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AID 1020-17-71 (PACE SHEET)

NONCAPITAL PROJECT PAPER (PROP)

PAGE 1 of 45 PAGES

I. PROJECT IDENTIFICATION

1. PROJECT TITLE: Integrated Agricultural Development

APPENDIX ATTACHED: ☐ YES ☒ NO

2. PROJECT NO. (M.O. 1095.3): 664-12-120-277

3. RECIPIENT (specify): ☒ COUNTRY Tunisia ☐ REGIONAL ☐ INTERREGIONAL

4. LIFE OF PROJECT: BEGINS FY 73 ENDS FY 78

5. SUBMISSION: ☐ ORIGINAL 6-2-72 DATE ☐ REV. NO. DATE

CONTR./PASA NO.

II. FUNDING ($000) AND MAN MONTHS (MM) REQUIREMENTS

H. LOCAL EXCHANGE CURRENCY RATE: 1 US $ = 2.12 (U.S. OWNED)

A. FUNDING BY FISCAL YEAR	B. TOTAL $	C. PERSONNEL (1) $	C. PERSONNEL (2) MM	D. PARTICIPANTS (1) $	D. PARTICIPANTS (2) MM	E. COMMODITIES $	F. OTHER COSTS $	G. PASA/CONTR. (1) $	G. PASA/CONTR. (2) MM	H. (1) U.S. GRANT LOAN	H. (2) COOP COUNTRY (A) JOINT	H. (2) COOP COUNTRY (B) BUDGET
1. PRIOR THRU ACTUAL FY												
2. OPRN FY 73	215	195	92	12	16	8		160			80TD*	331TD
3. BUDGET FY 74	404	199	94	40	52	165		164			60	559
4. BUDGET +1 FY 75	306	185	89	27	36	94		150			50	664
5. BUDGET +2 FY 76	303	246	87	21	28	66		181			60	699
6. BUDGET +3 FY 77	259	208	84	15	20	36		173			50	635
7. ALL SUBSEQ. FY 78	233	208	84	–	0	25		173			50	992**
8. GRAND TOTAL	1720	1211	530	115	152	394		1001			360TD*	3880**

9. OTHER DONOR CONTRIBUTIONS

(A) NAME OF DONOR	(B) KIND OF GOODS/SERVICES	(C) AMOUNT

III. ORIGINATING OFFICE CLEARANCE

1. DRAFTER: James Holtaway, PEV	TITLE: Program Evaluation Officer	DATE
2. CLEARANCE OFFICER: Ahmed Frih, Sumner Gerard	TITLE: Director, OMVVM; Mission Director	DATE

IV. PROJECT AUTHORIZATION

1. CONDITIONS OF APPROVAL

NOTE: 1/ Signed copy on file in AFR/NARA/TUN

2/ This PROP is approved for the life-of-the-project. Continued analysis and planning should be given to staffing requirements, supporting budgets, and recruitment and training of agriculture engineers and other staff to further improve the institutional capability of the OMVVM.

*1TD=$2.12

**Includes TD$80,000 Agriculture Credit revolving Fund

2. CLEARANCES

SUR/OFF.	SIGNATURE	DATE	SUR/OFF	SIGNATURE	DATE
AFR/DP	Edward Hogan	11/6/72	FR/NARA/T	Charles R. Sadler	11/3/72
AA/AFR	Donald Brown		AFR/NARA	TEC Woodrow W Leake	11/3/72
AFR/NARA	Ullmont L James	11/3/72	AFR/NARA	T Gilda Varrati	11/3/72

3. APPROVAL AAs OR OFFICE DIRECTORS

SIGNATURE: Samuel C. Adams, Jr. DATE: 11/7/72

TITLE: Assistant Administrator, Bureau for Africa

4. APPROVAL A/AID (See M.O. 1010.1 VI C)

SIGNATURE: DATE:

TITLE: ADMINISTRATOR, AGENCY FOR INTERNATIONAL DEVELOPMENT

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A. STATEMENT OF THE GOAL

1. The Goal - to increase the income and level of living of the agricultural population

2. Measurements of the Goal

   a. Increases in farmer income
   b. Distribution patterns of increased income in rural areas

3. Assumptions about Goal Achievement

   a. Government policy will continue to support agricultural development

   b. There will be a continued emphasis on agricultural development in the private sector.

B. STATEMENT OF PROJECT PURPOSE

1. The Purpose - to demonstrate the beneficial effect, in terms of increased farmer income, of the proper utilization and integration of all agricultural production factors on irrigated land, and to develop the GOT capacity in the Northern Region to expand such an integrated program.

2. Conditions Expected at the End of Project

   a. Substantially increased net income to farmers in project area resulting from:

      (1) Farmers convinced of possible yield attainable
      (2) Farmers accepting advice on and demonstrations of improved farm management practices
      (3) Farmers able to adapt new production techniques to changing conditions
      (4) Farmers taking full advantage of farm credit program
      (5) At least 200% average increase in productivity on 5,400 ha.
      (6) Increased marketing of crops and livestock from project area.

   b. Key GOT agricultural officials convinced of effectiveness of integrated approach to increased production.

c. Baseline and post-project statistical information and outstanding examples of improved production for dissemination to other areas.

d. Northern Region Office of OMVVM capable of:

(1) Planning, developing, operating, and maintaining public irrigation perimeters.
(2) Planning and implementing a program of 100 farm demonstrations per year
(3) Delivering an extension package of integrated farm management practices to 500 farmers annually
(4) Identifying critical problem areas requiring research and adapting subsequent findings.

3. Basic Assumptions about Achievement of Purpose

a. GOT agricultural policy continues to support private enterprise farming

b. GOT and USAID will provide financial, personnel, and commodity inputs in a timely manner

c. Weather conditions are within a normal range during life of project

d. Farmers can be persuaded to change cropping patterns and farm management practices

e. Successful introduction of improved livestock production to area

f. Tunisian agricultural price structure will not inhibit production or discourage marketing

C. STATEMENT OF PROJECT OUTPUTS

1. Outputs and Output Indicators

(see following page)

Outputs	Output Indicators
Developed Ghardimaou Irrigation Perimeter	By 1978
a. Irrigation infrastructure compl.	a. 5,400 ha.
b. Land developed, leveled and ready for active irrigation	b. 75% or 4,050 ha.
c. Developed, irrigable land under active cultivation	c. 50%, or 2,700 ha.
d. Completed model farm demonstrations (5 ha)	d. 8, (6 agronomic only, (2 agronomic and livestock)
e. Completed field demonstration (1/2 - 1 ha)	e. 160
f. Farmers using improved practices and obtaining increased yields (extension)	f. 1300 farmers obtaining 50 - 300% increases in yield depending on crop
g. Optimum cropping, rotation, livestock development plans for perimeter	g. One (1) each
h. Farm credit program suitable for seasonal and medium term credit requirements	h. 1200 seasonal and medium term loans per year by 1978
i. Cooperative service that can meet seed, fertilizer, equipment and other farm inputs for all interested farmers	i. One, open membership, self-governing cooperative with capacity to service approximately 1500 farmers
j. An effective marketing system open to all interested farmers (large or small)	j. 75% members marketing through Co-op and getting highest prevailing prices
k. New land ownership pattern legally established	k. 90% of project area
Permanent OMVVM Regional Office with adequate staff, facilities and financial resources	
a. Trained agricultural engineers, adjoint techniques, equipment operators, et al on the job.	a. 38 short-term trainees
b. Permanent facilities, i.e., office, equipment storage and repair, and reproduction/graphics	b. Established at Djendouba
c. Implemented organization, program and staffing plans, policies and regulations	c. In place and being utilized

cont'd..

Permanent OMVVM Regional Office, etc. cont'd.

d. Integrated demonstration teams (self-contained, fully equipped) trained and operating	d. Two
e. Technical extension literature in French and Arabic	e. As required, small facets of extension work
f. Organization having following units: (1) Engineering & technical design (2) Operation and maintenance (3) Agricultural activities (4) Planning Coordination* (5) Administrative Support (6) Area Project Managers (7) Directorate	f. Operating and fully staffed

* Central Planning Unit to be located at OMVVM in Tunis.

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2 Basic Assumptions about Production of Outputs

a. Work incentives for government employees will be adequate:

(1) salary and benefits
(2) good supervision
(3) meaningful program
(4) transportation and living facilities

b. Problem of suitable living location for field personnel (Tunisian and American) resolved.

c. Cooperation of local government officials and farmers.

d. Service Foncier completes land ownership survey and issues new titles.

e. OMVVM will maintain adequate demonstration and extension equipment, spare parts and repair facilities within project area.

f. Demonstrations will be conducted on selected but scattered irrigated fields to maximize their visibility, increase potential for expansion and impact on non-project farmers.

D. STATEMENT OF PROJECT INPUTS

	Budget ($000) Schedule						
	1973	1974	1975	1976	1977	1978	Total
1. Inputs - U.S.							
a. U.S. Technicians							
Project Manager	25	25	25	30	30	30	165
Civil Engineer (Irrig)	20	20	20	25	25	25	135
Farm Development Engineer	20	20	20	25	25	25	135
Agronomist/Horticulturist	20	20	20	25	25	25	135
Farm Credit/Mktg Specialist	20	20	20	25	25	25	135
Equipment Oper/Maint Advisor	15	15	15	20	20	20	105
Drainage/Soils Specialist	5	4	1	-	-	-	10
Org Mgt Specialist (Rey Off)	4	4	2	-	-	-	10
COOP Specialist	5	5	2	2	-	-	14
Short-Term Experts/Consultant	5	10	5	5	-	-	25
Sub-Total	139	143	130	157	150	150	869
15% USDA Overhead	21	21	20	24	23	23	132
USAID Direct Hire Project Mgr	35	35	35	35	35	35	210
Sub-Total	195	199	185	216	208	208	1211
b. Commodities							
Equipment including farm implements for demonstration	-	100	50	20	10	5	185
Demonstration materials	-	15	20	30	10	10	85
Seed and fertilizers (demonstration and experimental)	-	5	5	5	5	-	20
Insecticides	-	1	1	1	1	-	4
Vehicles	3	9	3	-	-	-	15
Engineering equipment & supplies	-	30	10	5	5	5	55
Miscellaneous	5	5	5	5	5	5	30
Sub-Total	8	165	94	66	36	25	394
c. Participant Training (Short-Term. 4 Mos. Average)							
Short-Term Observation	6	6	6	6	6	-	30
Farm Developmental Planning	3	6	-	3	-	-	12
Irrigation System Design and Land Shaping	3	3	-	-	-	-	6
Irrigation Practices	-	3	3	-	-	-	6
Drainage and Soils	-	3	-	-	-	-	3
Agronomist/Horticult Practices	-	10	6	6	6	-	27
Farm Credit	-	-	3	-	-	-	3
Farm Development Management	-	3	3	3	-	-	9
Agr Services Cooperatives	-	3	3	-	-	-	6
Agricultural Marketing	-	3	3	3	3	-	12
Sub-Total	12	40	27	21	15	-	115
Grand Total U.S. Inputs	215	404	306	303	269	233	1720

2. Inputs - Tunisia

a. Inputs related to production aspect of Project (TD 000)*:

	1973	1974	1975	1976	1977	1978	Total
1. Construction and rough land shaping	200	400	500	500	400	250	2,250
2. Demonstration Grants	6	9	9	9	5	2	40
3. Trust Fund support for U.S. contract team	80	60	60	60	50	50	360
Total	286	469	569	569	455	302	2,650

b. Inputs related to OMVVM services in the whole regional area (TD 000)*:

	1973	1974	1975	1976	1977	1978	Total
1. Regional Office Support	75	100	125	150	150	150	750
2. Perimeter Operation and Maintenance Expenses	50	50	30	40	80	110	360
3. Farm Credit Revolving Fund	-	-	-	-	-	-	480
Total	125	150	155	190	230	260	1,590

* 1 TD=$2.12 @ 10-72

E. RATIONALE

Introduction: The agricultural sector's contribution to the Tunisian economy has plummeted from nearly 30% of the gross domestic product in the early 1960s to 16% in 1970, but it continues to employ approximately, directly or indirectly, 70% of the population. It accounts for about 65% of export earnings. While Tunisia was once a net exporter of agricultural commodities, it now suffers from a food deficit and is compelled to import annually large quantities of agricultural products. The Government of Tunisia was aware of the long-term trend and recognized the need for increasing agricultural production to alleviate its unfavorable balance of trade and food deficit problems. Consequently, it turned to irrigated agriculture and invested approximately $120 million over a 13-year period to develop its hydraulic resources and expand the amount of land under irrigation. Although water was made available on nearly 400 irrigation perimeters covering approximately 100,000 hectares, productivity has remained low and relatively few farmers have been mobilized, motivated and trained to utilize efficiently the water made available to them. This situation is due to several interrelated factors such as land reform problems, inadequacy of extension services, failure of agricultural credit programs to reach small, low income farmers, lack of an efficient marketing service, poor farming management, decreasing private investment, and until 1969 the unsuccessful expansion of government-controlled cooperatives.

Recognizing the past ills of irrigated agricultural development in Tunisia and the convergence of thought among OMVVM officials and other donors, the design of this project has been expanded somewhat beyond the purely technical nature of many previous projects in agriculture. Because of the unsatisfactory experiences of the past, there is a greater appreciation for the numerous known and unknown variables involved in successful agricultural development and the sometimes incomprehensible complexity of interrelationships among these variables. While the proposed design is not exhaustive in the number and types of activities, it attempts to address the critical points in the overall agricultural development process, starting with essential farmer motivation and successively considering required infrastructure, modern agricultural practices, land reform, credit, cooperative services, marketing, and public institutional support. It is further recognized that a government-sponsored project of this nature can go a long way in creating favorable preconditions for development of removing impediments to growth, but ultimately it is the farmer, himself, who is the key to success. Enhancing the farmer's willingness to produce in an optimum fashion will be an important objective throughout the life of the project. In this context, a special effort has been made to evaluate needs from the farmer's viewpoint and focus each component of the project on him, his needs, and what it takes to motivate him to produce.

Background: Comprehensive agricultural production and yield figures have not been compiled for the entire area irrigated in Tunisia. For most crops comparison of existing yields with potential yield cannot be reliably made at this time. However, the normal yields presented in the 1967 - 1972 Tunisian National Planning Report are compared with average recent California State average yields for the same kind of crops in order to show roughly the potential for improved productivity.

Crop	1967 -1972 PLAN Report	1971 PLAN Note (Metric Tons per Hectare)	California: Avg. Under Irrigation
Sugar beets	16.7	-	46
Potatoes	15	13	31-37
Tomatoes	17.3	16.6	19-45
Peppers	NA	7.5	NA
Asparagus	1.0	-	6.7
Melons and Watermelons	10.0	11.0	13-17 (cantaloupes)
Onions	NA	NA	37
Strawberries	NA	NA	31
Sorghum	17 (gross)	-	4.4 (seed)
Alfalfa	20 (wet)	-	12 (dry)
Grapes	(3-4)*	-	16
Almonds	(0.12)*	-	1.6
Apricots	(1.24)*	-	11.9

* Most areas dry farmed

As USAID has assisted in developing the water supply infrastructure by providing $17 million in grants and loans and TD 15 million from counterpart funds, it has an interest in helping the GOT to realize maximum economic utilization from these irrigation areas.

The GOT also recognizes that irrigation is a new type of farming activity for many of the small farmers, and is therefore giving high priority to training cadres of government technicians who will have the responsibility to provide technical advice to the farmers. In this connection, the GOT and the United Nations have recently initiated a $2 million program of research and training of government workers in water requirements, irrigation practices, and drainage practices adaptable

to the different crops and regions of Tunisia. The United Nations program does not contemplate becoming directly involved in carrying the research knowledge to the farmers. The new project proposed herein would be aimed at developing and motivating a Tunisian institution to train and assist the farmers in the techniques and financing required to increase agricultural income in irrigation areas.

1. Farmer Attitudes: An excerpt from a recent Trip Report

During a visit to Ghardimaou region December 14-15, 1971, the design team took the opportunity to interview farmers who were irrigating some of their land from the deep wells. These farmers were using the water to irrigate winter vegetables and fruit tree groves planted mainly with orange, apple, and pear trees. Asked if they were making a good profit from crops grown under irrigation, the farmers answered "No" and gave a variety of reasons for this suitation; they stated that (a) the water was cut off by REPI (Resources en Eaux et Perimetres Irrigûes) for a certain length of time, interrupting the planned farm operations, (b) they could only commercialize their crops in the local markets where prices offered were very low, and (c) most of the skilled agricultural workers have emigrated. The available farm laborers do not know how to irrigate or prune trees. They are not only inefficient, claimed the farmers, but they also want higher wages. As a result, the burden on their budgets is heavy and without a proper and equitable return. Asked why the water was cut off, the farmers simply answered because they did not pay their bills; they rejected the responsibility for this matter because the REPI insisted that they pay water bills on a quarterly basis. The farmers claimed that their own funds did not allow them to cover farm operation expenses as well as the water cost before harvest time. They stated that it would have been more reasonable for REPI to wait until they have sold their crops and then request payment for the total water consumption of the season.

The farmers at Ghardimaou do not seem to resist change, appear receptive to new techniques, and willing to grow new crops, so long as they can be assured a profit, security, and status they have achieved in the past with their less expensive traditional and lower-producing practices. When asked if they wanted to produce more from their land and willing to invest more, the farmers looked puzzled by the question and strongly answered in the affirmative, but added that they do not want to waste their efforts and barter away their crops in the local markets or sell them to middlemen. They want assistance to get to the best market, learn new techniques and obtain credit to purchase the seeds, the fertilizers and the farm machinery to increase their production.

2. Project Location - Upper Medjerda Valley (Ghardimaou)

The Upper Medjerda Valley is located in Northwest Tunisia, 180 kilometers West of Tunis and 75 kilometers South of the Mediterranean Sea. The project area is the Upper Valley section of the Medjerda River between Jendouba and the Algerian Frontier. It encompasses an area of approximately 14,000 hectares and extends about 7 kilometers in a north/south direction and 20 kilometers in an east/west direction. The irrigable portion of the Upper Valley includes an area of approximately 5,000 hectares. It is divided into three parts by the Oueds Medjerda and Rarai, which have their confluence near the village of Oued Meliz. Of the total land, there is about 6,200 hectares north of the Oued Rarai, 3700 hectares between the rivers and 4100 hectares south of the Oued Medjerda.

3. Geography: Of primary concern is the broad alluvial plain of the Upper Medjerda Valley and its alluvial borders. The Upper Valley is bordered on the North and West by the Medjerda Mountains which attain elevations of 1200 meters above sea level, and on the South by the Ouergha Mountains which reach 800 meters above sea level.

4. Soils: The soils on the bottom part of the Valley are deep, stratified, and alluvial. They are calcareous and range in soil reaction from pH 8.0 to 8.8. They are nearly level but no longer have any flooding hazard. The soil type varies rapidly within short lateral distances, and in many sites contrasting layers are in vertical sequence. As a result, soils with a variety of permeabilities and drainage classes are represented in close proximity. The International Engineering Company (IECO) report, Upper Medjerda Projects Feasibility Report, shows that a land classification system similar to that used by the U.S. Soil Conservation Service was made. The land classified II through IV are irrigable; classes III and IV are subdivided to provide more detail. The soils run to clay loams with permeability ranging from slow to moderate, and clay soils from slow to very slow permeability. Soils of both Class II and III are suited for general crops, with preference given to Class II areas which are more easily managed. Class III-3 and III-1 lands may be preferable for tree crops. The soils in Class IV will be difficult to manage under irrigation and will have to be avoided.

Salinity levels are at present insignificant in surface soils. On about one-third of the land the subsurface salinity is in excess of 4 mmoh/cm. Thus, under intensive irrigation with the water available, the level of salinity in all horizons will tend to increase. The progression of salinization will be a function of regional irrigation in the Valley in that extensive irrigation will cause the natural ground water table to rise. Preparations must be made at an early date for careful irrigation water applications to allow excesses to supplement natural leaching of soluble salts accumulating in surface soils.

Internal drainage varies widely in soil profiles and the presence of dense clay horizons in some soils will possibly require artificial drainage. Again, the progression of regional irrigation and the rising of natural water tables will determine at what point artificial drainage is needed, if any.

5. Water Quality: Preliminary laboratory analysis of the water of the upper portion of the Oued Medjerda and tributaries indicates that this surface water is usable for irrigation on the soils to be irrigated. The quality of ground water which varies from 400 - 1200 ppm in salinity is considered to be very good and available in abundant quantity for this project.

Regardless of the source of water - surface, ground water, or both - it is apparent that the water quality downstream from the Upper Medjerda project will ultimately be affected by the drainage from the irrigated areas. Since water quality is a critical problem on the Lower Medjerda Irrigation Project, it is important that the effect of the drainage water on the overall salinity of the water in the Oued Medjerda Basin be observed and analyzed with a view of planning any remedial measures necessary.

6. Drainage: Investigations by International Engineering Company indicate that sub-surface drainage will not be a major problem except in those areas where Class IV land may be irrigated. Topography is such that adequate outlets can be obtained for both surface and subsurface drainage.

Adequate surface drainage systems must be included in the plans for the irrigated areas since the average annual rainfall is 449 mm (17.7 in.) and the water disposal systems must be large enough to dispose of the runoff from rainfall as well as the surplus irrigation water.

7. Climate: Long-term weather records at Jendouba and Ghardimaou indicate the average growing season for this area is slightly more than 300 days a year. Records at Jendouba indicate an absolute frost-free period of 236 days with a normal frost-free period of 307 days. The temperature at Jendouba averages 9 degrees C. in January, and 28 degrees C. in August. Winters are mild and moist and summers are hot and dry. The average rainfall of this area amounts approximately to 450 mm per year. The rainy season normally extends from September through May. The average wind velocity is 2.2 meters per second. The weather is calm about 50% of the time, but a few strong winds are recorded in winter and early spring.

Frost and relatively low temperatures may have an influence limiting the production of very early vegetables but should not detrimentally influence production of mid-season vegetables. Frosts may also cause some damage to citrus blossoms, and occasionally to fruit and leaves, but is not expected to cause extensive damage to fruiting wood. The citrus trees observed in the area showed leaf damage and certain attenuation in overall size, but extensive wood damage apparently does not occur. Fruit can be damaged by hail at intervals of several years. More detailed climatic information will have to be developed during the life of the project.

8. Existing Infrastructure: As mentioned elsewhere, the Tunisian Government invested huge sums of money and effort since independence for irrigation infrastructure. There now exists a tacit government policy of which the USAID is supportive to turn away from further infrastructure development and redirect its efforts to improving agricultural production on previously constructed perimeters. This policy is generally consistent with the observations and recommendations of the IBRD, other donors, USAID and certain offices within the GOT. Given present circumstances, it appears that the greatest gains in irrigated agricultural production can be achieved by de-emphasizing infrastructure and concentrating present resources on the qualitative aspects of production and by removing certain bottlenecks which have seriously hampered optimum production in the past. While this project does have a construction component, it should be noted that the intention is to limit this input and develop infrastructure only to the extent that it takes advantage of previously developed facilities and puts them into full production.

The Ghardimaou area was one of several sites that benefited from an earlier project designed to create a cadre of Tunisian well-drillers. The training program included practical drilling experience which due to the foresight of the trainers resulted in drilling many production wells in strategic locations around the Upper Medjerda Valley. Although they had envisaged that this productive spinoff would be further developed by another agency of the GOT, other factors intervened which prevented full utilization of the wells. Consequently, an important input to this project is 17 high-producing (1200-1300 liters/second in total) deep wells which are in varying degrees of readiness. Approximately nine of the wells are fully equipped and partially used while the others require pumps and/or motors. Thus, the construction component essentially involves installing a low-cost, open-ditch water distribution system to capitalize on the previously installed infrastructure. It should be restated in this context that the comprehensive nature of this project precludes over-emphasis on infrastructure development. The irrigation system, per se, is viewed as a precondition for accomplishing the stated purpose of this project and not as an end in itself.

9. Land Tenure: Land ownership in Tunisia is complicated by the various types of ownership under which land has been held. In addition to the large tracts of land owned by private holders and by the State after it nationalized the French colons, the land was many times owned by tribes or endowed to mosques and other public institutions. This, complicated by the law of inheritance, has resulted in confused ownership and untitled land. In spite of the government's efforts during the past ten years to achieve total land registration, from one-third to one-half of all the agricultural land titles still remain unclear. Making field surveys, identifying landowners and drafting official deeds usually takes about three years to accomplish. Another year is needed by the Courts to process the deeds, hold hearings and issue the official titles to the land. As a direct consequence of this situation, land reform or even land consolidation on irrigation perimeters has proved to be difficult to implement and has hampered to a certain extent the improvement of production on irrigated land. This problem can be minimized somewhat if an effort is made to adapt as much as possible the irrigation system to the existing landownership patterns. Presently, the Service Foncier has completed its initial survey of the Ghardimaou area and is waiting construction of the irrigation perimeter and redistribution of land before finalizing its survey and legalizing landownership in the area.

10. Prevailing Landownership Patterns: In general, the size of the farms in the Ghardimaou region do not exceed 5 to 10 hectares and according to the regional authorities only 17 farmers own more than 100 hectares. There are four cooperative farms in the area, but all are located substantially outside the perimeter boundaries; however, if irrigation is expanded beyond the present 5000 ha, it then would include at least one or two cooperative farms. As stated above, the existing land parcels are of reasonable size so land consolidation and re-parcelment should not be abnormally complicated, though problems can be expected.

The government owns a number of small plots scattered over the project area which are presently rented to private farmers. These plots could be used to compensate for expropriated land required for roads, or canal rights of way or consolidation. This use of government-owned land should help a great deal in ameliorating some of the local land problems. The only large tract of government land is the experimental orchard at Chemtou which covers approximately 400 hectares. This orchard is directly managed by the "Office des Terres Domaniales" and is used to test many varieties of fruit trees introduced from Europe and something like 82 varieties of oranges and tangerines.

The OTD does not appear to offer any obstacle to the implementation of the proposed project and could be expected to participate, as a private farmer, in the project activities. Representatives of the OTD seemed quite pleased with the prospect of an irrigated agricultural project in the Ghardimaou area, especially, and expressed a wish that the irrigation of the Chemtou orchard be included in the initial phases of the Project Plan.

11. Agricultural Credit: A comprehensive farm credit program is an integral part of agricultural development in the project area. All other components of the project to varying degrees will depend upon the timely and suitable injection of credit. Seasonal production credit will be necessary to finance inputs such as seed, fertilizers, weed killers, and insecticide. Medium and long-term credit will be required for irrigation installation, land leveling, orchard development, implements and facilities.

a. Seasonal Credit: The OMVVM has had considerable experience in farm credit and is presently providing a substantial amount of seasonal production credit to farmers on government irrigation perimeters from a TD 350,000 revolving fund. Such credit, which is actually provided in kind, is extended in the following manner:

Before December 1:	The OMVVM technician works out the credit request with farmer.
Before January 2 :	The credit request is acted upon by the local credit committee consisting of the delegate, OMVVM Engineer, Farmers Union Representative, and some local farmers.
By January 15 :	The National Credit Committee reviews the list of loans approved by the local committees and eliminates any applicants with a bad credit history.
By February 1 :	The farmers are issued certificates for obtaining in kind from either the Office of Cereals or the Office of CCPS the seeds, fertilizers, etc. they are authorized
By February 15 :	The farmer is supposed to be ready to commence field operations.

A similar schedule is enacted for the summer crop season, and again for the fall crop season, making three open periods per year for the farmer to apply for credit. The loan limit is 90% of the production costs. Delays in credit approval are frequent at the local level due to deficiencies in the application or to the need to investigate the applicant's situation. Delays have not been encountered at the national committee level. The OMVVM collects from the farmers for the credit. Recovery rates vary greatly from perimeter to perimeter because of psychological and economic conditions of the farmers. This program has been in effect two years and the average rate of collection has been about 60 per cent. The OMVVM has been fairly lenient with the farmers the first year to assist

them to get started in irrigated farming. The OMVVM legal recourse for collection is to take the farmer to court for nonpayment of debts. The debt is not secured by the land. The payment for the water used is kept separate from the payment for the credit, and they do not consider turning off the water except for nonpayment of the water charges, which are on a cubic-meter-delivered basis only.

b. Medium and Long-term Credit: Medium and long-term credit is provided by the Banque Nationale de Tunisie (BNT). Farmers have had difficulty obtaining medium and long-term credit in absence of official land titles. Since BNT requires collateral, usually land titles, before making farm loans, it has been unable to make loans to most farmers on irrigation projects until final and legal land allocation has taken place. Consequently, farm equipment and irrigation system improvements have been difficult to finance. OMVVM's 350,000 TD revolving credit fund was designed to partially alleviate this problem.

A technically supervised medium and long-term credit program can be established for the proposed project area. A special fund can be created for this purpose and loans will be tied to irrigation system improvements, water delivery, and equipment procurement. This special medium and long-term credit program will be considered as an interim mechanism only for providing credit until the landownership survey is completed and new titles delivered to the farmers. Once this occurs, medium and long-term credit requirements can be transferred to the BNT. It would improve the continuity and technical soundness of this program if a BNT supervisor was assigned from the start to work at the field level with OMVVM to smooth the transition from special fund, medium and long-term credit to BNT credit as more farmers gain title to their land. It would also serve to encourage BNT to move more of their operations and personnel to the field. In areas not covered by OMVVM and its 350,000 TD revolving fund, there is a system of BNT subsidiaries called "Caisse Mutuelle" which provides seasonal credit to small farmers. While the credit is badly needed, the restrictions on total amount available per hectare limit the usefulness of this source of credit. As with other credit programs, the repayment problem is endemic.

As elsewhere, it can be safely assumed that the larger the farming operation, the fewer the problems with credit. Most large farmers have access to required credit, while the small farmers continually encounter difficulty.

The project's credit program will have to take this reality into consideration and realize that one of the keys to increased productivity is the small farmer who predominates in the area. He is critically dependent upon credit and can easily lose his incentive to expand production in its absence.

12. Marketing: Providing production inputs and marketing outputs is another important element in optimizing agricultural development. Presently, COREMAF, which covers an area much broader than the project zone, is the single service cooperative handling production inputs and marketing. Any other arrangements are private and unorganized, except regional centers of the "Office National des Cereales" which handle wheat exclusively.

COREMAF is essentially a stock company with 71 shareholders and a Board of Directors composed of nine members. Its capital amounts to TD 14,305; it has eleven permanent employees and hires a varying number of workers during the cropping seasons. COREMAF rents a six-room building for offices and owns one general store where selected seeds, fertilizers, insecticides and spraying equipment are available for retail sale to the farmers. It also uses a 60 sq.meter warehouse for short period crop storage. Several branches of the cooperative are opened during the cropping seasons at Ghardimaou, Tabarka and Ain Draham; these branches are merely collection points where crops bought by COREMAF at auction sales are deposited for a day or two before being shipped to Jendouba or to the local canning plant.

COREMAF is not presently equipped with trucks. Transport facilities are provided by the "Societe Regionale de Transport" on a rental basis. Market research is done at the start of the season primarily to obtain the market trend for the year. A high percentage of the products commercialized by COREMAF goes to a canning plant in the area for a fixed price. COREMAF indicated that they are planning to purchase some trucks and to install retail stores in several villages in Jendouba Governorate. Membership of the cooperative has stayed the same since 1969.

For a variety of reasons the project design team was not satisfied with COREMAF operation. Its 71 shareholders probably represent no more than 5% of all the farmers in the area serviced. There is little hope for a customer, non-shareholding farmer to influence the cooperative's policies or service. If a farmer finds the cooperative unresponsive, he has no alternative but to fend for himself and sometimes take a financial beating at the market. An undesirable situation has indeed developed in the area. The farmers appeared to be dissatisfied with the services they are obtaining from the cooperative, especially marketing service. COREMAF, on the other hand, is making a fine profit, has money in the bank, and has little incentive to expand and improve its services in spite of its professed willingness to do so. COREMAF blames most of its inability to provide marketing to all that want it on the unsatisfactory transportation situation. At present, it must rent trucks from a public company in competition with other users. It has been trying for two to three years to obtain an import license for several trucks but, to date, is still

waiting. While improved transportation will go a long way in resolving the marketing problems in the area, there still exist some basic weaknesses in the present cooperative that makes it questionable whether or not the farmers in the project area will get good, responsive service.

13. Agricultural Extension: Tunisia has a national extension service. Agricultural extension programs are carried out in the regions by groups of monitors, called "animateurs", under the supervision of agricultural engineers who are located in Regional Offices of the Ministry of Agriculture. The number varies according to the region. These animateurs or demonstration agents are generally graduates of vocational training centers where they are given one or two years education in agricultural practices. While some progress has been made in introducing new crops and upgrading the skills and knowledge of the farmers, agricultural extension programs have not yet had a large impact on agricultural production. This is partially due to the small number of extension workers assigned and the lack of sustained support from the national extension service. Groups of two or three extension agents have been assigned to vast regions including several hundreds of farmers, with little logistical support such as transportation, special tools, technical extension literature, and ample communications media material. Model farms are scattered throughout the country, their number is limited and they are rarely visited by neighboring farmers.

Frequently, the extension agents are not natives of the area in which they are working and thus have limited regional knowledge and experience from which to draw when attempting to persuade the farmers to change or improve their traditional agricultural practices. As a result, the farmers have no confidence in the extension workers who, in turn, feel frustrated.

In summary, the existing agricultural extension program is not adequate for the type of agricultural activities to be undertaken on the irrigation perimeters of the Medjerdah Valley. For this reason OMVVM was given the responsibility and authority to operate demonstration and extension programs on public irrigation perimeters. Thus, the Northern Region office of OMVVM being developed under this project will organize and implement the demonstration and extension components of the project.

14. Agricultural Production and Cropping: Because of the favorable soil, climate and topographic conditions, the Upper Medjerdah area is well suited to the production of food crops and forage under irrigation. Almost all the cultivated lands are presently used to produce small grains, principally wheat, with small plots of olives, tobacco and forage. The exception is the expanding but scattered production of vegetable and citrus crops around small shallow-well perimeters, small perimeters utilizing river water, and small one or two-hectare plots around deep wells. While there was a combined total of approximately 600 hectares under irrigation

in 1971, it was mostly the result of the unorganized and unplanned efforts of a few ambitious farmers, except for a 200 hectare irrigated apple and pear orchard operated by a government organization (OTD).

One provisional cropping plan prepared by the GOT recommended 20 percent citrus (1,000 hectares) and 80 percent (4,000 hectares) in a four-year rotation of sugar beets, forage, vegetables and cotton. The soils of the Upper Medjerdah are good and capable of producing a variety of crops.

At the pilot farm, "Chemtou", there are test plantings of apples, pears, quince, and prunes which were introduced from France. There is also a small planting of citrus. There are approximately 82 varieties of oranges and tangerines being tested. The results may very well help to decide whether it is more desirable to encourage citrus production or modify the cropping plan to use fruit trees other than citrus.

Since citrus is an important ingredient of most cropping plans relating to the Upper Medjerdah, the project team will have to make a special effort to examine the many variables involved, e.g., weather, soils, farmer skill, etc. to determine the feasibility of an expanded, commercial citrus production effort. It is recommended that the team utilize the short-term services of an outstanding citrus expert in making the determination.

Forage production is another important aspect of cropping. It is anticipated that livestock production will be a significant activity undertaken in conjunction with this project. An essential precondition for this link is a reliable input of forage and feed grain which could very efficiently be provided from the irrigated lands.

15. Livestock Production: The Upper Medjerdah project holds important implications for improvements in the livestock industry of Tunisia. Nearly 40% of the cattle in Tunisia are in the three governorates (Djendouba, Le Kef, Beja) in and immediately adjacent to the proposed irrigation project area. One-eighth of the nation's cattle are in the Djendouba governorate alone. Successfully linking irrigated agriculture and livestock production in the Ghardimaou area will have an immediate impact on the entire region under OMVVM jurisdiction.

About 4% of the total sheep population of Tunisia is in the Djendouba Governorate, but the adjacent governorates are important for overall production. The three contiguous governorates account for approximately one-fourth of Tunisia's sheep.

The Upper Medjerdah project is especially important to livestock as a potential for substantially increased feed availability on which an expanded livestock and poultry industry can be achieved. With the wide seasonal variation that now exists in feed supplies in Tunisia, it is important that this potentially productive area be utilized to increase livestock feed output to the maximum practical extent. This includes not only increased forage production in the irrigated area but also the pastures and grazing lands in and adjacent to the irrigated area. A balanced production of feed as well as food crops on the irrigated lands, plus improving the grazing and forage on the non-irrigated lands, can make a major contribution to this area.

The link between livestock production and overall irrigated agriculture development will be a prime responsibility of the project team. An important vehicle for establishing this link will be close cooperation with the USAID-sponsored accelerated Livestock Production Project.

16. Unemployment: Unemployment and underemployment must be considered one of the major socio-economic problems in the project. While there are no precise employment figures for the area, it is generally acknowledged that the Djendouba Governorate has one of the highest unemployment rates in Tunisia. An average unemployment rate of 30% would probably not be too far from the actual figure. The Ghardimaou area, in particular, has contributed substantially to this high unemployment rate.

The implications for this project are two: (1) There must be a special emphasis on labor-intensive approaches to the various development activities carried out during the life of this project, and (2) in the process of shifting from the traditional dry farm to irrigated cultivation practices with the resultant increases in productivity and total production, it is anticipated that employment in the project area will increase by two unskilled workers per hectare; i.e., one on the farm and one off the farm in related agricultural services. Translated for the Ghardimaou area the potential employment spin-off by the late 1970s is 10,000 more jobs. For the other perimeters in the project area one would expect commensurate increases in employment.

17. Transportation System: The Ghardimaou area of the project is served by one main all-weather road and a main line of the Tunisian railroad system. The main highway which connects the Governorate capital of Djendouba with the villages of Oued Meliz and Ghardimaou is crisscrossed with a system of dirt and gravel roads which cover most of the valley floor. Extending out from Djendouba there are excellent all-weather roads which interconnect all the major towns and cities in Northern Tunisia. The railroad connects the area with Tunis and other major coastal cities.

18. Rural Electrical Power: The project design team has not had an opportunity to explore this aspect of the project. While there is rural electric service to the project area, the capacity of the transmission and distribution systems to handle the increased requirements is not known. In the future for the sake of economy it would be advantageous to shift the operation of permanently installed equipment from mechanical to electrical power. The existing well pumps in the Ghardimaou area, for example, are driven by expensive diesel engines which require uneconomical outlays for fuel and maintenance. It would be desirable to consider operating pumps and other facilities by electrical power.

As the project area develops one would also expect an increased demand for electrical power resulting from additional on-farm use, expanded irrigation system operation, and new requirements from enlarged agricultural processing and manufacturing operations. Conceivably, the availability of electrical power could become a constraint on development as prosperity in the project area grows.

19. Benefit/Cost - Ghardimaou Perimeter: Assuming 3,000 ha summer irrigation and 2,000 ha winter irrigation,

	Investment Cost (TD)	Annual Cost @ 8% Interest
a. Cost		
Wells and pumping plants	1,305,000	152,000
Irrigation distribution system and rough land shaping	2,250,000	189,000
Orchard development (2000 ha)	1,000,000	102,000
Cow sheds for 2000 cows	200,000	20,000
Cows - 2000	540,000	-
Farm eqpmt & improvements excl. farm residences	750,000	112,000
Total Investment & Amortization	6,045,000	575,000
Irrigation system operation	-	50,000
Irrigation system maintenance		60,000
		685,000
b. Tangible Benefits		
(1) Present Net Benefits to Landowner (annual)		
4,400 ha of wheat at 25 dinars/ha for grain		110,000
Net value of meat produced with straw(22d/ha)		97,000
600 ha irrigated citrus & vegetables at 100d/ha		60,000
Present Benefits - Total		267,000

b. Tangible Benefits - cont'd

(2) Estimated Benefits after Completion of Project

(a) Primary benefits: The Bureau du Plan et du Developpement Agricole of the Ministry of Agriculture in April 1971 issued a detailed report on the Agricultural economics for the Ghardimaou Project (including 2000 ha of citrus and nearly 3000 ha of other crops) showing a net benefit of 212 d/ha after paying 51.3d/ha for water. On this basis the net benefit before paying for the water on the 5000 ha would be 1,316,000 dinars minus 267,000 dinars present benefit or TD 1,049,000.

(b) Secondary Benefits: For an irrigation project of this nature it is expected, based on California experience, that the secondary benefits accruing to persons such as those employed in supplying the production inputs, marketing the produce, and serving the family needs of the farmers generated from the increased farmer income, will equal approximately the primary benefits and amount to TD 1,049,000 per year.

(3) Total Primary and Secondary Benefits will total - TD 2,098,000.

c. Intangible Benefits

Intangible benefits from the proposed project will include providing increased social welfare and political stability by reason of creating employment opportunities which are greatly needed in the Ghardimaou area of Tunisia. The project will also provide the base for introducing modern irrigation and agricultural development practices to Tunisia and for giving Tunisian technical administrative and farm personnel experience in the application of such practices with the expectation that the use of such practices will spread to other areas of Tunisia and progressively increase the efficiency of agricultural development within the country.

d. Benefit/Cost Ratio

The total primary and secondary benefits of TD 2,098,000 annually divided by the direct annual cost of 685,000 dinars attributable to the project, exclusive of foreign technical assistance, produces a benefit/cost ratio of 3.0 to 1.

20. Existing Studies of Project Area: There is an abundance of available informational material pertaining to all facets of agricultural development in Tunisia. The following list while not complete is a representative sample of what is available that relates to the project area. A more thorough collection of available materials will be carried out by the project team.

LMS Office, USAID/Tunis

a. Map Supplement to a Reconnaissance Ground Water Investigation Oued Medjerdah Valley - Tunisia

b. Upper Medjerdah Projects: Feasibility Report (Appendixes) Int'l Engr. Company (IECO), April 1967, English and French

c. Preliminary Report Ground Water Investigation: Upper Medjerdah Valley, R.M. Parsons Co., Feb. 1967, Engl. & French

d. A Reconnaissance Ground Water Investigation: Oued Medjerdah Valley, IDJ Belcher & Asso., French and English, Aug. 1964

e. Final Report: Ground Water Investigation Upper Medjerdah Valley, Ralph M. Parsons Co., August 1967

f. Tunisian Irrigation Projects: Reconnaissance Report, Int'l Engr. Co. (IECO) January 1963, English and French

g. Carte des Nappes Phreatiques du Nord-Tunisie, Zebidi, May 1967

h. Etat des Nappes Profondes de Tunisie, March 1967

i. Etude Preliminaire et Recommandations sur les Récherches des Eaux Souterraines Vallée de la Haute Medjerdah, R. M. Parsons Co., and IECO, November 1965 English and French

j. Agriculture in Tunisia: Organization, Production and Trade USDA, February 1964

k. Amenagement Hydro-Agricole de la Plaine de Ghardimaou, HAR, June 1969, French only

l. Haute Vallee de la Medjerdah: Amenagement Hydro-Agricole de la Region de Ghardimaou, Premier Phase de Developpement a Partir de Nappes Souterraines, HAR, Avril, 1968

m. A Pre-Feasibility Reconnaissance Study for the Development of Ground Water Projects, Parsons Company, April, 1968.

n. Salinite et Debits de Base de la Medjerdah, Nov., 1966 Ramananantoandro BIRH.

o. Final Report: Ground Water Investigation Upper Medjerdah Valley, Tunisia, Parsons Co., August 1967.

p. Amenagement Hydro-Agricole de la Plaine de Ghardimaou: Avant Projet: Irrigation a partir des nappes et de la Medjerdah, HAR (2 copies), June/July 1969.

q. Northern Tunisia Master Plan Study, IBRD, Italconsult, Rome, July 1970 (Annexes A to F, G to H, I to L).

r. Etudes de Reconnaissances des Eaux Souterraines, Donald J. Belcher, August 1964.

s. Estimate for 30 water wells: Upper Medjerdah Project, Ralph Parsons Company, November 1967.

t. Land Development Project: Perimeter of Oued Meliz Well #2, prepared by AID/Soil Conservation Service, April 1968

u. Haute Vallee de la Medjerdah: Amenagement Hydro-Agricole de la Region de Ghardimaou, Premiere Partie, Plaine de Ghardimaou: Etude de l'infrastructure general hydraulique, HAR, Juillet/Aout, 1967.

v. Upper Medjerdah Valley: Legend of Land Capability/Class: USDA PASA Team, Bower, April 1968.

w. Bassin Versant de la Medjerdah, Exploitation des Ressources Hydrauliques, HAR, April/May 1968.

x. Production Methodes of Tunisian Agriculture & Agricultural Spheres of Tunisia, prepared by Ministry of Plan, Government of Tunisia.

PRM Office, US AID/Tunis

a. Agricultural Development of Specific Irrigation Projects in Tunisia, USDA, Feb/March 1966

b. The Farmer Restored: A View of Tunisian Development, John L. Simmons, Harvard University, September 1970.

c. Staff Paper on Key Problem Areas in Agriculture, AID, Milo L. Cox, November 1970.

d. The Strong and Weak Points of Tunisian Agriculture, Zaanouni Speach, Beja, March 29, 1971

AGR Office, US AID/Tunis

a. Situation Actuelle et Perspective de l'Elevage en Tunisie, FAO, Rome, 1969. (#AT 2667)

b. Amélioration de la Production des Cultures Irriquées, FAO, Rome, 1964

c. Amélioration des Paturages et la Production Fourragère, FAO, Rome, 1963.

d. Tunisia Nitrogen Fertilizer Needs: Alternatives to Meet Needs, Tennessee Valley Authority, 1968.

e. Principes, Méthodes et Techniques d'Amélioration Pastorale et Fourrageres, FAO, Rome, 1969.

O.M.V.V.M.

a. Element de Calcul d'un Hectare de Culture

b. Projet de Lakhmes

c. Principales Caractéristiques du Barrage sur l'Oued Lakhmes

d. Agro-Combinat: Badrouna (Bou Salem)

e. Plaine de Souk El Khemis
   (1) Irrigation de complement d'hiver par-pompage dans l'Oued Medjerdah Haute Vallee de la Medjerdah.
   (2) Irrigation de la Plaine Sud-Est de Souk El Khemis perimetres d'irrigation de complement Badrouna Sidi Smail.

f. Proposition concernant la reconduction du projet de vulgarisation agricole dans le cadre de l'assistance

O.M.V.V.M. (Continued)

technique allemande.

g. État des Sources et des Fourageres du Gouvernorat du Kef.

h. Perimètre irrigable d'Oued Lakhmes.
Projet de Mise en Valeur, Ministère de L'Agriculture, Direction de la Production Agricole du Gouvernoral du Kef.

i. Etude Pédologique de la Haute Vallée de Medjerdah.

j. Etude pour l'élaboration d'un modèle. Agro-Economique optinal pour le périmètre irrigable de Ghardimaou Ministère de l'Agriculture - Bureau de Plan et de développement agricole - Division des Etudes de Projects.

21. OMVVM (Office de la Mise en Valeur de la Medjerdah): The principal GOT implementing agent for this project is the OMVVM. OMVVM is a semi-autonomous office not unlike the Tennessee Valley Authority, headquartered in Tunis, which originally was responsible for the development of public irrigation perimeters in the Medjerdah Valley. OMVVM is outside the regular, functionally organized Ministry of Agriculture structure and answers directly to the Ministry of Agriculture. This organizational relationship gives OMVVM a great deal of operational flexibility and permits it to function outside the cumbersome civil service (Function Publique) mechanism. This arrangement, which devolved from special legislation, gives OMVVM authority to recruit and hire its own personnel, provide salary and fringe benefits above the normal civil service level, prepare and submit separate operational and capital budgets to the Ministry of Plan, and initiate, more or less independently, and execute agricultural programs throughout the geographic area under its purview.

While the basic structure of OMVVM essentially has remained the same until recently, its role in irrigated agriculture has evolved substantially. As mentioned earlier, its initial responsibilities were restricted to the Medjerdah Valley and included irrigation, infrastructure development and operation, applied research, extension, and public enterprise operation. In response to new policy initiatives related to irrigated agriculture, OMVVM will divest itself of public enterprise operations and concentrate on extension, operation and maintenance of the system on all irrigated perimeters in Tunisia. In addition, it has the authority to develop programs in credit and marketing, as required to alleviate these serious bottlenecks to improved agricultural production. Further illustrating the change in OMVVM's role is a statement from a recent IBRD report, "Irrigation policy is ***** in a state of transition with emphasis initially going to the public sector irrigated areas. This change, *****, is designed to increase the utilization made of existing facilities, and to this extent it is a long overdue development. Recent discussions of the problem indicate that it is less

a matter of physical rehabilitation than it is a need for an integrated approach which will require heightened emphasis on agricultural extension, credit to small farmers in the perimeter, and transport and marketing infrastructure." At this point, it is appropriate to evaluate OMVVM's ability to undertake this new and expanded mandate for the development and improvement of irrigated land throughout Tunisia.

The new responsibilities thrust upon OMVVM will unquestionably overtax its present institutional capacity. A rapid expansion program, naturally, will require many additional technical, engineering, and administrative personnel in addition to substantial increases in both the capital and operating budgets. The exact magnitude of these increases has not been assessed to date although, out of bureaucratic necessity, certain projected gross personnel and budgetary figures have been provided to the Ministry of Plan. Instead, OMVVM has concentrated its efforts on assessing the scope of the national irrigated agriculture problem, preparing an integrated plan of attack for ameliorating identified problems related to irrigated agricultural production and designing a decentralized administrative structure for carrying out the plan which will provide increased authority at the regional level. More specifically in regard to this project, USAID/Tunisia has assisted in each one of these efforts as they relate to the northern region of Tunisia. USAID was asked to work with OMVVM in conducting a comprehensive baseline study, developing, executing, and refining a development model for irrigation perimeters, and designing and establishing a decentralized regional office having the institutional capability of applying the development model elsewhere in the northern region. While the first two aspects of the request are covered elsewhere in the PROP, the institution building component needs further amplification.

The GOT institutional base for implementing this project in the Ghardimaou area and the replication of the development model elsewhere in the northern area of Tunisia will be a regional office of OMVVM. For all intents and purposes no organizational structure or program exists in the project area presently. During the life of the project it is planned to design an organizational structure, establish a physical facility (with GOT funds), recruit and train a staff of 130 (in effect almost doubling the present OMVVM staff), and provide an operational plan to accomplish the region's overall production objectives. It is anticipated that the development of the regional office will be accomplished in several phases and closely linked to the development of the Ghardimaou pilot perimeter. While the actual work in the pilot perimeter will require approximately 7 Tunisian engineers and 25 "adjoint techniques" during the peak work periods, it is planned to funnel all 130 professional and semi-professional personnel required ultimately to staff the regional office through the project for on-the-job training and experience. This OJT experience, which could last up to several years for some technical personnel, will be a stage preparatory to work unsupervised by American personnel on other perimeters. Critical to the staffing of this office will be the availability of a sufficient number of qualified Tunisian personnel. While no absolute guarantees can be made, little difficulty is expected.

Some of the factors that lead to this positive conclusion are the favorable competitive position held by OMVVM in recruiting personnel, the availability of technical personnel who have been trained under other completed projects, the steady flow of graduates from the secondary and college level agricultural schools in Tunisia, training conducted by other donors; e.g., German, Dutch, Belgians, Canadians, which will result in an additional reservoir of experienced personnel.

The budgetary inputs necessary to support the staff and program of the northern regional office are indicated on page 8 of the PROP. While these are only jointly planned projections at this time, the GOT has informally agreed (note signature of OMVVM Director on PROP) to support this level of funding for the life of the project. Formal commitments will be made in the official Project Agreement. Given OMVVM's new legislative mandate to cover irrigation perimeters throughout the country and the high priority given by the GOT to agricultural projection, it is anticipated that the financial commitments to the project will be met fully.

F. Course of Action

1. Implementation Plan

FY-72

1. Noncapital Project Paper Prepared
2. AID/W Project Authorization

FY 73-74

1. Implementation documents completed.
2. Agreement signed with U.S. firm as implementing agent.
3. First contingent project team arrives in Tunisia.
4. Plan for development of Northern Regional Office of OMVVM completed.
5. Detailed, time-phases project work plan completed and submitted to OMVVM/USAID.
6. Ghardimaou phase commences.
   a. Construction (1,000 ha per year), land leveling begin.
   b. Extension and demonstration programs developed and commence on existing irrigated plots.
   c. Incentive grants program begins.
   d. Agricultural credit program developed.
   e. Service cooperative plan developed.
   f. Scopes of work for special studies and research developed.
   g. Experts and consultants visit project site for special study
   h. Landownership, redistribution & compensation prog. developed
   i. Improved marketing program developed.

FY 75-76-77. Implementation of various project components; joint project evaluations each year (OMVVM, USAID, US implementing agency.)

FY-78. Project completion - OMVVM replication of project elsewhere in northern region.

AID 1028-1A (7-72) (NARRATIVE DESCRIPTION)

PROJECT NO. [illegible]

SUBMISSION: [X] ORIGINAL [ ] REVISION ____ (Number) DATE ____

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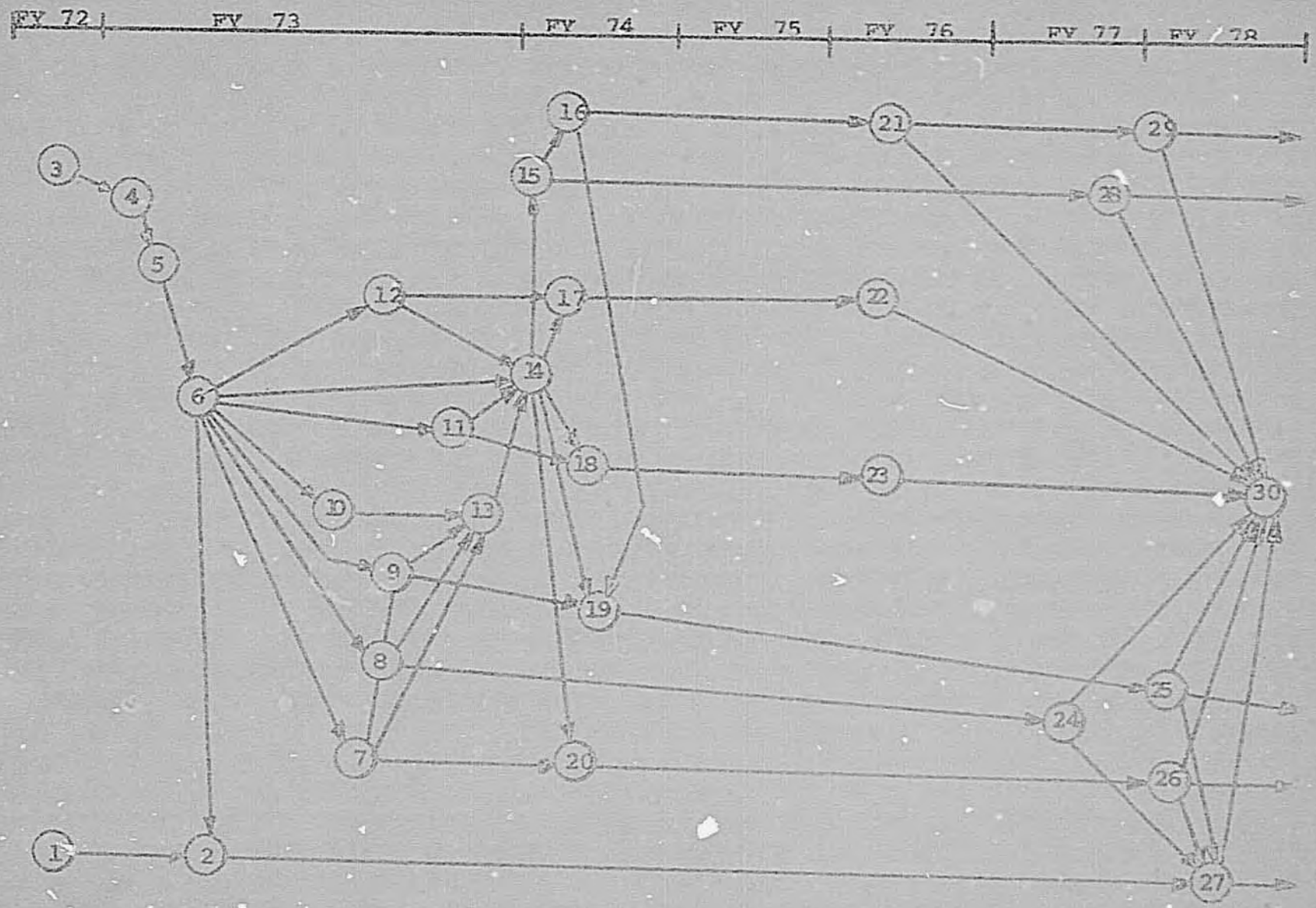


KEY TO PROJECT NETWORK

1. Northern Region Office of OMVVM established.
2. Joint OMVVM/US plan prepared for development of Northern Region Office.
3. PROP approved.
4. PIO/T completed.
5. Contract signed.
6. Project team arrives on-site.
7. Extension program begins on land presently under irrigation.
8. Agricultural Credit and Grant Program prepared.
9. Demonstration program begins on land presently under irrigation.
10. Baseline data Collecting begins.
11. Marketing survey begins.
12. Service Cooperative Survey begins.
13. Baseline Data Collection completed - Periodic Date Collection system established - Research requirements identified - Research Program and schedule prepared.
14. Detailed, time - phased project workplans completed and submitted to OMVVM/USAID.
15. Irrigation infrastructure construction begins.
16. Land-leveling begins.
17. Service Cooperative Plan activated.
18. Marketing Program Plan activated.
19. Comprehensive Demonstration Program begins.
20. Comprehensive extension program begins.
21. Land-leveling operation advisory work terminated.
22. Service Cooperative established and self sustaining.
23. Marketing system for project area established and on-going.
24. Agricultural Credit program turned over to existing credit institutions - grant program discontinued.
25. U.S. assistance to Demonstration Program discontinued.
26. U.S. assistance to extension program discontinued.
27. Northern Region Office of OMVVM self-sustaining.
28. U.S. Assistance to construction program terminated.
29. Land-leveling completed on 75% of project area.
30. All U.S. project assistance terminated.

2. Narrative Statement — Introduction

This project is broad in scope and comprehensively covers a variety of interdependent agricultural production factors. It is divided into two basic components: (a) the development of Ghardimaou irrigation perimeter, and (b) the establishment of a viable OMVVM regional office capable of replicating the project in other areas. As presently conceived the project has a planned life of six years (FY 73 - FY 78) with an expected perimeter maturity period thereafter of four to six years. It is planned to employ under contract a private American firm as the primary implementing agent. It will be the implementing agent's responsibility to undertake further project analysis, formulate detailed project implementation plans, assemble a project staff and carry out implementation in cooperation with OMVVM counterparts.

While the project design team has done much preliminary work and collected an abundance of information, it will be the project team's primary responsibility during the first six months of the project to undertake further analysis and data collection, synthesize all available information and prepare detailed work plans which will include but not be limited to an overall physical and financial resources flow plan, a plan for meeting the credit and marketing needs of this area, a time phased implementation schedule (preferably a PERT network), recommended cropping and rotation plan, and a revised organization plan for the Regional OMVVM Office.

a. Development of the Ghardimaou Irrigation Perimeter

The Ghardimaou perimeter will be the model for demonstrating the integrated development approach illustrated in the logical framework section of this document. The USAID/GOT design team conducted the preliminary project analysis and design which confirmed the feasibility and necessity of the integrated approach if increased agricultural income is to be realized. Consequently, interdependent activities in agricultural credit, marketing, demonstration, extension, irrigation infrastructure, cooperative services, cropping and livestock have been included in the design and will be specifically addressed by the project team.

(1) Irrigation System Infrastructure

Summary - USAID professional personnel have visited the project site on several occasions, talked with Government officials and private farmers, and have thoroughly analyzed existing studies on the irrigation potential, water resource availability, soil and climatic conditions, cropping patterns, and contemporary farm management practices. The proposal presented in this section represents the USAID/OMVVM

conception of the best way to develop the irrigation system for the Ghardimaou plain. In conceptualizing the scheme USAID/OMVVM consciously rejected a previously prepared plan for irrigation of 5000 hectares around Ghardimaou developed by the Direction de l'Hydraulique et des Aménagements Ruraux (HAR) in July 1969 and revised somewhat in 1971. Annex A[1] of the PROP explains in detail the rationale for rejecting this traditional, grid-type aspersion irrigation proposal which in our opinion does not meet certain economic and technical criteria or the changed social/political conditions resulting from the shift back to private enterprise in the agriculture sector. Briefly the HAR system calls for interconnecting the existing wells to a complex of buried concrete pressure pipelines to which portable lightweight pipes and sprinklers would be attached to irrigate each farm plot of 5.75 ha. The 1969 plan called for using a 500-liter per second pumping plant to lift winter flows from the Medjerda River. The estimated government cost of delivering the water to the sprinkler head was about 10 millimes ($.02) per cubic meter for both summer and winter flows. The farmers are generally unwilling to pay this price for water under present conditions and the grid-like design accentuates the already complex land-ownership pattern in the area. Possibly the most serious drawback of the HAR plan is the accompanying rigidity it imposes on agricultural development and the necessity for adapting all other production factors to the hydraulic design. This has been the recent government approach to irrigation in Tunisia other than the lower Medjerda Valley that we feel has hindered to a great extent the achievement of maximum agricultural productivity.

(2) OMVVM/USAID Plan for Irrigation System Development

(a) Introduction - The approach to irrigated system development presented in this section was specifically designed to take into consideration to the greatest extent possible the special conditions that exist in the Ghardimaou area. An attempt was made to analyze the various agricultural development factors and design a system that conformed to them as much as possible rather than impose what might be a technically feasible scheme developed in isolation and without consideration for the other non-hydraulic factors.

It was felt that presently existing land-ownership patterns, available manpower and materials, simplicity of design, construction and upkeep, past irrigation experience of farmers, and an early return on the investment were some of the important factors that should be reflected in any irrigation proposal. The proposed plan is divided into three distinct phases:

1) Annex A on file in USAID but not forwarded to AID/W.

Phase I: Is directed at the development and utilization of the existing water resources. This consists of approximately 17 previously drilled wells that are capable of producing between 1200 and 1300 liters of water per second. The structures proposed are a main East-West concrete-lined canal connecting the existing wells to appropriate earth lateral canals. The structures will be constructed in such a way that land-levelling and immediate cultivation can systematically follow as construction progresses. This canal system planned for the first 2000 hectares is well adapted for expansion and eventually diverting winter flows from the Soufi, Rarai and Medjerda Rivers for winter irrigation and groundwater replenishment.

Phase II: Consists of connecting a low cost Medjerda River diversion system into the high end of the completed main canal, drilling new wells if determined feasible, constructing additional canals, and determining the best approach to the development of a system of pumping stations and highline earth canals for irrigating the remainder of the irrigable land.

Phase III: Would include the construction of the highline canals designed to collect water from the natural flow of the rivers and carry it in earth canals along the south-west and north sides of the valley at an approximate elevation of 200 to 210 meters.

(b) Detailed Course of Action for Development of Irrigation Infrastructure

Phase I: Construct a 1.5 cubic meter per second main concrete open canal along the west side of the road from Ghardimaou to the northeast for 4.5 km to collect 355 liter-per-second of water from Wells No. 6910, 6100, 6911, 7007, and 6103, and provide capacity for future Medjerda River winter diversions. From this canal near Well 6103 continue the main canal with a nine km. concrete-lined open canal of one cubic meter per second capacity running East between the Rarai and Medjerda Rivers to collect 320 liters per second of water from Wells No. 7008, 6091, 6854, and 6090. From these canals at approximately 300 meters interval, construct concrete turn-outs and earth canals of 100 liters per second capacity running along falling contours transverse to the main canal ending at the rivers. This canal system could serve an area of approximately 2000 ha. of area consisting of about 700 ha. of summer crops, 1000 ha. of winter crops and 300 ha. of fallow land or dry farmed wheat. The capital cost of such a distribution system to carry the water from the pumping plants to the farms would be approximately 385,000 dinars or 193 dinars per ha. The cost of the land-shaping necessary for modern surface irrigation would be about 100 TD/ha. Since the land shaping is a major potential cost and should be determined

as part of the farmers' plan of farm development and cropping, the proposed line of action would be to do a minimum amount of the rough land shaping during construction of the canals to assue the canals are well located and the farmers could begin some irrigation by traditional methods. The additional leveling could best be deferred until land ownership boundaries were finalized and the farmers were contacted concerning their desired farm plans, and modern irrigation demonstrations were implemented. As the government land shaping capacity becomes available, it should be employed where economically desirable on a combination of grant and credit basis. The farmers on the 2000 ha. are likely to require about ten years to fully develop and irrigate all of their lands in a more or less efficient manner. These problems can best be worked out at the local level with the farmers, and the planting of trees or permanent crops should be discouraged until the farm irrigation systems and land shaping are properly established.

Phase II: The second phase of the project is to investigate various means of diverting water from the Medjerda River above Ghardimaou into the main canal of Phase I and to study the practicality and economics of diverting Medjerda River winter flows also to possible highline earth canal running along the south side of the valley between elevation 210 and 200 meters from the canyon upstream of Ghardimaou to the Oued Meliz and possibly beyond the vicinity of Sidi Meskine. At the same time study the desireability of running a highline canal from the Medjerda River around the west end of the valley at about elevation 200 to 210 meters to collect winter flows of the Medjerda, Rarai, Soufi, Hammon, and Enja Rivers and distribute them along the west and north sides of the valley.

Construct local gravity flow distribution systems of earth ditches to utilize the 273 liters per second combined capacity of Wells No. 6777, 7011, 7013, and 7012 to irrigate about 300 hectares at a cost of 45,000 dinars exclusive of pumping plants. At some future date a collector canal from the Medjerda River below Oued Meliz and running east to Sidi Meskine would be studied.

Construct a canal from the main canal near Well 6103 to cross the Rarai River just below the Enja River and continue east along the highest gravity contour to Chemtou. This 13 km canal would be concrete lined with a capacity varying between one and 0.5 cubic meter per second to serve the 1000 ha. between the canal and the Rarai River, including the large orchard on the OTD farm at Chemtou. From this canal water would be diverted at one kilometer intervals into concrete canals of 200 liters per second capacity. From these canals water would be diverted at intervals of 200 to 300 meters into tertiary earth canals extending both ways along the contour. This canal system for 1000 ha. would cost about

460,000 dinars, including 13 kms of new road and exclusive of wells and pumping plants and land shaping.

Before constructing the north Rarai sector of 1000 ha., additional groundwater supply would need development near the main canal, probably along the Rarai River and the Ghardimaou road.

Phase III: The third phase would be construction of highline canals collecting water from the natural flow of the rivers and carrying it in earth canals along the south, west and north sides of the Valley at about elevation 200 to 210 meters. Some sections of the canals, such as east of the Enja River, might be concrete lined and receive a dependable summer water supply by pumping water from the main canals interconnecting the wells in the middle of the valley. The function of these would be to divert the natural winter flows of the rivers when they were not carrying excessive amounts of sediment and augment ground water replenishment by winter irrigation and/or seepage from the unlined canals systems and from infiltration in the available natural stream channels. The feasibility of various parts of the third phase will have to be studied and coordinated with the experience gained in developing agriculture under Phase I and Phase II. Since the cost of summer water under Phase III will be considerably higher than the first phases, its feasibility will likely depend on the availability of suitable soils and the ability to grow and sell high price crops. The feasibility of winter irrigation under Phase III will depend on the economics of providing early fall and late spring irrigation water and on the benefits obtained by some increased groundwater recharge.

Investigation should cover the whole valley west of the Sidi Meskine railroad station. The economics of irrigated agriculture should consider integration of the dry land forage in the mountains surrounding the valley with the irrigated and dry land forage production in the valley.

(3) Marketing

The general marketing situation was discussed in section E. RATIONALE- 12. Marketing. Three alternative solutions are recommended which will need further exploration and analysis. These are:

(a) To improve and expand the COREMAF;

(b) Have OMVVM create and operate a new, open membership service cooperative for the project area;

(c) Establish a new, open membership service cooperative independently managed by professionals hired by the membership.

The marketing and agricultural credit member of the project will want to examine the entire marketing problem within the project area during the first six months before recommending a course of action. He will of course be examining factors that may or may not be under the direct control of the project. For those factors such as prevailing price structure, government controls, agricultural credit policy and national agricultural policy which are outside the scope of this project proposal, recommendations can be made and acted upon independently by the host government possibly with assistance from another source. The important criterion which will decide the range of marketing factors to be examined and addressed by the project is criticalness to successful accomplishment of the project purpose. Those more salient factors presently seen by the design team include marketing information, local transportation, local storage, local food processing, export marketing potential, local marketing requirements and facilities, and trained manpower required by the local marketing system. Upon development of a comprehensive marketing plan, the project will be responsible for mobilizing and coordinating its implementation.

(4) Agricultural Credit

The agricultural credit program of the project will be directed at two objectives. The first will be to analyze and evaluate the overall agricultural credit needs of the project. The team will then relate the credit needs to existing facilities and assist the farmers in developing permanent credit ties with these institutions. The second major objective will be the development and administration of an interim seasonal and medium-term credit and demonstrational grant program to last only for the life of the project.

(a) Supervised Farm Development Credit (Medium Term)

A medium-term loan fund will be established for purchase of farm equipment, land shaping, and irrigation system improvements, etc. These loans will be provided for repayment over periods of five to ten years. This fund is established primarily for those farmers without legal land titles required under BNT regulations for medium-term credit. It is assumed that as the land ownership component of the project progresses and land titles are delivered to the farmer medium term credit requests will be made to the existing institutional credit facilities and not the project fund.

(b) Supervised Farm Production Credit (Seasonal

A special, supervised production credit fund will be established for the public perimeters and operated during the first three years by the Agricultural Division of OMVVM regional office with the participation of the Agricultural Bank (BNT). Agricultural Bank personnel will be asked to work with the Agricultural Division Chief during the first three years after which the Agricultural Bank would assume responsibility with the Agricultural Division pesonnel providing the Bank with necessary technical advice.

(5) Demonstration Farms - Demonstration Grant Funds

Eight farmers for the Ghardimaou project will be selected to cooperate in creating long-term demonstration farms. On such demonstration farms, the Agricultural Activities Division, with assistance from the Engineering Division, would develop a farm plan with the farmer, and grant from the demonstration fund the necessary technical, land development, and production inputs to place up to five hectares of the farm into high production the first year. For additional area and from the second through the fifth year on the first five ha. the farmer will be provided credit along with free technical supervision. After five years the demonstration farmer will operate the farm on his own, except for the normal technical or financial assistance being offered to all farmers of the area through the Agricultural Bank and other credit institutions. The demonstration faxmer will be required to sign a contract to carry out certain precribed practices and to keep simple records of expenses, crop yield and returns with the assistance of the Agricultural Activities Division. He will be guaranteed a minimum income equal to his present income. He will also have to agree to permit visitors to observe his farming and farm records.

(6) Demonstration Fields - Demonstration Grant Funds

Demonstration fields of various kinds and sizes up to two hectares will be prepared, planted and supervised for one season by the demonstration team working with the assistance of the farmer, and using as much of the faxmers own equipment, methods and financing as is consistent with producing good crop yields. In the grant demonstration program, the percentage of the Government contribution to the total cost will be flexible. The grant policy will be formulated in relation to the type of demonstration and the number of farmer requests. The objective will be to keep the demonstration teams and equipment busy as continuously as possible and to implement the demonstrations over widely scattered areas using as wide a variety of soil, topography, crop, field size, and farming equipment conditions as possible. In general,

the priority will be given to those farmers offering to provide the most assistance in doing the demonstration. Initially, the entire cost of the demonstrations may have to be a government grant to the farmer, but as more farmers accept the practices being demonstrated, the percentage of government contribution will diminish.

(7) Livestock Production

A mainstay of any broad agricultural development program is livestock production. The conditions in the project area appear to be ideal for a special effort to develop mixed farming systems where livestock is integrated into crop and forage production. Beyond conducive physical conditions found in the Upper Medjerda Valley there is a series of complementary factors that will make the introduction of livestock beneficial for farmers in the project area. There is already a fairly high concentration of livestock in the area. In many cases it is a matter of improving the quality and quantity of production. The USAID-sponsored Accelerated Livestock Production Project is directed at this objective. Succinctly, that project is attempting to develop adequate forage and feedgrain production to support an accelerated livestock program, increase the number of livestock marketed for slaughter with a reduction in annual fluctuations of production, increase quality and slaughter weight of marketed livestock, and establish a GOT administrative organization for continuing the program. In the context of the Irrigated Agriculture Development project the important fact is that the resources and expertise of the livestock project can be utilized in fostering a mixed farming system. Under irrigation it should be relatively easy to substantially increase forage production since the land will be available for year-round use, yields will be higher, and rotation programs and concern for soil improvement will encourage efficient production.

In drawing up their comprehensive irrigation development plan, the project implementation team will be expected to incorporate the mixed-farming concept. Provisions have been made in the basic project design to include special extension and demonstration activities which are directed at this end. The intent is to create a flexible mixed farming program that permits farmers, depending on a variety of factors, to choose one of several options. Smaller farmers may wish to cultivate forage and feedgrains for sale to livestock owners outside the irrigated perimeter. Farmers with more land may wish to cultivate forage for their own livestock herd. The design team visualized a variety of options that should be made available within the context of the project depending upon what makes the best technological sense and what the farmer wishes to do. There could be a mixture of economic livestock production units utilizing

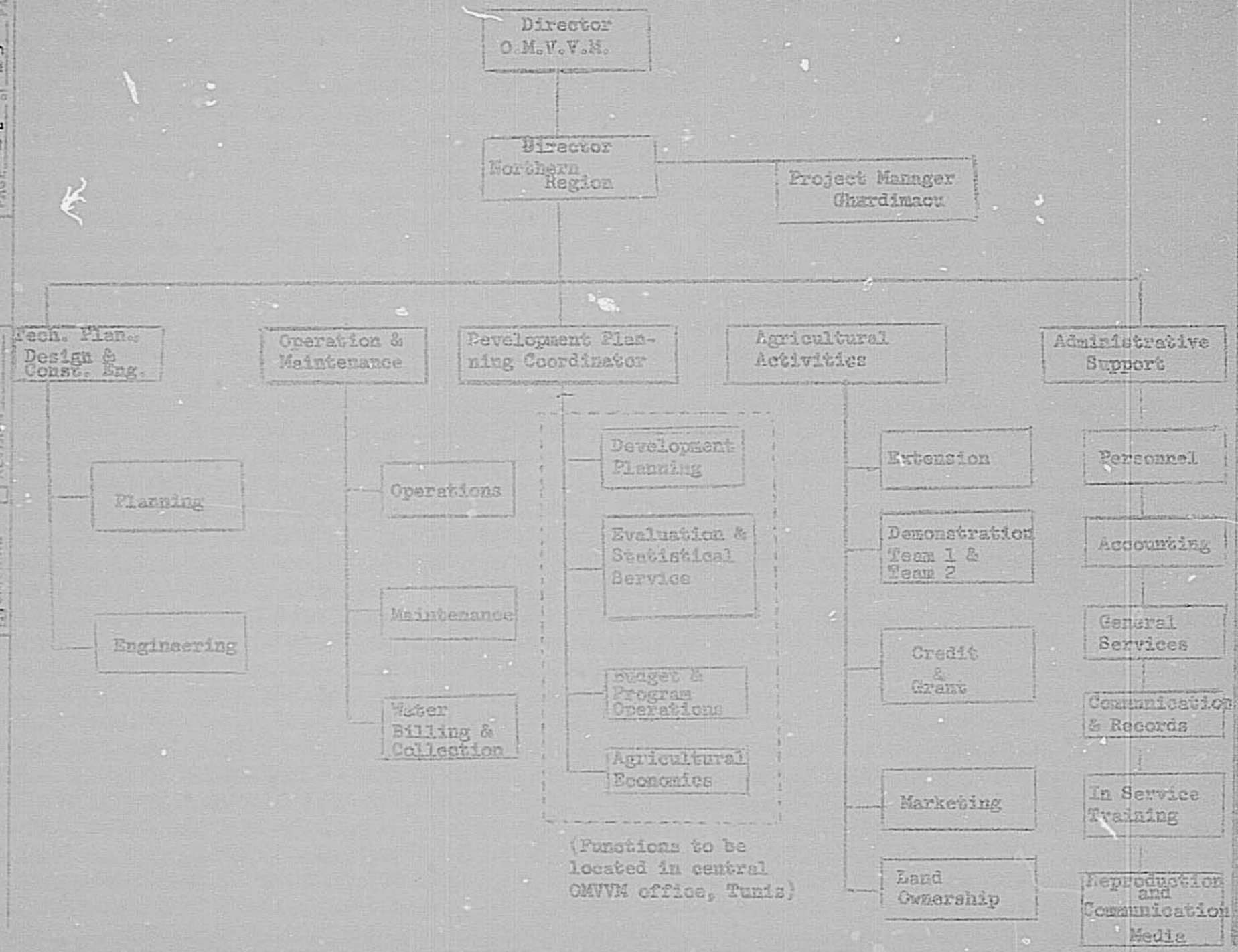
land within and outside the perimeter, or cooperative arrangements do do both. Also, preliminary discussions have taken place concerning the establishment of a government sponsored experimental farm in the area that could pioneer forage and livestock production technology and possibly experiment with an American style feedlot activity. The research program of such an experimental farm could assist in setting technical standards and guidelines in the project area for animal husbandry, feeds and feeding requirements, and rotation plans in addition to housing technical staff that could be utilized for advisory work on this project.

b. OMVVM Regional Office

The OMVVM shall obtain the necessary budget and personnel to establish an organization with the main divisions and branches as shown on the attached organization diagram. During the six-year period of this project the organization shall be staffed with the required number of professional, technical and skilled personnel and in addition shall have sufficient funds to hire such additional lower grade personnel as required for the work undertaken. This organization shall be responsible for the planning, design, operation, and maintenance of all government financed irrigation conduits of less than 500 liters per second within the northern region, consisting originally of the Medjerdah River watersheds above Testour and the watersheds tributary to Nefta Plain and the sea west to the Algerian border. The OMVVM and PPI shall be responsible for providing government extension and developmental services to all private irrigation farmers on government irrigated perimeters within this area. Within this area the German Government is providing financial and technical assistance in the irrigation and agricultural development on the Hergma-Bou Salim and Badrouna Projects which will not be a responsibility of the United States Team.

Under special circumstances, responsibility for construction of canals and appurtenances of over 500 liters per second diverting flows of rivers may be assigned to the OMVVM and PPI to preserve the unity of command on such projects as the Ghardimaou Project.

The United States will provide the services of a team of up to six full-time technical specialists during the six years of the project, plus additional short-term specialists as may be required for special problems. In addition, the United States will provide training in the United States and appropriate third countries for 38 Tunisian specialists for practical observation and/or training for periods of from two months to one year each.



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Initially the U.S. assistance will be directed toward developing the Agriculture and necessary appurtenant facilities on the Ghardimaou perimeter which now has 17 deep wells, some equipped with diesel motors capable of discharging about 1200-1300 liters per second, from which about 40 hectares were irrigated in 1971 by means of temporary portable steel pipe conduits. The groundwater supply of the Ghardimaou Valley is capable of supplying over 16 million cubic meters of groundwater per year, which is sufficient for nearly 2000 ha. of summer irrigation. The Medjerdah River and tributaries can supply sufficient natural winter flow in most years to irrigate over 4000 ha. of winter crops such as wheat, forage, and sugar beets. Exploiting the potential of this project entails sufficient work to keep a staff of six American and 70 Tunisians productively engaged for the six years of this technical assistance project.

As time permits, project activities will expand to other new perimeters as manpower, equipment materials and financing become available. In doing so, priority will generally be given to making productive those areas which will yield the best return of the investments added to those already expended.

(1) Planning

Initially the planning will concentrate on determining what crops are best suited to the areas and what the maximum and minimum limits ownership should be in conformance with the existing laws concerning public irrigation perimeters.

Concurrent with this will be the basic work of determining the location and size of existing landholdings and determining practical ways to working with the farmers to fit their boundaries with the irrigation system and the limitations of ownership size required by the existing laws.

Concurrently the planning branch would also collect the available information concerning the potential for developing additional water supplies and the location and characteristics of government drilled wells within the area, and the manner of best utilizing such wells to obtain maximum agricultural production. Based on such studies, recommendations would be made for constructing additional small irrigation systems or drains.

In conjunction with the Water Resource Department of the Ministry, observations or river flows, flooding, depth to groundwater, and rainfall would be made when and where important for future project planning or operation purposes.

When a need for increased water supplies is ascertained in order to foster local agricultural development, the planning branch will make field inspections and short reconnaissance of the potential for new irrigation projects and will make recommendations to the Minister concerning the need for new studies of major projects by HAR. For small projects involving less than 500 liters per second, the planning branch will prepare feasibility studies with the technical assistance of the Water Resource Department of the Ministry where needed.

(2) Engineering and Technical Design

For the small irrigation projects within the north region, the Engineering Branch shall make the designs, contract specifications, and control the construction of the water supply and drainage systems, and shall work with the planning and agricultural activities branches in determining the location of small ditches and land shaping activities. Irrigation system construction and land shaping will be done by private contractors working under the engineering supervision of the Northern Office of OMVVM.

(3) Operation and Maintenance

The Operation and Maintenance Branch shall operate and maintain all of the physical works of the public irrigation systems within the region and will also maintain the buildings, vehicles, and machinery used by the other divisions of the office.

c. Mechanism for Project Replication: Replication of the development model devised for this activity has been discussed as a crucial outcome or payoff of the project. The mechanisms for accomplishing this are essential to: (1) the funneling of trained personnel through the pilot production area to new irrigation perimeters within the northern region, and (2) the developing, testing, and packaging of an integrated plan for improving production that can be utilized in other areas.

It has been estimated that in order to meet its eventual responsibility in the northern region, OMVVM will need an office in the area staffed with approximately 130 employees. The Ghardimaou pilot perimeter itself will, during the life of the project, require approximately seven engineers and 25 "adjoint techniques." But, in addition to designing the organization, it is planned to hire and train the entire 130 man office contingent ultimately required by OMVVM to carry out its work in the northern region. Thus, the majority of the personnel who will replicate the project model elsewhere will be funneled through the Ghardimaou pilot program for training and experience. Since each employee initially will be hired by the regional office and assigned to work on the pilot perimeter, it will be a simple administrative procedure to reassign him to work elsewhere in the northern region when he has the requisite experience.

The comprehensive development model being designed and tested in this project is expected to set the pattern for improved irrigated agriculture in the region and, possibly, the entire country. It is a spearhead effort to create an integrated approach to improved agricultural production that is being recommended also by the IBRD and other donors. An important premise of the integrated approach relates to the improbability of achieving maximum agricultural production when addressing the various production factors such as credit marketing and land tenure in a piecemeal, sequential fashion. It is recognized now that the process is extremely complex and intertwined and does not easily lend itself to dissection and functional remedy. It is obvious that the approach must be integrated; i.e., the problems of irrigated agricultural production must be resolved simultaneously in that total production will always be a function of the worst bottleneck and cannot approach the optimum level until all the bottlenecks have been systematically and concurrently eliminated. Thus, it is this comprehensive model that will be tried and tested on the Ghardimaou pilot perimeter and modified until it is in a form that is adaptable to other irrigation perimeters.

It should be noted that replication will be facilitated also in many instances by the creation of facilities on the Ghardimaou perimeter having a capacity to service farmers in other areas of the northern region. For example, if the marketing cooperative, COREMAF, is expanded and improved during the life of the project, it will certainly have the capacity to supply services, as it does now to a certain extent, throughout the region. Agricultural credit is another case in point. A branch office of the Banque Nationale de Tunisia (BNT) once established will have the institutional capacity to service other customers outside the perimeter.