PD-AAR-961
ISN 41727

DRYLAND FARMING SYSTEMS RESEARCH -

SMALL HOLDERS SUB-PROJECT PAPER

000212

Conformed to NEAC of Dec. 14, 1978
and Subsequent USAID/Tunis Inputs:
March 2, 1979

14.

PD-AAR-961

PN. 41727

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

SUB-PROJECT 2

1. TRANSACTION CODE: A (A = ADD, C = CHANGE, D = DELETE)

PP

2. DOCUMENT CODE: 3

3. COUNTRY/ENTITY: TUNISIA/ USAID

4. DOCUMENT REVISION NUMBER:

5. PROJECT NUMBER (7 digits): 664-0312.2

6. BUREAU/OFFICE: A. SYMBOL: NE; B. CODE: 03

7. PROJECT TITLE (Maximum 40 characters): Dryland Farming Systems Research - Small Holders

8. ESTIMATED FY OF PROJECT COMPLETION: FY 84

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 79; B. QUARTER 2 (Enter 1, 2, 3 or 4); C. FINAL FY 81

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 -)

A. FUNDING SOURCE	FIRST FY B. FX	C. L/C	D. TOTAL	LIFE OF PROJECT E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL	900	100	1000	1820	980	2800
(GRANT)	(900)	(100)	(1000)	(1820)	(980)	(2800)
(LOAN)	( )	( )	( )	( )	( )	( )
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST COUNTRY		1540	1540		2640	2640
OTHER DONOR(S)						
TOTALS	900	1640	2540	1820	3620	5440

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	D. LOAN	E. 1ST FY 79 F. GRANT	G. LOAN	H. 2ND FY 80 I. GRANT	J. LOAN	K. 3RD FY 81 L. GRANT	M. LOAN
(1) FN	250	230		1000		780		1020	
(2)									
(3)									
(4)									
TOTALS				1000		780		1020	

A. APPROPRIATION	N. 4TH FY - O. GRANT	P. LOAN	Q. 5TH FY - R. GRANT	S. LOAN	LIFE OF PROJECT T. GRANT	U. LOAN
(1) FN					2800	
(2)						
(3)						
(4)						
TOTALS	-	-	-	-	2800	

12. IN-DEPTH EVALUATION SCHEDULED: MM 10 YY 81

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

1 (1 = NO, 2 = YES)

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE

TITLE: Herman D. Marshall, Director, USAID/Tunis (Acting)

DATE SIGNED: MM 11 DD 17 YY 78

15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM DD YY

AID 1330-4 (3-76)

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II. SUB-PROJECT DESCRIPTION

A. General

The purpose of this sub-project is to develop extendable packages of dryland farming technology through adaptive research and field trials designed to tailor known semi-arid agriculture technology to the small farmer environment of Central Tunisia.

The rationale for area selection is presented in the Project Paper. In this area, the vast majority (at least 30,000 of a total of 40,000 households) of farm families are dependent upon a mixed system of dryland farming which yield a bare subsistence output and annual per capita incomes in the $40 to $100 range. Constraints on the resource endowments of these farms (water and soil) are factors in limiting the potential output of the farms, but an important additional factor is the absence of an adapted and proven semi-arid agricultural technology to extend to the farmers of the region. This sub-project is a first step in responding to this problem. It proposes to support adaptive field testing of existing semi-arid technology (varieties and procedures already proven internationally) under small farmer conditions. The program of adaptive research will be specifically designed to address the production environment of the Central Tunisia small farmer (including little cash to invest in ancillary inputs, limited choice among tillage options, etc.).* The sub-project is designed to lead to an extendable range of semi-arid technologies and an understanding of the range of potential farm systems available to the dryland farmer of Central Tunisia. It does not directly address the diffusion of this technology. This will be addressed in later CTRD programming when we are confident that there is (or is about to be) an extendable package, and when the reconfiguration of extension resources under the Central Tunisia Development Authority is completed. The essential end-of-project status, therefore, is the existence of a range of field-proven varieties and practices suitable for extension to the small farmers of the region.

Recognizing that any type of research program is long-term, it has been concluded that the situation is favorable for putting in place a functioning and productive research capability to deal with major crop production problems. Applied and adaptive research techniques will be employed. Although funding will be scheduled over a three-year period, U.S. technical assistance will be spread over five years. At that time, the program should have adequate momentum for continuity and permanency.

* The instrument chosen to implement this process of adaptive field testing is the Cereals Research and Training Institute at Le Kef. The role of the Institute is discussed on p. 13.

B. Technical Interventions

Increasing dryland forage and cereal production in the sub-project area will be approached by developing complete packages of practices adapted to the climatic and soil zones of the region and to the opportunities and attitudes of its small farmers, with attention to risk-taking behavior. This will involve a continuing field research program in the area on the following items:

1. Cereal breeding (barley and wheat) and later legumes and forage directed toward adapted varieties for dryland conditions;

2. Continued variety testing of current materials throughout the region;

3. Soil fertility and fertilizer trials;

4. Agronomic trials (date and rate of seeding, seeding methods, weed control, crop rotation, etc.);

5. Soil management and moisture conservation trials (tillage techniques, fallow-crop rotations, seedbed preparation, erosion control).

In all cases, the adaptive research/field trials will be specifically designed around the real operating situation of the Central Tunisia small farmer. The trials will not be designed to establish "experiment station maxima" which can never even be approached by the small farmer because he could never make the capital and technical inputs of the experiment station. Rather, the experiments will be designed to establish optimum practices at varying constraint levels. For example, control over seeding depth is a variable which is costly to manipulate towards uniformity. The adaptive research will be oriented to identifying varieties which produce good yield under conditions of substantial variation of seeding depth. Another example, many farmers in the region simply do not own lightly sloping fields with deep well drained soils. They have to cultivate on relatively steeper slopes and in secondary soils. Again, these conditions will be incorporated into the adaptive research and field testing.

None of the trials will be done at an experiment station. All of them will be done in farmer's fields. The research elements will be done under highly controlled conditions on farmer's fields and the second level of field trials will be done under actual small farmer conditions in their own fields. Sites will be chosen to handle the range of variability in soils, rainfall, altitude, etc., necessary to encompass the variation within the region. Sites will

not be selected on a "progressive farmer" or other upwardly biased basis. Funds set aside in the project for full reimbursement of input costs for farmers cooperating in the experiments will not only make the inclusion of small, poorer farmers feasible, it may actually increase their interest in being full participants in the research as a way of hedging investment costs.

The trials will help to determine the actual yield potential of the dryland cereal zones. Additional work will be required to adapt these practices to the individual small farmer of the region. Many other constraints may affect the farmers' decisions to adopt new technology, especially the very small farmers. The availability of credit, improved seeds, fertilizers, herbicides, machinery, prices and marketing opportunities will all have an effect on the farmers' decisions to adopt new technology. The key is to make the technology available with suitable alternatives so he can make a rational decision. The new technology must have been demonstrated to him in his region before a decision to adopt the new practices will be made.

C. Farming Systems: Planning and Development

(Pilot study and demonstration area)

Only when new technologies and interventions are combined and coordinated into a complete system of farming, which suits the resources and needs of the farmer and his family, can the full potential of the new improvements be realized.

The purpose of each pilot study/demonstration area will be to assist farm families in a selected location in planning new systems of farming best suited to their own resources and needs. Since each farm and family unit is unique in some way, the system of farming will be planned and developed individually with each farmer in the study area. Most of the individual technologies or "packages" of them essential for a particular intervention, such as barley or wheat production and the procedure for farm planning, will be completely new to the farmers involved. Therefore, well-trained extension workers will need to be available to work closely with the individual farmers in planning and selecting most suitable farm plans and in developing them, step-by-step, over a period of years.

Actual selection of sites for an initial study (of a total of 8) area will be made by the research staff at Le Kef and the Central Tunisia Development Authority (CTDA) in cooperation with local authorities, the farm families involved, and local leaders. Dryland areas in either Djilma or Jedliane seem to merit first consideration, using criteria like the following:

1. Select an area large enough for 15 to 20 complete farm family units, each consisting of 30 or more hectares of land suitable for crop production and improved pasture;

2. To the extent possible, choose land with long, regular slopes, 2 percent to 6 percent grade, to allow for construction and farm units somewhat as illustrated in the Missouri feasibility study.

3. Try to locate an area typical of large areas of dryland in the different delegations to provide applicable patterns for future expansion.

One site will be selected in each of the eight delegations over the life of the sub-project.

Details of organizing the work and development of the pilot study/demonstration area (subsequently referred to as the sub-project area or the area) selected will vary somewhat with the location and the nature of the resources and families involved. Two factors will be given uppermost consideration -- the necessity for an interdisciplinary approach and for involvement of the local people from the beginning.

The implementing interdisciplinary group will include members of the extension and other technical services of the CTDA, the applied research staff (Le Kef Institute), and expertise available from other related institutes and agencies. One CTDA extension specialist, with farm management training and experience, will be assigned to work full-time with the Le Kef Institute in the area for work later described. A short-term consultant, with experience in farm planning and management work, will be provided to work with the group during the initial planning work and later as the program is implemented.

D. U.S. Inputs -- (See Annex B, Draft RFP)

The U.S. inputs into the sub-project will center on contract services procured from a U.S. land grant institution. These services will include a resident advisor to the Le Kef Institute for the duration of the research sub-project, short-term technical services (detailed below) and short-term training with emphasis on training at the International Agricultural Centers working on semi-arid applied agricultural research (ICARDA, ICRISAT, CIMMYT, etc.), but also including short-term applied training in the U.S. with appropriate agricultural agencies. The sub-project will not provide for any academic training or other long-term training.

The objective of the sub-project is to rapidly develop a Central Tunisia adapted set of dryland farming technologies drawing upon existing proven varieties and technology. This end does not warrant

long-term investment in overall staff development at Le Kef. The existing Agricultural Technology Transfer Project (No. 0304) does address the long-term Le Kef staff needs in the context of strengthening overall national research capacity in Tunisia. Key U.S. inputs are summarized below:

U.S. INPUTS ($000)*	FY 79	FY 80	FY 81	TOTAL
Commodities (equipment for adaptive field testing/mobile lab equipment & 2 US made diesel VW sedans)	570	200		770
Contract Services	330	400	320	1,050
Resident Advisor - 36 PM	150	150		300
Short-term consultants - 54 PM	130	200	270	600
Short-term U.S./Third Country Training	50	50		100
Grants to cover costs of adaptive testing in the farmers' fields of both varieties and total dryland systems	100	180	700	980

The long-term resident research advisor would be an experienced dryland agricultural researcher with proven experience in applied adaptive research and a capacity to manage the overall activity in light of the goal of producing technology adapted to and usable by the Central Tunisia small farmer. He should be at the Associate Professor level at the contracting university and required to speak French at the 3-level and read at the 4-level. A probable mix of short-term consultants is suggested below on the basis of advice received from an experienced international barley breeder consultant to the USAID. It is assumed that the contractor will have discretion in redefining the mix on the basis of on-the-ground experience. The extension training specialist suggested is foreseen not to actually carry out the diffusion process, but to work with extension officials and the Le Kef researchers on "packaging" the technologies which the adaptive research sub-project develops so that a follow-on extension effort can pick up this material in an extendable form.

* Note that funding is tranched over three years in line with present country funding guidance. Mission believes that life-of-project funding is preferable to the extent possible. 100% funding in the first year would not only be managerially feasible, it would be operationally preferable.

Discipline	Man Months
Crop Production (Agronomist - Dryland)	10
Soil Fertility (Laboratory Specialist)	10
Farm Machinery/Experiment Station Management	10
Farm Management Economist	6
Weed Control Specialist	4
Erosion Control and Conservation Specialist	4
Extension Training Specialist	6
Agr. Economist - Risk Analyst	2
Rural Sociologist (Near East Agr. experience)	2

The Agr. Risk Analyst and Rural Sociologist will carry out an initial assessment mission in conjunction with the resident advisor and such agricultural production staff as appropriate to develop the details of the actual small farmer constraints around which the research/field testing will be designed.

E. Expected Outputs (See Logical Framework - Annex A)

The first year of the approved program will be needed for acquiring the necessary equipment, supplies, and initial personnel training. At the end of the second year, initial data from carefully located field trials should become available to serve as a guide for the next year's testing of more complete production systems. By the end of the third year, information, trained personnel, improved seeds and other supplies, and financing should be available for launching a widespread demonstration program in most of the sectors of the 8 delegations.

In summary, the purpose of the first three-year intervention is to build a sound foundation for a permanent improvement program.

As indicated above, most of this three-year intervention will be a series of essential steps to develop a program to provide appropriate technology for this particular region. Increases in physical output -- in terms of quintals of wheat and barley for individual farmers and for the project area -- are expected to be insignificant in this early phase.

However, the benefits from this work, if well done, should really unfold and could be significant to the project area economy during a second five-year period (See Economic Feasibility).

F. Issues

1. Although the PID highlighted barley research activities and the examples of potential benefits use barley as an illustration, the sub-project research will include wheat varieties as well as legumes and forage. Initial concentration on barley research reflects varietal availability, i.e., several varieties exist and are ready for field testing; agro-climatic conditions which favor barley production; the extensive area in the region (relative to areas outside of the Central Tunisia region) presently sown to barley; and the fact that research on alternative wheat varieties has not been conducted in the area.

It is expected that over the life of the sub-project several packages of cropping systems will be tested, including cropping rotations with alternative varieties of wheat, barley, legumes, and forages.

III. SUB-PROJECT SPECIFIC ANALYSIS

A. Economic Feasibility

The economic feasibility of this sub-project will depend on:

1. Success in developing new technology packages which are adaptive to the needs and capability of small farmers in Central Tunisia, and

2. The effectiveness of the CTDA extension staff in diffusing the results of the applied research to small farmers. While CTDA extension agents will receive training at the Le Kef Institute and participate in adaptive research trials and in the pilot demonstrations, the actual extension of the results to a large number of farmers in the CTRD project area will take place after the successful completion of the applied research funded under this sub-project. However, the benefits which are forecast from adoption of improved practices by individual small farmers can be roughly estimated, as shown below:

-- Increase in Barley Yields and Production. Dryland barley yields on individual farms may be expected to increase as much as 400 percent -- from 2 QX/.ha. to 8 QX./ha. (on well-managed farms, the increase might be even more spectacular). For the area as a whole, however, an average increase of 100 percent (from 2-4 QX./ha.) may be a more reasonable estimate since only 15-25 percent of the farmers might adopt the new production system within this time frame.

Total barley production -- with the 2 QX/ha. increases in yield and 55,000 ha. planted as estimated for the area in 1977 -- would double, an increase from 110,000 QX to 220,000 QX. The value of the added production of TD 4,000 QX would amount to an additional TD 440,000 income for the project area. From a national view point, this added production -- which could expand over time in both hectarage planted and yields -- would provide an in-country source of high-energy concentrate feed to support the expanding livestock industry, and thereby reduce the dependence upon imported grain feeds. This contribution might be doubled if one-half of the 1977 wheat hectarage (amounting to 57,000 ha.) were shifted to barley production. This kind of shift is often recommended since the dryland conditions seem better suited for barley production.

-- Increases in Wheat Yields and Production. Application of the proposed intervention is expected to increase wheat yields about the same as those for barley, percentage-wise. The increase in total production per hectare also would be similar since the starting yields are about the same. The change in total production for the area would depend upon shifts in planted hectarage between barley and wheat, as earlier illustrated.

-- Effect on Individual Farm Units. Increases in production of wheat and/or barley resulting from adopting improved production systems on individual farms would be more impressive on a relative basis.

Using barley as an example and assuming a dryland farming system with 10 ha. of barley per year, the average increase of 2 QX/ha. in yield would provide an additional 20 QX of barley produced. At TD 4,000 per QX, this would add TD 80,000 to the family gross income. The good manager who achieves a five-fold increase in yield (from 2-10 QX per ha.) would produce an additional 80 QX, with an added gross income of TD 320.

B. Social Soundness Analysis

(See relevant Section in Project Paper)

C. Technical Feasibility

The following technical analysis is based primarily upon studies and assessments of a University of Missouri-Columbia team in reports of April 1978 and July 1978, other relevant CTRD documents on file in USAID/Tunis and AID/W, and the Dryland Farming Systems PID.

1. Potential for Increase in Cereal Production

About 130,000 ha. of cereals are grown in the 8 delegations of the project area. This includes about 80,000 ha. of durum wheat, 10,000 of bread wheat and 40,000 ha. of barley. The area seeded to cereals varies greatly from season to season depending upon the rainfall conditions. Yield levels in all three types of cereals are very low, ranging from 50-150 kg/ha. in Thala, Jedliane, Rohia, Maktar and Djilma delegations. Even though rainfall amounts are relatively low and highly variable from season to season, these yield levels are extremely low in relation to the potential yield possible under these conditions. Under comparable climatic conditions in Turkey, for example, the average yield of barley ranges from 1,200-2,000 kg/ha.

The critical constraints to a marked improvement in cereal production in this region comprise a mix of technical, management, and risk-taking issues which do not lend themselves to easy and quick solutions. The situation underlines the need for developing an adapted and proven semi-arid agricultural technology concerning cereals, among other elements, for central Tunisia. This sub-project assumes that there is a potential for improved cereal grain production in the region once these various issues are satisfactorily met.

The present cultural methods of producing cereals in the project area can best be described as "opportunity" cropping. The farmers of the region apparently decide to plant or not to plant depending upon the rainfall situation during October to December each year.

If the rains come early and in sufficient amounts, they will seed their cereal crops. As the season progresses toward December without adequate rains, more and more farmers decide not to plant. The land is then used for year-round grazing for animals. This "method" of cropping accounts for the wide fluctuations in the area planted to cereals from one year to the next. This system also allows heavy weed growth to occur which extracts most of the moisture out of the soil profile, leaving the crop entirely dependent on timely rains during the crop growth period. The most common method of tillage and seeding is to ground-broadcast seeds over the soil surface and then plow or disk to cover the seeds with a layer of soil. This leaves a very rough, cloddy seedbed with seeds buried to several depths and a considerable amount left exposed on the soil surface. The result is a thin, poor stand of seedlings which is not capable to competing with weeds for the meager moisture and soil nutrients that are available.

Even though the rainfall is relatively low and erratic in this region and the soils shallow in parts of the area, it appears that the potential yield on the average is at least 4-5 times greater than is presently being achieved. The seasonal fluctuations in yield are generally large even under good management, but the actual yield levels are considerably greater than presently achieved in the sub-project area. The potential yield of cereals in a given area is dependent on the amount and distribution of rainfall, temperature, and soil resources (depth, type, fertility). The actual yield achieved in a given area is determined by how well one manages the crop in relation to the climatic and soil conditions, the more critical good management techniques become.

Essentially, no cereal production field research is available in the sub-project area. Most field trials conducted by the Office of Cereals and other research groups are in the higher rainfall zones of the north. Little or no effort has been exerted to date to develop cereal varieties (barley or wheat) for the drier zones of Tunisia. As far as is known, there are no field trial results in the sub-project zone on varieties, fertilizers, planting dates and rates or soil management techniques. Without these kinds of data, it is almost impossible to mount an effective extension effort to increase the yield level of cereals. This information must be developed in the sub-project area and then production systems and extension activities can be devised that are feasible and acceptable to the farmers in the region.

The first five years of the proposed intervention is mostly preparatory in nature. However, the benefits from this preparatory work, if well done, should really unfold during a second five-year period after completion of life of the sub-project. Increases in physical output -- in terms of quintals of wheat and barley, for individual farmers and for the sub-project area -- are expected to be significant.

2. New Technologies to be Introduced

To improve the production of cereals (barley and wheat), the following practices must be developed and introduced in the sub-project area:

a. Cereal variety testing and breeding;
b. Improved cultural practices;
c. Improved fertilizer use;
d. Improved weed control (during both crop and non-crop period); and
e. Improved soil management and moisture conservation practices.

-- Cereal Variety Testing and Breeding. The testing, selection, increase, and distribution of better adapted barley and durum wheat varieties suitable for the dryland areas is perhaps the most immediate way to have an impact on production in the sub-project area. It should be emphasized that introduction of new varieties alone will not solve the problem of low productivity under dryland conditions. It does, however, offer an avenue to introduce new technology. Introduction of a well-adapted variety should give at least a slight increase in yields but perhaps not as great as expected. One should be careful about "overselling" the importance of a new variety so as to avoid disappointment if substantial increases are not achieved. In a good dryland production system, a well-adapted, productive variety is an essential ingredient, but must be combined with other elements of the package to give the desired increase. Perhaps the current varieties and lines do not include any types that are adapted for dryland conditions. In this case, immediate steps will be taken to obtain types from outside sources for testing in the sub-project area. Cereal variety trials will be conducted in every delegation where climatic and soil conditions are different. A strong barley and wheat breeding program will be encouraged and should be well-supported in order to supply to the farmers the best possible variety for their conditions.

-- Improved Cultural Practices. Thin, weak stands appear to be one of the main factors responsible for the low yields in the area. This can be overcome by better seeding methods, e.g., drill seeding instead of broadcast seeding. Other cultural practices that need attention are:

- rate of seeding (drill seeding should require less seeds/ha.,) and

- date of seeding (better seedbed preparation may allow earlier seeding).

Variety tests also must be conducted under "poor management" conditions.

-- Improved Fertilizer Use. Little or no fertilizer appears to be used in the sub-project area on cereals. The nature of the climate and soils suggests nutrient deficiencies in the cereal crop, especially for phosphates. A series of simple phosphate and nitrogen treatments will be established to determine the response to fertilizer application. The phosphate fertilizers can be drilled with the seed at planting, but nitrogen should be applied separately to avoid damage to emerging seedlings. If there are indeed nutrient deficiencies in the cereal crops of a serious nature, the introduction of other practices such as new varieties, better seedbed preparation, and better seeding methods may have little effect. The identification of the major limiting factors on yield is the key to developing a productive cropping system.

-- Improved Weed Control. Under dryland conditions, it is generally assumed that any moisture or nutrients used by weeds reduces the yield of the crop by a proportionate amount. Whatever is removed by weeds must be replaced in order to be available to the crop. It is particularly critical that weeds be eliminated in the early stages of crop growth.

The first priority in weed control research is to identify the magnitude of the weed problem, the species present, and the probable losses due to weeds. Each researcher working on the dryland cereal production system will be aware of the potential weed problem and report to the person responsible for carrying out weed control measures. Weeds are important in both the crop and the non-crop (fallow) periods. The present use of area cereal lands for heavy livestock grazing on the aftermath and weed growth during the non-crop (fallow) period is undoubtedly having an effect on the possible moisture storage in the soil profile which could be used later on by the cereal crop during the cropping period. Control of weeds in the fallow period is discussed in the following section.

-- Improved Soil Management and Moisture Conservation. In many areas of the world where cereals are produced under dryland conditions such as in Central Tunisia, a two-year fallow-crop rotation is used. This system involves storing moisture in the soil profile during the first year after harvest which is then used by the crop during the second year along with the rainfall received during the cropping period. The conditions in Central Tunisia appear conducive to the fallow-crop system and should be investigated as a possible cropping system.

In a fallow-crop system, the cereal lands can be used for grazing for a portion of the fallow period, but should be kept weed-free during the late spring, summer and early fall prior to planting. A series of preliminary trials will be conducted comparing the annual and fallow-crop rotation (biennial) system to determine the system best suited for the area.

Soil management research also will be conducted on time of tillage, tillage implements, soul moisture storage, and weed control. Research and training in dryland agronomy is limited to only a few areas of the world. Most of the basic studies in this area have been developed at a few universities in the western United States and in several universities in Australia.

Summary: Not all or even a small portion of some of the foregoing technologies can be satisfactorily tested during the first five years of the proposed sub-project. But starts can be made in a number of instances and sufficient evidence assembled to justify extension of some technologies on an expanded scale during the second five years of activity.

D. Administrative Feasibility

1. Role of the Le Kef Institute

Since 1975 the GOT has established several new research-cum training Institutes. The Cereals Research and Training institute at Le Kef has been identified as the institution most likely to serve the sub-project area with a sound applied field research program when adequately equipped and staffed (See pp. 65-67 of University of Missouri Report entitled "Agricultural Development in Central Tunisia"). The present Director of the Institute is confident that the opportunity to carry out field research with adequate equipment will attract professionally competent and dedicated Tunisian personnel. Their skills will be sharpened through short-term participant training in the U.S. or third countries, and on-the-job training to be provided through a contract with a U.S. university experienced in dryland farming research. A long-term resident advisor at Le Kef will be responsible for planning the training program, for coordinating the visits of short-term consultants (e.g., to train Institute personnel in operating the research equipment) and for insuring that the research program remains on track and that adequate coordination is maintained between the Institute and the CTDA.

While the Institute will carry out the applied research program for Central Tunisia under a contractual arrangement with the CTDA, it will continue to maintain research links with the National Agricultural Research Institute (INRAT) and other institutions operating under the supervision of the Ministry of Agriculture's Research, Training and Extension Bureau (DERV).

2. Role of the CTDA

As the agency responsible for the overall development of the CTRD project area, the CTDA will monitor the applied research conducted by the Le Kef Institute and insure that it is relevant to the needs of small farmers in Central Tunisia. (See evaluation section of Project Paper). Furthermore, the agricultural extension staff

of CTDA will be responsible for disseminating among the small farmers of the sub-project area the "technology packages developed by the Le Kef Institute for Central Tunisia. Thus, the "pay-off" of the applied research will depend to a large extent on the effectiveness of the CTDA extension staff. However, while the extension capability of the CTDA is a matter of concern to the CTRD project (see Project Paper), it is not addressed by this sub-project.

Nevertheless, the sub-project does provide for on-the-job technical training of CTDA extension staff as a by-product of the applied research process. Thus, the CTDA will be requested to assign agricultural extension staff personnel to work side-by-side with personnel of the Institute engaged in conducting field trials in the sub-project area. CTDA extension agents stationed in the vicinity of these trials will assist the research specialists in conducting field research so that they may become more proficient and confident in their efforts to extend the results to farmers. When appropriate, the CTDA extension agents will be expected to introduce to small farmers of the area individual practices identified during field trials as conducive to substantial yield increases. CTDA extension specialists with farm management training and experience also will be assigned to work full-time with the research specialist in the study/demonstration areas established in each delegation of the sub-project area.

The CTDA staff will be responsible for maintaing close working relationships with each delegation's officials and with the secteur and farm leadership within the area and for keeping farmers in the sub-project area fully informed about all the stages of development of the applied research program. The CTDA will also make necessary arrangement with the applied research and technical staff at Le Kef for essential technical training and of specialists and their assistants assigned to the area.

3. Role of the Peace Corps

U.S. Peace Corps officials in Tunisia are particularly interested in supporting the sub-project. The development of study demonstration farm units within the pilot study area will require on-going supervision and assistance of a specific and detailed nature. USAID and the Central Tunisia Development Authority will explore with the Peace Corps and CARE-Medico officials the possibility of assigning one or two Volunteers to work with the CTDA extension specialist in each pilot study area.

E. Environmental Analysis

(See Environmental Analysis in Project Paper.)

IV. FINANCIAL ANALYSIS AND PLAN

The following table summarizes USAID and GOT financed inputs to this sub-project. While funding is phased over these years, contract services will extend over the five year life of the project.*

The commodities shown as funded in FY 1979 and FY 1980 constitute the bulk of the research equipment required for the implementation of the sub-project (as detailed in Appendix Tables C-2, C-3 and C-4 of the University of Missouri Report on Agricultural Development in Central Tunisia). If additional funding (over and above the FY 1979 OYB) becomes available, USAID would prefer to fund all that equipment in FY 1979 so that it can be ordered as soon as possible following project approval and delivered before the beginning of the agricultural season in the Fall of 1980. Specifications for follow-on equipment, as required will be prepared by the technical assistance contractor and $50,00 has been included in the contract for that purpose.

An amount of $980,000 has been budgeted to reimburse cooperating farmers for on-farm experimental costs incurred in the course of field trials and pilot demonstrations. It is expected that reimbursement will be made by the CTDA directly to suppliers of farm production inputs upon certification by the Le Kef Institute and the resident contract advisor that these inputs were used for the applied research program.

Funds for that purpose would be advanced by A.I.D. to the CTDA on the basis of an estimate of needs for a six-month period. No less than every six months, the CTDA would provide USAID/Tunis a report of expenditures with a statement signed by the CTDA director certifying that funds were expanded for the purposes outlined in the project agreement. Although A.I.D. will reserve audit rights in the Project Agreement relating to the reimbursement of on-farm experimental costs, USAID/Tunis will undertake no independent verification of the accuracy of the original document substantiating these expenditures before reimbursing CTDA. USAID/Tunis has followed these procedures in the case of the Siliana Rural Development project and is satisfied with the fiscal procedures followed by the GOT.

*Phased Funding reflects current guidance on country funding levels. Mission would prefer life-of-project funding.

DRYLAND FARMING

Proposed Financial Plan ($000)

I. Obligations (FY 79)

Local Currency Financing	980
Commodities	770
Contract Services	1,050
Resident Agronomist - 36PM	300
St Consultants - 54 PM	600
St Consultants - 43 PM	100
Contractor Commodities	50
Total	2,800

II. Disbursements - Estimate

	FY 79	CY 80	CY 81	CY 82	CY 83	Total
L.C. Financing	80	200	200	250	250	980
Commodities	-	770	-	-	-	770
Resident Agronomist	-	90	90	90	30	300
St Consultants	50	150	150	150	100	600
St Participants	-	50	50	-	-	100
Commodities	-	-	30	20	-	50
Total	130	1260	520	510	380	2800

III. GOT Component

Land and Buildings	1000	-	-	-	-	1000
Equipment & Furnishings	100	-	-	-	-	100
Personnel & Operations	440	500	600	660	700	2900
Total	1540	500	600	660	700	4000

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V. IMPLEMENTATION PLAN

A. U.S. Monitoring Responsibility

(See Implementation Plan in Project Paper.)

B. GOT Monitoring Responsibility

(See Implementation Plan in Project Paper.)

C. Implementation Responsibility

Under the direction of the CTDA the Le Kef Institute will implement the applied research program to be funded under this sub-project. The GOT will negotiate a (host country) contract with a U.S. university experienced in semi-arid dryland agriculture (and, particularly in barley research) which will be responsible for advisory services and participant training. This contractor will also provide the technical assistance services in Small Farmer Irrigation. The selection of the contractor and the negotiation of the contract will, to the greatest practicable extent, follow normal GOT contracting procedures.

The Institute will be responsible for all operating costs of the research program, including salaries of Tunisian research staff and maintenance of the research staff and maintenance of the research facilities and equipment. These operating and maintenance expenses will be financed from the Institute's annual budget which will be increased to accommodate the new research function of the Institute.

AID/W will be responsible for procurement of the research equipment described in Annex A, Tables C-2, C-3, and C-4 of the University of Missouri Report, on the basis of a PIO/C prepared by USAID/Tunisia.

In Paragraph 5.D of STATE 246507, AID/W has raised the possibility of funding short-term participant training and equipment inputs under another project, the Agricultural Technology Transfer (ATT) Project. This option has been rejected by the Mission for the following reasons:

1. While it includes limited procurement of soil-testing equipment to support nation-wide thesis research needs, ATT is basically an academic participant training project and, therefore, is not a suitable vehicle for procurement of specialized applied research equipment;

2. It is essential that short-term training be closely integrated with on-the-job training which will be the responsibility

of the institution providing advisory services;

3. It is anticipated that all, or most of, the short-term participant training will be carried out at applied agricultural research stations, in many instances outside the U.S. It cannot be argued, therefore, that short-term training should be linked to long-term academic training which will be conducted at U.S. universities.

D. Logistical Support

(See Implementation Plan in Project Paper).

E. Implementation Schedule

(See Project Paper).

VI. EVALUATION PLAN

(See Project Paper).

VII. CONDITIONS, COVENANTS, AND NEGOTIATING STATUS

(See also the Conditions and Covenants Section of the Project Paper).

Conditions Precedent

A. General

Before the initial disbursement can be made under this sub-project, an agreement must be signed between the CTDA and the Le Kef Institute setting forth the responsibilities of each party with regard to the implementation of this sub-project. The agreement will clearly delineate the Institute's responsibility to carry out the adaptive research program in the project area and provide technical training for CTDA extension personnel and the CTDA's responsibility for assigning extension personnel to work with research personnel.

B. Technical Services

Before the initial disbursement can be made for technical services, the appropriate government agency shall sign a contract acceptable to A.I.D. with a U.S. land/grant institution for the provision of such services and must show evidence that it is adequately staffed to administer the contract.

C. Disbursement of Funds for On-Farm Experimental Costs

Before funds can be advanced or reimbursement can be made to CTDA for on-farm experimental costs incurred in the course of implementing this sub-project, the following conditions must be met:

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1. The resident advisor under the technical assistance contract must be in place at the institute in Le Kef.

2. Adequate staff are assigned to Le Kef Institute to effectively carry out the adaptive research program in the sub-project area.

3. Acceptable procedures for advances of funds and reimbursement of on-farm experimental costs have been developed and agreed to by Le Kef Institute and the CTDA.

4. Adequate CTDA extension staff (at least one agent working full-time per delegation) must be assigned to work with Le Kef Institute's research staff in the project area.

Dryland Research Log Frame

ANNEX A

PURPOSE	EOPS & MEASURES		MEANS OF VERIFICATION	ASSUMPTIONS
Development and adaptation of tested systems of dryland farming practices and inputs useable by and extendable to the small farmers of the Central Tunisia Rural Development zone	1. Defined production environment(s) for small farmers in Central Tunisia	- Minimum of 4 defined	- Records of the Le Kef Institute	1. There are definable production environments of varying kinds within Central Tunisia - applicable to local ecological differences.
	2. Development of field-tested dryland farming practices adapted to specific agro-climatic sub-zones of Central Tunisia	- Minimum of 2 such practices	- CTDA records - Manuals, Handbooks and other physical evidence of materials produced	2. The agro-climatic dryland farming zones of the 8 delegations within the AFD-project areas are different from each other; but similar in some classes of conditions, thus enabling them to be grouped.
	3. Cereal, legume, and forage crops tested and field-adapted within the context of extendable dryland farming practices	- Measurable number of varieties tested and agronomic/cultural practices applied	- CTDA information system - Special Studies	3. Some varieties of cereals, legumes, and forage crops will be quickly adopted by some enterprising CTRD area small farmers.
	4. Packages of farming, practices designed for rapid transfer to CTDA-operated extension system	- Minimum of 2 such packages defined		4. Most CTRD area small farmers will have to convinced in practice and with reference to their local conditions that adapted varieties and farm practices yield reliable and therefore not too risky opportunities for investment and change in methods.
	5. Minimum cadre of CTDA extension staff fully trained in content of packages relevant to their delegations	- CTDA personnel in each of 8 delegations		
	6. Results observable among limited number of beneficiaries	- 160 pilot demonstration participants		

PURPOSE	EOPS & MEASURES	MEANS OF VERIFICATION	ASSUMPTIONS
			5. Le Kef will seriously push it's staff in the concept of testing and adaptation only in field situated conditions.

OUTPUTS	EOPS & MEASURES	MEANS OF VERIFICATION	ASSUMPTIONS
1. Cereal, legume, and forage variety recommendations based on field tests developed for sub-zones of CTRD area.	a. Barley variety recommendations - 2 to 4 b. Wheat variety recommendations - 2 to 4 c. Forage and legume crop recommendations - 2 to 4 d. Delegation extension personnel participating in all components of field tests among delegations - 2 to 4	- CTDA Information systems - Recors of tests - Le Kef Institute records on reimburseable research with farmers - Staff assignments and work plans of CTDA staff	1. Adaptable cereal, legume, and forage varieties exist which can be adapted to Central Tunisia and provide increased returns. 2. Farmers in Central Tunisia, when confronted with examples of varieti and practices which yiel increased incomes and more reliable results, will utilize same.
2. Agronomic and cultural practice recommendations for cereal, legume and forage crops developed for sub-regions of CTRD.	- Optimum small farmer agronomic packages tested among delegations - 2 to 4	- Completed draft Handbooks and Manuals	3. Some enterprising farmers in Central Tunisi will be willing to cooperate with research personnel in carrying out test activities in their fields.
3. Completed pilot demonstrations of total dryland farming systems	a. Demonstrations - 4 b. Participating farmers - 160		4. Two full growing seasons, October 1980 and October 1981 will be sufficient to yield some useful results about farming practices if not adapted varieties.
4. Variety, agronomic, and farming systems information organized and tested as a means of transferring knowledge through CTDA extension system	a. Delegation extension chief draft handbooks developed - 1 Master Delegation Extension Chief Handbook b. Specialized, area-specific draft extension manuals developed - 2 to 4		5. Research efforts started in 1979 through CTDA and the contractor will continue over some meaningful period of time - such as five year.

OUTPUTS	EOPS & MEASURES	MEANS OF VERIFICATION	ASSUMPTIONS
5. Institutional research to extension linkages established. 6. Le Kef Institute experienced in new research model emphasizing 100% of content of research in farmers' fields	c. Draft handbook for farm budget and systems mgmt. - 1 - CTDA extension personnel directly involved in applied field research on a sustained basis - 27 a. Senior academic research staff - 5 b. Field research staff - 20	- CTDA information systems - Special studies - Le Kef staff assignments	16. Existing Le Kef staff with some additions to be provided by that institutions, will be sufficient to carry on extensive field testing in an effective manner. 17. CTDA will continue to take a growing interest in the problems associated with extension of proven research results among dryland farmers. 18. An effective U.S. contractor will provide the high-quality,resident French-speaking technical advice at Le Kef and in the field tests. 19. Systems of measuring farmer interest in research results can be developed by the CTDA. 10. Le Kef Institute personnel assigned to this activity will be sufficient mobile.

INPUTS	EOPS & MEASURES	MEANS OF VERIFICATION	ASSUMPTIONS
1. U.S.			
a. Equipment: -Mobile field labs for variety trials - 2 -Mobile field labs for agronomic trials - 2 -Ancillary lab testing equipment -Motor vehicles -2	$820,000	Pro-Ags Procurement Orders CTDA records CTDA information systems Le Kef Institute records	1. Host country contracting and fielding of an effective American contractor can be completed rather quickly. 2. Procurement of essential field testing labs and related equipment can be inititated by AID as soon as conditions precedent are met. 3. Effective management and training relationships can be worked out between CTDA, Le Kef Institute, and the contractor. 4. Short-term participant training will be confined, largely, to third countries now engaged in dryland crop and farming research. 5. The proposed reimbursement arrangements for small farmers who participate in the field testing can be designed to work smoothly and quickly. 6. The CTDA will devote increasing management and policy-development attention to drylands research
b. Technical Assistance: -Resident Research Advisor 36 P/M -Short-term consultants 54 P/M	$800,000		
c. Short-term Participant Trng Training 43 P/M	$100,000		
d. Reimbursement of small-farmers for on-farm experimental costs	$980,000		
Total:	$2,800,000		
2. G.O.T.			
Le Kef Institute			
a. Land and buildings	$1,000,000		
b. New quipment and furnishings for CTRD-related activities	100,000		
c. Operational Budget	$2,900,000		

INPUTS	EOPS & MEASURES	MEANS OF VERIFICATION	ASSUMPTIONS
2. GOT (Cont'd)			7. CTDA will become interested in devoting additional funds and effort to drylands farming systems researc in the Central Tunisia region.
CTDA:		CTDA records	
a. Senior Extension Officers (B.S.) 9 P/Y	Salary and Allowances		
b. Extension Assistants 18 P/Y	Salary and Allowances		
c. Minor Extension Field Staff 100 P/Y	Salary and Allowances		
	Total: $4,000,000		