ISN-29922 936-4135/42 PD-AAM-856

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: A (A = Add, C = Change, D = Delete)

Amendment Number: Original

DOCUMENT CODE: 3

2. COUNTRY/ENTITY: Type C - Field Support

3. PROJECT NUMBER: 936-4135

4. BUREAU/OFFICE: S&T/AGR/RNR 10

5. PROJECT TITLE (maximum 40 characters): Dryland Management Synthesis

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 09 DD 30 YY 88

7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4)

A. Initial FY 83 B. Quarter 3 C. Final FY 87

8. COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY 83 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	1,000		1,000	4,000		4,000
(Grant) S&T/AGR	(1,000)	( )	(1,000)	(4,000)	( )	(4,000)
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1. Mission/Bureaus						
Other U.S. 2. Anticipated Buy-ins				2,200		2,200
Host Country						
Other Donor(s)						
TOTALS	1,000		1,000	6,200		6,200

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) ARDN	120I	022		--	--	4,000	--	4,000	--
(2) ARDN	120I	022		--	--	2,200	--	2,200	--
(3)									
(4)									
TOTALS				--	--	6,200	--	6,200	--

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 091 | 095 | 064 | 066 | 032

11. SECONDARY PURPOSE CODE: 140

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code	BS	XII	INTR	TECH			
B. Amount							

13. PROJECT PURPOSE (maximum 480 characters)

The purpose of the project is to increase host country capabilities to plan and implement dryland Agricultural Management projects/programs.

14. SCHEDULED EVALUATIONS

Interim MM 06 YY 85 | MM 06 YY 87 Final MM 06 YY 89

15. SOURCE/ORIGIN OF GOODS AND SERVICES: [X] 000 [ ] 941 [ ] Local [ ] Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a ____ page PP Amendment)

17. APPROVED BY

Signature: [signature]

Title: J. S. Robins, Agency Director for Food and Agriculture, S&T/FA

Date Signed: MM 06 DD 17 YY 83

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

AID 1330-4 (8-79)

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS

PART II

ENTITY: Bureau for Science and Technology

PROJECT TITLE: Dryland Management Synthesis

PROJECT NUMBER: 936-4135

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961 as amended, I hereby authorize the centrally funded project entitled Dryland Management Synthesis involving planned obligations not to exceed $6,200,000 of grant funds over a period of five years from signing of the Contract, subject to availability of funds, in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the project.

2. The purpose of the project is to increase host country capabilities to plan and implement dryland agriculture management projects/programs.

3. Each developing country where training or other assistance takes place under this project shall be deemed a cooperating country for the purpose of permitting local cost financing.

4. Goods and services, except for ocean shipping financed by A.I.D. under the project shall, except as A I.D. may otherwise agree in writing, have their source and origin in a cooperating country or in the United States.

5. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States.

J S Robins Date 3/7/83
J. S. Robins
Director for Food and Agriculture
Bureau for Science and Technology

Attachments:
Action Memo
Project Paper

Clearances:

S&T/AGR/RNR:R.Meyer		Date 19 Feb 83
S&T/AGR/RNR:T.S. Gill		2/10/83
S&T/AGR:M.Mozynski		2/10/83
S&T/AGR:A.Bertrand		2/10/83
S&T/PO:E.Roche		2/24/83
S&T/PO:G.Eaton		3/1/83

FEB 12 1982

ACTION MEMORANDUM FOR THE AGENCY DIRECTOR FOR FOOD AND AGRICULTURE, BUREAU FOR SCIENCE AND TECHNOLOGY

FROM: S&T/AGR, A.R. Bertrand Arnold R Bertrand

SUBJECT: Authorization for S&T/AGR's Dryland Management Synthesis

Problem: Your approval is required for the five year Dryland Management Synthesis (DMS) project (936-4135) at a life-of-project funding level of $6,200,000.

Discussion: The Dryland Management Synthesis project is designed to assist U.S. AID Missions and LDCs to improve their capability to plan, implement and conduct dryland agricultural projects, which will increase their awareness and understanding of the potential for dryland production, the necessity of considering the fragility of the dryland natural resource system and how best to analyze and address the constraints in their dryland systems. This project will provide training and technical assistance in dryland technology to Missions and host country institutions, conduct special studies, and systematically synthesize appropriate dryland technologies for adaptation, adoption, and diffusion.

The objectives of the Dryland Management Synthesis project are to increase food production in developing countries where lack of sufficient rainfall is the major constraint through the improvement of dryland productivity, while maintaining the natural resource. This goal will be accomplished by: (1) encouraging and supporting international cooperation and collaboration of dryland agriculture development efforts; (2) assisting developing countries in the improvement of their in-country capacity to deal with dryland agriculture; (3) providing improved, effective, efficient, and rapid field support to AID Missions and host country institutions in dryland agricultural management; (4) providing a mechanism which can focus access to the expertise of the various institutions involved in dryland agriculture; and (5) developing a mechanism which will obtain, retrieve, disseminate, and diffuse a knowledge base for improving dryland agricultural production in LDCs.

The Sub-Committee of the Sector Council for Agriculture reviewed and endorsed the project paper on October 25, 1982. The Sector Council for Agriculture reviewed the project paper on November 2, 1982. Several issues were raised by the representatives from the Near East Bureau and PPC. These issues were later resolved and the project paper was brought back to the Sector Council on January 21, 1983. At that time, the major points of discussion dealt with the following issues which have been addressed in the revised project paper attached for your approval:

		Attachment Page Number
1.	Ways of organizing for effective farming systems	VI-A, Page 1
2.	Emphasis on Outreach during implementation	V-D, Page 23
3.	A clearer presentation of where, and with whom, research activities will be carried out.	VI-D, Pgs 1 & 2
4.	Detailed budgetary information	VI-B, Page 1

The project paper was later endorsed by the Sector Council on January 21, 1983. Copies of both endorsement sheets and the pertinent minutes are attached.

Recommendation: That you indicate your approval to proceed with the implementation of the five-year Dryland Management Synthesis (DMS) project (936-4135) at a life-of-project funding level of $6,200,000 by signing the attached PAF..

Attachments: PAF
PP
Minutes of the Sector Council
Minutes of the Sector Council Sub-Committee

Clearances:
S&T/AGR/RNR:T. Gill _____ Date 2/10/83
S&T/AGR:M.Mozynski _____ Date 2/10/83
S&T/PO:G.Eaton _____ Date 3/1/83

Drafted by S&T/AGR:BBeckett/MMozynski:bb:2/3/83:X58974

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

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

PP — 2. DOCUMENT CODE: 3

3. COUNTRY ENTITY: S&T/AGR

4. DOCUMENT REVISION NUMBER: Original

5. PROJECT NUMBER (7 DIGITS): 936-4135

6. BUREAU/OFFICE: A. SYMBOL: S&T; B. CODE: 10

7. PROJECT TITLE (MAXIMUM 40 CHARACTERS): Dryland Management Synthesis

8. ESTIMATED FY OF PROJECT COMPLETION: 88

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 83; B. QUARTER 3 (ENTER 1, 2, 3, OR 4); C. FINAL FY 87

10. ESTIMATED COSTS ($000 OR EQUIVALENT $)

A. FUNDING SOURCE	FIRST FY B. FX	FIRST FY C. LOC	FIRST FY D. TOTAL	LIFE OF PROJECT E. FX	LIFE OF PROJECT F. LOC	LIFE OF PROJECT G. TOTAL
AID APPROPRIATED TOTAL	1,000		1,000	4,000		4,000
GRANT	1,000		1,000	4,000		4,000
LOAN						
OTHER U.S. Missions/Bureau anticipated buy-ins				2,200		2,200
HOST COUNTRY						
OTHER DONORS						
TOTALS	1,000		1,000	6,200		6,200

11. PROPOSED BUDGET APPROPRIATED FUNDS ($)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	PRIMARY TECH. CODE D. LOAN	C. 1ST FY 83 E. GRANT	C. 1ST FY 83 F. LOAN	D. 2ND FY 84 G. GRANT	D. 2ND FY 84 H. LOAN	E. 3RD FY 85 I. GRANT	E. 3RD FY 85 J. LOAN
(1) S&T ARDN	1201	022		1,000		-		1,000	
(2) B/M	1201	022				380		340	
(3)									
(4)									
			TOTALS	1,000		380		1,340	

A. APPROPRIATION	D. 4TH FY 86 G. GRANT	D. 4TH FY 86 H. LOAN	E. 5TH FY 87 I. GRANT	E. 5TH FY 87 J. LOAN	F. LIFE OF PROJECT K. GRANT	F. LIFE OF PROJECT L. LOAN
(1) S&T ARDN	1,000		1,000		4,000	
(2) B/M ARDN	860		620		2,200	
(3)						
(4)						
TOTALS	1,860		1,620		6,200	

12. IN DEPTH EVALUATION SCHEDULE: MM 06 YY 89

13. DATA CHANGE INDICATOR: ANY CHANGE MADE IN THE PROJECT PAPER FACESHEET DATA BLOCK SHALL BE FOLLOWED BY A NEW FACESHEET.

1

14. A. CHIEF OF DELEGATION

SIGNATURE: Anson R. Bertrand

TITLE: Director, S&T/AGR

B. DATE SIGNED: MM DD YY

AID 1330-1 (3-78)

Best Available Document

PROJECT PAPER

DRYLAND MANAGEMENT SYNTHESIS

(936-4135)

An Activity to
Support AID Missions in
Soil and Water Management for
Nonirrigated, Rainfall-Deficient Agriculture

S&T/AGR/RNR
January, 1983

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I. PROJECT SUMMARY

A. Statistical

Project Title:	Dryland Management Synthesis
Implementing Entity (IE):	USDA, Title XII,
Duration:	Six years
S&T/AGR Evaluation:	Years 2 & 4

Estimated Cost:

Total Budgeted:	$6,200,000	S&T:	$4,000,000
Year 1:	445,000		445,000
2:	935,000		555,000
3:	1,340,000		1,000,000
4:	1,860,000		1,000,000
5:	1,620,000		1,000,000

Collaborators Support: (non-budget, estimated 5 yrs) $1,200,000
Project Manager: Raymond E. Meyer, S&T/AGR/R&R

B. Descriptive

This project, entitled Dryland Management Synthesis (DMS), was developed in response to the perceived needs of USAIDs and LDC institutions in rainfall deficient areas. The project will provide training and technical assistance in dryland technology to missions and host country institutions, conduct special studies, and systematically synthesize appropriate dryland technologies for adaptation, adoption, and diffusion.

Cooperating host countries will have the opportunity of improving their capability to plan, implement and conduct dryland agricultural projects. They will have an increased awareness and understanding of the potential for dryland production, the necessity of considering the fragility of the dryland natural resource system and how best to analyze and address the constraints in their dryland systems.

Development assistance agencies and developing country governments have come to understand that improving the productivity of small farms is essential in the battle against poverty and hunger. The understanding of dryland production systems, which this project addresses, is an important component of any strategy to improve food production for the more than 500 million people living in low rainfall areas of the developing countries.

In general, the project area will be limited to agricultural areas where average annual rainfall is between 250 and 1250 mm or where the precipitation (75% probability) to evapotranspiration ratio is between 0.1 and 0.8 during the crop growing season, and supplemental water is not available from irrigation. The project will emphasize the soil and water management aspects of dryland agriculture.

The project is based on the premises that:

- Effective farmer assistance programs result when the relevant country institutions have a thorough understanding of the problems facing the farmer.

- A necessary condition for implementation of improved programs is farmer involvement throughout the development process, from problem identification through implementation of solutions.

In assisting AID with identification and implementation of effective dryland agricultural projects, DMS will:

1. Assist in developing linkages among AID missions, IARCS, CRSPS, and soil and water management expertise in the U.S. dryland areas.

2. Provide AID with advisory and consulting service in dryland agricultural production systems and improve and broaden the base of expertise involved.

3. Develop an informational base of what is known about dryland agriculture, what AID and other donors are doing and systematically collect, evaluate, catalog, and disseminate information on dryland management technology.

4. Assist in training host country participants through developing, conducting, evaluating, and supporting field oriented/on-the-job courses, workshops, and seminars.

5. Assist in the diagnostic analysis of the dryland agricultural systems in several developing countries and through longer term relationships assist in pilot testing improved management technologies in several selected case countries.

These activities will be accomplished by the Implementing Entity (IE) working closely with the AID/W project manager, AID missions, host country institutions and farmers.

The project will result in a focused base of available expertise which is knowledgeable about the current state of dryland agriculture in developing countries, has developed a method of technology intervention to increase productivity in dryland production systems, has implemented several programs in LDCs, and is capable of providing continuing training in dryland agricultural technology.

II. PROJECT PROPOSAL

A. Introduction

In past years, AID projects have given major attention to problems of irrigated agriculture. This approach is understandable as it concentrated on areas with potentially high production per unit area and high concentration of human population. However, only about 10 percent of the world's arable cropland is irrigated. In recent years there has been a growing awareness of the importance of rainfed agriculture and the need to assist the farmers in rainfall deficient areas. Despite its relatively low (compared to irrigated agriculture) productivity per unit area, the vast expanses of land devoted to dryland agriculture make it the producer of the major portion of food for human consumption. At least 500 million people inhabit low rainfall areas of developing countries.

It is the dryland areas of the world that now and in the foreseeable future will produce the vast majority of food grains upon which an expanding population is dependent for sustenance. These are also the lands that exist in a tenuous ecological balance, the land that is being degraded and whose productivity is declining due to mismanagement, poor cropping practices and improper land use. In many cases, erosion is critical and the already limited soil and water resources continue to decline.

In general, factors such as land tenure policies, cultural mores, and lack of technology have contributed to retention of the small-sized farm in semiarid areas. In addition, population and economic pressures have "pushed" people into drier and less productive areas. In many cases, cultivated agriculture has moved beyond ecological limits where cultivated crops can be produced with any degree of reliability. In such cases, survival agriculture may be a more descriptive term than subsistance agriculture. Survival agriculture obviously tolerates lower productivity with its accompanying lower nutritional and consumption status and lower standard of living. Farmers in these areas are most assuredly among the world's poorest and yet, in total, "manage" a significantly large amount of the world's agricultural land. They are a social and economic force which must be included in the overall development of nations. In fact, these resources (land and people) represent the resource base upon which many LDCs must place their hopes for food self-reliance These resources now provide the bulk of agriculture production in many countries despite their underdeveloped state. ICRISAT and other organizations have shown that even within the existing climatic and soil constraints there is a production potential far in excess of that now realized. By proper management of available soil and water resources the production can be significantly increased. There is a need to increase the effort in transferring the technology necessary to achieve a greater production.

The farmers of these areas and the villagers who depend on their crops for food are touched only slightly by modern technology. The farmers use little fertilizer and the soils they till are often eroded and depleted of nutrients. The power base available is usually either animal or human. For the most part, farm implements are primitive, often the same type of wooden plow or hand tools used by their ancestors and with about the same results.

Water is the natural resource which is most limiting to agriculture production in these areas. It is limited in amount and often distributed during a short rainy season in unpredictable and frequently intensive storms that erode the land. However, through trial and error and astute observations the farmers living in these areas have learned to depend on crop varieties and farming practices which insure a subsistence crop yield in most years.

Despite these obstacles, farmers in these regions produce more than one-half the world's sorghum, at least 80 percent of the pearl millet, 90 percent of the chickpea, 96 percent of the pigeon pea and 67 percent of the groundnuts. Yields are only one-fourth to one-half of those in the developed world, yet these are the crops that sustain life in many areas of the world.

This project will provide a mechanism and the technical expertise to address problems of low agricultural production and conservation/utilization of soil and water resources in dryland agriculture systems in semiarid areas of LDCs. It is designed to reduce the risks associated with dryland agriculture while increasing and stabilizing production consistent with conservation of the available soil and water resources.

Project activities will be concentrated in areas with deficient precipitation during a growing season. The target sector is referred to as dryland agriculture and defined as areas receiving 250 to 1,250 mm of annual precipitation or where the precipitation (75% probability) is less than 0.8 of the evapotranspiration during the crop growing season and supplemental irrigation is not used, These areas include a wide belt across central Africa, the Mediterranean, the Indian subcontinent, most of central and eastern South America, much of Central America, and parts of Asia.

The project is not intended to encourage movement of cultivated agriculture into ecologically submarginal areas but to increase and stabilize agriculture production consistent with the limitations and potentials of the natural resource base and existing socio-ecoromic patterns. It is predicated on the realization that dryland areas are not just problem areas requiring famine relief and protection; but that they can be major contributors to growth, increased employment and reduction of rural poverty.

B. Justification

Despite the input of donor assistance, increases in agricultural production in the dryland areas have been minimal and per capita production has decreased in much of the area. The resource base has been degraded while hunger and poverty have increased. The situation is critical in many areas. It is quite evident that a better effort at improving the condition of the small-scale dryland farmer is necessary.

An agroclimatic map of the world indicates that there are only two areas in the developed world that have similar climatic conditions as the dryland area of the developing countries. These are the southern Great Plains of the U.S., and portions of Australia. It seems apparent that the successful agricultural production of these areas should provide useful sources of information for synthesizing technologies appropriate and applicable to the dryland areas of the developing countries.

There is growing evidence that successful programs of assistance to small-scale agriculture can be successfully designed and implemented. However, the margin of error for success in project design is particularly narrow with dryland LDC agriculture because: (1) farmers are hard to convince, their risk leverage is small and since productivity is dependent on weather conditions they are used to extreme variability in productivity, (2) they are extremely poor, and (3) they are sparsely settled, technology diffusion is difficult as extension service is poor to nonexistent. In addition, socio-economic constraints such as market availability, price policies, credit availability, land tenure, and lack of management skills contribute to the dilemma in which the small farmer finds himself.

In 1975, AID sponsored a study 1/ of 36 rural development projects that analyzed the conditions for success in small farm development. Overall success was mostly affected by the local action taken by small farmers to complement outside development management and resources. This study concluded that there were changes needed before achieving success with small farmer assistance programs.

> Our general conclusion is that getting the benefits of development to the small rural producer in a manner which can become self-sustaining will require changes in the project identification, design and implementation procedures of external assistance agencies. Projects have failed frequently in the past because of mistaken conceptions or inadequate information on the small farmer's priorities and the alternative mechanism by which they might be realized. These are not things an outsider can uncover in the short time during which external assistance projects are usually generated. A detailed knowledge of the thinking processes and behavior of the small farmer as well as his trust are required, and these things take time to develop.
>
> Gone should be the initial ten-day, ten-man expert team that flies in, around and out of a country to identify projects with a price tag of more than ten million dollars. Gone should be the amazingly detailed 150 page reports which specify exactly the procedures and steps to be taken when the project is implemented. Gone should be the extremely long and detailed outside evaluation of projects based upon the inputs used, construction completed and money spent. In their place should be a healthy appreciation for the perceptions, interests, and risk considerations of small farmers themselves.

What is recommended requires a great deal of time, patience, understanding and negotiation -- all inputs which cannot be purchased. Such projects require small funding per unit of time or per unit of management. In other, words the time and manpower inputs are, high and are difficult to implement at the USAID mission level. The AID project and budget system and the direct hire staffing restrictions preclude Missions from becoming too involved in projects which require large amounts of manpower and time relative to total fund obligations.

The rationale for focusing, strengthening, and broadening the base of expertise available to provide AID with an experience and knowledge base in dryland agriculture is based on the fact that AID does not have sufficient expertise in this area. The outside expertise available is limited and requests for this expertise are increasing rapidly.

There is a vast reservoir of experience and technology in the United States dealing with problems of dryland agriculture in semiarid areas. This experience and technology has evolved over the last five decades as a result

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1/ "Strategies for Small Farmer Development" AID funded study by Development Associates, 1976.

of dealing with problems of dryland agricultural production in ecological zones often marginally suited to intensive agriculture. In many cases, soil and water constraints are even more restrictive than those commonly found in LDCs.

The federal and state experimental stations throughout the Great Plains area and Pacific Northwest are the greatest mass of human, physical, and economic resource dedicated to improving agricultural production under limited precipitation; available any place in the world. Their success and ability can be measured, in an overly simplified manner, by the current level of production from these areas compared to the same areas 35 years ago or to any other area in the world with similar soil and climatic resources.

Most of the institutions in this area have been involved in international activities and continue to be involved. Approximately 50% of the personnel in the Agricultural Research Service (USDA) working in dryland systems have had some international experience. The proportion of the staff of other institutions may be somewhat higher. One of the objectives of this project is to provide systematic access to this broad and talented group.

It is generally agreed that the scientific principles on which agriculture production and soil and water conservation are based are universal. It is necessary, however, to apply the scientific principles through synthesis of a technology applicable to the socioeconomic conditions in LDCs. The art of applying scientific principles to dryland agriculture production under the socioeconomic conditions existing in LDCs is somewhat limited but does exist in those individuals with international experience. Implementation of this project will contribute to strengthening the capabilities of professionals in the application of scientific principles of dryland agriculture production under the socioeconomic conditions existing in LDCs.

While it is expected that this source of expertise will be focused through a small administrative core at a headquarters location it is likely that the professional/technical/scientific competence will be scattered among the staff and faculties of cooperating or associated institutions where the necessary talents are found. These professionals, as needed and mutually agreed upon, will be available to carry out program activities and meet project objectives.

This expertise will be multidisciplinary and will include a broad array of subject matter disciplines pertinent to dryland agricultural development in LDCs. This capability will be available to and utilized by AID missions and host governments to increase dryland agriculture production in LDCs. Utilization of this expertise will significantly improve USAID programs concerned with dryland agriculture. This base of expertise, once adequately focused, will provide an active resource of scientific/technical talent to address the full spectrum of dryland agriculture production problems in target areas.

The Implementing Entity will have a sizable professional staff currently heavily involved in dryland agriculture in the U.S. Many of the principles of production are the same in dryland agriculture regardless of

the inputs or natural resources available. The IE must strengthen and expand the experience and knowledge base regarding the state of dryland agriculture in LDCs, the principal constraints to increasing production, and the knowledge and evaluation of technologies which have or have not been successful in relieving constraints. This will include both biophysical and socioeconomic constraints. The latter may be more critical in many instances as cropping and agronomic practices normally considered to be agronomically sound may not be utilized for reasons that are not presently well understood. Dryland agricultural systems in semiarid areas are so fragile and the farmers operate with so many constraints that successful development assistance programs have little margin for error. Therefore, it is only logical that AID's projects benefit from the best possible expert advice. Presently no one person or institution contains such experience and knowledge. It has never been synthesized in the area of dryland farming in semiarid areas of LDCs.

Currently, country dryland projects are managed in essential isolation with no mechanism available to learn from previous experience. Missions go out ad hoc for teams to provide assistance with little or no feedback from previous teams. This results in a very inefficient, costly developmental process for AID. This project will address this situation.

The Implementing Entity will have the capability of helping AID develop a knowledge and data base on present, past, and planned future worldwide activities in dryland agriculture. AID does not have the personnel or institutional resources necessary to devote to this base but needs this knowledge of past experience so that mistakes are not repeated. It is logical for AID to develop this knowledge base of present dryland programs and the capability of monitoring them in order to maintain the best possible programs on a global scale.

The Implementing Entity will have some current ability to respond to AID requests for technical assistance but must be willing to increase and expand its ability. Lead time is frequently short and requires some capability to respond on short notice.

The Implementing Entity will develop a capacity to build relationships with LDCs in pursuit of strategies for problem identification and solution implementation which will improve dryland production systems. This will assist Missions and relieve them of some of the responsibility for the slow, variable cost, but relatively inexpensive process of accessing the present situation and determining intervention technologies to increase productivity. It will assist in the process of educating host country institutions to the situation and help build an awareness and interest among farmers and institutions regarding the need and possibilities for improvement in dryland agricultural production.

The project will build upon the solid scientific/technical base of dryland agriculture expertise available and will provide the mechanism for development of the skills and art of applying scientific principles to problems of dryland agricultural production in LDCs. The project will result in an amalgamation of scientific expertise; and the art and skills to adopt and apply it in the socioeconomic environment of the farmer in

underdeveloped countries. The Implementing Entity is and will continue to be heavily involved in dryland agriculture. This will ensure that the expertise that is strengthened under this grant will not be lost after termination of direct central funding. It will result in a much greater efficiency and payoff than the current ad hoc system of technical assistance.

C. Goal

The goal of the Dryland Management Synthesis project is to increase food production in developing countries where lack of sufficient rainfall is the major constraint; through the improvement of dryland productivity, while maintaining the natural resource.

D. Purpose

The purpose of the project is to increase host country capabilities to plan and implement dryland agricultural management projects/programs.

E. Objectives

The principal objectives of the project are:

1. To encourage and support international cooperation and collaboration of dryland agriculture development efforts.

2. To aid developing countries in the improvement of their in-country capacity to deal with dryland agriculture.

3. To provide improved, effective, efficient, and rapid field support to AID missions and host country institutions in dryland agricultural management.

4. To provide a mechanism which can focus access to the expertise of the various institutions involved in dryland agriculture including universities, USDA, and institutes, and increase the base of expertise available.

5. To develop a mechanism which will obtain, retrieve, disseminate, and diffuse a knowledge base for improving dryland agricultural production in LDCs.

6. To synthesize a transferrable technology and pilot test it in specific countries.

7. To provide for a long-term commitment by AID to dryland agricultural development.

III. PROJECT BACKGROUND

A. General Aspects of Dryland Agriculture

Many of the factors limiting crop production in the area of dryland agriculture are the same as in general rainfed and irrigated agriculture and

include genetic potential, diseases, insects, weeds, poorly adapted varieties, poor stands, and nutrient deficiencies, but the major overriding limiting factor is the supply of water. When there is little or no chance of increasing the water supply, through irrigation or improved rainfall, the existing water supply must be used more efficiently.

Dryland agricultural systems revolve around the principle that water is the limiting factor; and to increase or maintain an adequate level of yield, the water use efficiency (W.U.E.) for crop production must be maximized. This efficiency may be defined as the yield of product per unit area and unit of water (Kg/ha,mm). The efficiency is, to a considerable extent, a reflection of management skill. Thus, while the yield potential in dryland areas may be limited by the moisture supply; the actual yield obtained is determined by the production techniques used, by the manipulation of practices to optimize water use. This is as true of range/livestock systems as agronomic systems.

It is very difficult to find satisfactory data showing the true potential yields under dryland agriculture in LDCs. Generally, important factors, particularly soil water, are unspecified or identification of the soils is not given or the duration of the experiments is insufficient to provide response probabilities over time. In general, 3-5 T/ha would seem to be reasonable potential yield estimates for most grains. ICRISAT and IRAT have shown yields of this range. Data on the profitability of these areas under intensive agriculture is very limited but ICRISAT has published data indicating that "management" can decrease input costs and greatly increase profitability. There is an underlying belief among many people that many of these areas should not be used in continuous intensive agriculture. The question of whether they should be used may be irrelevant in many cases as they are or will be used and we must devise those systems allowing their use without further resource degradation.

General objectives for dryland agriculture in developing countries would be:

i) To conserve the basic resources of soil and rain water and devise techniques for using these resources optimally for increased crop production.

ii) To generate appropriate technologies for increasing the average farmer yield by at least 100%.

iii) To devise techniques for stabilizing dryland agricultural production by evolving alternate contingency plans to meet seasonal aberrations.

To achieve these objectives and improve "actual" yields with known production techniques involves essentially a double focus:

1) Finding and using systems that are more effective in storing the rainfall that reaches the earth. This may be achieved by management practices that increase infiltration or reduce losses of runoff or evapotranspiration.

2) Finding and using systems that convert this water into more usable plant material per unit of water. This may be achieved by agronomic management practices that are tailored to the available and expected moisture supply.

These systems, or strategies, must be applied within the realistic resource limits of land, climate, and socioeconomic patterns.

Systems that increase infiltration include tillage or residue management practices which affect the surface characteristics through surface roughness or prevention of sealing. Surface crusting and/or sealing is a major soil constraint in the soils of the Semi-Arid Tropics (SAT). In general, those practices that will improve infiltration will also decrease erosion problems.

Fallow systems are the deliberate extension of the noncropped season between crops to accumulate sufficient water to reduce the risk of failure when the next crop is planted. These very ancient systems continue to be used extensively despite critics. The fallow may have varying time periods of one year, multiple years, one growing season, or one mode of a bimodal rainfall pattern. Effective weed control is a major factor in the usefulness of any fallow system.

Agronomic management factors include the fertility-moisture balance. The highly variable moisture supply, typical of dryland regions, requires that fertilizer requirements be tailored to the season. Optimal fertility is the easiest and most profitable way of increasing crop water use efficiency. A nutrient deficient plant uses water at approximately the same rate as a nutritionally balanced plant but with much lower yield.

Short season plants reduce the time of field climatic exposure. Crops do not vary much in daily water requirements during the growing season, therefore the length of the growing season is a major factor in total water demand.

The type of crop is important for obtaining a minimal yield under extremely adverse conditions. Millet has a low straw/grain ratio of 1.1:1 compared to sorghum or corn of 2:1; the zero point of water use for millet is 5.5 to 6.0 inches while for sorghum it is 9-10 inches. The importance of reducing the risk of having a zero yield cannot be overestimated. Survival is possible with extremely low yields but impossible with a zero yield.

Weed control is extremely important for efficient water use and becomes more critical as the moisture supply becomes more limiting. It may also be more important under poor soil and crop management practices.

Emergence and stand establishment is a major constraint in dryland systems and is a parameter preferable to that of the planting date. Planting in dry soil during a time of a probable precipitation occurrence needed for emergence may be a major advance in cropping security as found by ICRISAT. It is a function of the risk of planting dry, the risk involved with crusting, and weed problems.

Better use of limited moisture supply is possible with more careful attention to plant population and distribution in dryland regions. Contrary to the generally accepted practice of close row spacing with sufficient precipitation, under limited water it may be beneficial to have sufficient within row competition to slow growth rates in the early part of the season together with wide between row spacing to prolong root extension into untapped stored soil water. Thinning of plants during the growing season based on existent moisture conditions may be a beneficial practice.

It is frequently considered that improved management practices accounts for 50% of the yield increases in dryland agriculture with improved varieties accounting for 30% and improved planting and harvesting equipment accounting for the other 20%.

Rainfed production is most successful with a "package of practices" approach. The best combination of tillage for moisture conservation and seedbed preparation, the best adapted varieties, optimum planting rates and dates, and fertilizer applied at the proper rate and time. The timing and application of various components of the package is very important and may vary from one locality to another. This timely application of management is very critical under dryland.

The proper package is determined by extensive applied field research conducted over long time periods and may vary with climatic and economic conditions. Each element in the package must be done in the right sequence or the advantage of the other may be lost. Interaction is very high. For example, improved varieties without proper weed control or appropriate fertilizer rates or needed seedbed preparation may actually decrease yields. Fertilizer without weed control may nullify or decrease yields. Improved initial tillage without secondary tillage for weed control or seedbed preparation may actually decrease yields.

In developing countries the rapid development of a complete production package is not generally possible. Many of the resources are not available and require considerable time and investment to develop. However, if certain elements of an improved production package are properly applied and in the right sequence, substantial yield increases are possible. The key to increasing crop yields is sorting out those practices which give the greatest benefit and which fit into the local traditional systems. As other resources become available and additional field research is conducted, the other elements of the production package can be applied.

Much time can be gained by using the judgment of qualified individuals who can draw on their reservoir of physical, biological, and economic information obtained by experience and study under similar conditions. The real and most unique experts are those few who are capable of optimizing the agricultural system through knowledge transfer after understanding the constraints confronting farmers in a given area. Much of the information in the soil-water-plant-climate continuum is transferable. It is not always necessary to do extensive field research to predict crop responses and obtain initial benefits if the environment has been sufficiently characterized through good agroclimatic analyses.

Technology should help to achieve the desired growth rate in agricultural production coupled with stability of production from year to year. There should be as much emphasis on factors that promote stability as on those that enhance productivity. Among the major factors causing large undulations in production from year to year are (i) weather abnormalities, (ii) pest epidemics, (iii) public policies in the area of pricing and marketing and (iv) availability of inputs.

Traditional agriculture in the semiarid tropics evolved to reduce risk of losses in dry years, because they can be very severe. Benefits that could accrue in good years are usually lost. Much of the effort in new or improved technology for the region should be designed to provide opportunities to invest safely in anticipation of good years. The aim of dryland technology is to prevent the destruction or diminution of the biological potential of land, to maximize economic benefits from a given environment and minimize damage through manmade as well as natural processes of desertification. Agrometeorological research data will have to be integrated into crop-planning models, so that contingency plans suited to different weather probabilities can be prepared.

Long-term prospects for major improvements seem good from a technological viewpoint. If buffer stocks are accumulated for distribution in the driest years, the major risk in rainfed farming of the SAT will be reduced and farmers will be able to invest more of their time in resources for the good years. Benefits will be substantial and will pervade a huge and disadvantaged portion of the world's population. These benefits, although attainable, may not be realized because of public policies in pricing and marketing.

B. AID's Dryland Experience

More than 10 years ago Omer J. Kelley, then Director of the Office of Agriculture in TAB, stated:

> "...AID has no intensive or coordinated programs dealing with the many problems of dryland agriculture and it is in these areas where the poorest of the poor people live and exist. In our judgment the time is long past when AID should deal with the specific problems of dryland."

This was the prelude for AID making 211(d) grants to two western institutions, Oregon State University and the University of California at Riverside. The objective of the 211(d) grants was:

> "...to build adequate U.S. response capabilities on priority development problems and facilitate utilization of such capabilities in joint problem-solving and knowledge transfers with the developing countries."

One institution (Oregon) continues to use and expand facilities and equipment developed with the grant. They have maintained their contacts and networks developed under the grant and acknowledge that their current involvement in at least two dryland projects was aided by the grant. They

have also double-staffed at least one position in dryland crop management, but admit that their current response capability is thin.

Some LDC experience has been gained and state-of-the-art reports have been prepared by each institution. Both of the reports lack detail, at the farmer and institutional level in LDCs, on the most probable technologies transferrable. Practices now being used and those which could be used to make dryland farming more predictable and productive are not described.

Bibliographic information was developed by both institutions. The data base developed is not, however, compatible with NAL's AGRICOLA system and thus has limited impact and usefulness.

Although it is not known why the entire Great Plains area was left out of the 211(d) effort, the lack of a significant residual capability having been developed with the grants illustrates the problem of AID/University efforts. Most universities have only a very limited personnel base in dryland. It is imperative that a broader base be utilized in future efforts and young professionals be trained for international dryland agriculture activities. The most significant and stable base of professionals involved in dryland activities, at the present, is in the southern Great Plains. It is also quite evident that strong program management by the AID manager is essential.

The number of rainfed and/or dryland projects in the field has increased tremendously in the last five years with active projects in all regions at the present time. There are a number of projects presently in various stages of development that are very extensive and involve large sums for funding. There is, however, still no mechanism for an AID "memory", i.e., what USDA "learns" in Kenya does not flow back into AID and out to help Nebraska in Morocco or Washington State in Sudan and vice versa. There is not sufficient available dryland expertise to serve all of the projects. Two dominant university consortia (CID, MIAC) in the dryland regions could not staff recent projects from within. The expertise base needs to be expanded and rapidly. Dr. Kelley's statement is as true today as 10 years ago.

C. AID's Soil and Water Management Support Service Experience

While support in general soil management is given to Missions under various projects and RSSAs, there are two specific projects which have soil and/or water management as their focus. Both of these projects, Water Management Synthesis under contract to CID and Soil Management Support Service under a RSSA with USDA/SCS, have been very well received by the Missions and LDC institutions. Both projects depend on a cadre of technically competent individuals to give efficient and able response to requests for support. This project will complement these projects but give a primary focus to the special needs of dryland. The type of institution is not as important as that it have the capability, competence, and desire to make the project work.

IV. PROJECT ACTIVITIES

To plan for a more productive dryland agriculture technology in LDCs requires us to start from what exists now and not some package that exists on an experimental farm in the U.S. As we evaluate the present situation we must look beyond problems of crops and soil and water management. We must have an understanding of what exists now on the farm, what is being done and why. We must understand the farmer's perception of his world and his relationship to it. Why he does what he does within the context of his socio/economic and bio/physical environment. We must also know where we are in our ability to adapt and apply scientific principles to dryland agriculture systems in semiarid areas of LDCs.

The evidence is convincing that successful interventions in dryland agricultureal farming systems will require:

- Farmer and LDC institution involvement in problem identification; and planning for, and testing suitable technologies for improvement of production.

- Clear understanding and descriptions of how the present farming system operates with full cognizance of livestock and fuelwood aspects, careful analyses of the variables which affect it; and a reasonable assessment of resources which can be used to bring about beneficial change.

- Pilot testing of selected on-farm improvement technologies so farmers and institutions can modify them to suit the local socioeconomic and environmental conditions.

These conditions require considerable time and are location specific because of variability among social, technical, and natural resource bases. It is difficult and time consuming to develop programs to positively influence productivity in dryland agriculture farming systems in semiarid areas. A great deal of time and patience is necessary to involve farmers and institutions in problem assessment and technology selection/adaptation. DMS will address this problem by providing central funding, competent technical assistance, and an improved information base during these initial project phases.

While the project must be fully cognizant of the existing "management" on dryland farms, it is technically oriented and does not duplicate the S&T Farming Systems project. It will provide valuable input for the Farming Systems project and receive valuable information from it. Coordination and collaboration with the Farming Systems project will be stressed.

A. Technical Assistance and Advisory Service

The Implementing Entity will already have strong domestic and some LDC experience in dryland farming systems and thus will be available to meet certain requests for consulting and advisory services immediately. This project will provide for a greatly expanded experience and knowledge base in LDC dryland agriculture.

DMS will provide for:

1. Short-term TA to:

   a) Advise on project and/or program strategies
   b) Help design and develop projects
   c) Monitor and evaluate projects
   d) Conduct analyses, assessments and reviews of dryland programs
   e) Develop and/or conduct training programs
   f) Conduct special studies on specific technical problems, regional or global issues, or dryland investment strategies.

2. The development of a methodology to carry out diagnostic analyses of constraints and practices at the farm level within a country together with an inventory of resources available for interventions. The initial methodology will be developed by means of the workshop method. The methodology will be devised so that a 4-6 person team can make the analysis in a given country in a 4-6 week period. The methodology will be field tested and refined by a team going to at least four countries and developing profiles of the dryland farming situation.

The methodology will be organized into manuals and guides which will then be available for use in training workshops in other countries. The results of these analyses will be recommendations for possible technologies which, after pilot testing, should have a high probability of increasing production using existing resources.

This activity requires farmers and host country institution involvement. This is the key to eventual successful development of a national program of assistance and must be continually kept in mind by all participants.

3. A systematic evaluation and improvement of the technical assistance performed under the project.

4. Long-term TA under special circumstances with Missions bearing the cost.

5. A mechanism to move "lessons learned" by TA to the information system.

Budget limitations will require that some requests will be paid for from Mission funds. Judgment on which requests will be paid from project funds and which must be co-funded will be based on regional and global considerations and will reside in the AID project manager. In general, 30 days will be provided at no cost with Missions requested to pay for any additional costs. If possible, Missions should generally pay for travel.

B. Information System

The communication of knowledge and experience from one project, country, or Mission to another is of prime importance in the impact that can be obtained from technical assistance inputs. It is essential that access to relevant information is available to the Mission and the LDC institutions.

The Food and Agriculture Act of 1977 presented a clear charge to establish a cooperative library and information network. It was declared to be the policy of Congress that:

> "...cooperation and coordination among, and the more effective utilization of, disparate agricultural and information units be facilitated;..."

It is in AID's interest to promote a more unified system of information flow and not contribute to fragmentation and disparate systems. Any information system contributed to or developed by this project will be compatible with and coordinated with the NAL; and S&T/DIU must be involved at all steps. This will include information dissemination to AID missions, LDC institutions, and individuals; as well as information gathering of research data, project data, and policy.

Currently each dryland project within a country tends to be a case study and there is no systematic means for one project or country to learn from another those successful technologies and approaches which can be transferred and adapted at low cost. This inability to learn from previous experience results in a highly inefficient and costly development. There is a tremendous need in AID dryland efforts to develop a memory mechanism to identify technologies and methodologies with transfer potential.

It is impossible to know at this point the details of developing the mechanism or how it may finally appear. We do not know, completely, the extent or diversity of the problem. NAL's AGRICOLA system is the most important database available at present in technical information but lacks a considerable amount in dryland technology, particularly internationally; DIU has information on past and present projects and documents but is not complete. There are also individual databases and collections related to drylands at universities and institutes.

There is a need for a unified means of access. It may be only a subsystem for Dryland Management with subsets of AID information, technical information, domestic, and international. It is impossible to detail the mechanism needed until further study by Information specialists who can then assist in devising and implementing a system that is the most comprehensive and complete possible within the limitations of monetary and other resources.

DMS will provide for:

a. Cooperation, coordination, and linkage of all activities, where feasible, with leading regional, and international organizations.

b. An updated state-of-the-art analysis of what is presently known about dryland agriculture management and what is going on in development assistance worldwide. The 211(d) grant activities at Oregon State University and at the University of California, Riverside have accomplished a part of this activity. There is much more, however, which needs to be done,

especially at the institutional and farm level in LDCs. Analyses will be made of farming practices and the rationale behind them in various ecological settings. The state-of-the-art will also include an analysis of bio/physical and socio/economic constraints at the farm level and how the farmers cope with them. An appraisal will be made of AID's present portfolio of dryland agriculture projects to determine what is planned and how it is to be accomplished. A similar appraisal will be made of other donor and multilateral aid programs including International Centers concerned with problems relating to dryland agriculture in semiarid areas.

The SOTA will be complementary to existing information including the new monograph on Dryland Agriculture. It will not repeat previous studies but will emphasize and augment those areas of particular relevance to LDCs.

c. An up-to-date inventory of significant technologies, technical reports, and training materials for systematic diffusion to users in LDCs.

d. Specific planning guides, concept papers, field manuals, and audiovisual materials for systematic transfer of selected proven technologies to technical personnel, planners, extension workers, and farmers.

e. An arrangement/network for systematically gathering successful or promising physical, biological, and social technologies related to dryland management.

f. Special working seminars for key scientists and policy makers, designed to document and share, in usable forms, those technologies and procedures which work well in any area and have transfer potential; special workshops designed for key policy makers and AID officials to help create awareness for institutional change and understanding of the advances in dryland management which contribute to successful projects.

g. An up-to-date bibliography of available training and research materials which are to be identified, obtained, abstracted, entered into bibliographies and data bases, and made known through a newsletter or other mechanism.

h. Cooperation with and assistance to private contractors with AID contracts related to dryland management to help them build up their capabilities and resolve problems they are facing in the field.

i. A data base of country specific data which will be useful to teams and other professionals working in a specific country involved in dryland activity.

It seems clear that there is a need for a permanent mechanism to systematically gather lessons learned from whatever source, and access them to any interested party. While such a mechanism could be institutionalized within AID, it is not clear that this is the most feasible place for it. An important task will be that of developing and locating the mechanism and establishing the linkages between it and other organizations to systematically provide inputs.

C. Training

While there is no question of the need for training, the type, conter and approaches needed are not well understood or documented. Conventional education and training in soils, agronomy, engineering, extension, and othe areas is essential but not sufficient. There is a need to train and develc the in-country expertise needed to implement successful projects together with specific training in dryland agriculture technologies. The missing link between research and development is the lack of appropriate training for the people involved in the process.

DMS will provide for:

a. Assistance in developing appropriate linkages with IARCS, FAO, and other international organizations involved in training in order to shar experiences, refine approaches, transfer lessons learned and collaborate where feasible.

b. Assistance in development and participation in intensive hands-c training programs in-country, regionally, at IARCS, and at selected U.S. institutions for policy makers, trainers, project managers, researchers, an project implementors.

c. Assistance to AID missions and host countries in designing and conducting appropriate training programs, including on-site field courses and the Diagnostic Analysis Training Workshop.

d. Assistance to AID missions and host countries in "front loading" new projects, with quick and effective in-service training for project execution personnel and farmers.

e. Assistance with identifying and evaluating training courses and materials worldwide and providing access to those considered to be of value to AID missions and LDCs.

f. Assistance to host country universities and training centers in developing relevant materials for building courses and activities into thei ongoing curricula in Soil Science, Agronomy, and Engineering.

g. Assistance in developing selection criteria and providing select formal training at institutions in the U.S. to provide leadership in key areas. A one or two semester non-degree type of training is needed for certain technical specialities to help develop the initial capacity to inst tutionalize their own training programs. Formal degree training will be minimal.

h. Assistance in participation for key professionals at seminars, workshops, and/or conferences designed to document and share those methodol gies and procedures which work well in any area and have transfer potential as well as institutional changes and dryland technology advances.

Training will particularly stress hands-on practical field experience with emphasis on diffusion of improved dryland technology to the farmer.

D. Pilot Testing/Case Countries

After analyses of several countries, a longer term relationship will be developed among DMS, the AID mission, IARCS, and country institutions in certain case countries. DMS will provide heavy input into the design, implementation, and monitoring of a country project. The activity will involve selecting and testing technologies for increasing dryland production. The selection will be based on the analysis and review of the success/failure rates of various technologies identified, with involvement by the host country institution and farmers. DMS will serve as a consultant during pilot testing and will place professionals in the field for sufficient periods of time to fully understand the socioeconomic problems of technology application and to develop a working relationship with LDC technicians and agricultural leaders in the pilot test area.

The final output of this activity will be the development and refinement of a program to implement field tested improvement technologies on a large scale (many small farms over a large area). It is expected that donor funding assistance will be required to expand and integrate selected technologies into full scale development projects. However, the groundwork will have been laid for implementation of a successful national program.

The existence of a strong base of expertise which is knowledgeable about the current state of dryland agricultural development in semiarid areas of the world, has developed a methodology of technology intervention to increase production within dryland farming systems, has implemented several programs in LDCs, and will continue to be available to AID and LDCs to address the broad array of problems related to dryland agriculture in semi-arid environments will not in itself result in increased agriculture production at the farm level. This project is a critical link in a chain of events leading toward increased productivity and human welfare for the small farmer. This project lays the groundwork for subsequent projects but its contribution to development will be limited unless the next logical steps are taken to assure that the information and technology developed are available to and actually used by small farmers to increase agricultural production.

V. PROJECT ANALYSES

A. Technical Feasibility

The development model suggested by this project requires: (1) a careful precise quantification of farmers' problems; (2) the selection of appropriate solutions based on farmer and institutional constraints; (3) the testing and evaluation of solutions within the farmer and institutional environment, and (4) careful implementation which provides the required training and technical assistance.

This project is designed to ensure that, for dryland agricultural farming systems, the items in this model are accomplished in AID programs with farmer and governmental institutional involvement. There is much evidence in the literature and from successful small farmer projects; that

in successfully changing fragile farming systems there is no alternative to total involvement of the farmers in selecting and adapting change agents to his constraints and limited available resources.

The project recognizes that AID personnel need expert help in the dryland farming system area and that U.S. professionals will need to gain experience in LDC systems. This experience will be gained by participating in the problem identification and the technology selection/testing process with LDC farmers and institutions.

The project is timely in that AID's mandate to reach small-scale farmers, especially the poorer sector, has caused an increase in Mission projects in the dryland area where; in fact, most of the world's poor farmers operate on most of the world's agricultural land. It is expected that the emphasis on increasing food production in dryland agricultural farming systems will increase significantly over the next ten years.

(i) Environmental Impact

The Environmental Threshold Determination was approved March 28, 1980 and determined that this project is not a major federal action which will have a significant effect on the human environment.

The project activities fall into the area described in environmental procedural regulations as "analyses, studies, academic or investigative research, workshops and meetings." These classes of activities will not normally require the filing of an Environmental Impact Statement or the preparation of an Environmental Assessment.

(ii) End of Project Status (EOPS)

The EOPS indicated are fully achievable and indicate the technical feasibility of achieving the purpose.

1. There will be ongoing pilot programs in at least two (2) LDCs in dryland agriculture improvement in semiarid areas. These programs will have been based upon careful analyses of existing situations, with testing and development of improvement programs to fit these situations. Farmers and host government institutions will have played the major role in problem identification, development of solutions, and program implementation.

2. The technical basis for improving agricultural productivity will be available in project areas.

3. Personnel trained in dryland management are implementing country projects.

4. Follow-on projects will have been designed to ensure extension of project findings to other appropriate areas in LDCs.

5. The IE will have achieved the following status:

a. Developed the capability to respond expeditiously to AID by

focusing and stabilizing the professional staff in dryland agriculture experienced in LDCs.

b. Developed a knowledge and data base on worldwide activities in dryland agriculture with the base being available to AID.

c. Developed and tested methodologies and techniques to identify constraints to dryland agriculture production in LDCs.

d. Developed an experience and knowledge base regarding dryland agriculture in LDCs, the principal constraints to increasing production, and a knowledge/evaluation of technologies which have or have not been successful in relieving constraints.

e. Developed relationships with several LDCs and assisted with on-farm problem identification and solution implementation strategies leading to increased production by small-scale dryland agricultural farming systems.

B. Economic Analysis

The rationale for the project is based on the assumption that AID will invest considerable funds over the next ten years in projects to increase production in dryland agriculture. It is further assumed that the target beneficiaries of these projects will be the farmers who presently practice little more than survival agriculture.

DMS is largely a field-support project. It will provide technical assistance and training to missions and host countries, and facilitate the transfer, adaptation and adoption of improved dryland management technologies. Through these activities, the project will strengthen the capabilities of LDC institutions responsible for dryland development and improvement.

DMS will be assisting missions with projects for which economic analyses have already been conducted; it will also be assisting missions in developing new projects/programs for which economic analyses would have to be conducted before being approved. Presumably, DMS will be working with projects which are economically viable.

It would be relatively easy to identify and cost-out the inputs. However, the same would not be true for the benefits. Thus, it would be difficult to accurately allocate the incremental benefits between DMS and the projects it would be assisting, on an a priori basis or even after the fact. Moreover, the project is composed of a relatively large number of different activities that will be implemented under widely varying conditions. And while the return to each activity should be approximately the same at the margin, it is unrealistic to suppose that this will be the case, since foresight is far from perfect. Also, DMS can be viewed as an experimental project in the sense that it is designed to generate feedback for input into the project and for modifying it. Similarly, the project is designed to gather lessons learned; for transfer to other projects within regions and to other regions for adaptation, adoption and diffusion. Existing documentation of benefits accruing to activities similar to those under DMS is often piecemeal and generally applicable to a narrowly defined

activity conducted at a specific site under controlled conditions. Documentation of benefits attributable to broader activities generally is presented in qualitative terms or is not comparable.

Because of the foregoing, it was not feasible to perform an economic analysis which would develop quantified estimates of economic benefits, such as rates of returns or benefit/cost ratios. The returns to the resources absorbed by this project will be at least as high as if utilized in alternative uses, including alternative approaches to the problem that DMS is addressing. Based mainly on observations of expert teams, assessments, and evaluations; we are confident that this is the case.

The alternative to this project is to continue to develop USAID dryland agriculture projects by contracting with short-term design teams who necessarily will design projects with limited farmer and host government institutional involvement. It must be realized that nowhere in the United States are dryland agriculture practices under conditions identical to the LDC farmers' situation.

It has been observed that AID seems to be weak in capturing "lessons learned". Yet, it is wasteful to be continually rediscovering the proverbial wheel. As experience is gained in LDC dryland systems, it is imperative for cost efficiency and sound development that this experience not be lost to AID but be institutionalized in some way. It is also important that the source of expertise remain available even without continued central AID funding. We believe that this project will yield large benefits relative to costs.

The capability for focusing the broad base of available expertise will have to be developed and refined during the time of the project. As it is unknown what particular institution will implement the project it is impossible to say what the structure will be at this point. It is apparent from the budget that there is not enough monetary resource to develop a separate complete administrative structure or bureaucracy. It is evident that an institution must be selected that will allow DMS to "plug into" an existing management structure to obtain the input and output necessary in a cost effective, systematic manner.

The true benefits of this project will result through its effect on other projects. However, assuming AID will invest $800 million over the next ten years (surely conservative since projects presently initiated total more than $50 million, and others in various stages of initiation total $300 million) this project will then represent less than a one percent investment in improvement and use of design techniques. This is not an unrealistic amount when compared with any other development endeavors anywhere in the world. Important also is the fact that benefits will accrue relatively soon and be repeated over time, certainly beyond the project life.

Moreover, providing more appropriate technologies to small-scale farmers promises great returns in increased food production, more efficient labor utilization, and higher rural incomes, as well as improved soil conservation and environmental protection -- all of which are necessary if the LDCs are to increase food supplies for their growing populations while stimulating private sector growth.

A similar AID program in irrigated agriculture has affected thinking worldwide concerning irrigation system renovation and has caused FAO to change its emphasis in irrigation programs. The economic benefits of these types of project consequences cannot be specifically measured.

It is expected that Regional Bureaus and Missions will "buy into" the project for more efficient use of their resources. This will result in a considerable long-term saving of administrative and overhead costs.

C. Social Analysis

The initial beneficiaries of the proposed project are institutions and agencies involved in designing and implementing dryland projects. Through training programs, action oriented technical assistance, planning guides, technical field manuals, and the findings of special studies, the staff of these organizations will be prepared to impact the end users -- the farmers -- more effectively. The social impact of this project, then, is manifest in its influence on other projects which will have significant social and economic impacts on farmers.

Further, DMS expressly designs interventions that fit existing production systems and that disrupt existing patterns as little as possible in the short run. Insofar as DMS has evolved primarily to serve limited resource farmers better, application of the approach will probably lessen inequality.

The social responsibility of this project consists in the broad application of available knowledge and practical experience in combating famine and resource degradation. Poor utilization of existing knowledge and achievements rather than the lack of knowledge result in the current conditions.

Certainly, the social impact is broader and more equitable if the agricultural production on one million hectares of dryland can be raised from 0.5 T/ha to 1.0 T/ha, than by raising the production of 100,000 hectares. of irrigated land from 2.5 T/ha to 5.0 T/ha. The premise of this project is that these sorts of increases are feasible and can be achieved at lower social and economic costs in drylands.

(i) Women in Development

This project will encourage the widest possible participation of women, worker-professional and nonprofessionals. Overall thrust of the program is to advance transference of dryland agriculture technology to the developing countries. Within these countries, improved dryland technology holds great promise for increased involvement and a better life for the women who have traditionally played a major role in agriculture.

D. Implementation Arrangements

(i) Administrative Arrangements

(a) Implementing Entity (IE)

The project will contract with an institution involved in semiarid

rainfed agriculture, to strengthen, refine, and maintain a focus of the dryland capability available to assist AID in developing and implementing sound projects to increase productivity in dryland systems in semiarid areas of the world.

There is a vast reservoir of talent in dryland agriculture within the USDA and the universities of the United States Great Plains region and Pacific northwest. There are more than 10 USDA research units or experimental stations with dryland endeavors; and more than 10 universities, with their associated field stations, are located in the dryland regions; not including the more arid states or the northern Great Plains. The natural resources, precipitation patterns, soils and topographies, where these institutions work; have characteristics common with the natural resource base of the LDC target areas envisaged for this project.

The project will require careful and continual planning and negotiation among the IE, the AID/W project manager, concerned Regional Bureaus, Missions, LDC institutions and other interested institutions and universities. For this reason, it is imperative that the IE assign at least one professional to full time status as manager for this project. This professional will be stationed at the IE headquarters with full-time project responsibilities and will not become involved with extra curricular activities.

It is expected that the IE will work closely with the international centers, especially ICRISAT, ICRAF, ISNAR and ICARDA, to learn their techniques and programs as they relate to this project. The IE will give special attention to the methodologies and techniques of the International Centers for problem identification and extending research results to farmers under various socio-economic conditions in LDCs. The IE may develop cooperative arrangements with International Centers, as appropriate; to more effectively pursue certain aspects of this project, particularly training. The IE will make special efforts to improve linkages of the IARCS with AID missions, host country institutions and U.S. institutions.

The IE will also become familiar with and work closely with the various CRSPs (Soil Management, Sorghum/Millet, Bean/Cowpea, Peanut), regional centers as ACSAD, CATIE; and specific projects such as the centrally-funded Farming Systems, Agroforestry, Benchmark Soils Network, Biological-N, and Water Management Synthesis projects.

Since one of the objectives of the project is to focus a broad source of expertise in dryland agriculture, the IE is expected to develop clear work plans and carefully select personnel to manage each activity. Especially important for the manager will be to be sure that several disciplines (agro-climatologists, agricultural economists, agronomists, soil specialists, crop specialists, rural sociologists) become involved and experienced in LDC dryland farming systems.

It is essential that the IE have extensive experience in dryland technology, that it be currently heavily involved with a significant staff base in this activity and have some LDC experience. It is essential that the IE

be an organization that will continue to be heavily involved in dryland activity with or without AID funding and will maintain and keep available information and capability developed with this project even if project funding should terminate.

The operational (day-to-day) management of the project must be headquartered at a specific place but specific project activities may be allocated to participating organizations. The IE project manager must be assigned full time and appointed with approval from the AID project manager. The activities called for in this project require a great amount of organizational and managerial skills; however, the IE project manager will also need to have technical competence and experience in dryland management. It is essential that all project experiences be captured and recorded in a form that is useful later. The logistical problems of staffing, organizing, scheduling and implementing the many short-term overseas activities will require considerable administrative time, experience, and efficiency. The technical professionals working on this project should not be required to handle these management-related activities. The operational management modes of the WMS and SMSS projects will be considered.

(b) AID

The project will be managed in the Renewable Natural Resources Division of S&T/AGR. A water management specialist with a soil physics background and experience in dryland agriculture will have responsibility for the project.

The S&T/AGR project manager will be responsible for project monitoring and will provide administrative/technical guidance.

A project advisory committee will be selected to assist S&T/AGR/RNR, in an informal capacity, with carrying out the cooperative effort. This committee will be made up of persons knowledgeable in dryland agriculture and will include representations from Regional Bureaus, USDA, IARCs, LDCs, other donors, and developed countries. This committee will review and recommend major outputs and decisions.

They will ensure that the project's objectives are consistent with those of the recipient countries and will advise on new developments and targets of opportunity that will enhance project effectiveness.

(ii) Implementation Plan

This project will be implemented by negotiating a contract with an institution involved in dryland agriculture.

The rationale for the project is to combine resources in order to focus a sufficiently large pool of expertise and technologies so that experiences can be built into the system and used to improve it. The alternative is for each bureau to have projects contracted for separately. This is not acceptable because each, taken alone, would not provide sufficient funding to insure a stable, full-time identifiable source of expertise. Piecemeal contracting does not provide for a unified means of learning from past experiences.

The anticipated schedule for project approval and awarding of the contract is as follows:

1.	PID approved	July 1979
2.	Limited review of brief project description	February 15, 1980
3.	Project Paper prepared	August 1, 1980
4.	Project Review by Missions	April 1981
5.	Project Approved by AID	January 1983
6.	Proposals received and RFP issued	February 1983
7.	PIO/T to CM/COD	March 1983
8.	Contract awarded	March 1983

This draft of the Project Paper has considered suggestions from the PID review, from the review of the brief project description circulated in 1980, from the draft PP reviewed in 1980-81, subcommittee review in July 1982, and the Agricultural Council review in October 1982. Comments appear in Annex C but many of the improvements came from discussions with agricultural officers throughout AID.

The Scope of Work (Annex D) provides a general, overall description of project activities. However, this is not sufficiently detailed for expeditious project implementation. An annual work plan will be developed each year by the IE and the project manager, in conjunction with the Advisory Committee. These plans will be based in part on a poll of missions, by each bureau, to determine their assistance needs for the coming twelve-month period. With this basic information, reliable annual work plans and schedules can be developed. Activities are anticipated approximately as:

Activity	Year 1	Year 2	Year 3	Year 4	Year 5
Field Support	xxxx	xxxx	xxxx	xxxx	xxxx
Review AID and other donor activities	xx	x	x	x	x
Update SOTA	xx	x		x	x
Develop methodology for problem assessment	xx		x	x	
Conduct country assessments		xx	xx	xx	
Pilot testing of technologies			xx		xx
Information dissemination	xx	xxxx	xxxx	xxxx	xxxx
Advisory committee meeting	x	x	x	x	x
Project reviews			x		x
Training	x	xx	xxx	xxxx	xxxx

The problem assessment and pilot testing phases of the project will require close USAID mission and host country involvement. The arrangements for these activities will have to be made after project initiation by careful planning and negotiation. A commitment by a host country to devote resources to the project will be an important consideration in selecting sites for project implementation. For example, even with the problem assessment activity it is not planned that the IE do this on his own. One of the important benefits of doing a problem assessment is to provide a vehicle through which local institutions can systematically study and become aware of dryland farming system constraints. Therefore, as a minimum the

host country would need to provide technicians to be trained and assist in the problem assessment phase.

The pilot testing phase will require even more host country resource since a local agency will have to provide key personnel on a full-time basis to the effort. It is anticipated that this phase will only be attempted in countries where some on-going program of government assistance to farmers in the dryland sector is in place. Selection and arrangements for this activity can only be made through careful planning. It will be noted on the schedule that the first pilot program is not anticipated until two years after project initiation.

(iii) Evaluation

A regular assessment/evaluation to assess progress, direction, and available options will be made annually with the IE presenting a progress report before the project advisory committee. A comprehensive, outside, multidisciplinary team evaluation, with mission participation will be made at the beginning of the third year and the end of the fourth year.

E. Budget

This proposal provides for a five year contract to strengthen, refine, and maintain technical capabilities and capacities by the contractor and to provide for the use of these capabilities to increase productivity in LDC dryland farming systems.

Project costs, to be borne by AID, are estimated to be $6,200,000 for the 5-year period of which $4,000,000 will be from the Bureau for Science and Technology. It is estimated that an additional non-budgeted amount of $1,200,000 will be contributed by collaborators. This would include support of cooperating institutions such as IARCS, AID missions, FAO, universities, and CRSPS, in joint endeavors. The project will be initially funded in FY 1983. A summary output budget is given on the following page and an input budget is given on page VI-B-1.

SUMMARY BUDGET (000's)

Activity	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Field support (TA)	200 (20 pm)	260 (25)	275 (25)	275 (25)	270 (25)	1280
Review AID and other Donor Documents	25	20	10	15	15	85
Update SOTA	45	40		20	20	125
Develop Methodology for Problem Assessment	60	55	75	50	40	280
Conduct Country Assessments		120 (2)	150 (2)	270 (3)	210 (2)	750
Pilot Testing of Technologies			300 (2)	600 (4)	400 (2)	1300
Information Dissemination	90	100	120	210	280	800
Advisory Committee	15	20	20	20	25	100
Project Reviews/Evaluations			30	40		70
Training	10	320	360	360	360	1410
Total	445	935	1340	1860	1620	6200

VI. ATTACHMENTS

A. Logical Framework

Goal

The goal of the Dryland Management Synthesis project is TO INCREASE FOOD PRODUCTION IN LDC's within the context of broad-based and equitable; social and economic development.

Measures of Goal Attainment
- Increased agricultural production.
- Improved agricultural trade balances.
- Increased farm income.

Means of Verification
- Host country statistics.
- A.I.D. statistics.
- Mission statistics.
- Other sources (World Bank, FAO, other donors)

Assumptions
- Agriculture will remain an important A.I.D. funded activity.
- All involved agencies will fulfill their commitments to the project.
- Host countries will have policies which support and encourage agriculture.
- Data available which will provide statistics for period prior to, as well as, during and subsequent to project life.

Subgoal

The subgoal of the project is TO INCREASE PRODUCTIVITY OF LDC DRYLAND FARMING SYSTEMS WITH MAINTENANCE OF THE NATURAL RESOURCE.

Measures of Subgoal Achievement
- Increased production in dryland agriculture.
- Increased use of improved practices in dryland systems.
- Decreased environmental degradation of natural resources.

Means of Verification
- Host country statistics.
- Farm surveys.
- Vegetation and soil erosion surveys.

Assumptions
- A.I.D. will fund dryland agriculture activities.
- Host countries will commit resources to assist farmers in dryland agriculture.
- Climatic conditions are reasonable.
- Data available.

Purpose

The purpose of this project is TO INCREASE HOST COUNTRY CAPABILITIES TO PLAN AND IMPLEMENT DRYLAND AGRICULTURAL MANAGEMENT PROJECTS/PROGRAMS.

End of Project Status

1. Country dryland management projects/programs are being conducted effectively.

A base of knowledge and experience with technologies to increase dryland production is being used.
Personnel trained in dryland management are implementing country projects.

Means of Verification

Assessments of country dryland sector.
Evaluations of dryland projects.
Monitoring of country dryland programs.

Assumptions

Host country support of improved dryland management program.
Effective implementation of project.

Outputs and Magnitudes

1. Technical support to the field.	1. At least 20 months of requests per year.
2. Country profiles of dryland activities and production constraints.	2. Profiles of at least 4 countries.
3. Training courses developed and conducted.	3. At least 5 courses conducted.
4. Field guides/handbooks.	4. At least 3 published and in use.
5. Information network.	5. Capability of responding to at least 20 requests for information weekly.
6. Pilot tests of technologies for increasing dryland productivity.	6. Pilot tests in at least 2 countries.

Means of Verification

Project records
Evaluations
Publications
Country records

Assumptions

All involved agencies will cooperate.
Project will be implemented effectively

Inputs

1. Implementing Entity involved in dryland agriculture activities.
2. A.I.D. management and cooperation.
3. A.I.D. Mission cooperation.
4. A.I.D. Funding.
5. LDC installations and personnel.

Implementation Target

1. Implementing Entity with capability to focus and access a significant number of personnel devoted to dryland agricultural systems.
2. A.I.D. project manager.
3. International advisory committee.
4. At least 6 countries desiring project involvement.
5. At least $6.2 million over 5 year LOP

B. BUDGET

INPUT BUDGET (000)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Salaries & Fees						
Core Staff						
Administrative-Technical	55	60	60	65	65	305
Technical-Training	20	25	25	30	30	130
Sec'y Clerical	15	35	40	45	50	185
Short-Term Staff						
Mission Support (120)	105	150	150	155	165	725
Assessments		60	70	105	105	340
Pilot Testing			140	300	140	580
Travel & Subsistence						
Mission Support	90	110	110	120	125	555
Assessments		65	75	110	110	360
Training	35	270	300	300	310	1215
Pilot Testing			140	280	140	560
Advisory & Management	20	30	60	60	50	220
Other	10	10	20	20	20	80
Information Dissemination						
Data Bases	60	30	20	20	20	150
Publications	10	20	40	110	160	340
Communication (reprints, etc.)	10	30	40	50	60	190
Other (postage, courier, telex)	10	20	20	30	40	120
Equipment & Supplies						
Field		10	20	40	10	80
Office	5	10	10	20	20	65
Total (all sources)	445	935	1340	1860	1620	6200
S&T Funding	445	555	1000	1000	1000	4000

C. Review by USAIDs

The project has been reviewed by Missions and Regional Bureaus.

Comments (Pre-81)

Africa

- Chad is interested but question the 30-day TDY limitation.

Asia

- India - a good idea
- Useful to field missions in Asia

Near East

- Need to consider the entire production system, not just the water management portion.

Latin America-Caribbean

- Bolivia - anticipates use of service
- Guatemala - would make effective use of service
- Colombia - strong support

DSB

- Define relationship to ICRISAT and Benchmark Soils Project
- This is a sound approach and I hope we have the courage to see it through.
- We need to go forward aggressively -- there is a need -- doubt that it is recognized so we'll have to be pushy.

Comments (Post-80)

Africa

- Kenya/REDSO-EA, there is a need for a project to assist with technology in the areas of dryland agriculture.
- USAIDs in Africa have supported dryland projects for decades. Much has been learned and we need to expand the knowledge base.
- The project duplicates Agr-Research and Methodology project with farming systems. IARCs have experience in problem identification and analyses.
- Agency should be beyond pilot testing stage as have been involved in dryland activities for 20 years.
- Re-do the project into a general technical service project.
- In favor of having a group of scientists to meet the needs of missions/host country, complement IARCs and widen the range of expertise - particularly from the Mid-Western states.

Niger

- Ag program is primarily rainfed or dryland.
- 99% of Niger's production is from dryland farming.
- Services needed will be provided under existing project.
- Concur with project's approach and believe this kind of activity is necessary.

Lesotho

- Have a current farming system: research project.
- Wish to be kept informed of project.

Cameroon

- Need actual dryland agriculture intervention, technical know-how and trained manpower.
- Do not support the project paper.

Sudan
- Mission is involved in dryland agriculture.
- CDSS indicated that Mission should concentrate efforts on traditional ag sector and leave irrigated to other donors.
- CID (Washington State) project is on adaptive research in dryland areas.

Swaziland
- Participation is not appropriate at this time.

Near East

Tunisia
- Parallels their current dryland research project.
- Have their focus on development of dryland ag.
- Believe that the key to future agriculture development is with dryland.
- Do not anticipate an additional requirement.

Morocco
- Has a dryland farming project.
- Unlikely that they would use short-term TA.
- Still a good idea.

Asia

India
- Such a project should be very helpful to many Missions.
- AID/I does not have a dryland project.
- May have need for TA for GOI drought program.
- Recommend that DSB move ahead as rapidly as possible.

Thailand
- Dryland is our highest priority.
- It is a well developed project.
- Wish to be included as a project participation.
- NE Thailand needs improvements in dryland practices to improve situation of the small farmer.
- Wish to support in any way possible immediate implementation of the project.

LAC

ROCAP
- Substantial areas with wet-dry rainfall patterns.
- Interest in problem identification surveys and adaptive research pilot testing.
- Project should cooperate with CATIE.

Non-Specific Comments

Upper Volta
- The case for addressing constraints to development of dryland sector is very strong.
- 80% of the work force depends on dryland agriculture.

ICRISAT would like to cooperate.

Other Missions have indicated interest in rainfed support.

In a review by Missions of DSB/AGR projects, Dryland Support consistently ranked in the upper one-fourth of the projects in importance to present and future AID activities in their country.

D. Scope of Work

1. Purpose

The purpose of the project is to increase host country capabilities to plan and implement dryland agricultural management projects/programs.

2. Objectives

The principal objectives of the project are:

a. To support and encourage international cooperation and collaboration of dryland agricultural development efforts.

b. To aid developing countries in the improvement of their in-country capacity to deal with dryland agriculture.

c. To provide improved, effective, efficient, and host country institutions in dryland agricultural management.

d. To provide a mechanism which can focus the existing expertise of the various institutions involved in dryland agriculture including universities, USDA, and institutes; and increase the base of expertise available for assisting US/AIDs and LDC institutions.

e. To develop a mechanism which will obtain, retrieve, disseminate, and diffuse a knowledge base for improving dryland agricultural production in LDCs.

f. To synthesize a transferrable technology and pilot test it in specific countries.

g. To provide for a long term commitment by AID to dryland agricultural development.

3. Organization

All specific project activities, discussed here, will be developed and coordinated by the Implementing Entity (IE) in consultation with the AID project manager and the Advisory Committee. The IE will have considerable previous experience in dryland systems and will be currently involved in dryland activities. The IE must have some current capability to respond to AID requests but must be willing to develop and define linkages with other institutions both domestic and international involved in dryland technology. These linkages will be described explicitly. The level of effort for the various activities will be dependent on the level of funding. If funds are insufficient for all activities, the IE and the AID project manager, with advice of the Advisory Committee, will determine priorities among the activities. The IE will also consult and work with USAID regional bureaus and missions as appropriate and necessary. Arrangements for such consultations will be made through the AID project manager. The IE and the AID project manager will make every effort to secure additional AID mission and host government support for specific country related activities. Such

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cost sharing will reduce costs to the centrally-funded project, thereby enabling the project to support a wider range of activities.

The IE will assign at least one full-time professional to management of this project. The individual will be selected and assigned as coordinator with approval of the AID project manager. That person will be technically qualified in some phase of dryland agriculture and have some experience in developing countries. He must have demonstrated considerable organizational and managerial skills. The operational (day-to-day) management of the project must be headquarted at a specific place but specific project activities may be allocated to participating organizations. It is essential to ensure that all project experiences are captured and recorded in a form that is useful later. All activities of this project should be accomplished in an interdisciplinary manner with inputs from soil science, agroclimatology, agronomy, agroforestry/ watershed management, agricultural engineering, agricultural economics, rural sociology/anthropology, and range/livestock management. The logistical problems of staffing, organizing, scheduling and implementing the many short-term overseas activities will require efficient administrative action. The technical professionals working on this project should not be required to handle these management-related activities. The operational management modes of the WMS and SMSS projects will be considered.

The IE will become knowledgeable with the AID project development system to facilitate communication with AID and better understand specific advisory and consulting assignments. It will also be necessary for the IE to understand other S&T/AGR projects closely related to this one. Specifically, the IE will become familiar with the Benchmark Soils, the Soil Management Support Service, the Soils CRSP, Sorghum/Millet CRSP, Bean/Cowpea CRSP, the Water Management Synthesis, Biological-N, and Farming System projects in the Science and Technology Bureau; and dryland agriculture projects in Regional Bureaus.

The IE will also become familiar with the dryland activities at International Centers. Especially important are ICRISAT, ICRAF, and ICARDA. Where, and whenever appropriate and possible; the IE should work directly with these centers in the accomplishment of the project specified activities which are listed below. It is expected that the domestic network in dryland technology will developed specific linkages with IARCs, AID missions, other international institutions as FAO, UNDP, UNEP, World Bank, and certain LDC institutions resulting in an international network for dryland management technology and development. Use of AID facilities is authorized when essential for the performance of the contract.

4. Activities

A. <u>Technical Assistance and Advisory</u>

(i) Short-Term TA

The IE will provide up to a minimum of 20 months of short-term technical assistance per year. Most of this assistance will be provided in response to USAID/host-country requests and will involve project

identification/design/monitoring/evaluation, dryland production system analysis, and sector surveys. The IE will also, upon request from AID/W or the regional bureaus, provide technical backstopping to specialists working on Mission dryland agriculture projects. The IE may also be requested to conduct special studies on specific technical problems, regional or global issues, or dryland investment strategies.

Although one-person and two-person teams will be used when appropriate, the management concept calls for an interdisciplinary approach requiring teams of specialists, able to deal effectively with all aspects -- socioeconomic, environmental, agronomic, engineering, etc.. Teams will be formed with other projects when appropriate. Technical assistance assignments will normally not exceed 4-6 weeks. While formal planning, through the development of work plans, is expected to identify most assistance needs well in advance, there will be special and urgent requests requiring immediate servicing which the IE will be expected to accommodate in an acceptable manner. The IE will submit a report on all technical assistance assignments.

The IE will establish and maintain an up-to-date roster of expertise in the U.S. with experience in dryland management available to the IE and other agencies or institutions working in this area. An inventory of professionals within the developing countries, with demonstrated expertise in dryland management and available for consulting within or outside their countries, will also be developed. The IE will make an overt effort to expand the base/roster of expertise in dryland agriculture both in the U.S. and in developing countries. Needed language skills will be addressed.

The IE is also to undertake an evaluation of the assistance performed under the contract, to be used internally to improve the quality of service provided.

(ii) Methodology Development and Problem Assessment

The IE will use the workshop method in a developing country to develop the initial set of methodologies for doing a diagnostic analysis of the dryland agriculture situation in a country. The procedures developed should have the benefit of the world's best experience. The workshop should be cooperative with the IARCs or other donor whenever possible. They should be generally 4-6 weeks in length and in response to a request from a host country through an AID mission.

It should draw from the SOTA, from what AID and contractors have learned from other dryland projects, and should be an interdisciplinary approach based on working cooperatively with farmers and local institutions. The methodology will be published and become part of the memory system of AID including the Farming Systems Project.

Using the methodology, the IE will determine constraints, describe present practices, and access available resources to increase dryland productivity in at least 5 countries. The methodology will be reviewed and refined after testing in two countries.

These country dryland agriculture profiles will be published in a form most useful to the host country and USAID. They should provide a valuable basis for the most effective strategy and action necessary to obtain immediate and long-term benefits by the host country.

B. Information System

The communication of knowledge and experience from one project, country or mission to another is of prime importance in the impact that can be obtained from technical assistance inputs. Effective training of individuals in improved dryland technology and the transfer of this technology to farms requires access to relevant information for the missions and the LDC institutions.

(i) State-Of-The-Art Update

This activity will involve a careful analysis of what is presently known about dryland agricultural management and what is going on in drylands developmental assistance worldwide. The 211(d) grant activities at Oregon State University and at the University of California, Riverside have accomplished a part of this activity. There is much more, however, which needs to be done; especially at the farm level in LDCs. Analyses will be made of farming practices and the rationale behind them in various ecological settings. The state-of-the-art will also include an analysis of bio-physical and socioeconomic constraints at the farm level and how the farmers cope with them. An appraisal will be made of AID's present portfolio of dryland agriculture projects to determine what is planned and how it is to be accomplished. A similar appraisal will be made of other donor and multilateral aid programs, including International Centers, concerned with problems relating to dryland agriculture in semiarid areas. Recommendations will be offered on areas of better coordination between AID and the IARCs on dryland management. Gaps in current research or technical information should be identified and research priorities suggested for an AID and IARCs focus.

This will also include a study and description of technological packages for dryland agriculture and an analysis of the conditions under which each could be successfully implemented. This activity will contribute information basic to selecting technologies to be pilot tested. The IE is expected to keep abreast of new activities within AID, FAO, and other donor agencies and provide a mechanism for incorporating these activities into a "memory" for AID.

(ii) Publications and Reports

The IE will develop and keep current a network of professionals directly involved in international dryland agriculture and provide 2-4 professional newsletters per year to the mailing list. The newsletter will be of professional quality and contain information about innovations in dryland agriculture, reviews of useful publications in the field, and highlights of current dryland issues. The newsletters will be in easy-to-read English and will be provided without charge to AID and host country users. Actual numbers, frequency of publication, and need for other languages will be reviewed by the Advisory Committee and will be reflected in the work plans.

The IE will publish at least two technical manuals or handbooks and one planning guide on subjects dealing with increasing productivity in dryland agriculture. Subjects will be selected by the IE and the AID project manager with the advice of the Advisory Committee. These guides and handbooks will emphasize the "how to" rather than theory and background material. Each guide or handbook will address the pros and cons of the use of the technology under various conditions. The users of these planning guides will be nontechnical personnel responsible for planning; while the handbooks will be for technical personnel responsible for implementing technologies. The guides and handbooks should also be useful to technicians and field staff. The IE should prepare the field guide in easy-to-read English of about the 12th standard. Both handbooks and guides will be presented in clear and concise language with appropriate illustrations to help readers use the material effectively. They will be printed in English, French, and Spanish. Actual numbers to be printed will be decided by the IE and AID project manager.

The IE may also be asked to prepare "concept" or "strategy" papers explaining various economic, social, and technical aspects and their interactions with dryland production systems. The subject matter will be approved by the AID manager for an audience of resource or environmental planners.

All technical reports or training packages shall be approved by the AID project manager prior to publication.

The IE will prepare a brochure which briefly describes the project and all outputs.

The IE will work with the National Agricultural Library (NAL,USDA) and S&T/DIU to develop a mechanism that will provide rapid delivery of requested information to the field. Existing databases of prime importance to dryland agriculture and any new databases will be made compatible with NAL's AGRICOLA system. The IE will ensure that resource materials are expanded to the point necessary for effective communication with trainees and LDC professionals. Resources will be announced or reviewed in the newsletter.

C. Training

This component is an important part of the project and the IE will be expected to devote a considerable amount of time to dryland management training; including the development of new courses, training materials, and audiovisual modules; as well as the conducting of in-country training courses in those LDCs requesting them and in a position to utilize them effectively.

(1) Diagnostic Analysis Workshops

The IE will conduct at least four diagnostic workshops on the methodology of assessment and analyses of dryland agricultural constraints. These will be held in the various AID regions and will be closely coordinated with ICRISAT and ICARDA. The workshops will train individuals for continual assessment, evaluation, and planning of the dryland sector with diffusion of improved technology to the farmer. The training will particularly stress hands-on practical field experience. The workshops will

also provide a forum for discussion of successes and failures of programs in different countries.

(ii) Short Courses/Seminars

If requested by AID and approved by the AID project manager, the IE will organize and conduct short courses and/or seminars on subjects related to management of resources in dryland agriculture. The IE will provide professionally edited proceedings for all participants and sufficient copies for distribution through the transfer network. A formal evaluation of each seminar will be conducted by an evaluator designated by AID. FAO, international banks, and other donor agency cooperation will be sought in order to maintain close collaboration of an international level. The participants will be from LDC supervisory personnel who are responsible for agricultural policy, administration, training, and operation. The IE will publicize the workshop, seminar or short course through a special brochure and the newsletter. The IE will be expected to make all arrangements for these workshops. All travel costs and per diem for invited LDC participants will be covered by the DMS. The principal participants are to be LDC professionals. The only developed country experts would be those located in LDCs.

(iii) Evaluation of Training Courses

The IE will evaluate courses developed by other organizations, assessing their success and suitability to the needs and orientation of this project. The IE will accomplish this by acquiring training materials from others offering training programs and will evaluate their usefulness for transfer to LDCs. Training materials found appropriate will be highlighted in the newsletter on a regular basis.

(iv) Short-Term Non-Degree Training

Each year, for the duration of the project, the IE will make available a short course offering special discipline training for trainers and/or directors of host country training programs. The training is for one but not more than two semesters and will focus on special disciplinary and training skills. The contract will cover all costs of the training.

(v) Development of Audio-Visual Materials

The IE will develop, on an experimental basis, audio or video modules which can be used in LDC dryland management training programs and universities. The modules will focus on how-to-do field methodologies and dryland management concepts needed for diagnosis and improvement of farm systems. The modules should be about 25 minutes in length. The modules will be used in the training courses and evaluated for wider use.

D. Pilot Testing/Case Countries

After analysis of at least four countries, a longer term relationship between the IE and several countries will be developed. This activity will involve selecting and testing technologies for increasing dryland production. The selection will be based on the analysis and the review of the success/failure rates of various technologies identified with involvement of the host government institutions and farmers. The IE will serve as a consultant during pilot testing. It is essential that the

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consultant spent sufficient time in the field to fully understand the socioeconomic problems of technology application and to develop a working relationship with LDC technicians and agriculture leaders in the pilot test area.

The final output of this activity will be the development and refinement of a program to implement field tested improvement technologies, on a large scale (many small farms over a large area).

E. Implementing Entity Reporting

(i) Annual Work Plans

Annual work plans will be prepared by the IE in consultation with the AID manager. These are used as a management tool for scheduling specific activities which require close coordination with USAID missions. Activities are sequenced in the work plans and specific tasks are assigned to specific project staff. The AID project manager will assist with the work plan preparations and these plans are to be completed at the beginning of each contract year.

(ii) Annual Reports

Within 60 days after completion of each 12 months of project activity, 50 copies of an annual report will be provided to AID/Washington. Other copies are to be distributed to appropriate dryland institutions worldwide.

(iii) Travel

All travel must be approved by the AID project manager (S&T/AGR/RNR). Clearance must be obtained from AID missions and Regional Bureaus before travel commences. Within 10 days of termination of travel, a trip report will be submitted to the AID project manager.

(iv) Personnel

The IE will submit to the AID project manager a written quarterly report or statement indicating the personnel who participated on the project during that quarter, the amount of time each devoted to the project, and the activities each worked on.

The IE shall submit three copies of all reports produced under this contract to the Documentation Coordinator, S&T/DIU, Agency for International Development, Washington, D.C. 20523, or his designee. These reports include those which are technical, administrative, evaluative, annual, final and other reports which may be produced during the life of the project. These reports shall have a title page showing the title of the report, project title as set forth in this contract and the contract number. One copy of each report shall be clearly typed or printed on white paper so that it may be photographed to produce a micro-film master. Technical reports shall be accompanied by an author-prepared abstract.