

year	CIF Casablanca (Dollars/MT)	Exchange Rate (Dh/Dollar)	GOM Support Price (Dollars/MT)	Percent Difference Domestic over World Prices
1981	152	5.7	168	10
1982	134	6.0	167	24
1983	144	7.1	141	(2)
1984	147	8.7	126	(16)
1985	150 (est)	9.2	163	8

Source: USAID/Rabat, "Update on Moroccan Cereal Production and Producer Prices", Cable - RABAT 0074, January 4, 1985.

Table 9-4: ONICL Cereals Purchases as a Percentage of Total Domestic Output

Year	Durum Wheat %	Bread Wheat %	Barley %	Corn %
1980	10	33	4	18
1981	12	44	6	12
1982	1	17	2	9
1983	4	62	8	28
1984	2	49	2	8
Average	6	41	4	15
Range	1-12	17-62	2-8	8-28

Source: AIRD, Memo to Dr. Purvis, USAID/Morocco.

as a percentage of domestic production for the four major cereals. Domestic procurement is subject to officially set margins for marketing, handling, and storage. Over the past decade, these margins have been squeezed such that domestic procurement is not at the present time profitable for mills [Tuluy, Internal Memorandum on the Effective Protection of Moroccan Agriculture, p. 9]. Moreover, since the government support price is higher than the concessional import price, it is cheaper for the government to buy bread wheat abroad than to pay its support price to Moroccan farmers. Government purchases of bread wheat have averaged around 40 percent of estimated total bread wheat production over the past 5 years.

Since 1979, the average annual market (souk) price for bread wheat has generally been below the official price. The average annual souk prices for durum wheat and barley, on the other hand, have been above their respective support prices. The prices for these cereals on the domestic market do, however, fall below the official price during the year, particularly during the harvest period.

There is little public intervention in the markets for durum wheat and barley, and therefore the official prices for these crops probably have little impact on the free market price. Since durum wheat and barley souk prices have been above the official prices, farmers have had little incentive to sell these crops to ONICL. In turn, ONICL has had little incentive to purchase them. In 1984/85, for example, ONICL purchased only 2 percent of estimated national durum wheat and barley production.

2. Producer Prices for Other Crops

Internal markets for food legumes are free and unregulated. However, Morocco had been an important supplier of food legumes to the EEC. Between 1977 and 1984 the GOM, through ONICL which controls export licenses, imposed export restrictions on food legumes in an effort to dampen domestic prices rises.

The pricing structure for sugar is similar to that for bread wheat, in that there is a "unique" price. However, since the government controls processing capacity, there is, in fact, only a single market and a single price. A national average beet and sugarcane price is set annually by an interministerial commission. The official producer price for sugar has generally been well above world sugar prices. Rainfed producers receive an additional 15 Dh/MT to compensate for their lower yields and more erratic output. Rainfed and high yield irrigated sugarbeet production appears to be profitable for the farmer. Without the compensatory 15 Dh/MT payment, however, rainfed beet production would not be profitable. Further, given a uniform price and the wide range of yields under irrigated conditions, average profitability to the farmer varies considerably. While production in the Tadla and Doukkala, with yields exceeding 40 MT/ha, is highly profitable to the farmer, irrigated beet production in Moulouya and Gharb are not.

The domestic market for horticultural products in Morocco is relatively free and the government does not set domestic horticultural prices. However, domestic producer prices has been affected by the producer prices paid by the Office of Commercial Exports (OCE) for horticultural exports, especially of citrus. Limited producer price data suggests that prices in the domestic

market have been 40 percent of the export price for clementines and 60 percent for "late" oranges, and 90 percent for navel oranges.

The price structure for vegetables resembles that of citrus in that, while domestic market prices are not set officially, the GOM can exert downward pressure on the internal price through its export pricing policy. It appears, however, that growing domestic demand for vegetables has put pressure on domestic prices such that they are approaching their border price equivalents. [Tuluy, Internal Memorandum on the Effective Protection of Moroccan Agriculture, pp. 13, 19, 24-25].

X. LIVESTOCK PRODUCTION

1. Importance of the Livestock Sector

Livestock production in Morocco represents 36 percent of gross agricultural production (which, in turn, accounts for 11 percent of GDP). Beef and milk production account for around 47 percent of livestock production, sheep for 30 percent, poultry for 14 percent, and goats for 4 percent. Miscellaneous activities, including wool production, small animals husbandry, beekeeping, and so forth, make up the remaining 4 percent of production. Morocco is nearly self-sufficient in red meat production. It does, however, import dairy products to compensate for seasonal shortages in domestic production. Moroccan exports of meat products are negligible.

According to the World Bank, livestock production provided approximately 330,000 manyears of employment in 1981 (or 17 percent of total agricultural employment). Almost 95 percent of the population directly dependent upon agriculture are involved in livestock husbandry. Approximately 19 percent are dependent solely upon livestock production. Another 51 percent produce both crops and livestock.

Most livestock production takes place in small and medium-sized operations, generally in conjunction with cropping activities. Livestock production is particularly important for low income producers. Farmers with less than 10 hectares own 78.3 percent of the country's cattle, 63.6 percent of the sheep, and 84.4 percent of the goats (the landless rural population accounts for 22 percent of the cattle, 18 percent of the sheep and 16.4 percent of the goats). (See Table 10-1).

It has been argued that Moroccan agriculturalists are primarily livestock farmers raising cereals, rather than cereal farmers raising livestock. Indeed, the interrelationship between cereal production and livestock is vital to understanding the Moroccan farming system. The foraging of ruminant livestock on croplands ensures that as much as possible of the bio-mass per hectare of land is harvested. Animals utilize cereal crop residues, e.g. straw, stubble, beet pulp, and poor quality grain that is not fit for human consumption and would otherwise be wasted. Indeed, demand by livestock is so great that other uses of crop residues (e.g. as mulch or as a source of biogas) is rather limited. Ruminants also play a part in cereal improvement efforts through crop rotations involving nitrogen-fixing legume forages. The use of legumes to increase soil nitrogen levels, combined with the use of animal wastes, is probably an inexpensive method to increase soil fertility and hence cereal productivity (especially given that Morocco must import nitrogen for fertilizers).

Sheep and goat production are generally extensive, while cattle production may be either extensive or intensive. Most of the livestock is maintained in household herds. Sheep and goats are normally pastured during the day and confined at night. Cattle under fattening regimes are confined and stall-fed. The daily care of livestock is often managed by women and children. Often, livestock are raised under sharecropping arrangements whereby herdsmen receive a specified share of the offspring. With the exception of cattle being fattened, livestock production involves low levels of capital inputs and moderate levels of labor inputs. Breeding is largely

Table 10-1: Distribution of Livestock According to Farm Size

	Cattle		Sheep		Goats		Camels	
	Number	%	Number	%	Number	%	Number	%
Landless	796.4	22.0	2,368.6	16.6	942.4	16.4	43.2	10.8
Less than 5 ha	1,473.0	40.7	3,967.1	27.8	3,177.7	55.3	104.4	26.1
5 to 10 ha	564.7	15.6	2,540.1	17.8	729.7	12.2	86.4	21.6
10 to 20 ha	430.4	11.9	2,425.9	17.0	517.1	9.0	93.6	23.4
20 to 50 ha	224.4	6.2	1,798.0	12.6	235.6	4.1	61.2	15.3
50 to 100 ha	76.0	2.1	599.3	4.2	74.7	1.3	11.2	2.8
Over 100 ha	54.3	1.5	371.3	2.6	68.9	1.2	-	-
Total	3,619.2	100.0	14,270.3	100.0	5,746.1	100.0	400.0	100.0

	Horses		Mules		Donkeys		Total Livestock	
	Number	%	Number	%	Number	%	Number	%
Landless	30.8	8.6	23.6	6.0	87.5	7.8	4,492.5	17.3
Less than 5 ha	87.8	24.5	192.2	48.7	630.9	56.2	9,633.1	37.2
5 to 10 ha	95.4	26.6	81.3	20.6	208.8	18.6	4,306.4	16.6
10 to 20 "	79.2	22.1	59.2	15.0	126.8	11.3	3,733.2	14.4
20 to 50 "	48.0	13.4	28.4	7.2	56.1	5.0	2,451.7	9.5
50 to 100 ha	12.1	3.4	7.1	1.8	11.2	1.0	791.6	3.1
More than 100	5.0	1.4	2.7	0.7	1.1	0.1	503.3	1.9
Total	358.3	100.0	394.5	100.0	1,122.4	100.0	2,5910.8	100.0

Source: MARA 1975, World Bank. Agricultural Sector Adjustment Loan.

Table 10-2: Livestock Populations, 1965-1983 ('000)

Year	Cattle	Sheep	Goats
1965	2,288	8,659	5,050
1966	2,372	9,607	5,970
1967	n.a	n.a.	n.a.
1968	2,536	10,918	5,852
1969	2,576	11,724	5,824
1970	2,674	11,724	5,553
1971	2,718	11,120	5,023
1972	2,785	11,907	4,616
1973	2,751	13,241	5,527
1974	n.a.	n.a.	n.a.
1975	3,600	14,300	5,700
1976	3,400	13,500	5,600
1977	3,620	14,270	5,750
1978	2,907	15,272	5,972
1979	3,461	15,992	5,703
1980	3,376	16,510	6,153
1981	3,248	15,675	6,153
1982	2,537	10,155	4,091
1983	2,431	12,611	4,911
1984	2,363	11,493	4,222

Source: Banque Marocaine du Commerce Exterieur, Monthly Information Review, No. 48, March-April 1984, and No. 51, January-February 1985; DPAE, Enquete Elevage, 1980, 1981.

uncontrolled, few preventive health practices are used, and dietary supplements are seldom given.

Annual rainfall conditions determine the relative importance given to livestock and, given the strong variations in annual rainfall that occur in Morocco, the relative importance attached to livestock by producers varies from year to year. Generally, the drier the year, the more rainfed grain producers must rely on their livestock to generate cash. While livestock may suffer from the lack of forage during dry years, they may constitute the producer's only source of income. Livestock provides a means of investing wealth, for conversion to cash in emergencies, for special events, and to meet peak demands for cash during the year (e.g. at seeding time). In this way farmers attempt to stabilize family income over time and reduce the risks characteristic of agricultural production. Further, due to limitations in the marketing system (e.g. absence of scales), the prices received for animals only very roughly reflect differences in animal quality. Consequently, it may be very rational for livestock producers to maximize the quantity, rather than the quality, of animals owned.

The interrelationships between crop production, livestock husbandry, and off-farm employment have important implications in terms of promoting changes in crop and livestock practices or new technologies. If an innovation which increases the production in one area causes a loss of income from other sources, it may not improve a family's net income and, therefore, may not be adopted.

2. Trends in National Production

Between 1965 and 1977, the size of the cattle herd increased steadily in Morocco, from 2.3 million head to 3.6 million. Since then, cattle numbers have fallen by 25 percent due primarily to the drought. In 1983, the cattle population numbered 2.4 million head, about equal that in 1967. Similarly, the size of the Moroccan sheep herd almost doubled between 1965 and 1980. After 1980, however, sheep numbers fell by almost 24 percent, from 16.5 to 12.6 million head. The goat population increased by almost 22 percent between 1965 and 1980. Since then it has fallen to pre-1965 levels. (See Table 10-2).

Farmer response to the drought can be seen in terms of offtake. (See Table 10-3). Cattle offtake rates increased in 1981 and 1982. Sheep offtake increased in 1981, but then decreased significantly in 1982 and 1983, as livestock owners attempted to rebuild their herds. In particular, home consumption (auto-consumption) of mutton decreased by almost 70 percent between 1981 and 1982 and sales at local souks decreased by almost half. In 1983 both home consumption and sales at souks remained at almost half their respective 1981 levels.

Cattle accounted for almost 60 percent of total red meat produced by cattle, sheep and goats in 1983. Two thirds of the bovine meat production is from the national dairy herd (pure and cross breeds). On the other hand, meat production from "non-specialized" local breed animals, which constitute 78 percent of the total number of cattle, provided only 40 percent of the beef. Sheep accounted for 32 percent of production and goats for the remaining 8 percent.

Table 10-3: Meat Production by Animal Type

Location of Slaughter	Cattle		Sheep		Goats		Total
	Head ('000)	Tons ('000)	Head ('000)	Tons ('000)	Head ('000)	Tons ('000)	Tons ('000)
1979							
Munic. Slaughterhouses	309	47.8	1,752	20.2	131	1.4	69.4
Souks	400	38.4	1,408	17.0	692	7.1	62.5
Home Consumption [1]	52	4.7	2,461	30.8	652	6.0	41.5
Clandestine Slaughter	9	1.1	47	0.6	31	0.3	2.0
Total	770	92.0	5,668	68.6	1,506	14.8	175.4
1981							
Munic. Slaughterhouses	363	49.6	1,896	21.3	168	1.7	72.6
Souks	460	50.9	2,160	24.4	746	6.6	81.9
Home Consumption	63	5.7	2,356	26.1	628	6.4	38.2
Clandestine Slaughter	5	0.3	31	0.3	33	0.3	0.9
Total	891	106.5	6,443	72.1	1,575	15.0	193.6
1982							
Munic. Slaughterhouses	425	57.1	1,670	22.6	140	1.4	81.1
Souks	421	44.7	1,276	15.8	925	9.1	69.6
Home Consumption	60	5.6	696	7.4	324	3.0	16.0
Clandestine Slaughter	45	3.9	143	1.6	116	1.0	6.5
Total	951	111.3	3,785	47.4	1,505	14.5	173.2
1983							
Munic. Slaughterhouses	324	51.5	1,567	20.0	87	0.9	72.4
Souks	329	36.6	1,292	15.3	782	7.7	59.6
Home Consumption	35	3.4	1,134	13.7	371	3.9	21.0
Clandestine Slaughter	13	1.3	87	1.1	58	0.5	2.9
Total	701	92.8	4,080	50.1	1,298	13.0	155.9

1/ Consumption by the producer.

Source: MARA/Direction de l'Elevage, cited in World Bank, Agriculture Sector Loan, p. 160.

Meat production in Morocco, as measured by offtake and carcass weight, is relatively low, given the size of the national herd. (See Table 10-4). Due to the low offtake and low carcass weight, output is only 26.6 kilograms of meat per existing head of cattle and 2.6 kilograms for sheep. This compares with 100 kilos of beef per head of cattle in the EEC and 8 kg of lamb per head of sheep in New Zealand). [World Bank, Sector Loan, p. 143]. This low output is due to the generally low levels of animal nutrition, inadequate husbandry practices, and insufficient application of disease and parasite control programs.

Annual red meat consumption per capita in Morocco was estimated at 15.7 kg in 1970, and fell to 13.9 kg in 1980 (See Table 3-3). The government recently elaborated a "Plan Viande" aimed at increasing meat production in the country by the year 2000 (see Table 10-5). According to these predictions, beef, mutton and white meat production will each more than double, while goat meat production will increase by 40 percent. Production increases of this magnitude would permit the level of red meat consumption to reach 16.79 kg/capita/year. Though the plan's predictions are based on historic trends in red meat production, continued increases of this magnitude will undoubtedly require a significant modernization and intensification of production techniques and practices within the livestock sector.

The 1970s saw a period of sustained growth in both the production and consumption of milk in Morocco. In 1981/82, however, consumer subsidies were eliminated (prices were increased by 60 percent and per capita consumption subsequently decreased by over 25 percent). Because of this, the dairy industry has been undergoing adjustment problems. The industry processes 40 percent of total domestic demand. However, seasonal variations in milk supply are enormous, with the peak season supply being almost double that of the lean season (when calf requirements and/or forage availability lowers the amount of milk available for human consumption). During the peak season, the amount of milk available exceeds processing capacity, while in the lean season significant amounts of powdered milk must be imported. The Moroccan dairy processing industry's capacity to make long duration products using the seasonal excess is limited. Existing tariff structures and often subsidized import prices make domestic production of long conservation dairy products unprofitable. Under the auspices of its Agriculture Sector Adjustment, the GOM is attempting to decrease the variability of seasonal milk supply, primarily by increasing the seasonal price differential in milk. In addition, restrictions on the production of low fat milk are being eliminated to promote increased domestic production of butter. [World Bank, Agriculture Sector Loan, Technical Support Volume, p. 141-43].

Poultry production in Morocco has increased dramatically in recent years, with poultry meat production doubling between 1975 and 1982. (See Table 10-6. In 1982, the production of poultry meat totaled 110,000 tons, or approximately 42 percent of the total meat production in Morocco. In particular, the production of chicken meat in the modern sector has grown rapidly, from 8.5 million MT in 1970 to 90 million MT in 1983, increasing its share of production from 25.0 to 75.0 percent. Similarly, egg production, especially within the modern sector, has doubled between 1972 and 1981. This growth has been fueled primarily by production in the modern sector, where egg production increased from 3.5 million eggs in 1971 to 278 million eggs 10 years later. Egg production in the modern sector now accounts for 44.3 percent of total egg production in Morocco.

Table 10-4: Offtake, Carcass Weight, and Meat Output (1982)

	Herd Size ('000)	Slaughtering Rate (%)	Number slaughtered	Carcass average weight (kg)	Meat Output ('000 MT)	Avg. Output of the National Herd [1]
Cattle	4,195	23	951	117.0	111.4	26.55
Sheep	17,994	21	3,784	12.5	47.4	2.64
Goats	7,830	19	1,504	9.7	17.6	2.24

1/ Kg/head in the national herd, (i.e. meat output divided by total herd size).

Source: World Bank, Agriculture Sector Loan, Livestock Subsector Note, Meat and Poultry, p. 2.

Table 10-5: Projected Increases in Red Meat Production in Morocco 1980-2000, (MT)

	1980	1985	2000
Total Red Meat	190,000	247,000	545,000
Cattle	107,000	154,500	395,000
Sheep	52,000	63,000	110,000
Goat	25,500	27,500	35,000
Camel	5,000	5,000	5,000
White Meat (chicken)	106,000	145,000	363,500
Offal	34,750	45,500	100,500
Total Meat	330,750	437,500	1,009,000

Source: MARA/DE, Table Ronde: Production de Viandes Rouges, Rabat, Nov. 20, 1984. Addition errors are in the original source.

Table 10-6: Poultry Production in Morocco, 1970 to 1983

	Production by the Modern Sector	% of Total Prod.	Production by the Traditional Sector	% of Total Prod.	Total National Production
White Meat ('000 MT)					
1970	8,500	29	20,750	71	29,250
1971	10,080	33	20,700	67	30,780
1972	18,800	47	21,400	53	40,200
1973	25,880	54	22,100	46	47,980
1974	24,070	51	22,800	49	46,870
1975	25,000	50	24,700	50	49,700
1976	30,760	56	24,250	44	55,010
1977	56,250	69	25,000	31	81,250
1978	64,430	71	25,750	29	90,180
1979	72,430	73	26,500	27	98,930
1980	70,000	70	30,000	30	100,000
1981	55,000	73	20,000	27	75,000
1982	80,000	73	30,000	27	110,000
1983	90,000	75	30,000	25	120,000
Eggs (millions)					
1970	1	0	306	100	307
1971	3	1	316	99	319
1972	6	2	325	98	331
1973	23	6	335	94	358
1974	42	11	345	89	387
1975	46	11	355	89	401
1976	60	14	366	86	426
1977	110	23	377	77	487
1978	140	27	388	73	528
1979	200	33	400	67	600
1980	201	33	412	67	613
1981	278	40	412	60	690
1982	340	45	412	55	752
1983	415	50	412	50	827

Source: MARA/DE, cited in MARA/AIRD, Etude sur la Politique des Prix, p. 153.

3. Constraints to Livestock Production

Morocco is comparable to the U.S. and other developed countries in terms of livestock/per capita. Nevertheless, the Moroccan livestock industry only accounts for around 36 percent of total agricultural income, as opposed to at least 50 percent of agricultural income in the U.S. Part of the reason for this relatively poor performance is low productivity per animal.

Animal Nutrition

Inadequate nutrition is probably the most serious problem facing Moroccan livestock. It leads to less meat, milk, and wool production, lower reproductive rates, and decreased resistance to diseases and parasites. In addition, inadequate nutrition limits the benefits possible from breeding and animal health programs. The nutrition problem involves not only the inadequate quantities of forage consumed, but also poor quality. Improving the quantity and quality of feed will require that livestock owners produce more of their own feed, and/or support improvements in the quantity and quality of forage production from communal rangeland.

The importance of inadequate nutrition in livestock loss is demonstrated in the case in the Western High Atlas. In that region, sheep losses are extreme during the winter months when forage is unavailable, accounting for upwards of 30 percent of total disappearance (the remaining 70 percent being attributed to sales or home consumption). Livestock deaths are caused by starvation (generally chronic starvation combined with extreme stress during short periods when the sheep are snowed in). Since the sheep are in a weakened condition, almost all losses due to diseases and parasites occur at this time of year.

The production of sheep and goats, and to a lesser extent cattle, integrates rangeland forages. crop residues, and cultivated forages. The extent to which these resources are used varies from region to region. (See Table 10-7). During the rainy season, for example, livestock may graze on green barley and on the available forage in untilled fallow fields and collective lands. Confined cattle are frequently fed the material weeded from the cereal plots. After the cereal harvest, animals are grazed on the stubble and later on corn stover. Until the onset of the rainy season, they must make do with the forage available on untilled fields and collective lands. In the more mountainous regions, rangelands contribute the majority of the nutrients consumed. In highly developed regions, on the other hand, the total forage utilized from rangelands may be as low as 20 percent of the annual forage consumed. In general, therefore, rangelands support livestock during the crop growing season. Once the crops are harvested, these same animals will consume the crop residues. Thus, the complementarity of rangeland forage and crop residues increases the value of each in producing farm income.

A significant problem with sheep production is the incongruity between lambing and forage availability. Because of traditional management practices and the indeterminant breeding season of Moroccan breeds of sheep, lambs arrive throughout the year (with, however, two lambing peaks, one in November-December and another in February-March). Many herders are satisfied with this system, as it ensures that lambs are always available to sell in time of need or when prices are favorable. This is not optimal from the point of view of lamb weights and survival, however, since forage availability for

Table 10-7: Nutritional Characteristics of Sheep Production Systems

1. Cereal Producing Zones (42 percent of animals)

Feeding Calendar:	June-Oct.:	Stubble (some range and roadside grazing)
	Oct.-Jan.	Straw, concentrated feed and range
	Jan.-June:	Fallow and range

Characteristics: Sheep production is closely tied to cereal production. Lambs graze young barley, ewes use stubble and straw. Barley grain is consumed by all animals. Range use will depend upon its availability and quality. Fallow is used to meet animals' needs as well as to build up soil fertility. Concentrated feeds are given, especially at the time of lambing and during periods of rain and cold. This type of system is common, for example, in the areas of Settat, Casablanca, Tanger, Meknes, Fes, Khemesset, and Rommani.

2. Irrigated Zones (22 percent of animals)

Feeding Calendar:	June-Oct.:	Stubble, byproducts, grazing by roadways and canals
	Oct.-Jan.	Straw, concentrated feeds, byproducts, grazing by roadways and canals
	Jan.-June:	transhumance to a range area situated close to an irrigated perimeter

Characteristics: Often, fallow and range have virtually vanished in irrigated areas. Industrial cultivation and planting provide significant quantities of by-products which can be used by sheep (e.g. olive and citrus foliage, beet leaves and tops, byproducts of market gardening). Cultivated forages are generally reserved for milk cows. This system is common in the Tadla, Gharb, Tassaout, and Haouz regions. In the Ziz and Draa valleys, on the other hand, alfalfa is used instead of fallow, stubble, and range.

3. Rangelands (36 percent of animals)

Feeding Calendar:	June-Oct.:	Range and stubble.
	Oct.-Dec.	Range
	Dec.-March	Range, with straw and concentrated feeds used during lamb kidding or during periods of severe cold.
	March-June	Range

Characteristics: In this system, rangelands and forest areas provide for up to 90 percent of the animals' total requirements per year. This system is common in the Middle Atlas, High Atlas, Anti-Atlas, and in the eastern region of the country.

Source: "The Small Ruminant CRSP in Morocco", p. 2-3

the pregnant ewe is often very low during critical periods of the gestation cycle. [1]

Little attention has been given to improving goat production. Nevertheless, goats are less affected by drought conditions than sheep. Goats can exploit browse and do not necessarily compete with sheep for grasses. An animal production consultant reported in July 1985 that, in all of the flocks he had seen, the goats appeared to be healthier and reproducing better than the sheep. GOM efforts to improve goat production appear to be limited to support for a milk goat breeding station at Skoura. This station is reported to be doing excellent work at improving the quality of goats. Since much of that production is consumed by the producer and does not enter the official marketing system, the benefits of improving goat production may not be easily measured. Nevertheless, increased goat meat and milk production would probably greatly improve the nutritional level of poorer households.

Health Care

Animal diseases decrease livestock productivity, in terms of both meat production and reproduction, and increase the mortality of animals. One study demonstrated that intestinal parasitism, for example, decreased weight gain in sheep by 20 percent, reduced the lamb crop by 10 percent, and increased mortality by 10 percent. In 1984, health control programs (primarily preventative health care, such as vaccination campaigns) accounted for 29 percent of the budget of the Direction de l'Elevage (DE). In order to broaden and decentralize health care efforts, as well as to increase the efficiency of delivery, the GOM plans to reduce DE's role in providing these health services under the Sector Adjustment Program. Instead, a system will be established under which private veterinarians will carry out compulsary vaccination programs under contract to the government and will provide a larger portion of veterinary services to producers.

Unfortunately, improved livestock health care is not possible without efforts to improve nutrition and changes in management practices to prevent reinfection. In addition, improved health care, without adequate attention to improving and properly using the forage base, will ultimately fail to improve animal production.

1/ Adequate nutrition prior to ovulation is an important factor in determining whether or not a ewe conceives. Ewes must then receive adequate nutrition at critical periods during the pregnancy (e.g. after three months, when the fetus starts to develop and the ewe begins to store fat for subsequent lactation). Ultimately, lambs must receive an adequate supply of nutrients during the weaning period, when they enter a period of high growth potential.

Breeding

Morocco has attempted to improve the genetic quality of its cattle herd through subsidized importation of animals, natural breeding and artificial insemination. Nevertheless, these efforts have not been entirely successful. Artificial insemination (AI), for example, which is provided by the public sector free of charge, has actually declined in Morocco, due to problems of quality control and the inability of DE to provide livestock owners with timely, on-the-spot services. (It has also been argued that a failure to educate livestock producers on the requirements for successful AI has led to their failure to request services on a timely basis). It has been demonstrated that private cooperatives can provide AI services at half the real average cost incurred by DE. The GOM's Agriculture Sector Adjustment Program aims to transfer, by 1988, all artificial insemination services to livestock groups and cooperatives and to turn over the management of breeding centers to private groups and cooperatives.

The rate of reproduction of sheep in Morocco is low (76 percent, or one lambing every 15-16 months). In addition, lamb mortality is high, at 23.5 percent. A similar situation exists with goats, where the birthrate is around 75 percent and mortality before weaning is between 30 and 60 percent.

Husbandry practices common to Morocco make it very difficult for sheep and goat producers to improve the genetic quality of their herds. Due to traditional customs, consumer preferences, and marketing factors, inferior males are rarely castrated. Moroccans have a preference for the meat from male animals and the presence of the testicles on the carcass is necessary to permit the consumer to determine the sex of the animal. Consequently, the inferior males are rarely castrated. Historically, males have been retained in the herd to meet the annual demand (and consequent favorable prices) for rams at Aid El K'Bir, a Moslem feast day during which large numbers of rams are slaughtered. Therefore, many herds contain as many rams in the flock as there are ewes. This contributes to indiscriminate breeding with lambs being born throughout the year, even when there is no forage available for the ewe and the lamb. The result is high ewe and lamb mortality and poorly developed lambs, together with little genetic improvement over time. In addition, the rate at which ewes are culled is low, less than 20 percent. Consequently, a relatively large number of unproductive females are maintained in the herd. Similarly, since the market value of female goats is so low, they are generally kept until they die of old age. The culling rate for female goats is 17.3 percent. It should be kept in mind, however, that these animal husbandry practices meet the producer's rational goals of risk reduction and liquidity (a culling rate that is optimal from the point of view of national production may not be optimal from the point of view of the individual producer).

Reproductive problems in rams are apparently serious, though little data exist on the incidence and causes of male fertility problems. These problems include epididymitis and testicular hypoplasia. Under the auspices of the breeding/reproduction component of the AID-funded Small Ruminant Collaborative Research Project (CRSP), U.S. and Moroccan scientists have been evaluating crosses between two indigenous breeds of sheep, the D'Man and the Sardi. The D'Man is very prolific but not very productive in terms of meat and wool production. The Sardi are more productive, but have a much lower incidence of

multiple lambing. By crossing these breeds, CRSP scientists hope to develop a breed which possesses the qualities of both parent breeds.

Offtake and Marketing

Livestock offtake in Morocco varies significantly during the year. This is due to a number of problems, including: (1) the extensive nature of livestock production in Morocco and its dependence upon available vegetation; (2) the reproductive patterns of the species (particularly sheep and goats); (3) the absence of a specialized fattening sector; and (4) the lack of farmer liquidity, which sometimes forces them to sell their stock at the least favorable periods.

The size of the cattle, sheep and goat populations decreases between March/April and October/November. (See Table 10-8). For cattle, births are concentrated in the early months of the year, while the maximum slaughter is in October-November. Between 1979 and 1983 the decrease in cattle population between these periods averaged 8.4 percent (varying between 14.1 percent in the 1981 drought year and 4.1 percent in 1983 when the cattle herd was being reconstituted). In recent years, sheep populations have fallen between 10 and 14 percent between these months (though the decrease was 29.8 percent during the 1981 drought year). The recent occurrence of Aid El Kebir in the fall has affected this trend, however. Over the years in question, the goat population has fallen an average of 11.0 percent. In the drought year, 1981, goat population decreased by 18.9 percent between March/April and October/November, while it actually increased during those months in 1982, a year in which the goat herd was being reconstituted.

In terms of sheep production, marketing factors have led to counterproductive herd management practices. Traditionally, at Aid El Kebir, between 1.5 and 2 million male sheep are slaughtered. Since this is a mobile feast, it is not coordinated with season production patterns. As noted earlier, this results in the maintenance of a large number of fertile rams in the herd, making genetic improvement of the sheep population under traditional management practices is almost impossible. In addition, the absence of scales in local marketplaces limits the ability of the market to discriminate among animals on the basis of carcass weight at slaughter, thus decreasing the relative importance attached to animal quality.

Little attention has been given to improving the production and marketing of wool. There is apparently no price differential based on wool quality at the local level. No system of grading, classification, and marketing for wool exists. Returns of only 12 to 20 Dh per fleece dampen interest in wool improvement, given that a lamb brings 650 to 750 dh. However, wool characteristics (length, fiber diameter, and clean fiber production) are all highly heritable characteristics. Therefore, with proper breeding management, wool production could be improved rapidly in conjunction with selection for increasing lamb weights. While it is reasonable to assume that weavers of rugs and blankets would be willing to pay higher prices for graded wool of good quality, further research is necessary to determine the reasons for the current lack of wool quality discrimination.

Table 10-8: Seasonal Changes in Livestock Populations (1979-1983)

	1979	1980	1981	1982	1983
Cattle					
March-April	3460.9	3376.2	3247.9	2536.5	2430.9
October-November	3202.6	3109.9	2792.7	2341.2	2330.9
Percent Drop	7.5	7.9	14.1	7.7	4.1
Sheep					
March-April	15992.0	16509.8	15675.5	10155.1	12610.7
October-November	13668.5	14829.0	11006.5	9766.4	9272.3
Percent Drop	14.5	10.2	29.8	3.8	26.5
Goats					
March-April	5702.4	6153.5	5462.3	4091.1	4911.0
October-November	5166.1	5608.2	4431.5	4169.8	4054.1
Percent Drop	9.4	8.9	18.9	- 1.9	17.4

Source: MARA, "Systemes Animaux: Premiere Partie - Effectifs et Productions", Developpement de la Production Fourragere. TCP/MOR/4402

4. Forage Production

Total food requirements of the Moroccan livestock population are estimated to be between 11 and 12 million Forage Units (FU) per year. (A forage unit is the nutritional equivalent to one kilogram of barley). A number of estimates of feed availability have been calculated for Morocco. Tables 10-9 and 10-10 present two versions, both taken from World Bank documents. The data presented in Table 10-9 indicate that the available feed is roughly that required annually by the existing national herd. Table 10-10, on the other hand, indicates that only 9.5 million FU (80 percent of total needs) are produced annually. The difference would represent a forage deficit resulting in over-exploitation and degradation of the land. [1] Currently, feed imports (around 400,000 MT/year) account for 3 to 4 percent of total feed availability.

The provision of adequate feed to livestock is a major concern for most farmers. Almost all cereal residues and corn fodder, and a substantial portion of the barley crop, is fed to livestock. Weeds are pulled by hand and cereal crops are often rotated with "weedy fallow", to provide pasture during the winter rainy season. As Table 10-9 indicates, however, low quality roughages (range vegetation, straw, fallow, and plant leaves and tops) comprise almost three quarters of forage.

In recent years the GOM has emphasized forage production on irrigated lands. However, irrigated forage production is not competitive with alternative uses of irrigated land. The potential for increased forage production under rainfed conditions (currently around 220,000 ha), at the expense of fallow (some 2.1 million ha) is large, however. Research aimed at improving cultivated forage production under rainfed conditions is underway at the Aridoculture Center in Settat, as part of USAID's Dryland Agriculture Applied Research Project. A major thrust of this research is the incorporation of high yielding forages into cereal cropping systems, as an alternative to relying on weeds (since substantial reductions in cereal yields result from waiting until weeds are large enough to pull).

One forage production system that has shown promise in other regions of the world is a rotation of wheat with annual medicagos (medics). The benefit of medics is that they both provide increased forage and, being legumes, can increase the amount of nitrogen in the soil to support a subsequent cereal crop. The Ministry of Agriculture is currently promoting the adoption of cereal medic rotations (ley farming) and has imported seed from southern Australia for planting over 23,000 ha. Unfortunately, there is a very limited local research base upon which to build such a program. For example, the varieties of medic seed being sold in the Settat area have already been shown at the Aridoculture Center to be unadapted to Moroccan conditions. To help develop the information base needed, the Aridoculture Center's forage program is conducting research on medic rotations.

1/ Other feed budgets that are available have calculated total feed availability at 7.85 million FU (MARA, Etude sur la Politique des Prix, p. 138); 11.3 million FU (FAO, Assessment of the Food Agriculture and Livestock Situation, p. 14).

Table 10-9: Forage Production by Source: Data Indicating an Equilibrium

	Unit	Amount ('000)	FU per unit	FU [1] (million)	% of Total FU
Straw and Stubble	ha	4703	455	2140	19.0
Grain	MT	1415	-	1424	12.0
Fallow	ha	2137	620	1320	11.0
By-products	MT	1100	-	765	7.0
Forage Crops	ha	274	2460	674	6.0
Plant Leaves and Tops	ha	1000	170	168	1.0
Total Cropland				6491	56.0
Rangeland	ha	25800	190	5000	44.0
Total Availability				11491	100.0

1/ FU = Forage Unit - 1 kg of barley.

Source: World Bank, Agricultural Adjustment Loan, Technical Support Volume, p. 139.

Table 10-10: Forage Production by Source: Data Indicating a Deficit

	Area ('000 ha)	% of Total Area	Forage Units (million)	% of Total FU [2]
Cultivated Lands)			4,200	44.2
Supplements)	8,339	22.5	1,100	11.6
Nonforest Rangelands	20,900	56.5	2,500	26.3
Esparto (alfa) grass	2,581	7.0	200	2.1
Forest Rangelands	5,194	18.0	1,500	15.8
Total	37,014	100.0	9,500	100.0

Source: Forage Unit estimates from World Bank, Agricultural Sector Loan, Technical Support Volume, p. 209. Area estimates taken from Table 4-1.

Beyond forage cultivation, the best hope for increasing feed resources is through the regeneration of degraded pastures. Semi-arid and forest regions suitable for grazing purposes account for around 28.7 million hectares, as opposed to 8.3 million hectares which can be cropped. Unfortunately, overstocking and uncontrolled use has resulted in the degradation of this extensive area. This has been aggravated by the expansion of cereal production into lands previously devoted to range/livestock production. The frontier of cropland has already been pushed into lands that are marginal, if not totally unsuitable, for cultivation.

Improving the production potential on common rangelands has proven difficult. In part, this is due to the "tragedy of the commons". When land is used collectively, individual producers have less incentive to avoid overuse, since they cannot "capture" the benefits from their individual sacrifices made to improve the range (such as limiting one's herd size, rotational use of pastures, and investments in revegetation). This problem is illustrated by the situation in Western High Atlas mountains. In that area, uncontrolled grazing in the summer uses up the forage available from pastures that are close to villages. Consequently, in the winter, when the sheep must graze near the villages due to snow covering and shorter daylength, adequate forage is often not available. The optimal solution would be for villagers to go to the more distant pastures in the summer, saving those close to the village for winter use.

It has been argued that the eventual privatization of collective lands is the only practical method of protecting and improving the forage-producing capacity of the rangelands. Unfortunately, such a solution is not possible without concentrating ownership of collective lands in the hands of a favored few. The rangelands cannot be subdivided into a large number of private plots because of the uneven distribution of forage resources on the land. The availability and quality of forage in some areas is better than in others. Moreover, the distribution of forage in a given area changes from season to season and from year to year. An individual with a small plot that has adequate forage in the spring but not in the winter, for example, will not be able to maintain his herd throughout the year. Consequently, viable livestock enterprises based on rangeland must be extensive, permitting the mobility essential for livestock owners to respond to changes in forage availability.

The USAID-funded Range Management Improvement Project has been experimenting with various technical strategies to improve the productivity of the rangelands. These have included revegetation with forage shrubs on collective and private land, terracing and chiseling to improve infiltration and entrapment of rainfall. Such efforts on public land would have to be viewed as subsidized reclamation, similar to the efforts undertaken in the U.S. during the depression.

Another approach that needs to be further explored is the use of agdals. Agdals are pastures and rangelands set aside by traditional local groups (e.g. villages or tribes) for use at critical times of the year. In other words, they are the traditional means of managing collective rangelands. Agdals may have existed throughout Morocco, and hundreds of them still survive in the High Atlas region. Their utility as a socially compatible model for range management (and as an extension tool given that large numbers of herders gather on them at fixed dates) needs to be further explored. [Gilles, Socio-economic Research Consultancy Report, p. 10].

5. Supplementation and Feed Subsidies

In order to support livestock production, the government supplies farmers with subsidized feed, including beet pulp, molasses, soybean and sunflower oil cake, and bran. In 1983/84, for example, the government distributed 450,000 MTs of bran (half of the national production) and 130,000 MT of dehydrated sugar beet pulp (the entire production from the sugar mills). These feeds are heavily subsidized. For example, the price established for bran is 20 to 30 percent lower than that on the open market. Therefore, the government must ration their distribution. Moreover, the subsidized prices of these higher value fodders, including bran, sugarbeet pulp, and barley, discourage the domestic production of these and lower value feeds, such as hay and straw. [World Bank, Agriculture Sector Loan, Technical Support Volume, p. 137-8]. To deal with these problems, the GOM will progressively deregulate the prices and marketing of high value feeds (e.g. sugarbeet pulp and bran).

6. Institutional Support for the Livestock Sector

Responsibility for development of livestock in Morocco rests with the Direccion de l'Elevage (DE). Table 10-11 summarizes the distribution of DE funds by activity through DPAs (in rainfed areas). In terms of percentages (and omitting extra-budgetary financing), the major DE investments in 1984 were in animal health (29 percent); milk collection and processing (11.9 percent); slaughterhouse and sanitary control (9.2 percent); and direct subsidies to livestock producers (9.1 percent). In sum, DE's attention has been focused on animal health, artificial insemination, and administration, to the neglect of forage production, fodder preservation, animal nutrition, and grazing management.

A number of reforms in public sector assistance to livestock are either underway or currently being considered. These include the transfer of responsibility for vaccination campaigns, and veterinary and breeding services to the private sector or cooperatives and the strengthening the capacity of the extension service (Direction de Vulgarization) to conduct livestock extension.

In October 1985, USAID funded an evaluation of the Range Management Improvement Project which examined the extensive livestock sector, focusing particularly on range management. This team concluded that budgetary allocations to the sector needed to be increased and the resources available more equitably distributed between intensive animal production needs (e.g. animal health and genetic improvement) and extensive production. They also concluded that the GOM should develop a long-term strategy for the development of the extensive livestock sector that would, in particular, provide a framework by which local communities could better manage common land to prevent its degradation and loss.

Table 10-11: Total DE Expenditures through DPAs (Rainfed Areas), 1984
('000 dirhams)

Activity	Investment Budget	Salaries	Operating Budget	Total Amount	Total %
Administration	2,310	10,385	159	12,854	7.0
Animal Health	33,080	19,960	400	53,440	29.1
Slaughterhouses & Sanitary Control	8,500	8,395	-	16,895	9.2
Dairy Performance Testing	700	178	-	878	0.5
Herd Book Maintenance	-	550	-	550	0.3
Artificial Insemination	3,250	4,735	1,202	9,187	5.0
Cattle Breeding	1,200	2,920	-	4,120	2.2
Horse Breeding [1]	500	5,445	1,214	7,159	3.9
Extension	600	870	-	1,470	0.8
Range Management	10,000	915	232	11,147	6.1
Feed Supply [2]	5,300	1,535	-	6,835	3.7
Milk Collection and Processing	18,380	3,380	-	21,760	11.9
Sheep Selection Farm	400	3,160	802	4,362	2.4
Cattle Selection Farm	1,460	930	236	2,626	1.4
Hatcheries	1,200	125	-	1,325	0.7
Subsidies to SNDE and COMAGRI	12,000	-	-	12,000	6.5
Direct subsidies to Livestock Owners	16,730	-	-	16,730	9.1
Subtotal				183,338	99.8
Moyen Atlas Project	(26,500)	-	-	(26,500)	
Grand Total	114,910	63,885	4,424	299,838	

1/ Horse breeding was supplemented by 25 million dh levy on paramutual betting operations.

2/ Feed supply was supplemented by a 65 million dh Drought Control Fund (Fonds de Sauvegarde du Cheptel), constituted from taxes on beet pulp and a slaughtering tax.

Source: World Bank, Agricultural Sector Loan, Technical Support Volume, p. 158.

XI. THE FORESTRY SUBSECTOR

1. Importance of Forestry in Morocco

Moroccan forests cover about 5.2 million hectares (some 360,000 hectares of which is in plantations and the remainder natural growth). Another 2.6 million hectares is covered with alfa grass (Stipa tenacissima). It is estimated that 2.4 million hectares of forests (31 percent of the total) and 1 million hectares of alfa grass (13 percent of the total) have some productive potential. The primary value of the remaining forest and grass land is in soil and watershed protection. The main forest producing areas in Morocco are east of the Rabat-Mohammedia region, the Middle Atlas and Rif mountains, and the Gharb Mamora forest near Kenitra. Alfa grass, which is primarily used for producing paper and for forage, grows primarily in the northeastern part of the country.

Forestry accounted for 2 percent of agriculture GDP in 1982 (and 0.4 percent of total GDP). About 160,000 rural people rely on forestry as an important source of direct income. In addition, forestry-related industries, including small scale sawmills and joineries, employ an estimated 38,000 people [World Bank Sector Loan, p. 203-204].

In 1982, forestry-related imports (primarily sawnwood and lumber) cost Dh 626 million and represented 3 percent of Morocco's total imports and 10 percent of its agricultural imports. Domestic production only meets 70 percent of sawnwood and lumber needs, even though Moroccan per capita consumption of wood and paper products is low compared to countries at a similar level of development. In 1982 wood product exports (72 percent of which was wood pulp and 24 percent was cork) earned Dh 195 million. Thus, Morocco's trade balance for forest products, which has deteriorated steadily since the 1960s, had a deficit of Dh 431 million in 1982 [World Bank, Agriculture Sector Adjustment Loan, Technical Support Volume, p. 207]. These figures, of course, do not take into account the economic value of forest resources for fuelwood.

2. Fuelwood Demand and Supply

In terms of energy production, wood is the most important fuel source, providing over 40 percent of the energy currently consumed in the country. Rural families rely on wood for practically all cooking and heating needs. Gas lamps, kerosene lamps, or candles provide lighting. Most charcoal is sold in urban areas, although wealthier rural households may also use charcoal for cooking. Low income urban families still rely on wood for cooking bread in individual or communal ovens and charcoal for meal preparation and heating. Butane gas is slowly replacing charcoal as the choice fuel for cooking in lower income households. The use of butane for household lighting has also increased rapidly in recent years, particularly in rural areas. However, the demand for butane appears to be leveling off due to its increasing price. In eastern Morocco, alpha grass (Stipa tenicissima L.) and sagebrush (Artemesia herba alba Asso) are the most common fuel sources. Though the dominant plant species in the region, these two plants are also the most important forage sources.

FAO estimates that annual per capita consumption of fuelwood is 0.8 m^3 in rural areas and 0.1 m^3 in urban areas. Based on these statistics, Table 11-1 estimates annual demand in 1990 and 2000. In 1980, according to FAO estimates, total consumption of fuelwood in Morocco was about 10.5 million m^3 per year. Moroccan forests are estimated to produce around 3 million m^3 per year. Consequently, the current annual fuelwood deficit would be around 7.5 million m^3 (or over 70 percent of total demand). [1] [World Bank, Agriculture Sector Loan, p. 208-09].

It should be noted, however, that these fuelwood demand and supply estimates assume that forests supply all of the woody biomass used for fuelwood in the country. This is clearly not true, given the spacial distribution of the forests and the population. An estimated 25 percent of the rural population lives adjacent to forests and can meet their firewood needs by direct harvesting. A large portion of the rural population lives in heavily cultivated areas or in semi-arid and arid regions of the country, where forests are limited and fuelwood much scarcer. To date, the importance of this factor has not been adequately incorporated into the fuelwood demand and supply equation. It is probable, however, that the estimates available seriously underestimate both the demand and supply of woody biomass in Morocco. [Kirmse, "Wood Fuel Supply and Demand Issues, p. 2-3].

3. Grazing Pressure on Forest Land

The second major cause of deforestation is increased grazing pressure, which reduces the regenerative capacity of the forests. Forest lands, which equal about 18 percent of total rangeland area, produce the equivalent of 1.5 million forage units/year or 15.8 percent of the Moroccan livestock food requirement (see table 10-10). According to the World Bank, an estimated 1 million cattle, 3.5 million sheep, and 4.0 million goats spend more than 6 months per year on forest rangelands. This population produces 35,000 tons of meat per year (15 percent of total annual production). The value of fodder production in forests is estimated at Dh 800 million per year [World Bank Agriculture Sector Loan, p. 209-210].

The plowing of marginal lands for crop production has also increased grazing pressure on forested regions. With continuous grazing of forested areas, natural regeneration is reduced. The forests then become bushy stands, eventually turning into open shrublands. Soil erodes to the extent that only subsoil exists. Morocco's Forest Service has tried to protect the forests from overgrazing by restricting access to the forests by livestock. As a result, the Forest Service is often seen by livestock owners in antagonistic terms and its ability to work with local communities to manage forest resources has been compromised.

1/ Energy and Environmental Engineering, Inc. (E^3I), consultants for USAID, estimated renewal capacity at 3.5 million m^3/year and national consumption at 10.9 million m^3/year (of which rural demand is 9.8 million m^3/year. This would put consumption at over three times renewal capacity and imply losses in forest cover equivalent to 29,000 ha/year. E^3I also reported that L'Eaux et Forêts officials have estimated renewal capacity at only 2.5 million m^3 per year). [E^3I, Fuelwood Use in Morocco, p. 14, 34].

Table 11-1: Projected Fuel Wood Consumption in Morocco

	1980	1990	2000
Total Population (million) [1]	20.00	27.10	37.60
Rural Areas			
Population (million) [1]	12.00	14.30	17.10
Per-capita Consumption in 1980 (m^3) [2]	0.80	0.80	0.80
Substitution Coefficient (%) [3]	-	20.00	40.00
Per capita Consumption (m^3)	0.80	0.64	0.48
Total Rural Consumption ('000 m^3)	9,600.00	9,150.00	8,210.00
Urban Areas			
Population (million) [1]	8.00	12.80	20.50
Per-capita Consumption in 1980 (m^3) [2]	0.10	0.10	0.10
Substitution Coefficient (%) [3]	-	20.00	40.00
Per capita Consumption (m^3)	0.10	0.08	0.06
Total Urban Consumption ('000 m^3)	800.00	1,025.00	1,230.00
Total Consumption ('000 m^3)	10,400.00	10,175.00	9,440.00

1/ Based on an estimated 1980 population of 20 million, of which 39.3 percent was urban and 60.7 percent was rural, and upon annual population growth rate estimates of 1.8 percent for the rural population and 4.8 percent for the urban population.

2/ FAO estimates.

3/ Estimated in IBRD's Renewable Energy Task Force Study. The coefficient of substitution into alternative fuel may be optimistic. With the coefficient equal to 20 percent in the year 2000, fuelwood consumption in that year would rise to 12.6 million of m^3.

Source: World Bank, Agricultural Sector Loan, Technical Support Volume, p. 228.

4. Level of Forest Degradation

As a result of these twin factors, wood harvesting and overgrazing, large areas in of Morocco are being deforested and degraded annually. It is estimated that the equivalent of 29,000 hectares are deforested per year due to excessive animal and human pressure on the forests. (The estimate generally used by the World Bank is a disappearance of 20,000 ha of forests per year). Based on these estimates, 506,000 hectares of forests (10 percent of cover) may be lost by the year 2000 unless major reforestation programs are carried out. By the year 2020, up to 30 percent of existing forest cover may be lost. [1] [Energy and Environmental Engineering, Inc., Fuelwood Use in Morocco, p. 14, 23-24, 34].

The degradation of the forest and forage resources is particularly severe in drier parts of Morocco. In Oujda, for example, local inhabitants are uprooting perennial range forage species (primarily sagebrush) to meet their fuelwood needs. For example, the collection of sagebrush for fuel has denuded most of the area for about 10 kilometers south of the village of Ain Beni Mathar, near Oujda (one of the project sites of the USAID-financed Range Management Improvement Project). [Visness, p. 18].

As a result of soil degradation and increased erosion, annual erosion rates in Morocco range from 300 to 5000 tons per square kilometer. Siltation decreases irrigation capacity by 6000 hectares per year. In addition, the loss of capacity in most reservoirs ranges from 0.5 to 3 percent per year. Some of the major reservoirs constructed before 1960 have lost at least half of their original capacity and most others have lost between 7 and 50 percent of their capacity. [USAID, Project Identification Document, Winter Snowpack Augmentation Project].

5. Reforestation Efforts

The GOM Forest Service (L'Eaux et Forêts et la Restauration des Sols) of the Ministry of Agriculture manages and protects forested lands, the great majority of which are owned by the state. The Forest Service employs some 2000 people with a budget of roughly $12 million. In 1970, the GOM adopted a national reforestation plan calling for an annual plantation program of 22,000 hectares per year during the 1970-2000 period. Budgetary restrictions, however, have seriously limited even these modest reforestation activities. Prior to 1983, the GOM was able to meet the 22,000 hectare target only once (1981-82). In 1982 MARA and the World Bank estimated the need for a reforestation program of 35-40,000 ha/yr in order to meet wood product demand (but not necessarily fuelwood demand) to the year 2000. FAO has estimated that a reforestation level of only 23,000 ha/year is currently feasible. [Energy and Environmental Engineering, Fuelwood Use in Morocco, p. 14]. In particular, little attention has been given to the fact that the potential for large scale reforestation is the lowest precisely in those areas where the fuelwood deficits are the most acute, i.e. in heavily cultivated and low rainfall areas.

1/ These estimates assume a biomass density of 361 m^3/ha. If a lower biomass density is assumed (200 m^3/ha) the losses increase to 20 percent of forest cover in the year 2000 and 50 percent in the year 2020.

In order to promote local participation in forestry development, a Dahir was passed in 1976 that enabled communes that were endowed with forest resources to generate revenues from their exploitation. In return, the communes were to devote at least 20 percent of their revenues to reforestation. Few communes have done the required amount of reforestation, however, and the net result has been an acceleration of deforestation in many areas.

In recent years, the World Bank has been implementing five projects with forestry components. One of these, the Gharb-Mamora Forestry Development Project, is completely forestry related. The other four projects are primarily rural development projects with forestry activities. These are the Moyen Atlas Agriculture Development Project, the Fez-Karia-Tissa Agriculture Project, the Loukkos Rural Development Project, and the Oulmes-Roumani Rural Development Project. USAID has been contributing to each of the four rural development projects by providing PL 480 generated dirhams to enable the GOM to meet its counterpart requirements.

6. USAID Assistance to Forestry-related Activities

While USAID has been interested in undertaking a more active role in the forestry sector in Morocco for a number of years, its direct involvement in the sector has been limited to date. USAID/Morocco considered funding an Integrated Forestry Development Project in 1980. However, that project was never approved. A forestry effort was again proposed in the FY 1986 CDSS, though its scope and objectives were not specified. Nevertheless, USAID has not prepared a forestry-related project, primarily because of a desire to focus the Mission's portfolio of projects. Only limited forestry-related activities are being carried out under the auspices of bilateral projects in USAID's agriculture portfolio. Under the Range Management Improvement Project (608-0145), efforts are being undertaken in Oujda to establish a nursery for fuelwood and forage plants. This facility will supplement the efforts of the project-funded Plant Materials Center.

The U.S. has provided significant levels of support to the development of the Moroccan forestry sector since 1957, particularly in the form of PL 480 Titles I and II. During the last 27 years, PL 480 support, which has exceeded US-$142 million, has contributed to reforestation efforts on at least 220,000 hectares throughout Morocco. [Resch, History of Tree Planting, 1984].

While historically significant, PL 480 Title II food for work is not currently contributing to forestry in Morocco. PL 480 Title I local currency generations, however, have provided substantial support for the forestry sector in Morocco over the last four years. Indeed, PL 480 Title I commitments and obligations to forestry-related activities almost equal the annual budget of l'Eaux et Forets. Though this assistance has not been "additive", dedicating PL 480 revenues to forestry has probably provided l'Eaux et Forets with a budgetary floor and protection against budget cuts.

In 1984, P.L. 480 Title I local currency generations to forestry were over US-$9 million. Targets were established of 20,000 hectares of reforestration. soil protection and reclamation on 8,000 hectares, and sand dune stabilization on 6,000 hectares. In addition, some US-$1.2 million in 1984 PL 480 Title I local currency generation supported the forestry-related activities of USAID and World Bank-financed projects (by providing the dirhams needed to enable the government to meet its counterpart support commitments to

these projects). This assistance supported, for example, the development of the Ecole Nationale Forestière d'Ingénieurs (ENFI) at Salé and an MS-level graduate forestry program within the Hassan II Agronomic and Veterinary Institute under the USAID-financed Agronomic Institute Project (0160).

During the last four years, AID has also provided support to forestry through the World Food Programme (WFP). In particular, the U.S. has contributed over US-$5.2 million in wheat to a WFP Project entitled "Soil Restoration and Agricultural Development in the Rif Provinces - DERRO" (No. 2319 ext). This project involves reforestation, pasture improvement, planting fruit trees, and soil conservation in degraded areas. In June 1985, WFP received approval for the "Development of Northern Provinces" Project (No. 2319 ext II), a three year, $17.7 million effort. In addition to soil protection, rehabilitation of watersheds, and fruit trees development, this project will involve seed production at nursuries and the development of village woodlots. Finally, WFP is planning a $27.4 million "Forestry Development and Erosion Control" Project (WFP 2691). This is a five year effort which will involve 100,000 ha of reforestation on state lands, 22,500 ha of sand dune fixation, and 14,900 ha for watershed stabilization.

XII. FISHERIES PRODUCTION

The Moroccan waters are among the richest in the world. [1] They contain large stocks of surface-swimming pelagics (e.g. sardines and anchovies), demersals (bottom-dwelling white fish) and cephalopods (e.g. squid, octopus, and cuttlefish). Shrimp, lobster, tuna, and other species are also harvested, though they are relatively less important. The Atlantic fishing grounds contribute 95 percent of the total value of the fisheries sector, while the fishing grounds along the Mediterranean coast contribute the remaining 5 percent.

Morocco's 1,640 miles of Atlantic coastline are divided into three water temperature zones. The area between Tangiers and El Jadida contributes less than 10 percent of the value of the fisheries sector. In part, this is because the average water temperature (72 degrees farenheit) is too warm for sardines and the fish that follow them. However, the zone has, in general, also been overfished. A second zone, extending from El Jadida to Agadir, has water temperatures (65 degrees farenheit) and other conditions conducive to sardines. While it produces only 20 percent of the value of total catch, it has been the traditional Moroccan fishing grounds for sardines. The third zone, extending from Agadir south to the border with Mauritania, has cold waters (an average water temperature of 57 degrees farenheit) and yields the largest sardine and anchovie catches. In addition, modern stern trawler fleets operate in these waters, harvesting cephalopods and demersal white fish. This zone, which is principally off the coast of the former Western Sahara, contributes 65 percent of the value of total catch.

Though reliable estimates of sustainable yield and annual fish catch are either unavailable or incomplete, indications are that Moroccan waters are being fully exploited, if not overexploited. The maximum sustainable yield was estimated by the Ministry of Fisheries in 1982 at 875,000 MT for pelagics and 393,000 MT for demersal white fish and cephalopods. In 1980, the fishing catch was estimated at 1,526,132 MT (over 1 million MT for pelagics and 521,000 MT for demersal fish and cephalopods). This is 114 percent of the estimated sustainable yield for pelagics and 132 percent of that for dermersals.

Foreign fleets account for over two-thirds of the total catch in Moroccan waters. The Moroccan fleet, on the other hand, accounts for only 21.8 percent of the pelagic catch and 9 percent of the demersal fish and cephalopods. In 1983, the Banque Marocaine du Commerce Exterieur reported that boats from Spain, the U.S.S.R., Bulgaria, Greece, East Germany, Romania, Japan, and South Korea made significant catches in Moroccan waters. However, only Japan and Spain have written fisheries agreements with Morocco. Thus, Morocco receives very little benefit, direct or indirect, from much of this harvesting.

1/ The GOM's definition of Moroccan waters is an economic zone extending 200 miles from the Kingdom's coastline, including the waters off the former Western Sahara.

The Moroccan fishing fleet is still relatively small. At the end of 1982 it contained less than 2500 motorized and 5500 non-motorized boats. A large portion of Morocco's own high seas fleet operates out of Las Palmas, a free port in the Canary Islands. Approximately 6,000 fishermen are employed by the several major companies that make up the Moroccan high seas fleet, earning relatively good wages. However, a majority of these individuals are non-Moroccan (primarily Spanish or Korean). Another 30,000 fishermen work in thousands of small boats along the Moroccan coasts, generally using much more labor-intensive techniques and earning much lower incomes.

Much of the income generated by the Moroccan high seas fleet, and the multiplier effects of that income, benefits Las Palmas, rather than the Moroccan economy. Consequently, the Moroccan government has urged its fleet to establish its home port in Morocco. Until recently, this appeal had not been successful, due to the increased fuel costs entailed and the lack of a Moroccan port with a service and repair industry comparable to Las Palmas. Further, the Moroccan fleet owners prefer Las Palmas because they are paid for their catch in fully convertible foreign exchange.

In an effort to offer an alternative to Las Palmas, a major private Moroccan company, Omnium Morocain de Peche (OMP) has constructed a US-$50 million refrigeration and processing compound at the port of Tan-Tan, which is 200 miles south of Agadir and just north of the Saharan fishing grounds. The facility can handle around 150 high seas trawlers, each making 4 to 5 voyages per year. In addition, OMP is spending around US-$35 million to purchase trawlers and smaller boats. The success of this investment will depend upon whether Moroccan trawlers can operate as profitably from Tan-Tan as from Las Palmas. A critical concern for the future of Tan Tan as a fishing port will be the availability of services (dock space, spare parts, skilled labor, etc.) and currency facilitation for paying wages and for imported equipment. A second concern is whether Morocco can successfully manage the marketing of the processed white fish that will be harvested. It should be noted that OMP is neither government-owned nor government-subsidized. The prospects, nevertheless, are promising. Landings at Tan Tan, which were insignificant in 1981, had reached 64,733 MTs by 1984 (17.5 percent of the total catch), making Tan Tan Morocco's second most important fishing port. As of this writing, it appears that OMP's high seas fleet will "homeport" in Tan-Tan beginning in March 1986.

Agadir remains Morocco's most important fishing port, receiving almost 50 percent of the coastal product landed by Moroccans. Safi and Essaouira account for another 11.8 percent of the catch. These ports lack adequate equipment to receive, store and process the deep sea catch. However, a new fish processing and freezing plant is now under construction in Agadir and SONARP, a private fishing company, also plans to bring its high seas fleet home in March 1986.

Fish exports earned Morocco Dh 1,795 million in 1984 (accounting for about 9.4 percent of total exports and almost 42 percent of food exports). Exports of crustaceans and mollusks made up 49 percent of the total (Dh 881 million); canned fish accounted for 30.9 percent (Dh 555 million); fresh fish accounted for 18.3 percent (Dh 328 million); and fish oils, fats and meal accounted for the remaining 1.7 percent (Dh 31.1 million). [BMCE Information Review, June 1985, p. 19]. It has been estimated that the total exported catch from Moroccan waters, both domestic and foreign, would be

valued at between US-$400 to US-$800 million, or between 21 and 42 percent of Morocco's total export revenue in 1984.

Approximately 80 percent of Morocco's canned fish production is exported. During periods of peak harvest, more sardines are caught than can be processed by Morocco's 68 major canneries (which employ around 25,000 people, primarily women). Thus, though the government sets a minimum and maximum price to be paid to fishermen (based on quality), it is a buyers' market. Sardines which cannot be sold to the canneries must be sold for fish meal, generally at prices that do not permit fishermen to recover their costs. In Agadir, for example, the canneries can process 450 MT per day, while in the peak season, boats can harvest 2000 MT of fish per day. Consequently, fishermen regulate themselves during the peak season, fishing in rotation to limit the daily amount of sardines harvested. When the sardines migrate south beyond the coastal fishermens' range (which is limited by a lack of refrigeration), the canneries work fewer hours. As a result, canneries average only 150 full production days per year, while sardine fishermen average 270 days at sea.

Roughly 10 to 15 percent of the white fish caught is exported, often processed and shipped by air or refrigerated truck to Europe. In the near term, the economic potential of white fish appears to exceed that of blue fish (e.g. sardines and mackerel). In 1984, Moroccan sardines sold at port for 3 to 5 cents a pound, while white fish sold at 20 to 50 cents a pound. However, increased refrigeration, both on-board and at port is a constraint to increased production.

Further development of the fishing industry will require a number of actions, including: (1) preserving the biomass while at the same time increasing Morocco's share in the exploitation of the resource, (2) active surveillance and control of Moroccan fishing grounds, (3) improving fishing methods and increasing on-board refrigeration, (4) increasing on-shore cold storage and freezing capacity, (5) improving processing and packaging methods, (6) improving the transportation and distribution systems, and (7) creating incentives for export from Morocco and actively seeking and developing these markets.

XIII. AGRICULTURAL TRADE

1. Agricultural Imports

Food production has not kept pace with the increased demand generated by rapid urbanization, increased income levels, high population growth, and a policy of consumer food subsidies. However, a steady increase in food imports has permitted aggregate food consumption, particularly of grain products, to continue to rise. Food imports have risen by about 19 percent per year in volume between 1970 and 1980. Morocco became a net importer of food in 1974, and is now heavily dependent on imports to meet consumption needs for basic foodstuffs, including wheat, vegetable oils, and milk products. (See Table 13-1 and 13-2).

Bread wheat, vegetable oils, sugar, and milk products currently account for 85 percent of food imports and for 56 percent of the value of all agricultural imports. Bread wheat imports have increased by more than 19 percent per year between 1969/70 and 1981/82. Grain imports averaged over 2 million MT annually in 1980-83, while domestic grain production averaged 3.8 million MT. This may be contrasted with 650,000 MT of grain imports and 4.5 million MT of grain produced annually a decade earlier. (See Table 13-3). Similarly, vegetable oil imports increased by more than 12 percent per year during between 1969/70 and 1981/82. Even for sugar and dairy products, for which domestic production has increased by 4 percent per annum since 1970, the level of imports has remained more or less constant. [World Bank, Agricultural Sector Adjustment Loan, p. 10].

Taking into account increases in the prices (c.i.f.) of the imported products, the increase in the cost of imports is even greater. Between 1969/70 and 1981/82, the value of agricultural imports increased by 12 percent per year.

Between 1980 and 1983, domestic agriculture production covered only about 25 percent of soft wheat consumption needs and about 62 percent of total cereal needs (as against 87 percent in 1965-69). While Morocco is self-sufficient in terms of meat consumption, domestic production meets only 64 percent of domestic milk consumption needs (up from 54 percent in 1965-69), 53 percent of sugar consumption needs (up from 28 percent in 1965-69) and 23 percent of the domestic demand for edible oil (down from 38 percent in 1965-69).

The World Bank has estimated that, if present trends continue, imports of cereals could reach 3.5 million metric tons by the year 2000, compared to an average of 1.5 million metric tons in 1980-84. Imports of vegetable oil could double to 400,000 by the year 2000. Increasing incomes could generate additional animal feed imports of the same magnitude up to 7 million metric tons by the year 2000. [World Bank, Agricultural Sector Adjustment Loan, p. 10]

In 1983, imports of foodstuffs, beverages, and tobacco cost Dh 3,796 million Dh (c.i.f.), nearly 15 percent of total imports. Imports of agricultural machinery and equipment are minor, accounting for only 1.15 percent of total imports. Imports of foodstuffs, beverages, and tobacco has been declining as a percentage of total imports, at least since 1967, when they constituted 28 percent of total imports. However, principally due to fluctuations in wheat imports, the relationship of this category to all

Table 13-1: Value of Foreign Trade, 1969-83 (millions of current Dirhams)

Year	Exports					Imports				
	Total	Agriculture		Food		Total	Agriculture		Food	
		Amount	(%)	Amount	(%)		Amount	(%)	Amount	(%)
1969	2,455	1,495	61	1,097	45	2,837	751	26	392	14
1970	2,470	1,464	59	1,081	44	3,463	953	28	558	16
1971	2,526	1,450	57	1,155	46	3,528	1,123	32	711	20
1972	2,953	1,655	56	1,116	38	3,565	1,023	29	600	17
1973	3,746	2,242	60	1,714	46	4,683	1,623	35	1,075	23
1974	7,440	2,168	29	1,539	21	8,291	2,923	35	2,042	25
1975	6,238	1,800	29	1,384	22	10,394	3,665	35	2,629	25
1976	5,579	2,134	38	1,869	34	11,555	2,953	26	2,081	18
1977	5,860	2,055	35	1,784	30	14,402	3,249	23	2,106	15
1978	6,261	2,384	38	2,014	32	12,361	3,193	26	2,233	18
1979	7,287	2,610	36	2,297	32	14,328	3,702	26	2,219	15
1980	9,645	3,106	32	2,653	28	16,793	4,376	26	2,390	14
1981	12,003	3,633	30	2,988	25	22,455	6,341	28	3,243	14
1982	12,440	3,753	30	2,971	24	25,990	5,842	22	2,515	10
1983	14,724	n.a.		n.a.		25,591	n.a		n.a.	
1984	19,110	n.a.		n.a.		34,396	n.a		n.a.	

Source: Statistiques du Commerce Exterieur, cited in MARA/AIRD, La Politique de Prix, p. 5. Figures are on a calendar year basis.

Table 13-2: Principal Agricultural Imports of Morocco 1969-83 (quantities in '000 metric tons and values in million of dirhams)

Year	Agri-cultural Imports (value)	Food Products								
		Total Value	Bread Wheat		Sugar		Vegetable Oils		Dairy Products	
			Qty	Val	Qty	Val	Qty	Val	Qty	Val
1969	751	392	98	40	253	108	40	44	41	66
1970	953	558	358	130	273	137	54	81	41	71
1971	1,123	711	672	243	245	149	81	132	27	73
1972	1,023	600	382	137	222	169	84	103	23	70
1973	1,623	1,075	905	483	272	239	106	166	26	73
1974	2,923	2,042	778	708	295	641	123	417	35	119
1975	3,665	2,629	1303	960	267	971	161	406	31	124
1976	2,953	2,081	1012	726	261	645	113	216	35	141
1977	2,923	1,944	1202	587	379	510	140	345	36	149
1978	2,193	2,005	1555	856	289	305	139	338	35	1561
1979	3,702	2,143	1497	973	279	269	174	460	43	200
1980	4,580	2,833	1652	1255	328	627	152	383	41	252
1981	5,910	4,613	2262	2044	310	1054	166	508	38	349
1982	5,345	3,496	1498	1444	270	519	195	567	42	458
1983	n.a.	3,796	1738	1834	248	413	165	563	30	357

Source: Statistiques du Commerce Exterieur. Cited in MARA/AIRD, La Politique de Prix, p. 7. Figures are on a calendar year basis.

Table 13-3: Moroccan Cereals Imports, 1960/61 to 1983/84 (in '000 MT and in millions of dirhams)

Crop Year	Bread Wheat		Durum Wheat		Barley		Corn		Total of the four Cereals ('000 MT)
	Quan.	Value	Quan.	Value	Quan.	Value	Quan.	Value	
1960-61	257.9	85	--	--	67.3	16	--	--	325.2
1964-65	338.5	111	--	--	--	--	6.0	2	344.5
1969-70	181.2	59	--	--	--	--	--	--	181.2
1970-71	570.2	204	3.1	n.a.	--	--	10.0	3	583.3
1971-72	570.6	187	6.0	n.a.	55.0	2	10.7	4	592.8
1972-73	472.6	186	--	--	44.9	17	20.3	7	537.8
1973-74	983.2	769	--	--	19.1	8	33.2	22	1035.5
1974-75	1032.7	897	--	--	88.8	65	41.5	33	1162.9
1975-76	1164.8	813	45.0	45	13.9	8	--	--	1226.6
1976-77	924.3	560	74.7	45	--	--	--	--	999.1
1977-78	1697.4	881	40.1	23	42.6	23	80.7	42	1860.8
1978-79	1413.8	811	--	--	10.6	5	80.9	44	1505.2
1979-80	1537.3	1146	--	--	10.3	7	90.3	56	1637.9
1980-81	1821.0	1451	80.0	93	124.4	111	145.6	132	2171.0
1981-82	2244.1	2057	38.2	44	243.0	227	196.3	167	2721.6
1982-83	1356.8	1244	--	--	9.7	10	141.5	120	1508.0
1983-84	2060.7	2435	--	--	9.8	13	187.3	255	2257.8
1984-85	2097.1	2808	--	--	98.0	118	105.8	140	2300.9

Source: ONICL, cited in MARA/AIRD, La Politique de Prix, p. 96. Note that these figures are based on a crop year. Therefore, the estimates for bread wheat will disagree with those in Table 13-2.

Table 13-4: Principal Agricultural Exports of Morocco 1969-83 (quantities in '000 metric tons and values in million of dirhams)

Year	Agri-cultural Exports (value)	Food Products								
		Total Value	Citrus		Tomatoes (Fresh)		Vegetables (canned)		Fish (canned)	
			Qty	Val	Qty	Val	Qty	Val	Qty	Val
1969	1,495	1,097	551	389	133	146	49	63	47	123
1970	1,464	1,081	602	357	140	180	40	54	44	127
1971	1,450	1,155	527	389	131	153	57	85	53	148
1972	1,655	1,116	586	229	120	179	77	106	46	134
1973	2,242	1,714	700	494	173	229	85	125	66	190
1974	2,168	1,539	543	388	146	183	77	162	59	244
1975	1,800	1,384	446	406	144	173	56	145	40	162
1976	2,134	1,869	548	611	112	127	73	157	53	236
1977	1,932	1,784	552	615	112	115	92	254	43	229
1978	2,225	2,014	663	810	109	128	82	234	37	225
1979	2,501	2,297	575	859	105	253	78	270	48	300
1980	2,998	2,693	772	1160	96	248	70	264	46	342
1981	3,378	2,988	632	1072	91	228	70	284	58	465
1982	3,291	2,971	595	1086	72	197	36	312	45	400

Source: Statistiques du Commerce Exterieur, cited by MARA/AIRD, La Politique de Prix, p. 6.

Moroccan imports has been very erratic. In addition, when imports of crude petroleum are excluded from total imports, this decreasing trend disappears.

2. Agricultural Exports

Agricultural exports earned Dh 4,283 million in 1984. These consisted mainly of citrus (Dh 1,057 million), vegetables, primarily fresh tomatoes and potatoes (Dh 525 million), preserved fruit and vegetables, including juices (Dh 648 million), and seafood products (Dh 1,783 million).

In the 1960s and early 1970s, food, beverages, and tobacco exports represented as much as 50 percent of total exports. Since then, there has been a gradual decline and, since 1980, this category has accounted for about 25 percent of total exports. Citrus fruits are the largest item in the category, frequently constituting as much as a third of the total, and between 7 to 12 percent of all exports.

The increase in value of exports is essentially due to the increase in the f.o.b. price for exported products. The price of citrus (f.o.b.) increased 8.7 percent per year, that for tomatoes by 6.8 percent, and for canned vegetables and canned fish 12.9 and 9.8 percent per year, respectively. (See Table 13-4). [MARA/AIRD, La Politique de Prix, p. 5].

The growth of Moroccan agricultural exports, in volume, has been nearly stagnant over the past 15 years. This has been due to increasingly restrictive import policies by France and other EEC countries, as well as to trade controls and currency overvaluation by Morocco. Citrus exports peaked in 1979-80 at 770,000 metric tons. Since then they have fallen steadily to 521,000 metric tons. In 1983/84 citrus exports decreased by over 13 percent, even though total production increased by over 6 percent. Exports of tomatoes and potatoes have been decreasing (exports of each in 1983 were only half what they had been in 1974/75) even as total production has increased. The export of olive oil was 34,500 metric tons in 1972. It fell to 16,600 metric tons in 1979/80, and then dwindled to 1,300 metric tons in 1982/83. Similarly, wine exports, primarily to the EEC, have fallen by more than half since 1972/73. As a result of these adverse trends, the agricultural trade balance has gone from being a surplus in 1974 to one of substantial deficits (U.S. $374 million in 1984). [World Bank, Agricultural Sector Adjustment Loan, p. 11]

Exports of horticultural products, which have historically played an important role in Morocco's overall trade picture, have also been declining. Most reliable projections suggest that this decline will continue. Unfortunately, the underlying causes of this decline are beyond the control and influence of Morocco. [1]

Moroccan agricultural exports are dominated by horticultural exports, primarily citrus exports directed towards France and the European market. In 1982, for example, citrus exports (primarily oranges and clementines)

1/ The bulk of this analysis is taken from Michael V. Martin, "Production and Marketing of Horticultural Commodities: Morocco", completed under contract to AID, draft January 15, 1985, and Michael Martin, Ed Hogan, and Ludwig Eisgruber, "Agricultural Trade and the EC Enlargement: The Likely Impacts

accounted for nearly half of the value of food exports (excluding fish and fish products). The majority of Morocco's citrus production is destined for the export market (e.g. some 74 percent of Morocco's oranges and 66 percent of its clementines were exported in 1983). While a wide range of vegetable crops is grown in Morocco, only tomatoes and potatoes are important export crops. Sales of tomatoes accounted for 8 percent of the value of food imports (again, excluding fish and fish products).

The European Economic Community (EEC) imports about two-thirds of Morocco's citrus exports. In turn, France accounts for 43 percent of the EEC total. Almost all (94 percent) of Morocco's tomato exports goes to the EEC (of which France receives 78 percent).

Given the concentration of exports to the EEC, changes in EEC structure and policies will significantly affect Morocco in both the short- and long-run. The most significant recent change has been the accession of Greece, Spain and Portugal to the EEC. The obvious impact will be a marked increase in the EEC's self-sufficiency in a number of fruit and vegetable products. Spain, for example, accounts for 27 percent of the agricultural land and 80 percent of the irrigated land in the newly expanded EEC. Consequently, the EEC will move from being 51 to 89 percent self-sufficient in citrus fruit, from 94 to 99 percent self-sufficient in tomatoes, and from 99 to 100 percent self-sufficient in potatos. In addition, the EEC will become self-sufficient in olive oil, wine, and some vegetables. Morocco will be competing with other Mediterranean countries, e.g. Cyprus, Israel, Tunisia, and Turkey, to fill any of the EEC's remaining agricultural import needs.

While the EEC will immediately increase its self-sufficiency for a number of products on an annual basis, certain "seasonal windows" will continue to be available, due to both the production calendar in Europe and openings in the EEC's trade barriers. Currently, for example, Morocco receives a 50 percent tariff concession on its exports of tomatoes to the EEC between November 15 and April 30. It also receives a 40 percent tariff reduction on potatoes exported to the EEC between January 1 and March 31. Nevertheless, it is widely believed that, given the enlargement of the EEC, both production and policy adjustments will eventually narrow and completely close many of these windows. The higher producer price associated with EEC membership will bring about a relatively strong production response, particularly in Spain and the Canary Islands.

At the same time, European demand for most horticultural products is stagnant. In part, this is due to the relatively low population growth rates throughout Europe (approximately 0.5 percent per year). Given the apparent income elasticities for fruits and vegetables and the relatively slow growth in incomes and population projected for Europe, the demand for horticultural products will probably increase very slowly in coming years.

Since 1976, Morocco, along with Algeria and Tunisia, has enjoyed special access to the European market under the EEC-Maghreb Cooperation Agreements. This agreement grants Maghrebian countries tariff reductions ranging from 30 to 60 percent on their fruit and vegetable exports. The Maghreb preferences will almost certainly be reassessed now that Spain and Portugal have joined the EEC. The new EEC members will push for restrictions on import policies.

There is little that Morocco can do to change this outlook. Morocco already possesses a relatively efficient production and export marketing system, and produces citrus of consistently good quality. No apparent significant constraints exist in packing or physical handling capability. Consequently, opportunities for improvement in terms of quality or price competitiveness, or through reductions in production or marketing cost, are limited. The major constraints to the expansion of Moroccan citrus exports lie in the dynamics of the traditional export market. The evidence available suggests that Morocco will be unable to find alternative markets that will be able to absorb more than a fraction of current production.

A shift to alternative crops is possible. However, a major shift can only occur in the long run, in part, because Morocco's citrus orchards are relatively young. It is likely, however, that the horticultural sector in Morocco will undergo structural adjustments in the coming years. First, within the citrus sector, production will likely move away from oranges and towards clementines, which enjoy a strong reputation for quality in Europe. Secondly, there will probably be a shift towards a more diverse set of crops. Greater emphasis will be placed on crops such as cucumbers, onions and cut flowers, which fit the market windows in Europe. The volume of exports in these alternative crops will be relatively small, however.

A third alternative is increased production for the domestic market. Reliable estimates of food demand are not available, however it is possible that Morocco will see a significant expansion of domestic consumption of fruits and vegetables in the coming years. The consumption of citrus in Morocco increased by an estimated 43 percent between 1979 and 1982, while that of tomatoes increased by 28 percent during this same time period. Similar increases were experienced in the consumption of most other vegetables and fruits. In recent years, the drought and recession reversed this trend. However, as these problems recede, demand for horticultural products should increase at least as rapidly as the population growth. In the long run, it is also possible that irrigated production can be shifted towards non-horticultural crops, such as bread wheat, that are currently imported, or to crops, such as forages, for which demand is expected to increase.

XIV. THE ROLE OF THE PUBLIC SECTOR IN MOROCCAN AGRICULTURE

As in most developing countries, agriculture in Morocco is largely a private sector industry. Production, in particular, is in the hands of hundreds of thousands of small farmers who make millions of daily decisions on the choice of crops, inputs, marketing of products, and so forth. Nevertheless, the public sector is also directly involved in agricultural production through public and parastatal organisations. The state also plays a major indirect role in determining agricultural production, by establishing policies on subsidies, incentives, prices, and monopolies, which influence the effectiveness and the extent to which the private sector can contribute to the development process.

1. The Ministry of Agriculture and Agrarian Reform

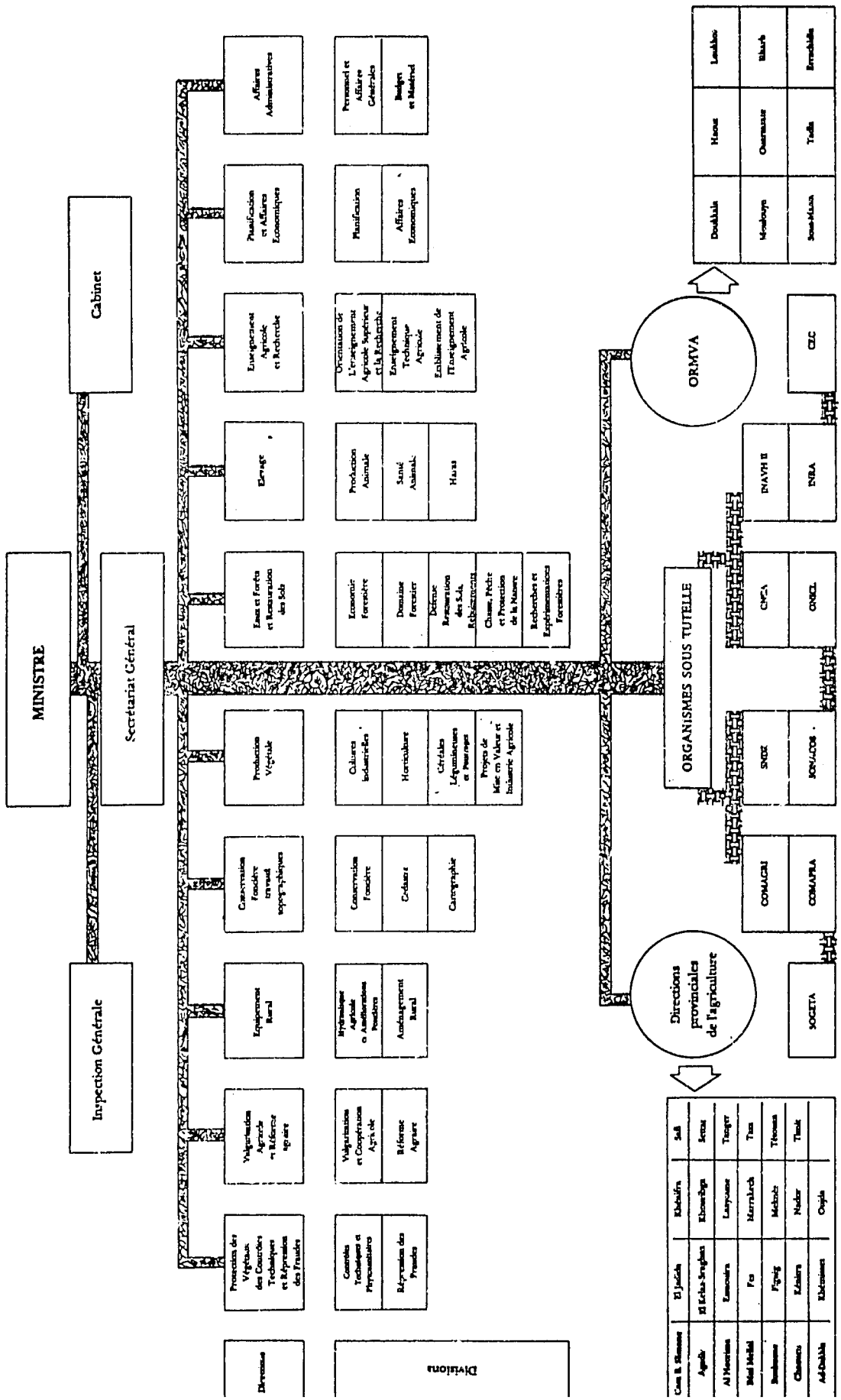
The Ministry of Agriculture and Agrarian Reform (MARA) has principal responsibility for the provision of public services to Moroccan agriculture. Measured in actual expenditures, MARA accounted for roughly 3.5 percent of the GOM's operating budget and 13 percent of its total investment budget in 1985. MARA is organized along fairly classical lines. (Figure 14-1 presents MARA's organizational structure.) At the local level, MARA operates through two separate and distinct institutional structures: the Offices de Mise en Valeur Agricole (ORMVAs), which serve the irrigation command zones, and the Directions Provinciales d'Agriculture (DPAs), which deal primarily with rainfed agriculture.

Each of the nine ORMVAs services the geographic area around a major irrigation command zone. (See Section IV-3, Figure 4-1). The ORMVAs are responsible for the design, construction, operation and maintenance of the irrigation networks. ORMVA technicians supervise farming operations for industrial crops and assist in the establishment and monitoring of agricultural cooperatives. In addition, ORMVA technicians distribute inputs, provide extension and mechanization services to farmers, supervise short-term credit, and provide genetic improvement and health control services for livestock.

The ORMVAs are also responsible for providing assistance to rainfed farmers and those dependent on traditional irrigation methods that are located within their jurisdictions. Currently, there are 4 hectares of rainfed land under ORMVA jurisdiction for every hectare of irrigated land. In general, however, ORMVAs have done little to assist crop production outside of the major irrigation command zones. Moreover, ORMVA resources have been concentrated on constructing new irrigation schemes, rather than on operating and maintaining existing ones. In addition, ORMVAs have concentrated on promoting and developing industrial crops (especially sugarcane and sugarbeet) and have paid relatively little attention to non-industrial crop production, even though these cover about 80 percent of the irrigated land in ORMVA areas.

The DPAs have jurisdiction over the most of the rainfed cropland in Morocco. As is the case with ORMVAs, the DPAs are responsible for distributing inputs and providing extension and mechanization services to farmers within their jurisdiction. However, the DPAs are perceived as being less effective than ORMVAs at providing goods and services to farmers. Two primary reasons have been suggested for this: (1) DPA salary scales are lower than those of ORMVAs and, therefore, they have had greater difficulty in

Figure: 14-1: Organizational Structure of the Ministry of Agriculture and Agrarian Reform



attracting and retaining competent staff; (2) DPAs are not legally autonomous vis-a-vis the Government (as are ORMVAs). Therefore, the DPA decision making and budgetary processes are less efficient and flexible, and the internal management structure of DPAs less clear-cut. [1]

To address these weaknesses, the GOM is considering a reform that would expand the responsibility of ORMVAs to include the development of rainfed and small-scale irrigation activities presently under the authority of DPAs. The first step would be the expansion of the areas under the nine existing ORMVAs to cover roughly two-thirds of the agricultural area in Morocco. Once this new structure was established, the government would create three new ORMVAs to cover the rest of the country's arable land. Ultimately, all agricultural development duties at the regional level will be the responsibility of ORMVAs. The details on the implementation of this proposed reform, and notably the roles of the DPA's and CTs in the enlarged areas of ORMVA responsibility, have yet to be determined.

At the same time, a number of reforms are being proposed to improve the overall effectiveness of ORMVAs. These include the transfer of some services (e.g. veterinary services and genetic improvement) to the private sector, streamlining the budgetary processes, and improving cost recovery for water delivery and other services. (See section IV-3).

2. Agricultural Research

Agricultural research in Morocco is primarily the responsibility of the semi-autonomous National Institute for Agricultural Research (INRA). To date, the impact of research on Moroccan agriculture has been limited. Moreover, expenditures for agricultural research in Morocco represent only 0.4 percent of total agricultural GDP. This is less than the average for third world countries (which average 0.5 percent) and substantially less than the 1 percent generally recommended by major international institutions. Almost all of INRA's budget is provided by the State.

INRA has very limited scientific capability to carry out its research program, especially given the diversity of the country's needs. It has only 228 scientists, of which some 55 percent have only BS degrees and most of which have less than five years of experience. Moreover, INRA is particularly weak in certain disciplines, such as plant genetics, animal husbandry, the social sciences and economics.

INRA has operated a large network of experimental stations throughout the country, including some 78 stations and 64 experimental farms, linked to 14 regional centers. Such a network may not be excessive in light of the diversity of agriculture in Morocco. However, the human and financial

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1/ The performance of the ORMVAs has also probably benefitted from the fact that a disproportionate amount of public sector resources have been directed to irrigated agriculture and the fact that they deal with crops and cropping systems for which production increases are more easily attainable.

resources available to INRA are limited. Therefore, this large network of research stations and farms has led to a counterproductive dispersion, both geographic and disciplinary, of its scarce professional and financial resources. Regional centers and research stations are very thinly staffed and, as a result, research is compartmentalized. Often those researchers in regional offices find themselves isolated and overburdened with management responsibilities. In addition, many of INRA's buildings and laboratories need to be renovated and equipment needs to be repaired or replaced.

As a result of these problems, insufficient research has been undertaken. In 1981-82, for example, only 10 percent of the arable land on INRA stations was used for experiments (440 ha), 45 percent was used for seed multiplication, 20 percent for production, and 25 percent was in fallow. Faced with these problems, INRA is eliminating or combining experimental farms, as well as a reducing the number of regional offices. [ISNAR, l'Institut National de la Recherche Agronomique du Maroc: Bilan et Perspectives, pp. 25-44].

The majority of the agricultural research in Morocco that has been undertaken has historically centered on irrigated crops, particularly bread wheat, sugarbeet, and cotton, rather than dryland crops. Research on dryland crops, such as barley (which represents over 45 percent of all land in cereals and more than 25 percent of all cropped area) has not been commensurate with their relative importance in the Moroccan economy. The recent creation of the Aridoculture Center, in Settat Province, is a major step towards redressing this imbalance.

Though INRA is the only government entity devoted solely to conducting agricultural research, other institutions also conduct research, and in some sense, compete with INRA. These include the Institut Agronomique et Veterinarie Hassan II (IAV), the Ecole Nationale d'Agriculture de Meknes, and other educational institutions, for which research is a necessary and integral activity. IAV alone has some 300 professor-researchers at levels more or less equal to the grade of ingenieur d'etat (four times the number within INRA), of which at least half are engaged in research at least part time (often preparing doctoral dissertations). Further, some central directorates within MARA conduct modest amounts of research. An example is the Direction de l'Elevage, which operates several experimental stations. In addition, ORMVAs, parastatals, and private agro-industrial enterprises carry out their own research. In many cases, these institutions are conducting this research because INRA's resources have not been adequate to address their research needs [ISNAR, l'Institut National de la Recherche Agronomique du Maroc: Bilan et Perspectives, pp. 66-69].

The absence of an integrated system of agricultural research has made it difficult to ensure that research results are disseminated and used. Given the weaknesses in the extension system, there is no mechanism established to transmit research results to farmers. At the same time, the relative paucity of research has meant that proven technological packages, particularly for rainfed crops, have not been available to extend to farmers.

USAID has been encouraging reforms within INRA as part of its program of PL 480 Self-Help Measures. These reforms have included (1) supporting the development by the GOM of a master plan for agricultural research and extension efforts; (2) ensuring the availability of material resources for

research units, laboratories, and stations carrying out research programs in dryland agriculture, with particular emphasis on GOM support for the Aridoculture Center in Settat; (3) restructuring INRA personnel policies to ensure that INRA offers researchers a career ladder based on competence and productivity, and that INRA salaries are competitive; (4) the termination of INRA involvement in seed production; (5) the closing of a some 40 experiment stations and farms, and (6) the development of a management-by-objectives system for budget and control and a new organizational structure that will focus the research program in regional centers and out of Rabat.

Rainfed Agricultural Research Needs and Objectives

The only comprehensive, multidisciplinary agricultural research program in Morocco is being conducted at the INRA Aridoculture Center, located in Settat, under the auspices of USAID's Dryland Applied Research Project (608-0136). The research being conducted there aims to improve rainfed crop production, particularly for cereals and forage, by focusing on the production system, rather than just individual components.

Traditional rainfed agriculture in Morocco is low in productivity. Addressing this problem involves two major areas of research activity. The first is directed at reducing the constraints on crop production, particularly with respect to water availability. This research is directed at:

1. Selecting germplasm and testing varieties for drought and pest tolerance;

2. Developing cropping systems for that produce an optimum economic yield while conserving soil moisture;

3. Developing tillage practices and equipment that improve soil water catchment, storage and utilization, and soil conservation;

4. Identifying soil fertility, structure, and water interactions that affect plant growth;

5. Identifying weed control techniques to enhance soil water storage and utilization;

6. Identifying pest control techniques to reduce crop losses; and

7. Improving forage quality and quantity for animal feed.

The second area of research activity involves socio-economic studies that are directed at farm economics and family behavior patterns as they interact in the decision-making process. In this research, particularly the analysis of farm survey data from the Settat region, social scientists and an agricultural economist at the Aridoculture Center are cooperating with researchers at IAV Hassan II. In addition, research is underway in the Abda region (which includes the Jemaa Shaim research station) aimed at:

1. Determining current strategies and practices for livestock production, with special emphasis on small ruminants;

2. Identifying the relationships between livestock and crop production strategies; and

3. Creating an information link between researchers and producers.

The socio-economic program will provide an essential understanding of the structure of the farming community, the economic constraints to production, the strategies for risk reduction used by farmers, and avenues through which improved technology may be best introduced.

3. Agricultural Extension

Extension services in rainfed areas are provided through Centres de Travaux (CTs - subunits of DPAs). CTs serve an estimated 1,385,800 farmers, covering nearly 7.5 million hectares. There are some 1,680 technicians working for CTs. These include ingénieurs, adjoint techniques, and agents/sous agents techniques, not all of which would be considered extension agents. Overall, there is a ratio of 825 farmers and 4,435 hectares per technician in rainfed areas. Extension services to the estimated 556,880 farmers in irrigation areas (some 700,000 hectares) are provided through the Centres de Mise en Valeurs (CMVs - subunits of the ORMVAs). There are 1009 ORMVA technicians working in CMVs, giving an average of 250 farmers and 700 hectares per technician. When rainfed areas within the ORMVAs are included, the average number of farmers/technician rises to 552. For both rainfed and irrigated lands, however, the farmer/agent ratio varies considerably from region to region. The World Bank has recommended that the number of extension agents in CTs be tripled, and that the number of ORMVA extension agents be doubled. [World Bank, Agricultural Sector Adjustment Loan, Technical Support Volume, p. 26, 44-45].

Extension agents are primarily involved in the delivery of services (fertilizer, seed, mechanized land preparation), regulatory work, and the collection of statistics. No regular system of contact (e.g training and visit system) with farmers exists. There are no subject matter specialists in the CTs and CMVs who are responsible for technical guidance and training of extension agents. The concept of extension as an educational service to farmers is virtually unknown. The limited extension education activities of the Ministry focus on developing test plots and field demonstrations, sponsoring ploughing competitions, and organizing farmers' field study tours. In the livestock area, "extension" is almost entirely focused on the delivery of services, particularly health control and artificial insemination. The services delivered by the extension agents may be appreciated by farmers (many are subsidised), but they are not directed at farmer education. They have become the major, if not exclusive, activity of the extension service. As noted above, communication between extension and research is extremely limited.

Extension in irrigated areas is much more intensive, and reportedly more effective, due to the ORMVA's greater administrative flexibility and efficiency. The limited geographic area of the irrigated offices, the high value crops being grown, and the highly integrated nature of the production and processing of certain major crops (e.g. sugarbeet and cotton), make possible a more structured and more intensive extension system. The principal job of the CMVs in the irrigated areas is to supply inputs to farmers, compile files for credit applications, arrange for the scheduling of harvesting and

transport of sugarbeet, sugarcane, or cotton to factories, and monitor the crop production work in each irrigation block. These are important, but not true extension education functions.

Extension is the responsibility of the Direction de Vulgarization et de la Réforme Agraire (DVRA). The organization of the extension service is unwieldy, and its personnel are undertrained, inadequately equipped, and relatively immobile. The extension service, itself, is underfunded. The overall budget for DVRA was about 22 million dollars in 1984 (excluding salaries of central and DPA staff but including salaries of CT staff). However, the amount going directly to carrying out extension activities is minimal (e.g. only 2 percent of CT expenses went for direct extension activities in 1983). On average, each of the 119 extension centers has only about $600 per year for all extension activities, including travel, or about $12 a week. In addition, no specialized extension training is provided to extension staff and in-service training of extension agents is inadequate (averaging only 2.7 days per year for extension agents in CTs).

In recent years several approaches have been explored aimed at improving Morocco's extension system. During 1982/83, USAID developed a US-$100 million production project which would have had a major extension component. This project, the Rainfed Agriculture Project (608-0170), included US-$42 million in DA funds, US-$7 million in ESF and US-$71 million in PL 480 Title I. The extension activities included in this proposed project were support for the then newly created National Center for Extension (CNERV), and a pilot extension project in Ben Ahmed district (in Settat Province). This draft Project Paper was never completed, and a Mission decision was made to suspend its proposed extension effort. [1]

The proposed USAID support to the CNERV (US-$14 million) was dropped because of weaknesses in the new Center's structure, organization and leadership. FAO fielded a seven person technical assistance team for one year (1983/84). This team has since departed and the fundamental problems of CNERV are still largely unaddressed. The pilot extension project was abandoned during PP development for a number of reasons, the most fundamental being the absence of any obvious and available technology to extend. For this reason, USAID began focusing on the long-term development of Morocco's national agricultural research capability.

Nevertheless, USAID has continued to encourage the GOM to reorganize its extension service, through PL 480 Self-Help Measures and other means. A first step in this process was to encourage MARA to develop an Extension Master Plan, to lay the basis for short, medium, and long term development of an effective extension service and of linkages to agricultural research. The Extension Master Plan was finally begun in late 1983 with the assistance of external consultants. A first draft report was produced in late 1984 [GOPA Conseils, Plan Directeur de la Vulgarisation]. The Ministry of Agriculture subsequently assumed sole responsibility for completing the Master Plan by late 1985.

1/ The economics and statistics components of this effort were subsequently developed as a separate project, the Planning, Economics and Statistics for Agriculture (608-0182), which was authorized in September, 1983.

The World Bank, through its four integrated rural development projects and, more recently, through its first Agricultural Sector Loan, has also been attempting to introduce a number of organizational reforms of extension on a pilot basis. A modified training and visit system (T&V) approach to extension has been tested under the World Bank-financed projects. In addition, 28 pilot extension areas have been identified for the application of these reforms. USAID has supported this effort through its 1985 PL 480 Self-Help Measures. The reforms primarily involve the creation of an extension service which is reasonably equipped and supported, has additional training and is only charged with extension education activities (i.e. is not involved in regulation or the delivery of services). Nevertheless, the more basic tasks, such as the strengthening of research/extension linkages, the overall upgrading of staff, and the development of the necessary organizational structures within the Ministry of Agriculture, are seen by IBRD as a long-term program of 5-10 years.

4. Agricultural Education

Higher Education

At independence in 1956, Morocco's only college-level agricultural school was the National Agriculture School at Meknes, established in 1947 to train the sons of wealthy French colonial farmers. Very few Moroccans were admitted to ENA prior to Morocco's independence. By 1956 there were a few Moroccans who had received higher-level training in agronomy and related subjects in France. In 1964, the GOM announced its intention to establish a Moroccan university-level agronomic training program. The Institut Agronomique et Vétérinaire, Hassan II (IAV) was established in Rabat in 1966. It started with only 12 students and with no buildings or equipment. The Institute now has 2,300 students and 33 programs of specialization on two campuses. There are 313 faculty, of whom 229 are Moroccan, teaching different subjects in 13 fields. Five professional associations have been created, as well as an active alumni association. IAV has developed an integrated philosophy of agricultural education in Morocco which includes an applied, "hands-on" approach to teaching, research and outreach.

This rapid development has been supported by three AID projects, beginning in 1970, as well as by other donor programs. IAV is now training the majority of Morocco's agricultural scientists, technicians and managers. IAV provides 4-year B.S. degrees and is the only institution in Morocco granting master's and doctoral degrees in agriculture and veterinary medicine.

IAV has recently established a second campus, located at Agadir. It provides training at all levels (B.S., Master's, two-year technician training and in-service training) in horticulture and plant protection. This has represented a conscious effort by IAV to decentralize and regionalize its training programs and to provide outreach to a variety of subsectors and commodity related agro-industries.

Four year B.S. degrees in agriculture are also granted by the National Agriculture School (ENA) at Meknes and the National School for Forestry Engineers at Sale. Both of these schools have received faculty training and related support from AID. ENA administrators and faculty are currently working closely with local farmers on a number of local disease and other

production problems. Faculty participants at ENFI are seeking ways to develop better linkages for applied research with the National Forest Service, especially in the areas of soil conservation and watershed management.

IAV is organized as an independent public establishment with its own statute. It is governed by an advisory board composed of representatives of MARA, the Ministry of Education, the Ministry of Finance, and INRA. Its budget is channelled through the Ministry of Agriculture. IAV and its sister institutions, ENA and ENFI, train all the higher-level manpower for the public and private organizations in the Moroccan agriculture sector.

The Institute is still dependent on expatriate faculty, although the balance is rapidly changing as Moroccanization occurs. Of the approximately 229 Moroccan faculty, most are young assistants, with no more than the equivalent of M.S. training, almost all trained at IAV in the last 4-5 years. Approximately, 19 Moroccan faculty have doctoral degrees. Some 40 percent of participants trained to the master's level with AID-funding have been recruited as members of the IAV faculty.

Technical Education in Agriculture

Historically, there have been two levels of agricultural technical education. The first involves the training of adjoints techniques (technical assistants) in a two-year program. Though participation in this program requires completion of secondary school, it does not require the attainment of a baccalauréat. Second, there is a one year program for agents techniques (technical agents), individuals who have completed the lower secondary cycle (grade 9). However, due to the increased numbers of secondary school graduates available, and the need for better educated personnel to carry out extension functions, the GOM recently decided to eliminate its training program for agents techniques.

Eleven schools provide technical training in agriculture. Six of these provide a wide range of technical agricultural studies. The others are specialized in livestock, rural development, topography, horticulture, agricultural mechanics, and forestry. All students receive scholarships which cover the full cost of their studies. They board at the schools and receive stipends to cover living expenses. These schools are all located in irrigated or higher rainfall areas and, therefore, may not adequately serve the training needs of more marginal agricultural areas. They also suffer from inadequate resources, lack of adequate teacher training, and weak curricula. In addition, the farms attached to these schools are often badly managed and incur substantial financial deficits annually. This, of course, reflects badly on the quality of the training and the reputation of the schools. [World Bank, Education and Training Sector Survey, Volume IV: Agriculture Education and Training, p. 15-24].

Farmer Training

A system of regional Farmer Training Centers (Centres Régionaux d'Animation et de Formation Agricoles - CRAFAs) was set up in 1968 to provide vocational training to young farmers. (The training of adult farmers is handled through the extension system). The official goal of each CRAFA is to offer five two-month courses, each with around 20 participants. The CRAFAs

are, however, seriously underutilized, due to shortages in funds and the difficulty of finding students. Although instruction and lodging at the centers is free, farmers prefer to keep their sons on the farm or in paid employment when possible. In general, the instructors at the CRAFAs are not sufficiently trained. Often, the farms attached to the CRAFAs are not operating because of a lack of funds, thus reducing the ability of the CRAFAs to provide practical training. Finally, the cost per student of operating the CRAFAs is high (three times the per student cost of secondary schools in general). The National Assembly has called upon MARA to establish a CRAFA in each of the 150 administrative districts (cercles) in the country. In this vein, the 1981-85 Five Year Plan proposed the creation of 25 new CRAFAs (there were 9 CRAFAs in 1981). Based upon the findings of its Education and Training Sector Survey (1983), the World Bank recommended that the GOM work towards improving the content and coverage of the training given by the existing facilities, rather than embarking on a major expansion of the system. [World Bank, Education and Training Sector Survey, Volume IV: Agriculture Education and Training, p. 9-12].

5. Agricultural Planning and Policy Analysis

Agricultural policy analysis is weak in Morocco, for various reasons. Historically the Ministry of Agriculture has not been perceived as having a policy role. Rather, it is viewed as a "technical" Ministry. Also, since the tradition of applied quantitative agricultural policy research is not strong in France, it has been slow to develop in Morocco. The bulk of social science research completed in Morocco (both prior to, and since, independence) has been in sociology and anthropology. [1] Consequently, the knowledge base on the agricultural economy and its underlying the structural relationships is not strong. In addition, statistics are unreliable, scattered and often contradictory. The basic data needed for agricultural economic analysis, e.g. prices and quantities in local, regional and national markets, are not readily available. As a consequence, the production functions, supply and demand elasticities, and other basic parameters needed for an economic analysis of the agricultural sector do not exist.

In addition to these constraints, the institutional and human resource base for agricultural policy analysis in Morocco is weak. The Agronomic Institute does not teach modern economic theory, production economics and marketing. The Ministry of Agriculture's economics division is preoccupied with the preparation of Five Year Plans, annual MARA budgets, and project analysis. It is neither well staffed nor well trained. The statistics division, while making progress, is still concerned with compiling classic "statistics", rather than in generating information useful to farmers and other policy makers. USAID's Planning, Economics and Statistics for Agriculture Project (608-0182) is designed to respond to these institutional weaknesses.

1/ There has been only one U.S. Ph.D dissertation concerning Morocco on an agricultural economics topic in the last 15 years. No Moroccan has completed dissertation research in agricultural economics. There are, however, four candidates currently studying towards their doctorates in agricultural economics, under the USAID-funded Agronomic Institute Project

Despite the analytical and institutional weaknesses mentioned above, Morocco has created, over the years, a wide panoply of policy instruments which explicitly or implicitly influence resource allocation in the agricultural sector. These include taxes, an enormous array of duties, regulations, market barriers, price controls, and subsidies. One must suppose that these policies are frequently at cross purposes. At World Bank insistance, and with USAID assistance, MARA has undertaken a major study of the agricultural policy environment, focusing specifically on the role of the government's price and incentives policies on agricultural production. A high level Study Group, reporting directly to the Minister of Agriculture, was formed and began the study in May 1984, with the assistance of AID-funded consultants.

The Prices and Incentives Study group has produced, and revised, a first descriptive report of the agricultural sector, entitled "La Politique de Prix et d'Incitations dans le Secteur Agricole". This report presents initial (static) calculations of private and social profitability, effective protection, and domestic resource costs for major crops and alternative techniques of production. This work has led to the selection of six sub-sectors for further in-depth study (including some dynamic modeling). The study will examine the impact of current price policy on producers, consumers, the budget, and the balance of payments, and will evaluate whether or not current policy is likely to achieve the desired objectives. In addition, the advantages and disadvantages of alternative feasible policies will be identified. The sub-sectors to be examined are: cereals (imports, consumer subsidies, marketing margins); livestock (including the pricing of feed-oriented by-products and feed grains, including barley, and seasonal milk pricing); cotton (the potential for expanding production); pulses (the impact of export prohibition and reasons for the declines in production); and sugar (domestic self sufficiency, pricing, regional distribution, dryland versus rainfed production, efficiency of processing).

As a consequence of their growing analytical capability, the GOM has undertaken a number of policy reforms in the last two or three years. (See Section XVIII). It has, for example, decreased fertilizer subsidies, eliminated all agricultural taxes, increased water rates and collection, increased CNCA interest rates, and raised producer prices for wheat and barley. It has also attempted to increase the share of public investment going to rainfed agriculture. Other policy changes underway in the agriculture sector include the "privatization" of veterinary and artificial insemination services, reforms in the certified seed production and distribution system, and increasing private sector participation in fertilizer distribution. Efforts to increase participation by the private sector in cereals storage and marketing are also being examined.

The value of micro-computers for data base management and analysis is becoming increasingly recognized by the staff of the DPAE and other divisions. (USAID has provided a large number of micros to MARA). Critical economic concepts such as "opportunity costs" are beginning to gain acceptance. Equally important is the increasing realization of the inadequacy of existing data on supply and demand relations and of the need to conduct statistical surveys and data analysis to provide basic knowledge about of the agricultural economy.

XV. PARASTATALS

1. The Importance of Parastatals in Moroccan Agriculture

The public sector participates directly or indirectly in the management of a large number of public enterprises in the Moroccan economy which, as a group, represent a substantial drain on the Treasury. As a consequence, the GOM has specified the rehabilitation of public enterprises as one of its economic policy reform priorities. In the agriculture sector there are relatively few public enterprises. The agricultural parastatals include: the CNCA (agricultural credit); SONACOS (cereal seed production and distribution); FERTIMA and Maroc Chimie (fertilizer production and distribution); ONICL (cereal importation and processing); OCE (agricultural and export licensing); COMAPRA (oilseed marketing and processing); and SOGETA, SODEA, COMAGRI, and SNDE (crop and livestock production). In addition, INRA, the national agricultural research institute, and the nine ORMVAs that provide extension and service delivery to irrigated agriculture are officially semi-autonomous (parastatal) entities. The roles of these agricultural parastatals, and their relationship to the private sector, sector are discussed below. [1]

USAID is engaged in a policy dialogue with the GOM on a number of issues related to the role and performance of public enterprises in agriculture. These issues include: increasing the self-sufficiency of ORMVAs; deregulation of fertilizer and cereals seed production and distribution; the production and distribution of animal feed (e.g. sugarbeet pulp, bran), and cereals storage and milling. All things considered, Morocco is relatively free from major state intervention in agricultural inputs, production and marketing. USAID is already focusing on most of the major exceptions.

2. Management of Irrigation Systems (the ORMVAs)

The nine Offices Régionaux de Mise en Valeur Agricole (the ORMVAs) perform extension and other functions that are often the responsibility of public sector institutions in developing countries. Nevertheless, while they are officially semi-autonomous, the ORMVAs are the most important parastatals in agriculture in terms of budgetary impact. Of the average Dh 1.4 billion per year in capital subsidies granted by the state to all public enterprises between 1977 and in 1981, the ORMVAs, as a group, received nearly 46.8 percent. In addition, ORMVAs received another 41.5 percent of the Dh 456.6 million per year in operating subsidies provided by the GOM to parastatals. [World Bank, Morocco: Financial Sector Study, p. 95-6]. The GOM's Agricultural Sector Adjustment Program seeks to make the ORMVAs, in particular, more self-sufficient. This will be done through increased collection of water charges, eliminating fertilizer subsidies, and transferring some responsibilities to the private sector (see Sections IV-4 and V). It should be noted, however, that the ultimate responsibilities of both the ORMVAs and the CTs is agricultural extension education, a function that often rests with the public sector, especially in developing countries.

1/ See Section VIII-6 for a discussion of the CNCA and Section XIV-2 for a discussion of INRA.

3. Production and Distribution of Improved Seeds (SONACOS)

SONACOS, the Société Nationale de Commercialisation des Semences, is responsible for coordinating, organizing, and controlling certified seed production, distribution and marketing. (See Section VIII-2 for a detailed discussion of the seed subsector). SONACOS contracts the actual production of certified seeds to SOGETA, SODEA, COMAGRI, to large private farmers, and to some agricultural cooperatives. The marketing of certified seeds is, by law, the sole responsibility of SONACOS. It has eleven regional seed treatment centers and around 300 sales outlets with, theoretically, a total annual handling capacity of 50,000 MT of seed. SONACOS's present activities include the multiplication, through contracts with selected farmers, of durum wheat, bread wheat, barley, oats, and a small amount of rice.

The cost of seed to farmers is subsidized and the fixed prices SONACOS has charged farmers have not been sufficient to cover the cost of producing that seed. Consequently SONACOS has been largely supported by GOM subsidies paid by the "Caisse de Compensation". In 1983/84 this subsidy amounted to 35.9 billion dirhams. The financial burden of this subsidy on the GOM has limited the size of SONACOS' seed production program. As a result, efforts are now underway to freeze the size of these subsidies to 1983/84 levels. Because of these production cost/price relationships, cereals multiplication has not attracted the private sector and, since other crops are of relatively minor importance, there are no private seed multiplication enterprises in Morocco.

SONACOS has a legal monopoly on the marketing of certified seeds, which it undertakes through the CT-CMV network. This system has been an impediment to certified seed distribution and use, however, since the MARA agents at these centers have neither the expertise, nor the incentive, to promote seed sale and use.

4. Fertilizer Production and Distribution (FERTIMA)

The public sector controls all fertilizer imports, manufactures over two-thirds of locally produced fertilizer, and distributes at the wholesale level approximately one-half of all fertilizer consumed in Morocco. (See section VII-3 for a detailed discussion of fertilizer production and distribution). Domestic fertilizer is produced by two firms. The largest producer is Maroc Chimie, an subsidiary of the publicly-owned Office Cherifien des Phosphates (OCP). The second producer is the Société Cherifienne d'Engrais et de Produits Chimiques (SCE), a private firm. SCE manufactures about 25 percent of the fertilizer produced in Morocco. Fertilizants Marocains (FERTIMA), an OCP affiliate, controls all importation of fertilizer and acts as domestic sales agent for OCP/Maroc Chimie. It maintains a distribution network at both the wholesale and, through the CT/CMV network, at the retail level.

With respect to fertilizer, the role of the private sector is limited to distribution. Nine private companies participate in wholesale fertilizer distribution, of which SCE is the largest, accounting for about 30 percent of total fertilizer sales. FERTIMA and SCE make up 80 percent of total fertilizer sales, with the other eight private firms sharing the remaining 20 percent of the market.

Retail fertilizer distribution is primarily handled by small-scale private firms. In 1983, for example, 63 percent of FERTIMA's output went to private sector retailers, cooperatives, and large individual farmers (another 25 percent went directly to parastatals and 11 percent was marketing through the CT and CMV outlets). Unfortunately, problems with the fertilizer pricing structure have discouraged retailers from expanding their distribution networks and made fertilizer storage at the local level unprofitable. The GOM is introducing major policy reforms in the fertilizer sector, including the elimination of fertilizer subsidies and fixed margins, in order to encourage greater participation by the private sector and cooperatives in fertilizer storage and distribution.

5. Cereal Distribution (ONICL)

The Office National Interprofessionnel des Céréales et des Legumineuses (ONICL) is responsible for importing cereals, establishing and enforcing cereals price policies, and coordinating cereals processing (including the setting of margins for traders and processors). ONICL has a monopoly on cereal imports and has licensed 12 importers to import cereals under its supervision. Once ONICL decides on import levels, it calls for bids from the licensed importers and allocates the contract to the lowest bidder. Imports are almost exclusively of bread wheat and are frequently obtained at concessional terms and below current market prices. Adjustments are made for differences between the official and import cost, such that the price paid by millers for imported and domestic wheat is the same.

ONICL appoints agents to purchase domestic cereals at fixed prices. These include around 58 traders, licensed by ONICL to purchase cereals; 7 Coopératives Marocaines Agricoles (CMAs) and 7 Sociétés Coopératives Agricoles Marocaines (SCAMs). In addition, industrial millers are permitted to purchase hard wheat directly from producers and middlemen.

The SCAMs and CMAs are located in primary and secondary cities. Both are, effectively, government-run organizations. Two thirds of SCAM/CMA purchases are made from their central stores, generally from larger commercial farmers who have the resources necessary to deliver the crop to the central store. Some 27 percent of SCAM/CMA purchases are from secondary centers and only 10 percent of their purchases are from souks. Over time, the proportion of cereal purchases at the souk level has declined. Both the SCAMs/CMAs and licensed buyers purchase cereals at the official price and sell it to millers at that price. They are reimbursed for their handling, storage, and transport costs by the government.

Since 1980 the share of total domestic production purchased through official channels has averaged 40 percent for bread wheat, 6 percent for durum wheat, 4 percent for barley, and 15 percent for corn. Licensed buyers account for an average of 40 percent of official domestic cereals purchases between 1975 and 1983 (33 percent of soft wheat). SCAMs and CMAs accounted for 46 percent of official domestic purchases (67 percent of soft wheat). Industrial millers accounted for the remaining 14 percent of official cereals purchases, exclusively hard wheat, of which they purchase 74 percent.

ONICL does not own or operate cereal processing or storage facilities. Rather, it controls the licensing and operation of some 67 industrial flour mills. The average crushing capacity of these mills is over 2 million metric tons per year. On average, around 92 percent of the wheat that they process is soft wheat, which they receive from ONICL, and imports account for 88 percent of deliveries. [World Bank, Agricultural Sector Strategy, Technical Support Volumne, p. 168-173.]

6. Export Marketing (OCE)

Until recently, all exports of Moroccan food products, both fresh and processed, were handled by the Office de Commercialisation et d'Exportation (OCE), a parastatal. (See Section XIII-2 for additional information on Moroccan exports). While private firms could carry out market surveys and contact buyers, OCE retained responsibility for contract negotiation, transportation, marketing and quality control. The Government abolished OCE's export monopoly for processed food exports in 1984 (though OCE remains responsible for quality control). OCE's monopoly on exports of fresh horticultural products (primarily citrus, tomatoes, and potatoes) is being eliminated as of the 1986/87 crop year. At that time, producers will have the option of exporting their output through private export companies or through OCE.

Export prices are effectively determined by the world market. Prices paid by the OCE to growers for exports are weighted (or blended) average prices across grades (subtracting the full cost of export services). Thus, a farmer that delivers uniformly high quality produce may receive a price that reflects a lower average quality. Over the past decade, while the prices received by OCE rose rapidly, the fees charged by OCE also increased such that producers did not realize proportionate gains in the dirham price of exports.

The domestic market for horticultural products in Morocco is relatively free. It is made up of relatively small wholesale and retail merchants who purchase their output from small producers. No central agency controls and coordinates the domestic horticulture market and the government does not set domestic horticultural prices. These prices are affected, however, by changes in the percentage of production exported, since output that is rejected for export enters the domestic fresh fruit or vegetable market or is processed.

7. Crop Production (SOGETA and SODEA)

SOGETA (Société de Gestion des Terres Agricoles) and SODEA (Société de Developpement Agricole) are public enterprises, created to publicly manage former "colon" farms. SOGETA was created in 1973, and currently manages a total of 97,000 hectares of non-irrigated land, scattered throughout the country. SOGETA's land is principally geared to cereal seed multiplication, annually producing almost half of the certified cereal seed used in Morocco. The GOM had planned to distribute SOGETA's land to small farmers under the Agrarian Reform program. However, due to the poor results of previous distribution programs, the GOM decided to hold the land and encourage SOGETA to improve its management and to become independent from government subsidy.

SODEA is similar to SOGETA, in that it manages just over 65,000 hectares of land for the state. However, a large part of the land managed by SODEA is irrigated (including 40,000 ha of fruit tree plantations. In contrast to SOGETA, SODEA has, since its inception, been financially profitable, but not overwhelmingly so. Observers have, however, commented that SODEA's management can be definitely improved, especially by reducing the number of technicians it employs (over 1,000 according to some sources).

8. Livestock Development (COMAGRI and SNDE)

The Compagnie Marocaine de Gestion des Exploitations Agricoles (COMAGRI) is a public enterprise, created in 1963 to promote the development of the livestock sector. It is responsible for obtaining and distributing improved breeds of dairy and beef cattle, sheep and goats to livestock owners, as a means of improving the quality of the national herd. COMAGRI operates seven breeding stations and cultivates its own land to feed its livestock. In addition, it grows high quality fruit tree stock for distribution to producers.

The Société Nationale de Developpement de l'Elevage (SNDE), created in 1974, is a parastatal which specializes in livestock breeding, with the overall goal of improving the national herd. SNDE is involved with the introduction and development of beef and dairy cattle and local and foreign breeds of sheep. SNDE operates a cattle feed plant at Sidi Bennour, with a capacity of 30,000 tons, and six pilot livestock fattening centers.

9. Cotton Production (COMAPRA)

The Compagnie Marocaine de Commercialisation des Produits Agricoles (COMAPRA) was created in 1962 and is responsible for the purchase and ginning of domestic cotton and the purchase of domestic sunflower production. COMAPRA is also responsible for the multiplication and distribution to farmers of selected cotton and sunflower seed. COMAPRA operates four multiplication stations and six processing facilities. Since edible oil prices and oilseed cake (meal) prices are held at subsidized levels to end-users, COMAPRA pays oilseed producers output prices that are below the border price equivalents.

XVI. PRIVATE SECTOR AGRO-INDUSTRY

Agro-industry in Morocco in 1980 consisted of 700 firms employing almost 38,000 workers with a total production of almost 10.2 billion dirhams. [1] The total gross value added by the sector was nearly 1.6 billion dirhams in that year.. Table 16-1 summarizes some of the basic characteristics of the sector. The dominant agro-industrial activities, in order of total output, are the sugar industry, cereal processing, tobacco manufacturing, and the processing of animal and vegetable fats and oils. These activities account for almost 57 percent of total output.

From 1978 to 1983, agro-industry accounted for about a quarter of all industrial investment and slightly more than a fifth of job creation in industry. Investment in agro-industry averaged 400 million dirhams annually and resulted in the creation of about 5,500 new jobs each year. In terms of permanent employment, the largest firms are located in the production of tobacco (one state-owned firm employing over 2,750 people), beer and malt (620 employees per firm) and sugar (336 employees per firm). Firms in the bakery/pastry subsector, on the other hand, were relatively small, employing an average of 13.2 persons each. (Note that data is not collected for firms employing fewer than 10 persons).

Food processing accounts for 37 percent of total production and 30 percent of "value added" in the processing sector. Among the most important processed food products are canned vegetables, fruit juices, canned olives, olive oil and wine. Of these, only olive oil, and to a lesser extent wines, serve a significant domestic market. About 85 percent of the processed product output is exported. The domestic demand for processed food products has grown slowly. In part, this has been due to the year-round availability of high quality fresh produce and to constraints on consumer income. Processing and packing capacity does not appear to be a constraint. Indeed, evidence suggests that there is substantial excess capacity in fruit packing.

Cereal processing (including bakery, pastry, and biscuit trades) accounts for 17.2 percent of total agroindustry output and over 20 percent of manpower in the sector. There are some 75 cereal processing and 306 bakery and pastry firms. In 1981/82 cereal mills in Morocco had a capacity of over 2 million metric tons. (See section XIV-5, Cereal Distribution). There are 12 sugar processing plants (10 processing sugar beets, 1 processing sugarcane, and 1 processing both. These plants employ over 4,000 people. In terms of value of output, the sugar industry represents 18 percent of the total agro-industry activity. The dairy industry has also seen a rapid growth since 1970. The number of processing units has increased. Dairy products comprise 5 percent of total of agro-industry output. (See Section X-2).

1/ Includes only firms that employ more than 10 persons or have gross sales of over 100,000 dh per year.

Table 16-1: Characteristics of the Agro-Industry Sector [1]

	No. of Firms	Permanent Manpower	Production Million Dirhams	%	Exports Million Dirhams	%	Use of Production Capacity	Value Added/ Worker ('000 dh)
Prepared Foodstuffs								
Cereal Processing	75	3,644	1,475	14.7	18	1.9	82	30.33
Bakery/Pastry	306	4,034	258	2.5	7	0.8	68	16.49
Sugar	12	7,055	1,877	18.4	21	2.2	89	43.41
Chocolate/Candy	16	986	108	1.1	-	-	61	27.53
Subtotal	409	15,719	3,719	36.5	46	4.9	84	32.47
Other Prepared Foodstuffs								
Preserved Fruit & Vegetables	57	3,249	536	5.3	306	32.6	59	39.97
Livestock Slaughter	6	212	17	0.2	7	0.8	75	18.75
Dairy Products	15	1,843	523	5.1	-	-	69	51.02
Animal/Veg fats & Oils	82	3,714	1,212	11.9	175	18.7	70	41.13
Preserved Fish & Seafood	42	2,918	430	4.2	332	35.4	61	39.78
Misc. Foodstuffs	41	2,025	1,137	11.1	17	1.8	82	70.86
Animal Fodder	11	1,008	397	3.9	-	-	79	44.54
Subtotal	254	14,969	4,251	41.7	836	89.2	72	45.77
Beverages and Tobacco								
Beer and Malt	2	1,240	248	2.4	-	-	98	52.32
Wine & Cider	13	821	265	2.6	22	2.3	54	53.31
Alcoholic Bev.	3	101	30	0.3	10	1.0	22	92.84
Non-alcoholic Bev.	18	2,356	438	4.3	19	2.0	78	52.57
Tobacco	1	2,758	1,245	12.2	5	0.5	100	54.03
Subtotal	37	7,276	2,226	21.8	55	5.9	74	53.75
Total	700	37,964	10,196	100.0	937	100.0	-	-

1/ Based on 1980 data. Table only includes data for firms with more than 10 employees or with sales of over 100,000 dh per year.

Source: Banque Marocaine du Commerce Extéroeur, Monthly Information Review, March-April 1984, p. 9.

The growth of the Moroccan agro-industry, especially with respect to exports, has been erratic, however. (See Table 16-2). The value of agro-industrial exports (measured in dirhams) has increased substantially in the last 10 years. In terms of volume, however, agro-industrial export performance has been mixed. For example, exports of preserved fruits and vegetables in 1984 were only 40 percent of the level reached in 1978, while exports of preserved vegetables were only 62 percent of 1977 level. Exports of fruit and vegetable juices and canned fish have likewise been erratic. While it is generally conceded that the potential for agro-industrial production is great, the recent experience of the several processing industries (below) suggests that major difficulties will have to be overcome to fulfill this potential. Twenty years ago, domestic olive oil production covered a large part of edible oil consumption in Morocco. Currently, however, 90 percent of edible oil consumption is met by animal and vegetable fats which represent 12 percent of the total production of agro-industrial sector. The olive oil industry has dwindled in significance, as a result.

Similarly, Morocco had a healthy tomato processing industry until the late 1970s, almost all of which was directed at the export market. However, a number of factors, including strong competition in the EEC market (both from domestic EEC producers and those in other countries), discriminatory EEC trade barriers, and ineffective marketing by the OCE, led to the collapse of the industry. Table 16-3 shows the drop in the exports of processed tomato products. The outlook for tomato processing looks bleak and, with increased domestic processing in the EEC it is unlikely that Morocco will be able to regain even a minor share of the European market. Consequently, the remaining Moroccan tomato processing firms are switching to other products.

Table 13-2: Selected Agro-industrial Exports 1975-84 (quantities in metric tons and values in thousands of dirhams)

Year	Preserved Fruit and Jams		Preserved Vegetables		Fruit and Vegetable Juices		Canned Fish	
	Qty	Value	Qty	Value	Qty	Value	Qty	Value
1975	19,498	39.3	37,344	108.6	12,436	18.4	39,799	171.3
1976	27,316	41.1	38,424	105.7	15,322	27.4	53,002	235.8
1977	24,601	57.2	67,411	197.1	12,116	29.8	43,393	229.0
1978	32,830	62.7	48,760	171.5	15,547	51.9	37,031	225.1
1979	19,193	53.8	58,719	215.9	13,954	45.7	47,549	300.2
1980	14,429	43.6	55,608	220.8	8,668	28.7	46,431	341.8
1981	19,595	58.4	50,709	225.8	9,009	39.8	58,267	464.9
1982	16,366	56.8	39,398	255.0	13,037	64.0	44,614	400.0
1983	17,748	69.1	49,605	327.7	11,029	57.1	51,987	498.4
1984	13,023	58.6	42,093	376.6	19,156	161.2	50,207	544.7

Source: Banque Marocaine du Commerce Extérieur, Monthly Information Review, No. 48, March April 1984 and No. 53, September 1985

Table 16-3: Exports of Processed Tomato Products, 1977 to 1981 (metric tons)

Year	Tomato Paste	Canned Tomatos	Tomato Juice
1977	6,969	6,675	24
1978	4,762	5,866	47
1979	2,150	5,092	3
1980	148	3,514	4
1981	848	158	1

Source: Martin Production and Marketing of Horticultural Commodities, p. 41.

XVII. DONOR ASSISTANCE TO THE AGRICULTURE SECTOR

The Moroccan agricultural sector is receiving both multilateral and bilateral development assistance. By far the major donor to the sector in Morocco is the World Bank, with seven active projects (life-of-project funding totalling over US-$400 million) and six proposed projects (life-of project funding estimated at US-$260 million). USAID is second in importance in terms of donor assistance to the sector. The life-of-project funding of USAID agriculture projects currently being implemented is almost US-$87.5 million. In addition, the U.S. has been providing some US-$45 million a year in PL-480 Title 1 assistance, the local currency proceeds of which go primarily to assisting the agriculture sector.

1. USAID Assistance to Moroccan Agriculture

Since 1982, USAID's agriculture strategy has focused assistance on the rainfed sector sector of Morocco. USAID's programs are aimed primarily at increasing food production and incomes in non-irrigated areas, especially in more marginal areas of 250 to 400 mm of average rainfall. This focus on rainfed agriculture serves three purposes: (1) it addresses the need for greater growth in domestic food production and reduced import expenditures; (2) it addresses income distribution concerns, since a large portion of Morocco's rural poor are dependent upon rainfed agriculture production; and (3) by increasing domestic food availability it will permit a decline in relative food prices to consumers, benefiting both the rural and urban poor for whom food constitutes the greatest portion of household expenditure.

USAID's assistance program consists of development grants and loans and PL 480 food assistance. It is focused around four strategy elements: institutional development, research/technology transfer, policy dialogue, and mobilization of the private sector for development. Table 17-1 provides a summary of the major USAID's current agriculture projects.

Given the increasing need for cereal imports by Morocco, and the foreign exchange constraints faced by the country, USAID's PL 480 Title I program has become increasingly important, particularly given the favorable credit terms available under the program. These food imports (US-$55 million in FY 1985) are purchased by Morocco with dirhams, and the local currency generated is then programmed to meet Moroccan development needs. A joint GOM-USAID PL 480 Title I committee has been established to plan the use of this program resource, and to monitor the policy measures and development activities that it supports. In particular, USAID has been able to negotiate with the GOM policy-related "Self-help Measures" that are supportive of USAID's technical assistance efforts in agriculture and bring about larger policy reforms

Table 17-1: USAID Development Projects in Agriculture, 1986

Dryland Agriculture Applied Research (608-0136)

A.I.D. Contribution:	$26,323,400	Duration: FY 1981-88
GOM Contribution:	11,936,400	
Total Project Cost:	$38,259,800	

The objective of this project is to increase cereal, legume, and forage production in Morocco and to improve income levels of small farmers in lower rainfall areas. The Project will strengthen the GOM's capability to conduct collaborative applied agronomic and socioeconomic research and will establish an applied agronomic research program which will both develop new technology, and adapt existing technology to local conditions, in order to increase small farmer productivity. The principal implementing agency is the National Institute for Agronomic Research (INRA). Under the Project, an INRA Aridoculture Center and an Agricultural Information Resource Center are being established at Settat, with satellite INRA research stations at various locations in cereal producing areas. A team of 14 scientists, from a wide range of scientific disciplines, is working with INRA counterparts at the Aridoculture Center. In addition, the project is supporting the provision of short-term technical assistance, long- and short-term training, and commodity procurement.

Planning, Economics and Statistics for Agriculture (608-0182)

A.I.D. Contribution:	$12,567,000	Duration: FY 1984-88
GOM Contribution:	17,551,000	
Total Project Cost:	$30,118,000	

Under the Planning, Economics and Statistics Project, USAID is strenthening the ability of the Ministry of Agriculture and Agrarian Reform (MARA) to do effective data collection, economic analysis, and project planning and evaluation in the agriculture sector. This project will also provide MARA with the analytical capacity necessary to give policy makers to better understand the impact of government subsidies, price supports, and marketing relationships on the overall performance of the agriculture sector. The project involves technical assistance, training, and commodity procurement (e.g. computers). Three long term resident advisors, two statisticians and an economist, are working directly with counterparts in MARA's Department of Planning and Economic Affairs (DPAE). In addition, the project is funding aerial photography and the creation of photographic and objective yield analysis laboratories that are needed for improving agricultural production estimates.

Agronomic Institute Project (608-0160)

A.I.D. Contribution:	$28,500,000	Duration: FY 1980-89
GOM Contribution:	10,870,000	
Total Project Cost:	$39,370,000	

USAID has been supporting the National Agronomic Institute (IAV) since 1970, providing both long-term participant training and resident American instructors. The current Project began in 1980 and will continue until 1989. The Project is designed to assist the Agronomic Institute in becoming a modern national institution that would train Moroccans for professional careers in the agricultural sector. This project will support PhD training for up to 140 IAV faculty members, covering all of the major agricultural disciplines (as well as the social sciences, human nutrition, and other related fields). After 2 years of course work in the United States, all participants carry out their research in Morocco and obtain degrees from the Agronomic Institute. The project also supports a small resident team of scientists, short-term assistance by US faculty-advisors, and commodity assistance (primarily for library and data processing needs).

Table 17-1: USAID Development Projects in Agriculture, 1986 (cont.)

Range Management Improvement Project (608-0145)

A.I.D. Contribution:	$ 5,075,000 (Grant)	Duration: FY 1981-86
GOM Contribution:	6,770,000	
Total Project Cost:	$11,845,000	

The objective of the Range Management Improvement Project is to strengthen the capability of the Range Management Service (DE/SP), a division of the Ministry of Agriculture, to plan and implement its applied research, extension, and rangeland development programs. The project has also supported the creation of a Plant Materials Center to produce forage species needed for revegetation of degraded rangelands. The project, which has provided technical assistance, long- and short-term participant training, and commodity procurement, is scheduled to end in August, 1986.

Drought Recovery Credit Project (608-0184)

A.I.D. Contribution:	$13,500,000 (Loan)	Duration: FY 1981-86
	1,500,000 (Grant)	
GOM Contribution:	$ 5,000,000	
Total Project Cost:	$20,000,000	

The drought which has afflicted many parts of the country in recent years has undermined the ability of many farmers, particularly those in more arid regions of the country, to repay production loans from the Caisse Nationale de Credit Agricole (CNCA). In response to this situation, the CNCA developed, together with USAID, a program to reschedule overdue loans to farmers in drought stricken regions. The rescheduling program has extended the period over which drought-stricken farmers have had to repay their overdue loans, thus reducing the size of their periodic payments and making it easier for them to meet these installments from the future income. The Project consists of a $13.5 million loan to enable the CNCA to carry out its rescheduling program, and a $1.5 million grant to provide technical assistance, commodities, and training opportunties to the CNCA in order to strengthen its capacity to promote and assist the development of small- and medium-scale dryland farming operations.

2. Other Donor Assistance to Moroccan Agriculture

Bilateral and multi-lateral assistance from donors other than USAID is presented in Tables 17-2 through 17-6. Much of the World Bank's efforts have been directed towards support for integrated rural development projects (Oulmès Rommani, Moyen Atlas, Fes-Karia-Tissa, and Loukkos). The World Bank has also supported a major reforestation project. Two Agricultural Sector Loans (totalling US-$180 million) are aimed at promoting structural and policy changes in the Ministry of Agriculture (See Section XVIII). The World Bank is also considering funding various projects aimed at improving irrigation, promoting land consolidation, and supporting agricultural research and seed production.

The World Food Program (WFP) has four projects in the agriculture sector, with life-of-project funding equivalent to US-$64 million. WFP has provided support to the forestry subsector, e.g. reforestation, soil conservation, and sand dune stabilization as well as to dairy production. The U.S. Government funds a significant portion of WFP's efforts. In June 1985 the WFP received approval for a three year, US-$17.7 million project to be designated WFP Morocco 2319 Exp II, and entitled "Development of Northern Provinces". In addition, the WFP is planning a US-$27.4 million "Forestry Development and Erosion Control" project (WFP 2691). This is a five year effort which will involve 100,000 hectares of reforestation on state lands, 22,500 hectares of sand dune fixation, and 14,900 hectares of watershed stabilization.

The African Development Bank (ADB) will be supporting the Settat Integrated Rural Development Project with a loan to the GOM of over US-$40 million. In addition, the ADB is co-financing the Agricultural Sector Adjustment Loan with around US-$43 million.

The Food and Agriculture Organization of the United Nations (FAO) is providing some US-$7 million in assistance, including support to INRA for foundation seed production and assistance in the training of extension agents at the National Center for Studies on Research and Extension (CNERV), which is affiliated with the Ecole Nationale d'Agriculture in Meknes.

The International Fund for Agricultural Development (IFAD) is providing an estimated US-$10.0 million to finance a major rural development project in the Abda region, near Safi.

The Federal Republic of Germany is providing almost US-$17 million in assistance to the agriculture sector, including assistance in the fields of sugarcane production and the forestry sector. Germany has been supporting SONACO's seed multiplication program. The German Government is also supporting research on forages with INRA which complements forage research being done under the USAID-funded Range Management Improvement Project. Adequate data is not available on the contributions of other bilateral donors, but the amounts appear relatively modest.

Table 17-2: World Bank Agricultural Projects Currently Underway, 1985

Project	Amount (millions of US dollars)	Description/Disbursement Dates
Agriculture Sector Loan	100.0	Policy reforms to improve investment programming, price and incentives framework, support services, and institutional capacity for agricultural planning and policy analysis. Signed July 1985.
Fifth Agricultural Credit Loan	115.4	To finance CNCA lending to farmers, Agrarian Reform Cooperatives, and agro-industry. (1983-86)
Oulmès Rommani Agricultural Development Project	30.0	To improve the living standards of people living in the Oulmès-Rommani region (Khemisset Province) through the development of agriculture, livestock, and forestry the provision of social and agricultural services. (1984-1990).
Middle Atlas-Central Area Agricultural Development	29.0	Forestry, range, and cropland development to benefit rural inhabitants in Ifrane and Khenifra provinces. (1983-1988)
Fes-Karia-Tissa Agriculture Project	65.0	To improve the standard of living of farm families in the Fes-Karia-Tissa region through improved agricultural extension and soil conservation services, training, the provision of credit, and infrastructure. (1979-1986)
Loukkos Rural Development Project	34.0	To increase incomes and productivity of poor farmers in the Loukkos Basin through soil erosion control, development of field crops and small-scale irrigation, construction of roads and provision of social services, reforestation, and completion of a cadastral survey. (1980-1987)
Forestry Project	27.5	Destumping and replanting of 30,000 ha of forest to supply the Sidi Yahia pulpmill. (1983-88)
Small and Medium Scale Irrigation	42.0	Rehabilitation of 12,500 ha of traditional irrigation schemes in Chichaoua, Ghiss, and Souss areas. Development of modern irrigation schemes (5,300 ha) in Middle Sebou and Jemaa Sahim areas. (1984-1989)

Table 17-3: Proposed World Bank Projects (as of 1985)

Project	Amount (millions of US dollars)	Description/Status
Agriculture Sector Loan II	80	Loan to support policy reforms in the Ministry of Agriculture.
Large Scale Irrigation Improvement	35	Improvement of the operation, maintenance, and agricultural production in large-scale irrigation areas and reform of ORMVAs. Appraisal report prepared.
Land Use Planning	25	Land consolidation, cadastral survey, and land registration. Under preparation.
Research and Improvement	20	Strengthening of the national research service and improved seed production. Under preparation.
Sixth Agricultural Credit Loan	100	To finance the CNCA's medium- and long-term lending for on-farm investments by private farmers and cooperatives and small- and medium-scale agro-industry. Under preparation.

Table 17-4: World Food Program Projects Planned or Underway, 1985

Project	Amount (millions of US dollars)	Description/Disbursement Dates
Soil Conservation and Sand Dune Stabilization (WFP 2526)	1.8	Construction of fence to stabilize sand dunes and slow desertification and protect infrastructure (e.g. roads, irrigation canals); reforestation, range improvement. WFP is providing wheat, flour and cooking oil, primarily as part of a food-for-work effort. (1982-1985).
Development of Dairy Production (WFP 2592)	17.0	Increase dairy production (milk, butter, and powdered milk) and the productivity of dairy cattle, in order to decrease the gap between supply and demand; promote the creation of collection centers; increase. WFP is providing dried skim milk and butter). (1985-1988)
Soil Conservation and Forestry Development (WFP 2691)	27.4	Reforestation at the village level road construction, range improvement; and sand dune stabilization. WFP will provide wheat and sugar to be distributed under a food for work program. Project has been approved by PAM but is not yet operational. (1985-1990).
Development of Northern Provinces (WFP 2319 Extension II)	17.7	Support for the GOM's development program in 12 northern provinces, including soil conservation, fruit tree plantations, pasture improvement, road construction, development of water resources, promotion of small livestock, extension, and training. WFP will provide wheat and edible oil as part of a food-for-work program. (1985-1988)

Table 17-5: Other Development Assistance Projects to the Agriculture Sector by Known Major Donors, 1985

Project	Amount (millions of US dollars)	Description/Disbursement Dates
U.N. Food and Agriculture Organization		
Rehabilitation of Flood Water Distribution Networks	2.86	Provides resources to a number of regions for irrigation system rehabilitation and maintenance. This was only a proposal as of March 1985. (1985-1987)
Development and Management of Mountain Zones	1.33	Range management and forage development research being undertaken in the province of Azilal. (1982-1986)
Support for Foundation Seed Production	2.05	Assistance to INRA in seed production. (1983-1985)
Support for CNERV (extension)	0.84	Assistance to the CNERV in training extension agents and conducting extension training and development. (1982-1985)
African Development Bank		
Settat Province Integrated Rural Development Project	40.8	A rural development project centered in Settat Province that will involve the construction of fertilizer and seed storage facilities, road construction, strengthening of the local DPA, well construction and the provision of social services.
Agricultural Sector Adjustment Loan	45.0	Co-financing of the Agricultural Sector Adjustment (with the World Bank). Will finance foreign exchange costs of inputs over a two year period.
International Fund for Agricutural Development		
Abda Plain Rural Development Project	10.0 (est.)	Improving crop and livestock production, strengthening essential support services to agriculture (e.g. rural roads, potable water, basic health), and improving the level of income and general welfare of the agricultural population in the Abda region.

Continued

Table 17-5: Other Development Assistance Projects to the Agriculture Sector by Known Major Donors, 1985 (Cont.)

Project	Amount (millions of US dollars)	Description/Disbursement Dates
Federal Republic of Germany		
Noxious Bird Control	1.11	Technical assistance, equipment, and training for the Direction de la Protection Végétal in MARA to control crop destruction by birds. (1983-1986)
Seed Control and Certification	0.82	Technical assistance, equipment and training for the Seed and Plant Control and Certification Service within the Direction des la Protection des Vegetaux, MARA
Forest Protection	0.85	Technical assistance, equipment, and training for the Sidi Aissa and El Hajeb farms (Meknes Province). (1984-1987)
Support for SONACOS	4.67	Technical assistance, equipment, and training to strengthen SONACOS' seed multiplication program. (1980-1987)
Beni Boufrah Nursery	1.44	Technical assistance, equipment, and training to create a plant nursery at Beni Boufrah, in Al Hoceima Province. (1980-1987)
Forage Plant Production	2.07	Technical assistance, equipment, and training to INRA in forage plant production. (1981-1984)
Agricultural Machinery	2.81	Technical assistance and equipment for the training of students in agricultural machinery at IAV. (1980-1986)
Improvement of Sugar Cane Production	3.15	Technical assistance, equipment, and training for the National Center for the Sugar Cane Research at Souk-Tleta du Gharb. (1982-1987)

Source: United Nations Develcpment Program, Rapport Annuel Sur L'Assistance au Developpement pour L'Annee 1983: Royaume du Maroc

The Caisse Nationale de Credit Agricole has received co-financing from a number of international donors. These include the World Bank, USAID, the Kreditanstalt für Wiederaufbau (KfW) of the Federal Republic of Germany, the European Investment Bank (EIB), the European Economic Community (EEC), and the Arab Fund for Economic and Social Development (FADES), and the African Development Bank (ADB). Together these lenders have provided US-$489 million in capital to the CNCA for on-lending to farmers and agroindustries. See Table 17-7. Indications are that, between 1986 and 1988, the World Bank will loan another US-$100 million to the CNCA under its Sixth Agricultural Credit Loan. Other donors may contribute an additional US-$90 million in cofinancing. The Sixth Agricultural Credit Loan is expected to finance (1) on-farm investments for small- and medium-scale farmers, cooperatives, and state farms; (2) agroindustrial investment in rural areas; (3) private farms and private and public companies engaged in cereal and fertilizer storage and the supply of inputs and services; (4) incremental short-term credit, (5) credit for vegetable production and commercialization for export; and (6) the construction and rehabilitation of CNCA branch offices and other CNCA institution building activities.

Table 17-7: CNCA Bank Assisted Credit Lines

Project	Lending Period	Proj. Cost	IBRD Total	Co-Financiers (U.S.-$ million) KfW	IFAD	FADES	ADB	EEC	EIB	USAID	Total Donor
CNCA I	69-71	35	10								10
CNCA II	73-76	100	34								34
CNCA III	77-80	100	35								35
CNCA IV	80-83	737	70	50	25						145
CNCA V	83-86	602	115	30	—	32	33	20	20	15	265
Total		1,574	264	74	25	25	32	20	20	15	489
CNCA VI[1]	86-89	800	100	30	—	30	—	15	15	—	190
Total		2,374	364	114	25	55	32	35	35	25	679

1/ Tentative estimates.

XVIII MOROCCO'S THE AGRICULTURE SECTOR ADJUSTMENT PROGRAM

In response to the worsening macro-economic situation in the early 1980s, the Government of Morocco, has developed, with external donor assistance (including that of USAID), a medium-term (5 year) agriculture sector adjustment program. This program, which was prepared in early 1984, will complement the overall economic policy reforms being undertaken by Morocco (see discussion in Section II-5). The World Bank has negotiated a US-$100 million loan to support the adjustment program. A second World Bank loan is currently in the appraisal stage. The African Development Bank has also provided a US-$45 million loan to support the adjustment program.

The principal objectives of this GOM program include (1) restructuring public investment and expenditures in agriculture, (2) reforming agricultural price and incentives policies, (3) increasing the effectiveness of public sector support to agriculture, and (4) improving the GOM's policy planning and analysis capacity.

Restructuring Public Investment and Expenditures

One objective of the GOM's Agriculture Sector Adjustment program is to encourage more rapid agricultural growth, particularly in the rainfed sector, by concentrating public actions in agriculture on more productive programs and by completing priority projects as quickly as possible. This has involved programming a larger proportion of public investment in rainfed agriculture and small- and medium-scale irrigation. Priority will be given to completing projects and activities that can be completed in the near-term, have high economic returns and low recurrent costs, offer high levels of employment creation, and will have a rapid impact on production and on Morocco's balance of payments. In order to ensure that funds are available to complete critical projects, the implementation of many lower priority investments is being cancelled or decelerated.

Reorienting Agricultural Prices and Incentives

Under the Sector Adjustment Program, efforts will be made to modify agricultural prices and incentives in order to achieve a more optimal mix of agricultural activities and to avoid unintended distortions in resource allocation and income distribution. A primary objective will be to restructure the pricing and incentives framework so as to reduce the excessive protection of irrigated agriculture and encourage rainfed agriculture. This should lead to a shift to cropping patterns that are more consistent with the long-term comparative advantage and growth potential of Moroccan agriculture. (See Section V-2); Among the specific measures being undertaken are:

(1) The elimination of fertilizer subsidies together with a more active policy of support for producer prices;

(2) The expansion of the private sector's role in fertilizer and seed distribution and in cereals marketing.

(3) Increasing the financial and management autonomy of ORMVAs and improving the collection of irrigation system water charges; and

(4) Price changes to resolve the problem of seasonal fluctuations in milk production; and the progressive deregulation of the prices and marketing of high value feeds (e.g. sugarbeet pulp and bran).

Strengthening Policy Planning and Analysis Capability

The adjustment program calls for improvements in MARA's institutional capacity for agricultural policy planning and analysis. This will involve strengthening the economic analysis capacity of MARA's various departments, particularly the Directorate of Planning and Economic Affaires (DPAE), within MARA, in terms of data collection, monitoring, and evaluation strengthening the statistical data base. USAID is directly assisting in this effort. Basic studies currently underway cover food strategy, the agricultural investment code, prices and incentives, a master plan for research, a fodder plan, etc.). Other efforts are envisioned (improvement of the compilation of agricultural statistics, terms of trade, agricultural value added, and supply and demand projections).

Improving the Effectiveness of Public Sector Support to Agriculture

Finally, under the Sector Adjustment Program, the GOM seeks to improve the efficiency of those services that are provided by the public sector to agriculture. In general, the role of the public sector in the provision of commercially viable services will be reduced, and cost recovery on those services the government continues to provide will be increased. Measures will be taken to rationalize and enhance the efficiency of the ORMVAs and of the research and extension services. In addition, efforts will be made to transfer activities such as custom mechanisation, input supply, and preventative health care and genetic services for livestock to the private sector and cooperatives.

Progress

Though this Structural Adjustment Program is just getting underway, initial progress is promising. The GOM is making a dedicated effort to implement the tough and even wrenching reforms needed to address the problems of Moroccan agriculture. The new willingness to look to market forces as an engine of agricultural growth is a significant departure from nearly a quarter century of government faith in the efficiency of its own public sector intervention. The full creative and productive potential of Morocco's skilled and hard working farmers will be realized if they are provided with the necessary access to resources and the market incentives to produce. The establishment of the analytical and monitoring capability in the Ministry of Agriculture necessary to understanding and fine tuning a market economy is a major undertaking for USAID in its assistance to Morocco. This, in turn, presents a new obligation to deepen our collective understanding of the complexity of the Moroccan agricultural economy. This volume is a small contribution to that undertaking.

ANNEXES

ANNEX 1, Table 1: Production of Durum Wheat and Bread Wheat

year	DURUM WHEAT area harvested ('000 ha)	DURUM WHEAT yield (qx/ha)	DURUM WHEAT total production ('000 qx)	BREAD WHEAT area harvested ('000 ha)	BREAD WHEAT yield (qx/ha)	BREAD WHEAT total production ('000 qx)
1961	1330	4.60	6119	510	4.30	2192
1962	1310	10.30	13488	463	10.29	4764
1963	1366	8.50	11614	422	9.50	4010
1964	1245	9.30	11575	410	9.71	3981
1965	1463	9.50	13899	450	9.51	4280
1966	1425	6.00	8551	460	6.30	2897
1967	1564	7.50	11727	472	7.11	3354
1968	1400	13.57	19000	530	12.26	6500
1969	1475	7.66	11300	470	7.21	3390
1970	1438	9.86	14179	454	8.43	3828
1971	1517	10.82	16415	389	14.05	5466
1972	1503	10.85	16310	495	10.70	5298
1973	1478	8.00	11820	562	6.98	3920
1974	1389	9.94	13800	529	8.94	4730
1975	1238	9.73	12040	453	8.19	3708
1976	1454	11.36	16518	468	11.48	5371
1977	1392	7.44	10358	537	4.69	2519
1978	1297	11.11	14409	457	9.53	4356
1979	1167	11.20	13070	490	9.99	4895
1980	1269	10.49	13310	446	10.76	4800
1981	1166	5.24	6105	481	5.86	2817
1982	1107	12.70	14062	579	13.42	7772
1983	1286	9.63	12385	690	10.61	7318
1984	1123	10.43	11713	733	11.16	8182
1961-70 Avg	1401.6	8.7	12145.2	464.1	8.5	3919.4
1971-80 Avg	1370.4	10.1	13805.0	482.6	9.5	4506.3
1981-84 Avg	1170.5	9.5	11066.3	620.8	10.3	6522.3

ANNEX 1, Table 2: Production of Barlet, Maize, and Total Cereals

year	BARLEY area harvested (' 000 ha)	BARLEY yield (qx/ha)	BARLEY total production ('000 qx)	MAIZE area harvested ('000 ha)	MAIZE yield (qx/ha)	MAIZE total production ('000 qx)	Total Cereals area harvested ('000 ha)	Total Cereals yield (qx/ha)	Total Cereals total production ('000 qx)
1961	1772	3.70	6555	467	3.20	1495	4079	4.01	16361
1962	1306	12.50	16330	514	9.40	4830	3593	10.97	39412
1963	2239	9.01	20165	531	10.40	5520	4558	9.06	41309
1964	1988	8.10	16100	529	8.70	4600	4172	8.69	36256
1965	1890	8.70	16445	493	7.70	3795	4296	8.94	38419
1966	2063	3.40	7015	508	4.30	2185	4456	4.63	20648
1967	2079	7.30	15180	532	6.83	3635	4647	7.29	33896
1968	2110	15.17	32000	500	7.73	3865	4540	13.52	61365
1969	2047	9.97	20400	460	9.35	4300	4452	8.85	39390
1970	1890	10.33	19532	510	6.27	3196	4292	9.49	40733
1971	1998	12.87	25719	453	8.61	3899	4357	11.82	51499
1972	1933	12.76	24659	481	7.64	3676	4412	11.32	49943
1973	2016	6.22	12546	446	4.87	2173	4502	6.77	30459
1974	1973	12.10	23870	447	8.72	3900	4338	10.67	46300
1975	1819	8.72	15853	492	7.54	3708	4002	8.82	35309
1976	2117	13.51	28604	433	11.37	4925	4472	12.39	55418
1977	2316	5.81	13450	425	4.34	1843	4670	6.03	28170
1978	2389	9.74	23262	394	9.91	3904	4537	10.12	45931
1979	2168	8.70	18862	416	7.49	3116	4241	9.42	39943
1980	2150	10.28	22097	411	8.09	3327	4276	10.18	43534
1981	2228	4.66	10390	362	2.48	897	4237	4.77	20209
1982	2047	11.40	23338	400	6.17	2469	4133	11.53	47641
1983	2151	5.71	12277	434	5.95	2584	4561	7.58	34564
1984	2126	6.61	14046	384	6.88	2640	4566	8.38	38581
1961-70 Avg	1938.4	8.8	16972.2	504.4	7.4	3742.1	4308.5	8.5	36778.9
1971-80 Avg	2087.9	10.1	20892.2	439.8	7.9	3447.1	4380.7	9.8	42650.6
1981-94 Avg	2138.0	7.1	15012.8	395.0	5.4	2147.5	4324.3	8.1	34748.8

ANNEX 1, Table 3: Production of Sorghum and Rice

harvest year	Sorghum area harvested ('000 ha)	Sorghum yield (qx/ha)	Sorghum total production ('000 quintals	Rice area harvested ('000 ha)	Rice yield (qx/ha)	Rice total production ('000 quintals)
1968	63.7	13.66	870.0	7.8	52.56	410.0
1969	55.0	8.82	485.0	8.8	57.95	510.0
1970	66.0	8.17	539.0	8.0	50.00	400.0
1971	83.0	14.52	1205.0	1.0	27.00	27.0
1972	65.8	8.97	590.0	3.1	44.84	139.0
1973	53.5	9.74	521.0	2.7	38.52	104.0
1974	70.5	12.44	877.0	3.8	32.37	123.0
1975	58.7	12.71	746.0	6.2	47.10	292.0
1976	48.7	3.96	193.0	5.3	33.96	180.0
1977	40.7	1.13	46.0	6.2	38.39	238.0
1978	31.8	11.35	361.0	5.6	52.32	293.0
1979	62.5	3.72	232.4	5.7	32.91	187.6
1980	39.3	5.81	228.4	5.9	48.71	287.4
1981	32.1	3.74	120.2	5.2	37.19	193.4
1982	34.9	8.21	286.6	1.0	36.40	36.4
1983	39.3	6.07	238.4	1.7	23.41	39.8
1984	32.6	7.54	245.9	1.8	25.22	45.4
1968-75 avg	64.5	11.1	729.1	5.2	43.8	250.6
1976-80 avg	44.6	5.2	212.2	5.7	41.3	237.2
1981-84 avg	34.7	6.4	222.8	2.4	30.6	78.8

ANNEX1, Table 4: Production of Canary Grass and Oats

harvest year	Canary Grass area harvested ('000 ha)	Canary Grass yield (qx/ha)	Canary Grass total production ('000 qx)	Oats area harvested ('000 ha)	Oats yield (qx/ha)	Oats total production ('000 qx)
1973	20.8	6.02	125.3	20.2	6.04	122.0
1974	23.6	6.41	151.2	19.9	9.95	198.0
1975	22.0	7.56	166.4	32.4	8.83	286.0
1976	74.6	4.49	335.0	30.7	11.80	362.4
1977	35.2	2.83	99.6	27.4	2.85	78.1
1978	33.4	4.22	141.1	25.7	4.41	113.3
1979	13.5	6.80	91.8	14.8	4.05	60.0
1980	10.7	7.84	83.9	28.7	11.49	329.7
1981	7.5	2.36	17.7	52.2	5.23	272.8
1982	10.1	5.99	60.5	68.6	10.82	742.1
1983	8.7	7.77	67.6	49.2	9.00	442.6
1984	4.3	7.88	33.9	54.7	8.07	441.4
1973-80 Avg	29.2	5.8	149.3	25.0	7.4	193.7
1981-84 Avg	7.7	6.0	44.9	56.2	8.3	474.7
1973-84 Avg	22.0	5.8	114.5	35.4	7.7	287.4

ANNEX 1, Table 5: Production of Peas and Lentils

harvest year	Peas: area harvested ('000 ha)	Peas: yield (qx/ha)	Peas: total production ('000 quintals)	Lentils: area harvested ('000 ha)	Lentils: yield (qx/ha)	Lentils: total production ('000 quintals)
1968	65.0	8.02	521.0	20.8	10.38	216.0
1969	51.0	6.59	336.0	32.0	6.19	198.0
1970	61.0	5.48	334.0	37.0	4.08	151.0
1971	70.0	7.14	500.0	28.0	5.57	156.0
1972	91.0	6.80	619.0	39.0	5.15	201.0
1973	102.0	3.64	371.0	31.0	3.68	114.0
1974	110.0	11.30	1243.0	41.0	6.68	274.0
1975	137.0	7.20	986.0	46.0	7.46	343.0
1976	133.0	8.44	1122.0	63.0	6.56	413.0
1977	117.0	2.65	333.0	36.0	2.19	79.0
1978	95.0	4.81	457.0	37.0	5.70	211.0
1979	63.3	10.13	641.0	28.7	4.70	134.9
1980	46.8	5.82	272.5	37.0	4.32	160.0
1981	36.1	0.24	8.8	34.3	1.38	47.4
1982	34.0	6.41	218.0	39.1	6.46	252.7
1983	47.6	4.67	222.2	78.6	4.08	320.3
1984	57.2	4.82	275.8	67.5	3.63	245.3
1968-75 avg	85.9	7.0	613.8	34.4	6.1	206.6
1976-80 avg	91.0	6.4	565.1	40.3	4.7	199.6
1981-84 avg	43.7	4.0	181.2	54.9	3.9	216.4

ANNEX 1, Table 6: Production of Beans and Chickpeas

harvest year	Beans: area harvested ('000 ha)	Beans: yield (qx/ha)	Beans: total production ('000 quintals	Chickpeas: area harvested ('000 ha)	Chickpeas: yield (qx/ha)	Chickpeas: total production ('000 quintals)
1968	115.0	14.78	1700.0	121.0	9.75	1180.0
1969	167.0	9.28	1550.0	85.0	8.46	719.0
1970	181.0	10.49	1899.0	158.0	8.68	1372.0
1971	190.0	12.77	2426.0	108.0	0.18	19.0
1972	259.0	10.32	2672.0	53.0	6.42	340.0
1973	278.0	6.79	1887.0	84.0	9.39	789.0
1974	227.0	15.22	3455.0	158.0	10.37	1638.0
1975	220.0	9.66	2126.0	99.0	6.14	608.0
1976	191.0	12.05	2302.0	100.0	5.11	511.0
1977	190.0	4.93	936.0	42.0	2.62	110.0
1978	221.0	7.30	1614.0	68.0	5.37	365.0
1979	207.0	7.13	1475.0	62.3	10.30	642.0
1980	155.8	6.70	1044.0	65.5	6.81	446.0
1981	130.0	2.98	387.9	32.1	1.89	60.8
1982	111.2	8.87	986.8	60.5	8.41	508.7
1983	170.6	8.34	1422.4	64.7	8.63	558.6
1984	190.3	6.43	1222.9	60.2	4.76	286.6
1968-75 avg	204.6	11.2	2214.4	108.3	7.4	833.1
1976-80 avg	193.0	7.6	1474.2	67.6	6.0	414.8
1981-84 avg	150.5	6.7	1005.0	54.4	5.9	353.7

ANNEX 1, Table 7: Production of Tomatoes and Potatoes

harvest year	Tomatoes area harvested ('000 ha)	Tomatoes yield (qx/ha)	Tomatoes total production ('000 quintals	Potatoes area harvested ('000 ha)	Potatoes yield (qx/ha)	Potatoes total production ('000 qx)
1968	17.0	254.94	4334.0	22.9	110.00	2519.0
1969	16.0	293.00	4688.0	21.3	140.00	2982.0
1970	19.3	266.99	5153.0	25.7	160.00	4112.0
1971	23.4	227.01	5312.0	31.2	150.16	4685.0
1972	22.2	244.01	5417.0	29.6	159.97	4735.0
1973	21.6	289.03	6243.0	28.8	160.00	4608.0
1974	21.6	284.03	6135.0	29.0	139.97	4059.0
1975	23.8	248.19	5907.0	26.0	140.00	3640.0
1976	23.7	240.00	5688.0	27.0	101.11	2730.0
1977	18.6	256.02	4762.0	20.0	150.00	3000.0
1978	17.9	234.02	4189.0	33.6	96.49	3242.0
1979	20.8	223.99	4659.0	40.1	157.01	6296.0
1980	19.7	217.01	4275.0	38.0	148.00	5624.0
1981	-	-	-	-	-	-
1982	16.3	299.69	4885.0	34.6	137.86	4770.0
1983	15.3	239.41	3663.0	40.6	133.99	5440.0
1984	16.5	306.85	5063.0	38.7	159.46	6171.0
1968-75 Avg	20.6	263.4	5398.6	26.8	145.0	3917.5
1976-80 Avg	20.1	234.2	4714.6	31.7	130.5	4178.4
1982-84 Avg	16.0	282.0	4537.0	38.0	143.8	5460.3

ANNEX 1, Table 8: Production of Cotton and Sugarcane

harvest year	Cotton area harvested ('000 ha)	Cotton yield (qx/ha)	Cotton total production ('000 qx)	Sugarcane area harvested (hectares)	Sugarcane yield (MT/ha)	Sugarcane total production (metric tons)
1973	15.5	17.19	266.5	113.0	80.53	9100.0
1974	16.3	10.90	177.6	438.0	57.28	25088.0
1975	14.7	11.76	172.8	1061.0	59.41	63037.0
1976	11.6	13.12	152.2	1868.0	41.10	77600.0
1977	18.1	12.20	220.8	3498.0	50.73	177445.0
1978	17.8	10.00	178.0	4534.0	73.64	333898.0
1979	8.6	17.85	152.6	3970.0	73.94	293537.0
1980	13.1	16.79	220.0	4022.0	93.28	375159.0
1981	11.4	16.44	187.4	7247.0	85.89	622425.0
1982	10.5	19.00	199.5	7692.0	67.26	517372.0
1983	10.6	22.60	239.6	9323.0	77.66	762833.0
1984	9.6	12.02	115.4	11575.0	69.03	798980.0
1973-80 Avg	14.5	13.7	192.6	2440.5	66.2	169358.0
1981-84 Avg	10.5	17.5	185.5	9084.3	75.0	675402.5
1973-84 Avg	13.1	15.0	190.2	4655.1	69.1	338039.5

ANNEX 1, Table 9: Production of Sugarbeet

year	----SUGARBEET----- area harvested (hectares)	yield (mt/ha)	total production (metric tons)
1963	6150	11.69	71866
1964	9140	19.78	180830
1965	9554	18.12	173146
1966	15794	24.43	385874
1967	21411	19.35	414311
1968	30608	28.16	861856
1969	36453	24.19	881659
1970	47403	23.82	1129100
1971	51262	30.79	1578200
1972	63169	26.73	1688684
1973	50379	29.35	1478567
1974	58041	33.63	1951960
1975	62395	28.79	1796369
1976	69908	33.95	2373175
1977	62937	23.50	1478861
1978	60252	39.32	2369010
1979	72004	30.20	2174686
1980	64954	33.78	2194203
1981	68220	31.00	2114681
1982	59525	38.87	2313559
1983	69486	37.26	2589109
1984	56435	44.76	2525806
1963-70 Avg	22064.1	21.2	512330.3
1971-80 Avg	61530.1	31.0	1908371.5
1981-84 Avg	63416.5	38.0	2385788.8

ANNEX 1, Table 10: Production of Sunflowers

harvest year	Sunflower: area harvested ('000 ha)	Sunflower: yield (qx/ha)	Sunflower: total production ('000 quintals)
1968	8.3	4.58	38.0
1969	17.0	4.00	68.0
1970	24.0	8.92	214.0
1971	14.5	8.14	118.0
1972	36.8	6.92	254.5
1973	20.5	8.96	183.6
1974	18.4	7.70	141.7
1975	23.3	6.67	155.5
1976	22.8	6.82	155.4
1977	49.1	3.88	190.7
1978	15.6	10.21	159.3
1979	34.3	11.76	403.2
1980	7.9	6.80	53.7
1981	14.9	5.85	87.0
1982	12.8	4.91	62.8
1983	19.6	8.04	157.6
1984	29.3	6.50	190.4
1968-75 avg	20.4	7.0	146.7
1976-80 avg	25.9	7.9	192.5
1981-84 avg	19.1	6.3	124.5

ANNEX 1, Table 11: Production of Peanuts

harvest year	Peanuts: area harvested ('000 ha)	Peanuts: yield (qx/ha)	Peanuts: total production ('000 qx)
1970	4.6	5.65	26.0
1971	4.4	7.50	33.0
1972	10.0	5.90	59.0
1973	13.0	5.54	72.0
1974	17.0	7.47	127.0
1975	16.0	11.75	188.0
1976	11.0	11.64	128.0
1977	19.0	4.42	84.0
1978	28.0	9.29	260.0
1979	26.4	10.36	273.6
1980	27.7	13.14	364.0
1981	31.8	5.60	178.2
1982	36.7	11.10	407.4
1983	23.3	13.55	315.8
1984	25.0	14.16	353.9
1970-75 Avg	10.8	7.3	84.2
1976-80 Avg	22.4	9.8	221.9
1981-84 Avg	29.2	11.1	313.8

ANNEX 1, Table 12: Production of Olives and Dates

harvest year	Olives: area harvested ('000 ha)	Olives: yield (qx/ha)	Olives: total production ('000 quintals	Dates: area harvested ('000 ha)	Dates: yield (qx/ha)	Dates: total production ('000 qx)
1969	223.0	22.06	4920.0	76.0	30.00	2280.0
1970	233.0	13.73	3200.0	76.0	30.00	2280.0
1971	247.0	6.48	1600.0	76.0	30.00	2280.0
1972	259.0	19.54	5060.0	74.0	30.00	2220.0
1973	266.0	7.33	1950.0	74.0	30.00	2220.0
1974	269.0	9.48	2550.0	74.0	30.00	2220.0
1975	269.0	8.22	2210.0	61.0	30.00	1830.0
1976	310.0	10.06	3120.0	49.0	30.00	1470.0
1977	314.0	9.68	3040.0	36.0	30.00	1080.0
1978	330.0	4.94	1630.0	23.0	30.00	690.0
1979	245.0	20.37	4990.0	22.9	30.00	687.0
1980	243.0	13.46	3270.0	20.7	30.05	622.0
1981	-	-	-	-	-	-
1982	320.7	13.50	4329.5	26.8	16.80	450.2
1983	320.0	8.56	2739.0	26.3	21.31	560.5
1984	337.8	9.67	3267.0	24.2	10.50	254.2
1969-75 Avg	252.3	12.4	3070.0	73.0	30.0	2190.0
1976-80 Avg	288.4	11.7	3210.0	30.3	30.0	909.8
1982-84 Avg	326.2	10.6	3445.2	25.8	16.2	421.6

ANNEX 1, Table 13: Production of Grapes

harvest year	Grapes: area harvested ('000 ha)	Grapes: yield (qx/ha)	Grapes: total production ('000 qx)
1968	67.0	35.52	2380.0
1969	61.0	50.82	3100.0
1970	60.4	26.49	1600.0
1971	61.0	33.28	2030.0
1972	59.2	46.62	2760.0
1973	55.4	47.65	2640.0
1974	55.4	51.62	2860.0
1975	52.7	53.13	2800.0
1976	55.3	50.63	2800.0
1977	61.1	34.37	2100.0
1978	50.4	42.66	2150.0
1979	51.2	41.99	2150.0
1980	54.0	44.26	2390.0
1981	-	-	-
1982	58.2	12.60	733.3
1983	57.1	34.89	1992.2
1984	58.2	39 50	2298.9
1968-75 Avg	**59.0**	**43.1**	**2521.3**
1976-80 Avg	**54.4**	**42.8**	**2318.0**
1982-84 Avg	**57.8**	**29.0**	**1674.8**

ANNEX 1, Table 14: Production of Oranges and Clementines

year	ORANGES total production ('000 qx)	CLEMENTINES total production ('000 qx)
1961	4250	370
1962	4100	290
1963	4230	480
1964	5440	560
1965	4460	470
1966	5350	600
1967	6030	980
1968	6810	1160
1969	6010	880
1970	7270	1490
1971	6800	1410
1972	6710	1520
1973	7370	2510
1974	6270	1880
1975	4770	1000
1976	5230	1180
1977	5700	2120
1978	7600	2830
1979	6300	2320
1980	7800	2720
1981	6800	3030
1982	6790	2970
1983	6910	2450
1984	7470	2430
1961-70 Avg	5395.0	728.0
1971-80 Avg	6455.0	1949.0
1981-84 Avg	6992.5	2720.0

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