PD-AAX-536

UNCLASSIFIED

AGENCY FOR INTERNATIONAL DEVELOPMENT

Washington, D. C. 20523

PROJECT PAPER
AMENDMENT #4

MOROCCO: Dryland Agriculture Applied Research (608-0136)

March 9, 1988

UNCLASSIFIED

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: C (A = Add, C = Change, D = Delete) — Amendment Number: 4 — DOCUMENT CODE: 3

2. COUNTRY/ENTITY: Morocco

3. PROJECT NUMBER: 608-0136

4. BUREAU/OFFICE: Asia Near East — 03

5. PROJECT TITLE (maximum 40 characters): Dryland Agriculture Applied Research

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 08 DD 31 YY 94

7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4)
A. Initial FY 78 B. Quarter 4 C. Final FY 94

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

A. FUNDING SOURCE	FIRST FY 78 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	2096		2096	50,000		50,000
(Grant)	(2096)	( )	(2096)	(50,000)	( )	(50,000
(Loan)	( )	( )	( )	( )	( )	(
Other U.S. 1.						
Other U.S. 2.						
Host Country		1300	1300		28,000	28,000
Other Donor(s)						
TOTALS	2096	1300	3396	50,000	28,000	78,000

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	121	023		20,687		23,677		50,000	
(2) ESF				5,636					
(3)									
(4)									
TOTALS				26,323		23,677		50,000	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 021 | 073 | 312 | 963

11. SECONDARY PURPOSE CODE

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

A. Code	BS	R/AG	TECH	EQTY			
B. Amount							

13. PROJECT PURPOSE (maximum 480 characters)

To establish a sustainable applied research capacity that is relevant to the dryland farming systems and natural resource constraints of the 250-450mm rainfall region of southern Morocco, and capable of providing technologies to improve farmer productivity.

14. SCHEDULED EVALUATIONS
Interim MM 08 YY 90 | MM YY | Final MM 06 YY 94

15. SOURCE/ORIGIN OF GOODS AND SERVICES
[X] 000 [ ] 941 [X] Local [X] Other (Specify) 935 Vehicles

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a ___ page PP Amendment.)
This Amendment increases LOP funding by $23, 676,600 to finance 72 additional person years of resident technical asssitance, 84 person months of short-term technical assistance, 7 MSc and 19 PhD training programs, and additional short-term training. This Amendment also extends the PACD to August 31, 1994.

USAID/Morocco Controller's approval of proposed methods of implementation and financing. Signature: Richard Warm Title: Controller

17. APPROVED BY
Signature: Charles G. Johnson
Title: Director USAID/Morocco
Date Signed: MM 03 DD 09 YY 88

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

AID 1330-4 (8-79)

TABLE OF CONTENTS

		PAGE
	Action Memorandum to the Mission Director	i
	Project Authorization Amendment	iv
	List of Project and Mission Review Committee Members	v
	Acronyms	vi
	Project Map	vii
I.	SUMMARY AND RECOMMENDATIONS	1
	A. Summary of Project Background	1
	B. Summary of Project Rationale	1
	C. Summary of Project Description	1
	D. Summary of Financial Plan	3
	E. Recommendations	3
II.	PROJECT BACKGROUND AND RATIONALE	5
	A. Problem Statement	5
	B. Relationship of Project to AID Strategy in Morocco	6
	C. The Dryland Agriculture Applied Research Project - Progress to Date	7
III.	DETAILED PROJECT DESCRIPTION	10
	A. The Aridoculture Center as a Model	10
	B. Project Components	11
	C. AID Financed Project Inputs	25
IV.	PROJECT FINANCIAL PLAN	35
	A. Budget Overview	35
	B. GOM Budget Overview	35
	C. Other Potential Project Activities	38
	D. GOM Contribution	38
	E. Disbursement Procedures	39
V.	IMPLEMENTATION PLAN	42
	A. Implementation Arrangements	42
	B. Illustrative Implementation Schedule	42
	C. Procurement Plan	44
	D. Monitoring and Evaluation Plan	45
VI.	PROJECT ANALYSES	50
	A. Institutional Analysis	50
	B. Social Soundness Analysis Summary	53
	C. Economic Analysis	54
	D. Technical Analysis	59
VII.	CONDITIONS PRECEDENT AND COVENANTS	64

ANNEXES:

Annex 1: Logical Framework

Annex 2: GOM Request for Assistance

Annex 3: Statutory Project Checklist

Annex 4: Action Memoranda for the Administrator for Ad Hoc Redelegation of Authority to Amend the Project and Sole Source Waiver

Annex 5: Cable to Mission granting ad hoc redelegation and waiver

Annex 6: Initial Environmental Examination

Annex 7: Vehicle Waiver

Annex 8: Social Soundness Analysis

Annex 9: Back-Up Tables and Justification for Budget

Annex 10: Bibliography

Annex 11: Summary of Baseline Survey

APPENDICES: (available in the official file at the Mission.)

Appendix 1: Report of the MIAC/INRA/USAID Research Design Team

Appendix 2: Report of the MIAC/INRA/USAID Design Team on Technology Transfer: Issues and Concepts for the Extended Aridoculture Project

Appendix 3: Report of the MIAC/INRA/USAID Institutional Sustainability Team

Appendix 4: Report of Community Systems Foundation (CSF): An Implementation Plan for Programming by Objectives at INRA

DRYLAND AGRICULTURE APPLIED RESEARCH PROJECT

(608-0136)

PROJECT PAPER SUPPLEMENT

USAID/MOROCCO

FEBRUARY, 1988

ACTION MEMORANDUM FOR THE USAID/MOROCCO DIRECTOR

DATE: March 7, 1988

FROM: Kenneth G. Schofield, Supervisory Program Officer

SUBJECT: Dryland Agriculture Applied Research Project (608-0136)

PROBLEM:

Your approval is requested for the Project Paper Supplement and the Project Authorization Amendment for the Dryland Agriculture Applied Research Project (608-0136).

DISCUSSION:

The Moroccan Dryland Agriculture Applied Research Project is designed to establish an applied agronomic research program in the dryland region of Morocco, capable of generating technologies to raise farmer productivity.

The Project Agreement was initially signed with the Government of Morocco in 1978, for a LOP funding level of $4,500,000 and a PACD of August 31, 1983. Mid-America International Agriculture Consortium (MIAC) was selected as the principal contractor, with the Institute of Agronomic Research (INRA) as the implementing agency. Then, in 1981, Morocco was hit by severe drought. While research trials were planted beginning in 1981, there were four successive crop failures due to the worst drought conditions in the last 300 years. Hence, there were no significant research results during this period although progress was made in establishing an effective regional research station at Settat (the Aridoculture Center). The first project evaluation took place in 1983. Inspite of the lack of research results to date, the evaluation team determined that there was a great potential for important research to be conducted in the region and that the institution building activities to date had been impressive. Hence, they recommended greatly increasing the project resources and extending the LOP. Consequently, the project was extended to August 1988 and funding was increased to $26,323,400. The expanded project provided additional technical assistance and related funding to enable a more complete treatment of the identified constraints for increasing agricultural production and improving productivity in the semi-arid zones.

In May 1986, a second evaluation was conducted to determine the extent to which the project's purpose and goal were being achieved. The evaluation found that the project had made significant strides and recommended that it be continued past the PACD both to permit the completion of planned activities included in the 1983 design as well as the addition of new research and transfer of technology activities consistent with the project's purpose and goal. The evaluation also recommended that more actions be taken to assure the institutional sustainability of the Aridoculture Center. The evaluation asserted that an extension of the project also was justified because promising research results had been obtained in several areas. In particular, a Hessian fly resistant wheat variety had been developed which promised to significantly increase production, the value of which would in itself more than pay for the project investment.

USAID/Morocco reviewed and approved these recommendations. USAID/Morocco then requested a sole source waiver to continue the services of MIAC to design and implement the project amendment under the collaborative assistance mode. This waiver was approved by the Counselor on February 12, 1987.

USAID/Morocco also requested an Ad Hoc Redelegation of Authority from the Administrator to amend the project. That Redelegation of Authority was granted to you in 87 State 79207, authorizing you to increase AID funding to a maximum of 50 million dollars and to extend the PACD from ten years to a maximum of twenty years.

USAID/Morocco then contracted with an eight-person MIAC design team who, in close collaboration with both INRA and USAID, designed project activities which comprise the attached Project Paper Supplement.

The goal and purpose of the project remain unchanged from that which was proposed in the original project paper. Both have been restated, however, for clarity.

The project goal is to increase food production in order to meet the needs of Morocco's fast growing population and to improve the income of farmers with small and medium sized land holdings.

The project purpose is to establish a sustainable applied research capacity relevant to the dryland farming systems and natural resource constraints of the 250-450mm rainfall region of southern Morocco, and capable of providing technologies to improve farmer productivity.

Under this project extension AID will add 72 person years of resident technical assistance, 84 person months of short-term technical assistance, 7 M.Sc. and 19 Ph.D. training slots, and additional short-term training. AID will increase its contribution by $23,676,600, bringing the total AID life of project contribution to $50,000,000. The GOM will increase its contribution

by the dirham equivalent, of $16,295,000, bringing its total contribution to the equivalent of $28,231,400. The PACD is being extended by six years until August 31, 1994. Project activities fall into three categories: (1) research; (2) transfer of technology; and (3) institutional sustainability. Institutional sustainability activities are especially important because the Aridoculture Center must be a self-sufficient organization by the PACD, when USAID support ultimately ends.

Under the project extension, vehicles of non-American source and origin will be purchased. A source and origin waiver for procurement of vehicles and spares from geographic code 935 in an amount up to $520,000 was granted by the AA/ANE on February 9, 1988. This waiver was conveyed to the Mission in State 042002.

RECOMMENDATION:

That, according to the authority granted to you in 87 State 79207 by the Assistant Administrator of the Asia and Near East Bureau, you sign the Project Paper Supplement Data Sheet and the attached Project Authorization Amendment, thereby increasing life-of-project funding from $23,323,400 to $50,000,000 and extending the PACD from August 31, 1988 to August 31, 1994.

APPROVED: Charles W. Johnson DATE: March 9, 1988 DISAPPROVED: _____

Charles W. Johnson
Director

PDO:RThompson:ubg RDT

Clearances:
DADO:RStryker RBS
ADO:REhrich RBS
CONT:RWarin
RLA:RMeighan RM
D/DIR:JBallantyne

AMENDMENT NO. 3 TO PROJECT AUTHORIZATION

Name of Country: MOROCCO

Name of Project: Dryland Agriculture Applied Research

Number of Project: 608-0136

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, the Dryland Agriculture Applied Research Project for Morocco (Cooperating Country) was authorized on June 30, 1978. That Authorization was amended on August 31, 1983 and on July 8, 1987.

2. The purpose of this amendment is to increase life of Project Funding to $50,000,000, and to extend the life of the Project by six years. Paragraph 4 of the amended Authorization is deleted in its entirety and the following paragraph inserted in lieu thereof:

   "Pursuant to Sections 103 and 531 of the Foreign Assistance Act of 1961, as amended, I hereby authorize an amendment to the Dryland Agriculture Applied Research Project for Morocco involving planned obligations of not to exceed $50,000,000, in grant funds over a sixteen year period from date of initial obligation subject to the availability of funds in accordance with the A.I.D./OYB/allotment process, to help in financing the foreign exchange and local currency costs for the project as amended."

3. All other provisions of the Authorization, as amended, remain in full force and effect.

Charles W. Johnson
Charles W. Johnson
Director

Date: March 9, 1988

LIST OF PROJECT DESIGN AND MISSION REVIEW COMMITTEE MEMBERS

Project Design Committee

Ronald Stryker, Chairman	Deputy Agricultural Development Officer
Randal Thompson	Project Development Officer
Pamela Callen	Budget and Fiscal Officer
M'Hamed Hanafi	Agricultural Project Officer
James Smith	Program Economist

Mission Review Committee

Charles W. Johnson	Mission Director
Janet C. Ballantyne	Deputy Director
Kenneth G. Schofield	Program Officer
Rollo Ehrich	Agricultural Development Officer
Dale Gibb	Population and Health Officer
Stephen Klein	Energy Officer
Robert Meighan	Regional Legal Advisor
Barnett Chessin	Executive Officer
Richard Warin	Controller

LIST OF ACRONYMS

ACSAD	The Arab Center for the Studies of Arid Zones and Dry Lands
AEIC	Agro-Economic Information Center (equivalent to AIRC)
AID	Agency for International Development
AIRC	Agricultural Information Resource Center - Settat (Centre de Conjoncture)
ANAFID	National Association for Land Consolidation, Irrigation and Drainage (Association Nationale des Améliorations Foncières de l'Irrigation et du Drainage)
ANE/TR/ARD	Africa and Near East Bureau/ Technical Resources Office/ Agriculture and Rural Development
CDN	National Documentation Center (Centre de Documentation National)
CDSS	Country Development Strategy Statement
CIMMYT	International Maize and Wheat Improvement Center
CT	Extension Center (Centre de Travaux)
CRSP	Cooperative Research Support Project
CRED	Centre Regional des Engagements et des Depenses
DAARP	Dryland Agriculture Applied Research Project
DDR	Division of Development Resources (Direction du Development Rural)
DPA	Provincial Level Agricultural Office (Direction Provincial d'Agriculture)
FAO	Food and Agriculture Organization
FSIP	Farming Systems Infrastructure and Policy
FSR	Farming Systems Research
FSR/E	Farming Systems Research/Extension
GOM	Government of Morocco
GNP	Gross National Product
IANR	Institute of Agriculture and Natural Resources
ICARDA	International Center for Agricultural Research in Dry Areas
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
INRA	National Agronomic Research Institute (Institut National de la Recherches Agronomique)
ISNAR	International Service for National Agricultural Research
IAV	National Agronomic and Veterinary Institute (Hassan II Institut National Agronomique et Veterinaire)
LOP	Life of Project
LDC	Less Developed Countries
MARA	Ministry of Agriculture and Agrarian Reform (Ministre de l'Agriculture et de la Reforme Agraire)
MIAC	Mid America International Agricultural Consortium
MOU	Memorandum of Understanding
PACD	Project Assistance Completion Date
PBO	Programming by Objective
PE	Professional Engineer
PT	Participant Trainee
SR/CRSP	Small Ruminant/Cooperative Research Support Project
TA	Technical Assistance
TRC	Technical Resource Center
UNL	University of Nebraska-Lincoln
USAID	United States Agency for International Development

PROJECT MAP

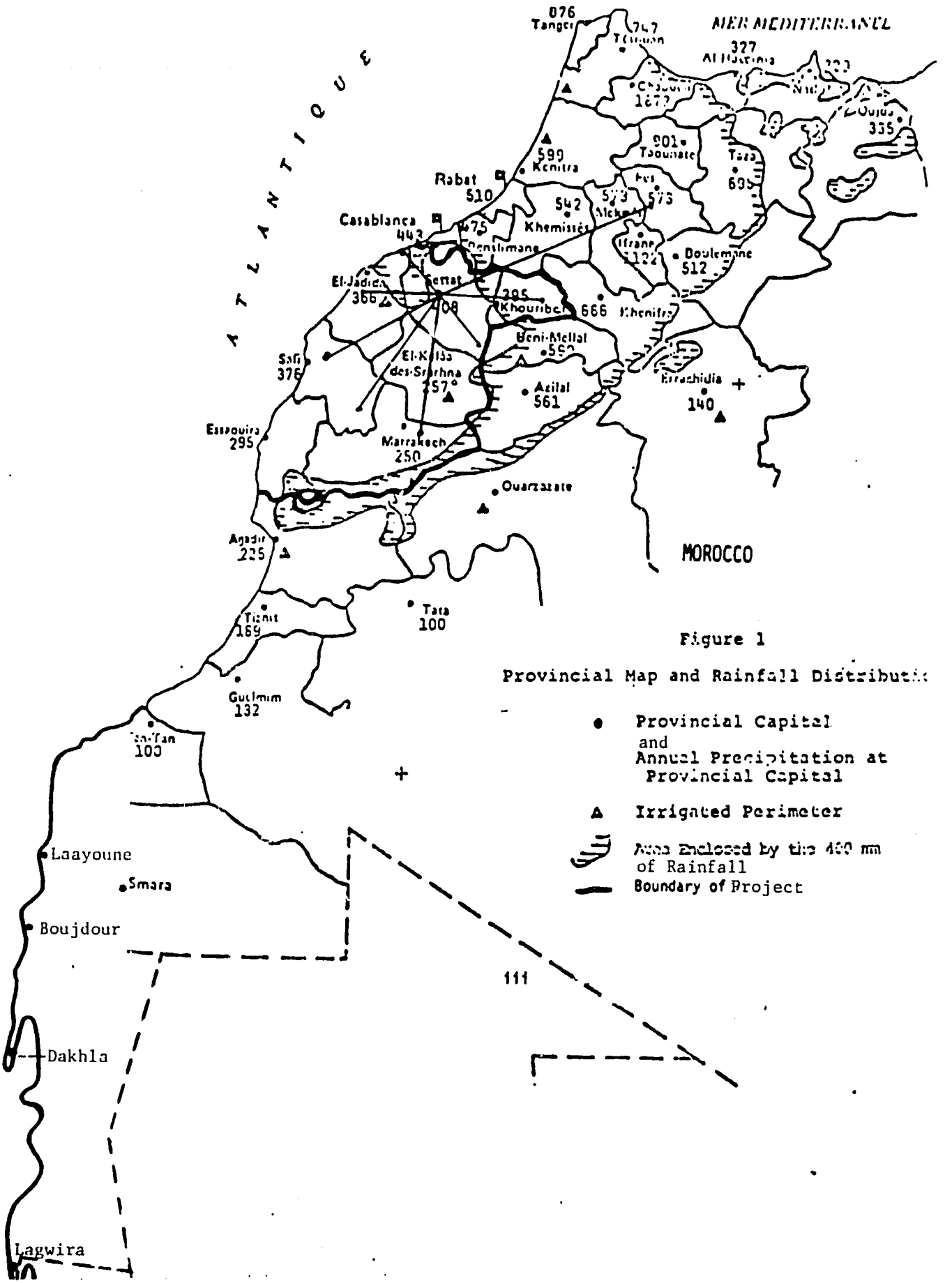


Figure 1

Provincial Map and Rainfall Distribution

- ● Provincial Capital and Annual Precipitation at Provincial Capital
- ▲ Irrigated Perimeter
- Area Enclosed by the 400 mm of Rainfall
- Boundary of Project

I. SUMMARY AND RECOMMENDATIONS

A. Summary of Project Background:

Morocco faces a serious crisis in agriculture. Persistent drought, poor soil conditions, and lack of appropriate technologies, coupled with a high population growth rate, have forced Morocco to rely increasingly on food imports. Food crop production in the dryland, semi-arid regions of Morocco, which in a normal year contributes almost half of Morocco's cereal production, has stagnated since 1970.

AID has been working with the GOM to overcome constraints to agricultural productivity in the southern, semi-arid, dryland region of the country through the Dryland Applied Agricultural Research Project, authorized in 1978. With support from the Mid-America International Agricultural Consortium (MIAC), the GOM's National Institute for Agricultural Research (INRA) has established the Aridoculture Center at Settat. The Aridoculture Center has made great strides in developing crop varieties which are disease, insect and drought resistant; improved cultivation practices; and appropriate mechanized equipment for the dryland regions.

B. Summary of Project Rationale:

Due to the persistence of drought in the target region, the Aridoculture Center is still in the early stages of development. The first years of the project focused on getting the critical mass of human and physical resources in place, as well as on establishing promising research areas. Both the nascent institutional framework and early research results show promise that the Aridoculture Center can become a critical force in solving the problems of the dryland farmers. However, several more years of AID support are needed to bring staff and facilities to appropriate levels so that the Center will have the capability to utilize its resources effectively and meet farmer needs.

C. Summary of Project Description:

This Project Paper Supplement will extend the project by six years to August 31, 1994 and increase AID life-of-project funding by $23,676,600 to a total of $50,000,000. The GOM will increase its contribution by the Dirham equivalent of $16,295,000 bringing its contribution to the equivalent of $28,231,400.

The goal of the project is to increase food production in order to meet the needs of Morocco's fast growing population and to improve the income of farmers with small and medium sized land holdings.

The project purpose is to establish a sustainable applied research capacity relevant to the dryland farming systems and natural resource constraints of the 250-450mm rainfall region of southern Morocco and capable of providing technologies to improve farmer productivity.

The project extension will provide inputs to strengthen the research programs, focus and upgrade the technology transfer program, and ensure the institutional sustainability of the Center. AID will add 72 person years of resident technical assistance, 84 person months of short term technical assistance, 7 M.Sc. and 19 Ph.D. training positions, additional short term training, and commodities.

Outputs of the project will include:

1. A functioning and sustainable Regional Research Station at Settat (the Aridoculture Center);

2. A functioning and sustainable network of supporting satellite research substations for the Center;

3. A functioning management system in place to carry out effective research programs and develop budgets, accountability and evaluation;

4. Agronomic technologies and farming systems practices developed that are appropriate to small and medium scale dryland farmers;

5. Farming equipment developed that is suitable for small and medium-scale farmers;

6. A functioning and sustainable technology transfer unit that is transmitting new technology information to clients;

7. Direct links between researchers and representative farmers established that provide a) basic understanding of targeted farming systems, b) baseline information for evaluation and feedback of research programs and c) a model for evaluating economic and social viability of alternative technologies.

Largely as a result of GOM construction efforts, the Aridoculture Center will have an adequate physical plant by 1994 including modern research laboratories, technical reference and micro-computer centers, greenhouses, repair shops, and office space. The facilities of two satellite research sub-stations have been upgraded and improvements to the remaining three stations are being made.

D. Summary of Financial Plan:

Project Expenditures under the extended project are projected to be as follows:

($000)

Budget Line Item	AID	GOM
Technical Assistance	15,420	
GOM Salaries		6,330
Training	1,681	72
Commodities	2,796	1,500
Operations	2,080	3,906
Construction		1,898
Inflation	2,907	2,589
Evaluation/Audit	140	
Contingency	862	
Total	25,886*	16,295

* Total includes approximately $2.2 million of the existing project unearmarked funds; project total is being increased by $23,676,600 by this amendment.

E. Recommendations:

The USAID Project Committee has determined that the proposed activities are technically, administratively, and financially feasible within the six-year extension and recommends the approval of this Project Paper Supplement.

AID/Washington raised several issues when they approved a redelegation of authority to the USAID/Rabat Mission Director to authorize the Project Amendment (State 79207- see Annex 5). These included: (1) to adequately cover policy constraints in agriculture which may affect project outcome; (2) to insist on a flexible contracting mechanism which will allow for contracting with other than MIAC entities when required to adequately complete project activities; (3) to consider adding research activities which are not already in the earlier Project Paper or amendment; and (4) to delineate, in the Project Paper Supplement, expenditures over a specified time frame and address both tight budgets and constraints now prevalent for development assistance activities. These issues have been dealt within the project Paper Supplement in the following way:

(1) Policy Constraints: The major policy constraints deal with (a) inadequate investment in the rainfed sector (especially cereals production), (b) inadequate research and extension investment by the GOM, (c) operational budget support by the GOM, (d) pricing incentives to farmers. Constraint (a) is directly addressed by resources provided by this project and the Title I program. Constraint (b) is addressed by USAID and World Bank efforts to augment research and extension. Constraint (c) is addressed in Section IV of this paper. Constraint (d) is being addressed through the World Bank's Agriculture Sector Loan II and USAID's Planning, Economics, and Statistics project.

(2) Flexible Contracting: A flexible contracting mechanism has been, and will continue to be employed with MIAC. Funds will be available for contracting with other entities as required. For example, the programming by objectives activity will be subcontracted by MIAC. A grant with CRS to develop a thresher machine is currently being funded under the project. Other project activities for which MIAC does not have a comparative advantage will be contracted with other organizations.

(3) Additional Activities: The amended project does include additional activities not included in the previous Project Paper (Amendment 3) which are consistent with the goal and purpose of the project. These are described in Section III of this paper.

(4) Budget Constraints: The Project Paper Supplement delineates expenditures over a specified time-frame of six years. Tight budgets are addressed both on the USAID and the GOM side. The budgets were derived based on expert analyses and projections of the minimum funding required to support proposed research programs. If funding levels drop moderately, the project would shift some technical assistance positions and commodities to the out years. However, this would contradict the phase-out plan and training schedules. If funding levels drop drastically, the project would need to consider eliminating programs altogether.

II. PROJECT BACKGROUND AND RATIONALE

A. Problem Statement.

Agriculture is the dominant employment sector in Morocco's economy, although it contributes only approximately 16% to the GDP. 55 percent of the country's population lives in rural areas and, despite a steady outmigration of rural inhabitants to the city, agriculture will continue to be the largest single employer of labor well into the next century.

Moroccan agriculture is under pressure from a rapidly expanding population to improve its efficiency and increase its production capability. Domestic demand for cereals, the primary staple in the Moroccan diet, is growing at an average rate of 2.5 percent per year. Domestic demand for food legumes and vegetables is increasing at even faster rates, with annual averages of 4.5 and 3.5 percent respectively. Recent performance of the agricultural sector in the face of this production challenge has been disappointing.

During the 1960s, Moroccan agriculture grew at an average rate of 3.6 percent per year. In the 1970s and early 1980s, however, the growth rate for the sector slid to around 1.2 percent. Although production of some crops, particularly irrigated crops such as citrus, sugar beet, and sugar cane, has increased, production of dryland crops has been stagnating and, in some instances, declining. The case of cereals is illustrative. Currently, yields in the drylands are less than one ton per hectare. Projections made for the period 1980 through the year 2000 indicate that under existing conditions cereal production increases will average 0.7 percent per year. Given the projected 2.5 percent annual increase in demand, there could be a gap of almost 5 million tons between production and consumption in the year 2000.

Poor agricultural yields have also been a handicap to Morocco's livestock production capability. Livestock production is an integral part of agriculture in the dryland regions. Animals consume cereal crop residues while forage production may be part of a crop rotation cycle. Inadequate quantity and quality of forage lead to less meat, milk, and wool production, lower reproductive rate, and decreased resistance to parasites and disease. Livestock production is especially important to low income farmers. Those with less than ten hectares of land own 78.3 percent of the country's cattle, 63.6 percent of the sheep, and 84.4 percent of the goats. Generally, the drier the year, the more grain producers rely on their livestock to generate cash. In this way they attempt to stabilize family income and reduce the ever present risk associated with dryland crop production.

Agriculture in the semi-arid region faces serious constraints. As compared with the more favorable areas, rainfall is much more erratic in amount and distribution through the growing season. Years of marginal crop production are quite common. Soils are frequently shallow with low moisture storage capacity. Mechanization that is well adapted for the better rainfed areas is frequently inappropriate for the semi-arid dryland conditions, often wasting scarce soil moisture. Inputs such as fertilizer, improved seeds, and pest control techniques, which can increase yields, require a financial outlay which may be lost in case of a crop failure. Risk is inherently greater.

9

One of the most commonly cited reasons for the less than optimal performance of the dryland sector is past government investment priorities. Since independence in 1956, the GOM has emphasized the development of an irrigated production capability with the intention of satisfying domestic sugar demand and increasing foreign exchange earnings through the export of citrus and vegetables. As a result, irrigated agriculture has benefited disproportionally from government price supports, subsidies, and services. Moreover, most of the agricultural research conducted in Morocco has centered on irrigated crops. Little has been done to develop or adapt technologies that would be of value to the dryland farmer. Consequently, problems such as inferior crop varieties, faulty crop and soil management practices, and unsuitable tillage, planting, and harvesting equipment, combine to mitigate against higher and more stable crop yields in the dryland regions. The present system of price supports for bread wheat fails to provide adequate incentives to producers, so that despite a clear comparative advantage in wheat production, production in Morocco continues to stagnate, declining in per capita terms.

Concerned with the low dryland crop yields, in the early 1980s, the GOM increased the budget allocation to dryland agriculture. Moreover, the GOM increased support for dryland agricultural research, recognizing that the development of an indigenous capability is critical to revitalizing the production capability of the semi-arid regions of the country.

The GOM also recently began to promote mechanization. Access to credit for purchase of machinery has increased; machinery repair shops have been made eligible for special credit concessions; and duties and taxes on tractors, combines, and other agricultural equipment have been greatly reduced. Unfortunately, the country's unique combination of soils and climate makes it difficult to directly transfer a significant percentage of the equipment developed outside Morocco. Many of the benefits of GOM policy changes for mechanization are not being realized because the research base for the adaptation and development of appropriate farm equipment is not in place.

B. Relationship of Project to AID Strategy in Morocco.

The important contribution of Morocco's semi-arid region to the country's agricultural production was recognized and documented in 1976 in studies prepared for USAID. These studies ultimately led to the planning and initiation of the Dryland Applied Agricultural Research Project (DAARP) in a region lying between Casablanca and Marrakech, Essaouira and Oued Zem. [1] The region contains about half of the nation's arable land. The agriculture of the region is characterized by integrated cropping-livestock systems.

[1] Boundaries were redefined in PP amendment no. 3 as being between 250 and 450 mm annual rainfall. This covers the crop land of about 40% of Ben Slimane, 30% of Beni Mellal and all that of Casablanca, El Jadida, El Kalaa, Essaouira, Khouribga, Marrakech, Safi and Settat provinces.

9

In spite of low average yields, in 1985, the 2.3 million hectares of cereal in the project area produced 45% in the nation's cereal crop, including over 27% of the wheat, 56% of the barley and 83% of the corn. The potential for increased production is substantial. Yields of 2 to 3 tons per hectare have been demonstrated utilizing appropriate technologies. However, if such potential is to be realized solutions for major production problems must be found. It was with this potential and these needs in mind that the DAARP was designed. Its aim was and continues to be to bring modern agricultural research techniques to bear on the problems of the region and to turn research results into practical techniques and technology that can be used by the farmer.

The Dryland Agriculture Applied Research Project is complemented in the USAID/Morocco portfolio by the Agronomic Institute Project (608-0160) which is designed to assure that highly trained manpower will exist to meet the professional needs, including research, of Moroccan agriculture, and by the PL 480 Title I Program through which increased budget allocations to the dryland sector are supported. Data generated under DAARP contributes directly to the successful implementation of the Planning, Economics, and Statistics Project (608-0182). The objective of this project is to strengthen the capacity of the Ministry of Agriculture to collect and analyze agricultural data and to use the analyses as the basis for policy formulation.

Other donors are also active in the agricultural research sector. The West Germans have a $2 million program with INRA to increase forage plant production and a $3 million program with the Agronomic and Veterinary Institute to improve agricultural machinery. The World Bank and the GOM are currently planning a $28 million program to support agricultural research and to upgrade the extension service. In addition, the World Bank has provided a $100 million dollar loan to the Agricultural sector and finalized negotiations for a second agricultural sector loan of $225 million focussing on policy constraints in the agricultural sector.

C. The Dryland Agriculture Applied Research Project: Progress to Date:

The Dryland Agriculture Applied Research Project was authorized in 1978 with an AID life of project contribution of $4.5 million. Through the project, AID and the GOM agreed to construct, staff, and equip a regional dryland research institution to be known as the Aridoculture Center. The Mid-America International Agricultural Consortium (MIAC) was contracted in 1980 under the collaborative assistance mode to field a team of U.S. agricultural scientists to develop a multi-disciplinary research program at the Aridoculture Center and to simultaneously train a cadre of Moroccan personnel in selected areas of expertise so that they could eventually assume full responsibility for Center activities.

Early project implementation was hampered by a number of factors. MIAC had difficulty identifying a suitable team of qualified, French speaking scientists and the attention of the Ministry of Agriculture and Agricultural Reform was diverted by a major institutional reorganization. As a result, construction progress at the Aridoculture Center was slow and selection of

Moroccan personnel to be enrolled in U.S. advanced degree programs was seriously delayed. Man-made constraints were not the only problems. The forces of nature also conspired against a quick project start-up. The first three years of field work (1981-84) were conducted in the midst of the worst drought in 300 years. Experiments suffered and data collection was limited.

Despite early implementation setbacks, USAID and a 1983 Project Evaluation Team remained convinced that a strong research program was critical to increased dryland yields and that, following the arrival of a new MIAC team leader and the selection and departure of several highly competent Moroccan scientists for U.S. degree programs, the Aridoculture Center did indeed show promise of becoming a productive institution. Subsequently, the project was amended to expand the scope of activities, increase the AID contribution (from a grant of $4,500,000 million to one of $26,323,400), and extend project implementation to August 31, 1988. This 1983 amendment, under which the project is currently being implemented, planned for long-term participant training of 15 M.Sc. and 17 Ph.D. candidates, 294 person months of short term training opportunities, and funding for 62 person years of resident technical assistance. By August 31, 1988, the Project Assistance Completion Date, 9 M.Sc. and 16 Ph.D. candidates will have returned to the Center from the U.S. and ten of these are expected to have degrees by the current PACD. The shortfall between planned and actual levels reflects delays in nominating candidates.

With strong support from its parent organization, the National Institute of Agricultural Research (INRA), the Aridoculture Center has made impressive gains over the past several years. The newly constructed complex now includes several research laboratories, most of which are in use or near completion. Research station facilities have been upgraded through the repair and modification of existing structures, the addition of appropriate plot research equipment, and the establishment of improved station management practices.

Another measure of progress is the high level of activity at the Center. During the 1986-87 growing season, a total of 118 research protocols representing 169 separate experiments were outlined in the annual work plan. This included on-station research, farmer interviews for economic and sociological surveys, extensive on-farm testing of new technologies and varieties, regional insect damage surveys, and on-farm testing of improved animal traction and tractor powered machinery.

Although there have been only two years of substantial crop yields from which to draw conclusions, findings of potentially major impact have already been recorded by Moroccan scientists at the Center. Some of the most exciting work is related to the Hessian fly. The Hessian fly is a major insect pest in wheat and barley in the semi-arid zone of Morocco. Losses of wheat grain alone due to fly attacks were estimated to be over $24,000,000 in 1985 in seven provinces of the project area. Including losses of barley and cereal straw would result in a substantially higher total.

Entomologists and cereal breeders in the project and at IAV-Hassan II have identified three separate genes that provide plant resistance to the biotypes of Hessian fly found in Morocco. A promising bread wheat carrying one of the resistant genes has been identified in a variety from South Dakota and is now being tested through the project area. These three genes are also being incorporated into advanced genetic material in the U.S. for use by American farmers.

A range of improved agricultural equipment has also been developed at the Center. On-farm tests of this equipment have begun and farmer reaction has been extremely positive. Scientists at the Center have also developed a new variety of cold resistant chickpeas which can be planted in the winter, when rainfall is adequate to sustain them.

In 1986 a second major evaluation of the project was undertaken. The evaluation commended INRA, the Aridoculture Center, and MIAC on project performance since the 1983 Amendment and confirmed the soundness of the project objectives and approach. It recommended an extension of activities in order to fully achieve the original goal and purpose of the project. As a result of the evaluation and the USAID/GOM commitment to increased dryland yields, a six year extension of the project to August 31, 1994, is described in this amendment. Following is a detailed description of activities that will be supported.

III. DETAILED PROJECT DESCRIPTION

The project goal and purpose for the project amendment remain the same as for the original project, but have been restated for clarity.

The project goal is to increase basic food production in order to meet the needs of Morocco's fast growing population and to improve income of farmers with small and medium sized land holdings.

The project purpose is to establish a sustainable applied research capacity relevant to the dryland farming systems and natural resource constraints of the 250-450mm rainfall region of southern Morocco and capable of providing technologies to increase farmer productivity.

A. The Aridoculture Center

The Aridoculture Center is one of seven regional centers in the INRA research network. The Center serves approximately 3.8 million rural people distributed over some 35,000 km^2 of land. The Aridoculture Center also has five satellite research stations: Sidi el Aydi, Jemaa Shaim, Khemis Zemamra, Dar Bouazza, and Annaceur. Each of these stations has distinct agro-climatic conditions which provide a suitable environment for testing different components of the research program. The Aridoculture Center currently houses ten laboratories for cereal breeding, weed science, entomology, food legumes, forage agronomy, soil management, cereal agronomy and plant physiology, soil fertility, and plant pathology. The Center also has a micro-computer center for data analysis and word processing and a technical reference center linked by telephone to international data bases. These laboratories and centers are found in three laboratory-office buildings. In addition, there is a soil and plant materials processing center. Construction has begun on a greenhouse complex and an agricultural mechanization building. Under the project extension, all the above-mentioned construction will be completed and additional construction will be planned and executed, both at the Center itself and at the satellite stations.

Over the past several years, INRA, with guidance from the International Service for National Agricultural Research (ISNAR), has been instituting a series of far-reaching management reforms. Most significant among the reforms has been the decision to reduce the number of research stations and experimental farms and the decision to adopt the "programming by objective" (PBO) approach to agricultural research.

Under PBO, research objectives are organized around major production systems as a whole. Consequently, multidisciplinary research is promoted. PBO has broad implications for how research agendas are articulated and resources allocated. It is a management tool that will strengthen INRA's ability to set its research priorities. It will provide a means to develop accountability and evaluation of research programs and to determine the true economic benefits of agricultural research to the GOM. PBO is discussed in more detail in Section III. B. 3.c. of this paper as well as in Appendices 1, 3 and 4.

13

B. Project Components

The extension of the Dryland Agriculture Applied Research Project will allow project participants to make up for time lost during the severe 1981-84 drought and will enable MIAC to complete training of scientific and support staff at the Center in a manner that will facilitate an orderly phase out of expatriate technical assistance. It will also enable AID to act on the recommendations of the 1986 project evaluation team and consequently leave the Center in a technically and institutionally stronger position to accomplish its mandate. As recommended by the evaluation, the extended project will upgrade the Center's plant disease research capability. A carefully defined livestock element is being added to the Center program so that the interface between forage and livestock production can be more carefully studied. The project extension will also support the evaluation recommmendation that the Center further develop its socio-economic research capability. For both research and technology transfer purposes, the Center must be able to conduct rapid, focused studies that will solicit farmer feedback on new technologies as well as more intensive, long term studies and profiles on which the Center can base its overall program objectives. Perhaps most important, the project extension will enable project managers to act on the evaluation recommendations that Moroccan staff be prepared to fully assume the research planning, management, and budgeting responsibility of the Center and that scientists take a more active role in technology transfer to its clients, i.e., farmers, the extension service, private sector manufacturers and distributors.

1. The Applied Research Program

The applied research program at the Aridoculture Center is designed to study and develop technologies in the context of agricultural production systems rather than to study specific problems in isolation of the production systems. Multidisciplinary research is promoted. This is consistent with the programming by objective approach. In the following description of the research program, activities have been broken down into four categories based on the new PBO management system: cereals production systems, forage and livestock production systems, legume production systems, and integrated applied production systems. Appendix 1 presents the research program in greater detail.

a. Cereal Production Systems

Cereals are the most important crop in the dryland regions. There is considerable scope for increasing cereal yields. Consequently, cereal production systems represent the major program at the Aridoculture Center. Increasing yields requires more than modifying a single input or practice. It is necessary to develop effective packages of improved inputs and practices that are relevant within the context of cropping patterns. To develop such packages, the following objectives have been identified and will remain valid over the course of the extension.

Develop cereal varieties resistant to the Hessian fly;

- Increase grain yield and quality through breeding and variety selection in cereals;

- Develop cereal varieties resistant to drought, rust, root rot, and barley yellow dwarf virus;

- Develop soil test calibrations to enable fertilizer recommendations by soil type;

- Improve crop and water management-conservation practices;

- Improve weed control techniques; and

- Improve cultivation techniques and associated mechanization.

Soil test calibration activities have been undertaken during the last two years and by the end of 1987 enough data will have been collected and analyzed to make provisional fertilizer recommendations for wheat production on three major soil types. Soil scientists have developed a program for on-farm testing of soil fertility levels and for training extension agents and educating farmers. Previously, Moroccan agriculturalists had tried to establish a universal fertilizer recommendation for major cereal crops in the dryland regions. This was not successful, primarily because each soil type presents a different set of circumstances.

There is a special need to undertake an extensive soil survey of the project region in order to transfer technology related principally to new fertilizer recommendations comming out of the research program. Soil surveys would also benefit many of the other applied research programs especially in terms of predicting response to new and/or alternative technologies throughout the region. Soil survey information would also benefit project understanding of the various farming systems and the land use priorities which farmers practice. Limited soil surveys have already been performed in the Settat province. It is estimated that about $150,000 per year over a three year period would finance soil survey work for most of the major remaining crop production areas in the project region. The project will consider financing additional soil survey work as stipulated in Section IV.C. Soon after the project start-up, MIAC will work with INRA to determine where soil surveys should be carried out, what methodology will be employed, and when the surveys should be undertaken.

Useful information regarding water management and drought simulation models is now beginning to come out of the soil management program. Research to date indicates a significant yield advantage through the use of minimum and zero tillage in cereal production. Current tillage practices result in critical loss of soil moisture.

Two years of on-farm testing show average cereal yield increases of about 20 percent when inexpensive, readily available herbicides are applied in a timely manner. Combined with early planting, the use of appropriate herbicides offers the potential for even larger yield increases as a result of a more efficient use of early rainfall. The Aridoculture Center is now in the process of transferring this information to extension personnel.

Working in concert with scientists from other disciplinary groups, the cereal agronomists have identified components of technology packages by means of diagnostic trials across the climatic gradient within the project area. A cereal production package including Hessian fly resitant wheat, minimum tillage, early planting with weed control, and proper fertilization has been designed and is ready for intensive testing in on-farm verification trials in 1987-88.

Under the project extension, the Aridoculture Center scientists working on the cereal program will build on the successes described in Section IIC. of this paper and continue to work toward meeting the objectives of its research agenda.

b. Forage and Livestock Production Systems

Forage crops are important because they constitute the basic feed supply for animal production and because legumenous forages can increase soil fertility during crop rotation cycles. Effective forage crop production systems in Morocco are limited. Farmers have traditionally used a number of forage sources including weeds which are allowed to grow with wheat even though they compete with the wheat for moisture and nutrients. Program objectives are:

- selection of medicago species, varieties and other forage alternatives;
- planting practices, seeding rates and innoculation studies
- fertilizer requirements
- weed and other pest control measures;
- livestock grazing trials

A major accomplishment under the forage production program at the Center, thus far, has been progress in adapting the Australian "ley farming system" (rotation of a winter cereal with an annual medicago for forage) to Moroccan conditions. Initial results indicate that the system may prove beneficial in terms of increasing the quantity and quality of feed supply for farm livestock. Concurrently, progress has been made in the selection of appropriate medicago varieties, seeding rates, fertilizer requirements, and weed control. Implementation, however, remains a major challenge because the medicago-cereal rotation requires a higher level of management than many small farmers may now be capable of. As a consequence, forage alternatives are also receiving substantial attention.

Under the project extension, scientists will continue to assess important management factors involved in ley farming such as seeding method and depth, tillage, weed control, fertilization, and inoculation. In order to better evaluate forage production options, livestock grazing trials will also be conducted. The maintaining of livestock specifically to be used for these grazing trials will add a limited livestock component to the project. The other high priority will be the continued assessment of indigenous and imported perennial forage grasses for use in rejuvenating overgrazed farm pastures. This has important implications for environmental protection.

c. Food Legumes Production Systems

Food legumes (chickpeas, lentils, faba beans, and peas) are important crops in the semi-arid regions. Used along with corn as the primary crops in rotation with cereals, they provide a major source of protein for many families, can be sold in the market to supplement income, and fix nitrogen in the soil. Unfortunately, little work has been done to adapt food legumes to the difficult growing conditions of the semi-arid regions. The objectives of the food legume program at the Aridoculture Center are:

- selecting and breeding for disease, yield and quality of chickpeas and lentils;

- improved agronomic practices, cultivation including mechanization for chickpeas and lentils;

- increased effectiveness for symbiotic fixation of nitrogen.

To date, work at the Center has focused on developing winter varieties of chickpeas that are resistant to Ascochyta blight, the most serious fungal disease of chickpeas. Results from planting winter blight resistant varieties show yield increases of 100-300% over spring planted varieties. Currently, spring varieties are the most commonly cultivated in Morocco. They are planted after the cool, damp weather of winter to escape the blight but have low yields because of severe moisture stress during the dry late spring period.

Development of a package of practices for winter chickpea production will continue to be an objective under the project extension. Activities will include selecting for drought tolerance, evaluating germination and seedling response to different stress levels, evaluating the vigor of the root systems of different varieties, and examining the constraints to chickpea production including inadequate weed control and the misuse of fertilizer.

Because the high requirement for hand labor in weeding and harvesting lentils is resulting in the actual planted area being reduced each year, the project extension will continue to support research to develop a feasible mechanical aid to harvesting. The package will include better adapted, taller varieties; tilling and planting methods that leave ground surface smooth; and suitable cutting machines similar to those being tried in other countries of the Near East.

d. Integrated Applied Production Systems

The major objective of the Aridoculture program is to get new, more productive technology integrated into the farming systems of the project area. A coordinated, multi-disciplinary effort by the agronomic and the socio-economic teams will provide a basis for the infusion of new technology into the production systems of both the subsistence farmers and those who produce for the market place.

In terms of research, the work in production systems is designed to evaluate how new technologies can be integrated into the existing farming systems and to quantify the gains made possible through major modification of present systems. Significant progress can be made with the adoption of "single" improved inputs or practices by farmers. However, major changes will come about as farmers adapt multi-faceted technical packages.

Several steps are being taken or planned. Some are sequential while others can be taken simultaneously.

(1) Field studies are being conducted to improve understanding of existing production systems, including the social and economic constraints that shape these systems.

(2) New technologies are being developed, some as singular units that can be added to or adapted to existing production systems, others as combinations of several practices.

(3) Farmer reaction to new technology is being evaluated and feedback to researchers.

(4) Technical "packages" are being assembled, some of which may significantly modify present farmer practice. Such packages must be evaluated to ascertain the degree of economic improvement they may provide; the increase or decrease of economic risk that may be involved in their application and their acceptability to the farmer.

(5) Increasing emphasis will be placed on technology transfer as new technology becomes available.

Currently a large number of studies are underway and/or have been completed as a part of steps "1" and "2." Progress is being made in step "3." Initial progress has been made in step "4," with at least a beginning in step "5."

Step 1: A qualitative analysis has been made of farming systems. A two and a half year field research effort by the sociology group has provided an in-depth description of the farming systems and operating environment of farmers in the Abda region of Safi Province. Farming systems have been shown to be primarily a function of major soil type, not farm size. A better understanding has been gained of the role of various crops in rotations, the integration of animal and cropping agriculture, the use of and attitudes toward mechanization, and farmers' attitudes toward technology acceptance.

18

A second major study in the Abda region has provided a quantitative evaluation of farmers' economic environment. A detailed economic survey of 159 farms in the Abda region yielded essential data for the development of crop production budgets for soft wheat, durum wheat, barley, and food legumes. In addition, quantitative descriptions of costs and returns for those farmers who own tractors and machines versus those who rent equipment have clarified the approaches and constraints of these two groups in regard to their financial management.

Step 2: Major strides have been made within the cereals, food legumes and forage sub-programs in defining single practices that may be readily accepted by farmers. Studies show that farmers are quite willing to adapt a new variety, for example, that fits into their present farming system and that requires a minimum adjustment of the system to incorporate. Some "single" practices such as weed control require more adjustment by the farmer and will be adopted more slowly. Information is being assembled and distributed regarding a number of such improvements.

Step 3: The sociology group is working with researchers in testing farmer response to new varieties and to new machinery. This work will be expanded in the next phase of the project.

Step 4: A major on-station study has been conducted to evaluate and solve problems in integrating forage and cereal production in crop rotations. This preliminary work was necessary to lay the foundation for on-farm studies that are being instituted or are continuing.

The cereal agronomy diagnostic trials conducted within the project region over the last two years have delineated certain combinations of inputs that may be important components of a cereal production package. Field work will begin in October of 1987 to test the package across the very large climatic gradient that exists from Ben Slimane province on the northeast to the southern part of Safi province in the southwest.

A very important part of the testing of the cereal production packages will be a parallel demonstration and evaluation of the effects of the individual components. In this way, project scientists will gather research data and at the same time provide demonstrations to the farmer so that logical choices can be made if resources are not available to implement the entire package at one time. The sociological team will work with the agronomists in evaluating farmer response even as research data continues to be collected. During the extended project, greater emphasis will be given to economic evaluation of production packages (systems) as soon as these packages are defined and judged ready for the technology transfer Step 5. These evaluations will be performed by INRA and MIAC resident experts and short-term consultants as required.

Step 5: Only tentative steps have been taken in technology transfer. The emphasis has been on developing technology. However, material has been developed for use by extension centers (CT's). Training sessions, workshops have been held. The expansion of technology transfer will be a major emphasis in the project extension.

19

2. The Technology Transfer Program

The Aridoculture Center has reached a stage in its development, both in terms of staff size and pace of technology generation, in which serious consideration must be given to technology transfer to assure that promising research results and new technologies get out to the farmer and to assure that researchers are learning from farmer feedback and adjusting their programs to respond to this feedback.

The 1986 evaluation of the project recommended that a technology transfer component be built in, so as to assure that farmers benefit from research results. A technology transfer strategy has been developed and will be implemented under the project extension. The strategy is laid out in more detail in Appendix 2. INRA and hence the Aridoculture Center does not have the mandate to carry out extension programs in Morocco, since agricultural research and extension functions are currently separated. The primary aim, therefore, will be to serve as a wholesaler of technology information to groups which have the mandate and/or incentive to disseminate technology to farmers on a much broader scale.

The client groups with which the Center will work include a wide range of organizations in addition to farmers. One client group is the GOM extension service, DVARA (Direction de la Vulgarization). Others include private sector manufacturers of equipment, suppliers of agricultural inputs such as seed and fertilizer, and farmer cooperatives and associations and parastatals such as FERTIMA, SONACOS, and SOGETA. Scientists working on the farm mechanization component of the project are already collaborating with several manufacturers in the project region to test the feasibility of building farm machinery for sale to Moroccan farmers. Suppliers of agricultural inputs will be worked with to assure that improved seeds are multiplied and distributed and that recommended fertilizer are available to the target farms.

Direct links between research scientists and representative farmers have already been established. However, these links will be further refined and expanded in order to directly assess technology adoption in the project region. Specifically, the economics and sociology team will formulate special studies on representative farms and cooperative groups or villages in order to (1) better understand the target farming systems, (2) establish baseline information for later evaluation of research and technology transfer programs, and (3) provide a model for testing the economic and social feasibility of alternative technologies. The baseline study is discussed in more detail in the Evaluation Plan of this paper.

Under the transfer of technology strategy, the Center will reach out selectively to farmers through special studies, on-farm trials, selective demonstrations, and field days to elicit farmer feedback. Farmer feedback is critical to assure that research is really relevant to farmer needs; thus, this feedback will be "institutionalized" by assuring that scientists and extension agents formally obtain information from the farmer and systematically review it when writing research protocols.

The GOM extension service is currently being reviewed with intentions to strengthen the service with World Bank support. A Train and Visit (T&V) system is being considered. To ensure the success of the extension service World Bank program, the subject matter expertise of extension agents must be upgraded. This creates a unique opportunity for the Aridoculture Center to strengthen cooperation with the GOM extension service. The Center will involve extension personnel in its field trials and demonstrations. A limited number of extension agents from each of the six provinces served by the Aridoculture Center will be invited to work with the Center in designing and conducting off-station trials and demonstrations. The extension service will thereby become thoroughly familiar with the technology packages and be better able to disseminate them to farmers. The Center will also host in-service training programs for extension personnel. This program will not duplicate the training program at the Meknes research station, but will train extension personnel in the project region to be able to deliver technology packages developed at the Aridoculture Center. Together, these activities will improve the quality of interaction between technology generators and technology disseminators. The extension service will gain by having a regular source of technology channeled into its operations and an in-depth training program for its leadership personnel. The Center will gain from farmer feedback passed through the extension personnel. The exact nature of the relationship between the Aridoculture Center and the extension service cannot be worked out until the World Bank has completed its design. Once the design is finished, a workplan will be drafted specifying the relationship in detail. At this point, however, it is clear that the Aridoculture Center will work closely with both the provincial level agriculture offices (Direction Provincial d'Agriculture/DPA) and the sub-provincial extension centers (Centre de Travaux/CP). The Aridoculture Center will work closely with CT personnel in contacting farmers and in operating all types of trials on farmers fields.

To direct the technology transfer effort, INRA has already established an Office of Services for Research and Development (SRD) at the Aridoculture Center. The SRD will be staffed by a part-time director and a full-time technology transfer specialist. The director, who will also be a practicing scientist, will be responsible for developing and implementing technology transfer programs for a wide range of target audiences and for promoting the participation of Center scientists in technology transfer activities. The technology transfer specialist will prepare newsletters for the respective clients and appropriate bulletins and news releases; work with Center scientists to prepare visual aids and other materials for technical and lay presentations; and, as appropriate, cooperate with the Extension Training Center at the National Agricultural School at Meknes to develop mass media materials for farmers and extension personnel.

The basic task of the SRD office will be to provide liaison with various clientele groups to ascertain their needs for information from the Center and to take leadership in providing coordination needed to develop a program of work that responds to such needs from within the Center. In doing so, external sources of information such as the international and other research centers will be accessed as well as specific Aridoculture research. The SRD office will also provide training and communication services in addition to leadership in program development and coordination.

In addition to the director and technology transfer specialist, selected Center scientists will devote as much as 50 percent of their time to technology transfer activities. These scientists will include both MIAC and Moroccan professionals. Obviously, because the number of scientists and the disciplines needed at any one time will depend on the subject matter to be communicated, assignments to technology transfer will vary over time, and will be reflected in MIAC's annual work plans. At present, however, it is estimated that technology transfer will utilize the full time equivalent (FTE) of the following specialists:

Crop Management and Soil Science	3 FTE
Pest Management (entomology, pathology, weed control)	1 FTE
Agricultural Mechanization	1 FTE
Economics and Sociology	2 FTE
Total	7 FTE

No scientists will have full-time responsibilities for technology transfer. Rather several scientists will contribute various amounts of their time to make up each full time equivalent. These scientists will perform much like "area extension specialists" in the U.S. Such specialists are strongly grounded in research but utilize their knowledge and special skills to formulate viable technology packages with input from selected farmers.

3. The Institutional Sustainability Program

Since USAID will phase out its support to the Aridoculture Center by the project completion date, one of the major concerns of the project extension is to assure that the Aridoculture Center is a sustainable research center by 1994. This entails assuring that the Aridoculture Center is capable of assuming full responsibility for the research and administrative functions currently handled by the MIAC team and that INRA and the GOM are ready and able to provide the budgetary support required to maintain the Center at the level envisioned. To ensure the continuous generation of useful technologies, the Center must have the capability to attract and retain talented, productive scientists and the resources and management system to support those scientists in shaping and implementing relevant research agendas.

In collaboration, INRA, the MIAC team, and USAID have developed a vision of an Aridoculture Center to be achieved by 1994, adequately staffed and equipped to produce research results and new technology for Morocco's dryland farmers. Several steps will be taken during the project extension to lead the Center

22

from where it is now to where it will be in 1994. These include: a) hiring and training of an adequate number and caliber of Moroccan scientific and support staff; b) completing adequate physical facilities for research and purchase of land for trials; c) improving the salary structure of INRA scientists and their career opportunities; d) assuring adequate budgetary levels and budgetary procedures for INRA; e) improving the internal management system of INRA; and f) establishing linkages with other Moroccan institutions and international research organizations.

a. Adequate Moroccan Staff

In order to assure that the research, transfer of technology, and management functions are carried out, the project is helping INRA build its staff to a level of 38 scientists. This is approximately the number of the current combined staff of Moroccans plus MIAC technical advisors. In addition, there will be four university graduates serving as support staff in the computer center, in scientific equipment repair, statistical analysis and support and the technical reference center. Two people will work full-time in the coordinating office for technology transfer (SRD) and four people at the B.S. degree level or higher will be involved in project administration (director, research coordinator, administrative coordinator, and financial manager). Hence, a minimum of 48 people is required to adequately staff the Center and carry out the approved program.

Institutional sustainability activities will include preparing Moroccan staff to take over the leadership and management of the Center. Technical assistance has been carefully structured so that MIAC scientists are systematically replaced by Moroccan scientists returning from U.S. degree programs. With guidance from MIAC staff, Moroccan scientists will gradually assume greater decision making responsibility with regard to the content and direction of the program as well as to the human and financial resources assigned to specific activities within the program.

Moroccan support staff will also assume increasing responsibility for the management of center facilities and services. Some of these responsibilities are currently being handled by local hire expatriates or through short-term technical consultants. During the project extension, M.Sc. degree training in the U.S. will be provided for a staff statistician. This will facilitate well designed field surveys and experiments as well as proper analysis of data. On-the-job training will be provided for a technician with skills in physical plant operation and maintenance so that a Moroccan can take charge of managing the Center's substantial physical plant and for a computer technician and librarian to run the Center's microcomputer center and its technical reference center. Training will also be provided for a scientific equipment maintenance specialist. Finally, responsibility for managing the motor pool, a fleet of 50 cars, pickups, and trucks, will be shifted from MIAC to Moroccan staff.

b. Adequate Physical Facilities and Land

The GOM has already undertaken a major construction program to house the research program. INRA will continue construction and development of research facilities during the project extension period. Ten laboratories are 85-90 percent complete already, including cereal breeding, weed science, entomology, food legumes, virology and mycology labs for plant pathology, forage agronomy, soil management, cereal agronomy/plant physiology, and soil fertility. In addition, there is a micro-computer center for data analysis and a technical reference center linked by telephone to international data bases. Foundations are being poured for greenhouse units and construction is underway for an agricultural mechanization building. Construction is planned in 1987 and 1988 for an additional laboratory cum office building (there are three currently) an auditorium and training facility, a storage depot, a seedhouse, a guesthouse, and a machinery storage shed.

Renovations and construction improvements will be made at the five satellite research sub-stations which the Aridoculture Center uses for trials and demonstrations. There is inadequate land at the Sidi El Aydi station to meet existing research needs. The station currently leases 26 contiguous hectares of land on which to conduct research trials. The lease for the property will expire in 1989. 40 hectares of land in addition to the 32 hectares already at the Side El Aydi Station are required to conduct trials, according to the MIAC team, Aridoculture Center scientists, and USAID. Funding for this land has been included in the GOM project extension budget during the first year (FY 1988/89). Since the land is so critical to the success of the project, a condition precedent to signature of the Project Agreement will be conveyed to the GOM. This will assure that they acquire at least 40 ha of land adjacent to Sidi El Aydi Station near Settat, no later than June 30, 1988. (See Section VII. for exact wording)

c. The Improvement of the Salary and Career Opportunities

Salaries for qualified research scientists are significantly lower than those for equivalent positions in the civil service. Problems of per diem reimbursement and lack of necessary incentives have added to the salary problem. Fairness dictates equivalency. Beyond that, putting salaries on a par with other professionals with equal training and responsibilities will improve morale, leading to greater productivity.

The Project Agreement will contain a covenant describing the salary issue. Specifically, the Government of Morocco will adopt a personnel policy for researchers which puts researchers' salaries and incentives on a par with other professional civil servants with equivalent qualifications and responsibilities.

d. Adequate Budgetary Support

Unless INRA provides adequate budgetary support to the Center in a timely fashion, the project purpose will not be achieved. There are three components to the budget problem: (1) securing adequate budgetary support from the GOM to operate the Center; (2) receiving the budgetary allocation from the Ministry of Finance in a timely fashion; and (3) improving cash flow management within INRA.

The project currently does not obtain adequate funds from the GOM to cover all the operating expenses of the Center. The project is currently covering some of the operating costs of the Center, because it was determined by the MIAC team and USAID that the project would be seriously threatened if USAID did not cover these costs. However, it is essential over the period of the project extension, that USAID phase out its support of the Center and that the GOM cover all Center expenses by the end of the project. How much the GOM must provide to the Center over the period of the project extension and hence to sustain the Center in the future was determined by an indepth analysis of current costs and their projection to 1994, taking into consideration the number of staff and the operational programs which will be in place by the end of the project. The projected costs for both AID and the GOM are presented in Section C. of this paper. A condition precedent to signature of the Project Agreement will be conveyed to the GOM to assure that they provide an adequate budget for the initial year of the project. (See Section VII. for exact wording of this condition precedent.)

The second part of the budgetary problem involves timeliness of receiving budgetary allocations. Timeliness is a crucial dimension of research budgets. Field and laboratory operations are strictly tied to weather and biological cycles. Operating budgets must be available at specific times within the crop year. Over-centralized control is one cause of untimely allocations of operating budgets. Cumbersome, time-consuming approval procedures, requiring the Centre Regional des Engagements et des Depenses (CRED) of the Ministry of Finance (MOF) approval for relatively minor expenditures, interfere with the operation of the research program by delaying expenditures. Complexity of line-item budgetary designations is another factor that causes unnecessary delays in approval of expenditures. But even more importantly, an excessive number of line items, each requiring central approval, does not allow the Aridoculture Center Director sufficient flexibility to meet the inevitable contingencies which arise in agricultural experiments.

The World Bank completed a study of the GOM's budgetary process. The study's recommendations for improving this process are being negotiated with the GOM as conditions precedent to the IBRD's agriculture extension project. These recommendations include decentralization of financial management within INRA, quarterly allocation of the budget, streamlining the budget system, and an

increase in INRA's discretionary expenditure. USAID will include a condition precedent to signature of the Project Agreement that these recommendations will be implemented, in so far as they affect the Aridoculture Center by June 30, 1988. Exact wording of this condition precedent is found in Section VII of this PPS.

The third aspect of the budget question concerns INRA's own internal cash management system. This will be addressed with project financing as described in Section e. below, "The Improvement of Internal INRA Management."

e. The Improvement of Internal INRA Management

The sustainability of the Aridoculture Center is contingent upon the efficiency of management of INRA, its mother institution. INRA has already made some strides in improving its internal management. The International Service for National Agricultural Research (ISNAR) was commissioned to analyze INRA's organization and management and to make suggestions for improvement.

One of the major ISNAR recommendations was the institution of the system of "programming by objectives" (PBO) that regroups disciplinary programs into commodity or activity-oriented entities, thus encouraging interdisciplinary work. PBO is discussed in detail in Appendices 1, 3 and 4 of this paper. Basically, PBO is the process by which research activities are designed and implemented based on methods to maximize the utilization of research resources to meet development objectives. PBO begins with research planning where research opportunities are evaluated for their potential to meet development objectives. These research strategies are then programmed in sets of research activities designed to meet specific research objectives. Research programs are groups of research activities, each related to a broad research topic. Commodity programs coordinate research in topics such as cereals, livestock, and fruits. Thematic programs coordinate research in disciplinary areas like land-use planning and use of herbicides. Systemic programs treat research from a broader perspective. For instance, production system research might study rainfed cropping systems vs. mountain agro-systems. Complex research programs are sometimes subdivided into sub-programs. For example, research in an arid agriculture program may be organized into sub-programs for cereals, forage crops, and production systems. Programs are supervised by senior program coordinators.

There is still much to be done to assist INRA to link up research selection and organization with management resources. To assist the Center to build such a system, an implementation plan was completed (see Appendix 4) in July, 1987. This plan will be executed during the project extension and will consist of the establishment of a computerized management information system (MIS) which will meet the information requirements of the Aridoculture center and strengthen and simplify the institution's internal links between research and administration .

The system will be implemented in five discrete modules: (1) a research programming module; (2) a personnel allocation module; (3) a budgeting module; (4) an accounting module; and (5) an evaluation module. These modules are summarized below and are presented in more detail in Appendix 4:

(1) The research programming module will consist of data bases which will link research activities with information on development objectives, target groups, geographic location, climatic regions, agricultural economic sectors, research disciplines, research institutions, and donor agencies;

(2) The personnel allocation module will assist INRA in planning the total time committed by each research scientist to research activities, teaching, training, seminars, study tours, administration, and vacation;

(3) The budgeting module will build a budget for INRA's estimated direct operational costs based on the research programs and personnel allocation modules.

(4) The accounting module will track INRA expenditures for direct operational costs; and

(5) The evaluation module will use information on the status and outputs of research projects to evaluate the impact of research in progress in meeting current development goals. This module will generate reports comparing the forecasted costs for implementing specific research projects to the potential for social and economic gains directly resulting from the research planned. It will institutionalize the economic evaluation process that is required for assessing the integrated production systems as described in Section II.B.d.

As each module is tested in its prototype stage at the Aridoculture Center, the methodology will be evaluated by INRA's research and administrative staff to ensure that the design specifications are appropriate. After each module is designed and tested, it will be released for gradual expansion throughout INRA's research network.

Assistance to implement PBO is being provided to INRA headquarters as well as to the Center in recognition of the fact that the Center is not a free standing institution but part of an integrated national effort coordinated and managed by INRA. INRA determines the level of human and budgetary resources available to the Center and sets national research priorities that define the parameters of the Center's research agenda. Consequently, it is critical that the planning, programming, budgeting, accounting and evaluation systems employed by INRA and the Center be compatible.

f. Linkages with Other Institutions

Linkages with other institutions are critical to the sustainability of the Aridoculture Center. Within Morocco, critical links include: (1) the program links between the Center's research and the extension service activities; (2) the link to educational and research programs at the National Agricultural

School (ENA) and the INRA regional center at Meknes, and (3) the link to educational and research programs at the Agronomic and Veterinary Institute Hassan II (IAV) in Rabat. These linkages are discussed in detail in Appendix 3 to this paper.

There is already an active dialogue between scientists at the Center and those at the IAV Hassan II in the areas of soil science, weed science, and agricultural engineering. Similar relationships with the National Agricultural School and the INRA Regional Center at Meknes will be encouraged through exchange visits, jointly sponsored seminars, and coordinated research. Linkages with Meknes will be developed in the areas of agricultural economics, extension education, and cereals.

Links to the International Agricultural Research Centers have been forged and will be strengthened. The cereals and legumes programs at ICARDA and CIMMYT have provided genetic material and scientific assistance. A relationship with ICRISAT has been useful in the development of the Center's animal drawn machinery program. The project extension will support participation in ICARDA, CIMMYT, and ICRISAT programs whenever appropriate and sponsor the collaboration of Center staff with relevant international programs. However, it is recognized that for the period of the project extension it is more important to build linkages within Morocco than internationally.

C. AID Financed Project Inputs

1. Training

Training is critical to the sustainability of the Aridoculture Center. Under the existing project, AID is committed to financing long term training for 9 M.Sc. and 16 Ph.D. candidates. To date, 8 M.Sc. and 10 Ph.D. candidates have returned to Morocco and ten are expected to have degrees by the current PACD. Seven candidates are in MIAC universities undertaking advanced training. Under the project extension, an additional 7 Moroccans will go to the U.S. for M.Sc. training and an additional 19 will go for Ph.D. training. INRA has tentatively identified 5 of the M.Sc. candidates and 8 Ph.D. candidates (including 7 Ph.D. candidates who received M.Sc. degrees under the existing program) for these new slots. Consequently, 2 M.Sc. candidates and 8 Ph.D. candidates remain to be identified. At the end of the project, 17 M.Sc. and 34 Ph.D. degrees will have been earned for a total of 51 degrees. Seven individuals will have earned both M.Sc. and Ph.D. degrees under the program. A total of 44 individuals will have received long term training. The following table indicates the type of long term training being provided and the years in which long term training participants return to Morocco.

28

TABLE III-1
ARIDOCULTURE STAFFING PATTERN
AND LONG-TERM TRAINING PLAN

Area of Specialization	May 1987			1988/89 - 1993/94		1994
	Total INRA Staff at Center	Those who are returned partic.	Now in U.S. Training	Proposed New Staff	Additional Training	Total INRA Staff at Center
I. Cereal Breeding	3	2	4	-	1 Ph.D.	4
II. Agronomy & Soil Science						
A. Agrononomy	4	3	-	2	2 Ph.D.,1 M.Sc.	5
B. Soil Management	1	1	1	1	1 Ph.D.	3
C. Soil Fertility	2	2	1	1	2 Ph.D.	4
III. Forage/Pastures/Livestock	3	2	-	2	2 Ph.D.	5
IV. Food Legumes	1	-	1	1	2 Ph.D.	3
V. Pest Management						
A. Entomology	2	2	-	1	2 Ph.D.	3
B. Plant Pathology	4	3	-	-	1 Ph.D., 1 M.Sc.	4
C. Weed Science	2	1	-	1	2 Ph.D.	3
VI. Agricultural Mechnization	2	-	-	2	3 M.Sc.	3
VII. Social Sciences						
A. Agricultural Economics	-	-	-	2	2 Ph.D.	2
B. Rural Sociology	1	-	-	1	1 Ph.D.	2
VIII. Support & Special Services	-	-	-	4	1 M.Sc.	4
IX. Technology Transfer	1	1	-	1	1 Ph.D.	2
X. Administration	2	1	-	2	1 M.Sc.	4
TOTAL	28	18	7	21	26	51*

* Total Aridoculture Center staff needs are estimated to be 48.
Attrition is estimated at 3.

Training of long term participants will follow the pattern already established under the project. Prior to going to the U.S. for course work, nominees for M.Sc. and Ph.D. programs spend at least one year working at the Aridoculture Center. After completing course work in the U.S. the participants return to Morocco to undertake dissertation research and to write a satisfactory draft of their dissertations. After preparing a suitable draft, the participants are provided a research grant to permit travel to the U.S. where they prepare a final dissertation, obtain their degree, and prepare paper(s) for publication in appropriate scientific journals. The schedule for the remaining training is included in Table III-2:

A valuable aspect of the training program has been student advisor visits to Morocco during the period in which the student is completing his dissertation research. This practice will continue under the extension. Table III-3 estimates advisor time that will be spent in Morocco.

ARIDOCULTURE CENTER

PARTICIPANT TRAINING SCHEDULE

	88/89	89/90	90/91	91/92	92/93	93/94	Total person mos
I. CEREAL BREED.& SELEC.							
(1) Cer. breeder	<—Ph.D.—>				⁞		27
(2) Cer. breeder			⁞				3
(3) Cer. breeder				⁞			3
(4) Cer. breeder				⁞			3
(5) Corn breeder				⁞			3
II. AGRONOMY & SOIL SCI							
Agronomy							
(1) Gen Agro/Phys	<—Ph.D.—>				▓		27
(2) Gen. Agron.		<—M.S.—>			⁞		25
(3) Sprg cer agron			<—Ph.D.—>			⁞	27
Soil Management							
(1)			⁞				3
(2) Soil Physicist (water consv.)		<—Ph.D.—>				⁞	27
Soil Chem. & Fert.							
(1) Soil Fert Spec	<—Ph.D.—>				⁞		27
(2) Soil Fert Spec		<—Ph.D.—>				⁞	27
(3) Soil Fert Spec			⁞				3
III. FORAGE, PASTURE & LIVESTOCK PROGRAM							
(1) Past Mgmt	⁞						3
(2) An Sci/Past	<—Ph.D.—>				⁞		27
(3) Forage Util			<—Ph.D.—>			⁞	27
IV. FOOD LEGUMES							
(1) Breeding		⁞					1
(2) Agronomy	<—Ph.D.—>				⁞		27
(3).Breeding			<—Ph.D.—>			⁞	27
V. PEST MANAGEMENT							
A. Entomology							
(1) Entomologist	<—Ph.D.—>				⁞		27
(2) Entomologist			<—Ph.D.—>			⁞	27
B. Plant Pathology							
(1) Mycologist	<—Ph.D.—>				⁞		27
(2) Food Leg Path	<—M.S.—>				⁞		25
(3) Virologist	▓						3
C. Weed Science							
(1) Weed Sci			<—Ph.D.—>			⁞	27
(2) Weed Sci	<—Ph.D.—>				⁞		27
VI. AGRIC. MECHANIZATION							
(1) Mach Design	<—M.S.—>			⁞			25
(2) Mach Design			<—M.S.—>			⁞	25
(3) Mod & Maint					<—M.S.—>		24
VII. SOCIAL SCIENCES							
Agric Economics							
(1)		<—Ph.D.—>			▓		27
(2)			<—Ph.D.—>			▓	27
Sociologist							
(1)	<—Ph.D.—>				▓		27
VIII. SUPPORT & SPEC SERV							
(1) Biometrics		<—M.S.—>			⁞		25
IX. TECHNOLOGY TRANSFER							
(1) Tech Trans Spec.		<—Ph.D.—>			⁞		27
X. ADMINISTRATION		<—M.S.—>					25
Total Person Months	126	212	188	91	58	37	712

⁞ M.S. Study Grant

▓ Ph.D. Study Grant

TABLE III-3

Participant Trainee' Advisor Visits (Months)

		88/89	89/90	90/91	91/92	92/93	93/94	Total
I.	Cereal Breeding & Select	1.2	1.5	.3	.3			3.3
II.	Agronomy & Soil Science Crop Manage. & Physio.	.3	.6	.3	.3			1.5
	Soil Management	.3	.3	.6	.3	.3		1.8
	Soil Fertility	.3	1.2	.3	.6	.3		2.7
III.	Forage, Pasture & Livest.		.3	.6	.3			1.2
IV.	Food Legumes		.3					.3
V.	Pest Management Entomology			.3	.3	.3	.3	1.2
	Plant Pathology			.6	.3	.3		1.2
	Weed Science	.3	.3	.3	.3			1.2
VI.	Agricultural Mechanization	.3		.3		.3		.9
VII.	Social Science Agricultural Economics	.3		.3				.6
	Sociology		.3	.3	.3	.3		1.2
VIII.	Support Services	.3	.3					.6
	TOTALS (Months)	3.3	5.7	3.9	3.0	1.5	.3	17.7

In addition to long term training, AID will also finance short term training and study tours in the U.S. and third countries which will be outlined in an annually prepared training plan. Like the long term training program, the short term program will concentrate its resources on the integrated applied research effort. However, a limited number of slots for out-of-country short term training related to technology transfer and institutional sustainability will be set aside in the annual training plans. An active in-country training program will be supported primarily to enhance institutional sustainability. The in-country program will consist of sending Aridoculture Center staff to Moroccan institutions for training in areas such as accounting and computer science as well as on-the-job training from long and short term expatriate consultants.

The scheduling of short term training will be flexible to meet needs as they arise during the course of project implementation. The following short term training is illustrative. A total of 169 person months will be provided.

-- For Moroccan Scientists: 24 person months

Ph.D. scientists will be sent to professional meetings and visit other research laboratories. Scientists in training will attend special meetings or short courses related to their programs.

-- For Moroccan Support Personnel (at B.S. level): 27 person months

The Technical Reference Center Director, Computer Center Director, Electronic Equipment Specialist, and Research Station Managers will receive training to enhance their capabilities.

-- For Research Technicians: 50 person months

Short courses of 2-6 months duration at ICARDA, CIMMYT, and at U.S. universities will be provided. Such programs will include cereal and food legume agronomy, breeding and management, greenhouse operation, agricultural equipment maintenance and management, and similar topics.

-- For Operating Support Technicians: 12 person months

In-country training will be provided in vehicle mechanics, vehicle repair center management, facility maintenance, electrical repair, plumbing.

-- For Administrative Personnel: 20 person months

Short courses, primarily in-country, in computer applications and financial management will be provided.

-- For Center Director and Research Coordinator: 6 person months

These individuals will receive training in research management at USDA or other appropriate institutions.

-- For Technology Transfer Specialists: 12 person months

Short courses in training methodologies, media preparation, and on-farm research will be funded.

-- For Project Area Extension Specialists Linked to the Aridoculture Center Program: 18 person months

Specialists will attend short courses in extension methods, on-farm research techniques, and research/extension linkages.

2. Technical Assistance

As of September 30, 1987, there were fourteen MIAC resident advisors at the Aridoculture Center. Responsibilities of MIAC staff include acting as coordinators of the research programs, directly participating in research and technology transfer activities, and serving as local faculty advisors for returning training participants who must complete the research portion of their studies. MIAC will expand its presence by the addition of three technical advisors: a training and media specialist for technology transfer, an electronic equipment maintenance technician (for one year only), and an entomologist. However, during the extension period, Moroccan staff will begin to assume greater responsibility for conduct, transfer, and management of research, and during the second year of the extension, MIAC staff will gradually begin to phase out. The following table reflects the composition of the MIAC team and the pace of the MIAC phase out.

TABLE III-4

Numbers of MIAC Resident Staff

Discipline Area	FY 86/87*	FY 87/88*	FY 88/89	FY 89/90	FY 90/91	FY 91/92	FY 92/93	FY 93/94
Cereal Agronomy	1	1	1	1	1	1	1	-
Cereal Breeding	1.25	1.25	1.25	1.25	1	1	-	-
Soil Management	1	1	1	1	1	1	1	-
Soil Fertility	1	1	1	1	1	1	1	-
Forage Agronomy	1	1	1	1	1	1	1	-
Pathology	1	1	1	1	1	-	-	-
Weed Science	1	1	1	1	1	1	-	-
Entomology	-	1	1	1	1	1	-	-
Ag Engineering (equip design)	1	1	1	1	1	1	1	1
Ag Equipment (maintenance)	1	1	1	1	1	1	1	1
Ag Economics	1	1	1	1	1	1	-	-
Sociology	1	1	1	1	-	-	-	-
Technology Transfer	-	1	1	1	1	1	-	-
Operational Management	-	-	1	-	-	-	-	-
Administrative Officer	1	1	1	1	1	1	1	1
Research Coordinator	0.75	0.75	0.75	0.75	-	-	-	-
Team Leader	1	1	1	1	1	1	1	1
Total Staff	14	16	17	16	14	13	8	4

* Financed under existing project.

In addition to the resident advisors MIAC will also provide 84 person months of short term technical assistance under the extension. This includes the 66 person months of short term consultant time shown in Table III-5, on the following page plus the 17.7 person months of participant trainee advisor visits shown in Table III-3.

TABLE III-5

SHORT-TERM CONSULTANT TIME
DRYLAND AGRICULTURE APPLIED RESEARCH PROJECT

	Research Category	88/89	89/90	90/91	91/92	92/93	93/94	TOTAL
I.	CEREAL BREEDING & SELECT.				0.5	1	1	2.5
II.	AGRONOMY & SOIL SCIENCE	1		1		1	2	5
III.	FORAGE, PASTURE, LIVESTK.	1	1	0.5	0.5	0.5	0.5	4
V.	PEST MANAGEMENT	0.5	0.5	0.5	1	2	2	6.5
	Entomology							
	Plant Pathology							
	Weed Science							
VI.	AGRICULTURAL MECHANIZAT.	0.5	0.5	0.5	0.5	0.5	0.5	3
VII.	SOCIAL SCIENCE							
	Agric. Economics	1	1	1	1	2	3	9
	Sociology	1	1	1	1	1	1	6
VIII.	SUPPORT & SPECIAL SERV.							
	Biometrics	1	1					2
	Computer Science	0.5	0.5					1
	Electronic Equip. Maint.		1	1	1	1	1	5
	Technology Transfer	1	1	0.5	0.5	0.5	0.5	4
IX.	RESEARCH MANAGEMENT	4	4	4	2	2	2	18
	Total, Months/Year	11.5	11.5	10	8	11.5	13.5	66

3. Commodities

AID will finance the procurement of about $2.8 million of commodities under the project extension. Approximately 85 percent of the support is for the procurement of equipment and supplies for research at the laboratory and research stations, for on-station and on-farm trials, and for technology transfer activities. The remaining 15% of the commodities budget is for vehicle procurement and minor, non-capital modifications to existing laboratories to upgrade them and make them more suitable for research to be undertaken. A discussion of procurement process is provided in the procurement plan of this Project Paper Supplement.

IV. PROJECT FINANCIAL PLAN

A. Budget Overview

To date, $26,323,400 has been authorized and all but $400.00 has been obligated for the Dryland Applied Agriculture Research Project. Under the project extension, another $23,676,600 will be authorized, bringing the total USAID life of project funding to $50,000,000. Under the current project, $24.1 million of the $26.3 million is committed to project activities through August 1988 (PACD). This includes all planned commitments to the MIAC contract as well as other commitments such as those provided to CRS, IAV Hassan II and/or other executed USAID Project Implementation orders (PIO'S). Thus, about $2.2 million of the existing project will be carried over to be made available for the extended project.

Estimated USAID expenditures for the extended project are shown in Master Budget Table IV-2 (see Annex 9 for detailed explanation of estimating costs). The core project activities of about $22 million include all technical assistance, training, commodities and operational costs planned for implementation through MIAC. This also includes implementation of programming by objective to be subcontracted by MIAC. To this, $2.9 million of inflation, $140 thousand for evaluation and audits, and $862 thousand for contingencies are added bringing the total estimated project activities to $25.9 million.

B. GOM Budget Overview

To date, the GOM has committed the equivalent of $11,936,400 to this project. Under this project extension, the GOM will increase its contribution by the equivalent of $16,295,000, bringing its total contribution to $28,231,400. Table IV-1 indicates the financial contribution of each government to the project since its inception in 1978.

Table IV-1

LIFE OF PROJECT BUDGET

	AID	GOM	TOTAL
Original Project plus subsequent amendments	$26,323,400	$11,936,400	$38,259,800
1988 amendment	$23,676,600	$16,295,000	$39,971,600
TOTAL	$50,000,000	$28,231,400	$78,231,400

The GOM will commit itself to a significant increase in its budgetary support for the project in order for project objectives to be met. The GOM will provide an increase of 25 percent over the 1987 budget level for 1988 and 47 percent increase over the 1987 budget level for 1989. These increased budgetary levels were derived from an indepth analysis of how much it costs to run the Center now, how much more the GOM will have to provide in operating expenses which the project currently provides, how much the GOM will have to pay for increased scientist salaries, assuming the salary issue is solved, and how much the GOM will have to provide to sustain the Center as AID funding is phased out. These budgetary levels are based on the vision of the Center agreed to by USAID, INRA, and the MIAC design team, and based on the past history of how much each operational and investment item has cost. The cost back-up sheets are included in Annex 9.

The projected overall 47 percent budgetary increase for 1989 represents an 82 percent increase in expenditures for salaries, a 47 percent increase in expenditures for operational support, and a 24 percent increase in the investment budget over 1987 levels. The operating budget increase reflects increased research activity by increasing numbers of Moroccan scientists and a gradual shifting of operating costs from the USAID budget to the GOM budget. By the end of project in 1994 the GOM will provide all operating costs. Beyond 1989, salaries increase about 4 percent per year. Operating costs covered by the GOM are projected to increase at about 10 percent per year and level out by 1992, thereafter remaining constant. The investment budget declines about 11 percent per year from 1989 through 1994, reflecting completion of major construction requirements. The overall budget for the GOM remains constant after 1992 at the equivalent of approximately 19 million dirhams per year through 1994 (see Table IV-2).

TABLE IV-2 MASTER BUDGET

FUNDING SOURCE	FY 1988/89 AID FE	FY 1988/89 AID LC	FY 1988/89 AID Total	FY 1988/89 GOH	FY 1988/89 Total	FY 1989/90 AID FE	FY 1989/90 AID LC	FY 1989/90 AID Total	FY 1989/90 GOH	FY 1989/90 Total	FY 1990/91 AID FE	FY 1990/91 AID LC	FY 1990/91 AID Total	FY 1990/91 GOH	FY 1990/91 Total	FY 1991/92 AID FE	FY 1991/92 AID LC
Budget Line Item 1)																	
A. U.S. Technical Assistance																	
1. Long Term Salaries	1391	—	1391	—	1391	1380	—	1380	—	1380	1135	—	1135	—	1135	1082	—
2. Short Term Salaries	121	—	121	—	121	164	—	164	—	164	163	—	163	—	163	124	—
3. Support Costs	623	141	764	—	764	499	130	509	—	509	501	123	624	—	624	300	163
4. Indirect Costs	1163	—	1163	—	1163	1133	—	1133	—	1133	1000	—	1000	—	1000	792	—
Subtotal	3298	141	3439	0	3439	3166	130	3236	0	3236	2827	123	2950	0	2950	2306	163
B. GOH Salaries 2)	—	—	—	965	965	—	—	—	1012	1012	—	—	—	1035	1035	—	—
C. Training 3)	303	5	308	16	324	429	5	434	22	456	375	5	380	18	398	234	5
D. Commodities 4)	557	125	682	280	1002	516	123	639	231	870	362	102	464	271	735	307	85
E. Operations 5)	188	279	467	353	1020	138	252	387	588	975	125	213	338	647	985	211	130
F. Construction 6)	—	—	—	509	509	—	—	—	372	372	—	—	—	432	432	—	—
Subtotal of A - F	4346	550	4896	2303	7199	4086	510	4596	2225	6821	3689	443	4132	3403	6535	2888	306
G. Inflation 7)	174	28	202	119	321	328	51	386	221	607	443	71	514	382	896	530	67
H. Evaluations/Audits	—	—	—	—	—	—	—	—	—	—	60	—	60	—	60	—	—
I. Contingencies 8)	100	67	167	—	167	100	67	167	—	167	80	27	107	—	107	100	67
	4620	645	5265	2512	7777	4621	638	5259	2446	7705	4272	541	4813	3785	7598	3530	438

FY 1991/92 GOH	FY 1991/92 Total	FY 1992/93 AID FE	FY 1992/93 AID LC	FY 1992/93 AID Total	FY 1992/93 GOH	FY 1992/93 Total	FY 1993/94 AID FE	FY 1993/94 AID LC	FY 1993/94 AID Total	FY 1993/94 GOH	FY 1993/94 Total	TOTAL AID FE	TOTAL AID LC	TOTAL AID Total	TOTAL GOH	TOTAL Total
1082	—	1082	757	—	757	—	757	669	—	669	—	669	6304	—	6304	—	6304
124	—	124	131	—	131	—	131	171	—	171	—	171	874	—	874	—	874
411	—	411	197	86	283	—	283	206	66	272	—	272	2294	649	2943	—	2943
792	—	792	702	—	702	—	702	680	—	680	—	680	5398	—	5398	—	5398
2409	0	2409	1787	86	1873	0	1873	1446	66	1512	0	1512	14770	649	15419	0	15419
—	1071	1071	—	—	—	1094	1094	—	—	—	1153	1153	—	—	—	6320	6320
239	12	251	172	5	177	2	179	138	5	142	2	145	1681	30	1681	72	1753
391	186	579	275	59	334	255	589	233	51	284	207	491	2230	546	2776	1280	4056
321	706	1027	190	100	290	706	1004	163	107	270	706	976	1012	1069	2081	3906	5987
—	274	274	—	—	—	175	175	—	—	—	136	136	—	—	—	1090	1090
3362	2249	5611	2424	250	2682	2232	4914	1980	229	2209	2204	4413	19683	2294	21977	12796	34683
587	493	1080	533	72	605	625	1230	535	78	613	749	1362	2540	367	2907	2589	5496
—	—	—	—	—	—	—	—	80	—	80	—	80	140	—	140	—	140
167	—	167	100	67	167	—	167	30	37	67	—	67	530	332	862	—	862
4116	2742	6858	3057	397	3454	2857	6311	2645	304	2949	2953	5902	22893	2993	25886	16293	42181

Footnotes

1) Exchange rates: 1 U.S. Dollar = 0.5 Durban
2) GOH contribution in from budget de fonctionnement
3) GOH contribution in for air fares of participants to U.S.
4) GOH contribution in from budget d'equipement
5) GOH contribution in from budget de fonctionnement
6) GOH contribution in from budget d'equipement
7) Inflation for AID FE is 4% compounded annually.
Inflation for AID LC and GOH is 3% compounded annually.
8) For related activities not yet specifically budgeted for in other line items and would require USAID/GOH approval.

Failure of the GOM to provide the minimum increase in the total budget would: 1) require eliminating research activities in key problem areas; 2) slow down the transfer of responsibility from MIAC advisors to GOM scientists, thereby weakening the institution in the long-run; and 3) endanger remaining priority programs by starving them with respect to operating funds.

In order to assure that the GOM will provide the necessary budgetary resources, a condition precedent to signature of the FY 88 Project Agreement will require the GOM to accept the budgetary amounts indicated in the project supplement budget and to allocate at least the amounts for 1988. A covenant will be included in the Project Agrement requiring that current year funds are available and prior year funds have been expended, prior to the signature of each subsequent Project Agreement. See Section VII for exact wording.

C. Other Potential Project Activities

Several other related activities have been identified which would be both useful and compatible with core project activities subject to the availability of funds. Such activities could be financed from contingency funds with approval by INRA and USAID. However, these activities have not been specifically planned nor budgeted for in the core project since their priority and operational plan is, as yet, unspecified. Such activities include but are not necessarily limited to the following:

a) Soil surveys for the remaining project region. The total estimated cost is $150,000 per year for three years. However, it is expected that the GOM would share some of these costs. INRA and MIAC will further analyze how and who will perform soil surveys and they will solicit proposals from competent entities for the work.

b) Selected Master degree training of INRA researchers not currently posted at the Aridoculture Center but who must interact with Aridoculture Center Research programs on a national level (for example, cereal breeding, forages, etc.) may be funded at a cost of $120,000 per year for four years.

c) Grants to other entities such as PVO'S or other Moroccan Institutions to carry out specific activities related to technology transfer have been anticipated at an approximate cost of $100,000 per year for two years.

D. GOM Contribution

The yearly GOM contribution in both dirhams and dollars is provided in the two tables below. The tables present the GOM's budget within their two categories, "Fonctionnment" and "Equipment." The columns named "Operating" and "Salaries" form the "Fonctionnment" budget. Equipment is the "Equipment" or Capital Budget.

TABLE IV-3

(Million Dirham Contribution of GOM)

Calendar Year	Operating	Investment	Salaries	Total
87/1988	4.1	6.5	6.3	16.9
88/1989	4.7	7.3	8.4	20.4
89/1990	5.0	5.1	8.8	18.9
90/1991	5.5	6.0	9.0	20.5
91/1992	6.0	3.9	9.2	19.1
92/1993	6.0	3.7	9.3	19.0
93/1994	6.0	2.9	9.8	18.7

TABLE IV-4

(000 Dollar Contribution of GOM -
Exchange Rate = 8.5 dirham/$
See Table IV-3 for Cross-Reference)

Calendar Year	Operating	Investment	Salaries	Total
87/1988				
88/1989	553	859	981	2393
89/1990	588	603	1034	2225
90/1991	647	703	1053	2403
91/1992	706	460	1083	2249
92/1993	706	430	1096	2232
93/1994	706	343	1155	2204

"Operating" Column above matches "Operations" in Table IV-2
"Investment" Column above matches "Constructions" Column plus "Commodities " Column in Table IV-2
"Salaries" Column above matches "Salaries" plus "Training" Column in Table IV-2.

"Total" Column above matches "GOM Total" before Inflation in Table IV-2

E. Disbursement Procedures

AID will follow disbursement procedures initiated under the on-going project. A federal reserve letter of credit has been issued in favor of MIAC. When draw downs on the letter of credit require that a replenishment be made, a contracting officer provides the AID Office of Financial Management (FM) with the necessary information and requests that the funds available under the letter of credit be increased to a specific amount. FM responds accordingly.

MIAC uses the letter of credit funds for both foreign exchange and local currency expenditures. For local currency expenditures, MIAC has opened a U.S. bank account on which the MIAC team leader in Morocco can write checks. A transaction by the U.S. Embassy/Morocco converts these dollar checks into dirham checks which are then deposited into a Moroccan bank and drawn upon for local currency expenditures.

Monthly statements of MIAC expenditures are forwarded to FM by the MIAC accounting office. FM, in turn, sends these statements to USAID/Morocco.

Table IV-5 is an obligations schedule for the project.

TABLE IV-5

PROJECT
7/1/88

OBLIGATIONS/EXPENDITURES SCHEDULE
THROUGH FY 1994
(000'S)
DRYLAND AGRICULTURE APPLIED RESEARCH
(608-0136)

LOP FUNDING: 50,000

	OBLIGATIONS/ MINIMUM FF REQUIREMENTS (A)	CUMULATIVE OBLIGATIONS	EXPENDITURES	CUMULATIVE EXPENDITURES	PIPELINE	BALANCE TO BE OBLIGATED
THRU FY 1987	26,323	26,323	18,797	18,797	7,526	23,677
THRU FY 1988	400	26,723	5,257	24,054	2,669	23,277
THRU FY 1989	5,200	31,923	5,265	29,319	2,604	18,077
THRU FY 1990	5,100	37,023	5,249	34,568	2,455	12,977
THRU FY 1991	4,500	41,523	4,873	39,441	2,082	8,477
THRU FY 1992	3,800	45,323	4,116	43,557	1,766	4,677
THRU FY 1993	3,200	48,523	3,454	47,011	1,512	1,477
THRU FY 1994	1,477 (B)	50,000	2,989	50,000	0	0

(A) This column represents minimum forward funding (FF) requirements of eighteen (18) months; that is, the pipeline of the previous fiscal year plus the current year obligation will cover current year expenditures plus six (6) months expenditures (through March) of the following fiscal year.

(B) This final fiscal year obligation is illustrative only, based strictly on minimum FF requirements. In fact, this obligation would be made in FY 1988 to compensate for possible short-fall in availability of DA funding in FYs 1987 and 1990.

V. IMPLEMENTATION PLAN

A. Implementation Arrangements

The USAID Morocco Agricultural Division will have the primary responsibility within AID for implementation and monitoring of the project. The GOM implementing agency is the National Institute for Agricultural Research (INRA). Decision making authority for project activities rests with the director of INRA.

As a Title XII collaborative assistance mode project, USAID, INRA, and MIAC will work together to set out the specific activities which will lead to the achievement of project objectives, track the progress of the project, and ensure that the procedural requirements of the respective governments are satisfied. The cornerstone of the collaborative assistance mode is the annual work plan process. It is through the annual work plan that the actual activities from year to year of the project become specified and operational targets are set. This annual work plan process offers more flexibility than other contracting modes and views a project as an evolving and changing entity rather than one fixed in concrete. In the spirit of collaborative assistance, the implementation schedule cannot be completely cast at this stage of the project design process. Only key milestones can be identified. These will be refined and further operationalized on a yearly basis.

Tracking the progress of the project means measuring the performance of the Aridoculture Center in meeting its research, technology transfer, and institutional sustainability objectives; evaluating the performance of MIAC in providing high quality and timely technical assistance and training; and doing self assessments of AID's and INRA's performance in facilitating project implementation. In tracking project progress, AID and INRA will rely on their respective monitoring systems (which consist of regular visits to the Center and quarterly and annual progress reports prepared by the Center) as well as on assessments and evaluations conducted by independent parties. The Scientific Review Panel and the scheduled project evaluations will be useful in this latter instance. (The Scientific Review Panel is a group of scientists from universities and international research centers which visits the Aridoculture Center on an annual basis to review and comment on the work being conducted.) In the event of project implementation problems, AID and INRA and, if appropriate, other project participants will meet to determine what action will be taken to resolve the problem.

B. Illustrative Implementation Schedule

Since the cornerstone of the collaborative assistance mode is the annual work plan which will lay out in great detail each implementation action year by year, the following implementation schedule lays out only the major project events. The annual workplans should be considered as supplements to this PPS.

	ACTIVITY	ESTIMATED DATE
1.	Project Paper Supplement Authorized	February 1988
2.	Survey Plan for Baseline Survey for two project regions (other than Abda) complete	March 1988
3.	Scientific Review Panel assesses project activities	May 1988-1994
4.	GOM acquires new land for Sidi El Aydi Research Station	June 1988
5.	GOM satisfies budgetary CPs	June 1988
6.	Bilateral Grant Agreement Amendment signed	June 1988
7.	Baseline Profile for Abda Region Published	August 1988
8.	Baseline data for two other regions collected	August 1988
9.	New Contract with MIAC signed	August 1988
10.	Annual Work Plan submitted to USAID	September 1988
11.	MIAC and INRA complete soil survey plan	June 1989
12.	Baseline Profile for all regions completed and published	December 1989
13.	Mid-Term Project Evaluation conducted	August 1990
14.	Annual Work Plans submitted to USAID	September 1990-1993
15.	Final Project Evaluation Team arrives and completes evaluation	July 1994
16.	End of Project	August 1994

C. Procurement Plan

Most of the AID-financed training, technical assistance, and commodities for the project are provided through a collaborative assistance contract with MIAC. MIAC first became involved with the project in 1976 when it was selected on a competitive basis to conduct the project feasibility study and subsequently assist with initial project design. It was awarded a collaborative assistance contract in 1980 to implement the project following a determination by an AID non-competitive review board in 1979. Prior to the initiation of design activities for the project extension, USAID/Morocco sought a sole source waiver to permit a continuation of the collaborative assistance contract with MIAC. The waiver which was approved by the Counselor to the Agency is copied in Annex 4 of this Project Paper Supplement.

The existing contract with MIAC expires on August 31, 1988. However, to reflect the adjustment in levels of training, technical assistance, and commodity procurement that will be made as a result of this extension, a new MIAC contract will be signed prior to the completion of the existing contract. It is expected that the new MIAC contract will be in place by mid 1988.

Under the new contract, MIAC will be required to provide USAID, through its annual work plans, yearly detailed estimates for short and long term training, short and long term technical assistance, and commodity procurement. The plans will indicate a budget and rationale for what will be required in the upcoming year.

It is expected that MIAC will provide through the amendment an estimated 72 person years of resident technical assistance, 84 person months of short term technical assistance, training for 7 M.Sc. and 19 Ph.D. candidates and an estimated 169 person months of short term training. Technical assistance will be provided by faculty and staff from MIAC universities or by individuals contracted by MIAC. Most of the U.S. training will take place at MIAC campuses. However, when appropriate, other universities or institutions will provide training through agreements with MIAC. This could be particularly relevant to short term training.

MIAC will also be responsible for commodity procurement of items financed by the project. This includes developing commodity specifications, procuring under a competitive procurement program, arranging commodity shipment and insurance, clearing commodities through customs, and establishing an equipment maintenance capability. The Project Paper Supplement has an estimated AID budget of $3 million for commodity procurement. Approximately 43 percent of this is set aside for equipment, 40 percent for expendable supplies and materials, 10 percent for vehicles, and 7 percent for facilities modification. Vehicles will not be of U.S. source and origin. A waiver for procurement of vehicles and spares from geographic code 935 in the amount up to $520,000 was granted by the AA/ANE on February 9, 1988.

There is flexibility in the project to contract the completion of certain activities with entities other than MIAC if, during the course of the project, it is determined that others have an advantage over MIAC. In these instances, Gray Amendment entities will be given consideration.

D. Monitoring and Evaluation Plan

1. Monitoring Plan

Oversight and monitoring responsibilities rest with the USAID/Morocco Agriculture Division project manager. In carrying out these responsibilities the project manager will visit the project site at least once a month to track project progress and assist in the resolution of implementation issues. To further facilitate project monitoring the MIAC team leader will prepare, as he has done in the past, a quarterly report that summarizes project progress. The report will include departures and returns of consultants and participant trainees, a briefing on research activities, and a discussion of pending problems and issues. Drawing from his regular visits and the MIAC quarterly reports, the project manager will prepare quarterly project implementation reports for USAID/Morocco review and discussion. Other documents that will be useful in the monitoring process are the annual research report, the annual work plan, and reports prepared by the Scientific Review Panel.

2. Evaluation Plan

a. Overview

Evaluation has been a valuable tool throughout the implementation of the project. Both the 1983 and the 1986 evaluations provided sound recommendations to improve and expand project activities. Under the extension, two major evaluations are planned. The objectives of the first, scheduled for August 1990, will be as follows: (1) to assess progress made in both research produced and in the institutionalization of the research function; (2) to assess progress made in initiating a technology transfer program at the Center; (3) to measure progress made in institution building activities including staffing, facility construction, management, and budgeting; (4) to measure the pace of the transition to Moroccan leadership at the Aridoculture Center; (5) to measure the rate of technology adoption among target farmers and the impact of this adoption; and (6) to make recommendations that will facilitate the successful completion of USAID assistance. The second, an end of project evaluation, will focus on overall project impact on transfer of technology and farmer productivity in the project region, determine whether the Aridoculture Center has become a high quality, sustainable institution, and derive lessons that can be useful to AID in the design of future research projects. The second evaluation will also make recommendations to the Government of Morocco as to actions it might wish to take in support of the Center's continued growth and development.

b. The Users of Evaluation Information

There will be four primary users of evaluation information:

- the Aridoculture Center will use the evaluations to improve its on-going operations and in developing plans for future operations;

- INRA will use the evaluations to facilitate improvements at the Aridoculture Center and to apply selected recommendations to other regional research institutes as it deems appropriate;

- USAID/Morocco will use the first evaluation to improve overall management of the project and to consider what steps it might take to facilitate implementation of the recommendations. The second evaluation will be used as a lessons learned exercise and will feed into the design of other USAID projects;

- MIAC will use the evaluation to judge its own performance and to make adjustments and improvements as appropriate;

c. Project Goal, Purpose, Inputs and Outputs

These are described in detail in the summary and recommendations section and the project description section of this paper. An overview is available in the logframe located at Annex 1.

d. Manager's Priority Questions

Manager's questions will reflect four levels of achievement relating to institutional capability, institutional performance, institutional sustainability, and development impact. Development impact is the most critical and will receive the greatest attention, especially during the second evaluation.

Questions which will be answered for each of these levels include:

- Institutional capability (measures whether inputs have been provided as scheduled in terms of both quantity and quality): Have appropriate numbers of Moroccan scientists and support staff been satisfactorily trained in relevant areas of expertise? Are laboratories and research stations designed to meet scientist needs? Are appropriate supplies and equipment readily available for research as well as technology transfer activities? Were cost estimates for GOM contribution accurate and if not, what are more realistic estimates? Are authorized funds being released on a timely basis?

- Institutional performance (measures whether outputs have been achieved): Is Center generating disease and drought resistant crop varieties, improved cultivation practices, and appropriate mechanized equipment for the dryland regions? Are there new technologies being transferred

successfully to the retailers of technology such as the extension service? Is the Center collecting, analyzing, and applying socio-economic data? Are sound management practices in force at the Center? Are scientists working comfortably in the multidisciplinary mode? Have Moroccan staff members assumed increased responsibilities at an appropriate pace? Have Center generated technologies performed as advertised? Has PBO resulted in improved institutional performances in terms of the selection of research? Is quality of research up to standards? Is the Center working with the extension service to disseminate technologies? Are female as well as male farmers being contacted?

Institutional sustainability (measures whether purpose has been achieved): Is the Center attracting and retaining competent, highly motivated scientists and support staff? Is the Government of Morocco authorizing a reasonable budget for Center operations? Is the procurement function being performed in an effective fashion? Has the Center established strong linkages with major retailers of technology? Has the Center formed active relationships with appropriate national and international organizations? Are scientists receiving satisfactory support in regard to reference material, computer services, and statistical analysis? Are equipment, vehicles, and physical plant receiving proper maintenance? Has PBO been successfully implemented?

Development impact (measures whether goal has been achieved): Are farmers adopting technologies developed at the Center? What is the rate of dissemination and adoption for all technologies released by the Center? Who are the adopters and non-adopters and why, in both cases? Does land size, farmer education, land tenure, etc. have an impact on who adopts? Have yields of cereals, forage, and legumes gone up as a result of adoption? Have livestock benefitted from the forage program? Has the Aridoculture Center had an impact as the model of agricultural research in Morocco? Are other research centers, duplicating the Center's approach? Are farmers in the project region better off than farmers in regions not benefitting from research? Have farmer incomes increased? What has been the gender impact of the project? Has the size of farm changed? If so, has this been caused in any way by new technologies provided by the project? Have the new technologies produced been "paid for" by production and/or income increases? Is Morocco more able to meet its food needs? Has increase in production resulting from project technologies improved Morocco's overall balance of agricultural trade? Have the technology dissemination techniques (e.g. with private firms) increased the involvement of the private sector in the agricultural input system?

e. Key Indicators and Administrative Data to Answer Manager's Question

The key indicators for each level of project objectives are found in the Logical Framework column on objectively verifiable indicators. The major sources of administrative data are listed in the means of verification columns.

Each evaluation will be conducted in a collaborative fashion as follows: A task force consisting of representatives from MIAC, USAID, the Aridoculture Center, the extension service, and a farmer organization will work closely with the evaluation team, although not participate in the actual data collection and analysis. The task force will develop the scope of work for the evaluation team which will then be drafted by the USAID project officer. The evaluation team will meet with the task force, shortly after their arrival in country, and review the evaluation plan, verifiable indicators, and data collection plan. They will develop more refined qualitative and quantitative measures of the indicators. In general the evaluation approach used will include review of project documents, interviews of project, Center, AID, and INRA staff, and structured interviews of a sample group of farmers. Following the data collection and analysis stage, the evaluation team will again meet with the task force to discuss the implications of the findings and to develop, as a group, the evaluation recommendations.

Obviously, one of the major objectives of the evaluation process will be to determine whether target farmers are adopting new technologies, which technologies they adopt, whether the new technologies improve their productivity and income, and whether agriculture in the project region is improving. In order to measure impacts in this area, a baseline survey will be conducted and repeated during each of the evaluations.

The baseline survey will build on the in-depth surveys of farms carried out in 1985/86 in Safi provinces, and work already completed in Chaouia. The MIAC agricultural economist, assisted by the sociologist, and short-term technical advisors as needed, will construct a comprehensive set of farm-level data. This set of baseline data will be constructed during 1988 and 1989 and will be funded by the MIAC contract. Representative farms will be identified for each major farming system and will represent the major soil-rainfall classifications. Data on current crop and livestock systems, cultural practices, costs and returns, and employment will be collected. The representative farms will be followed throughout the LOP, measuring the impact of adoption of recommended new technological packages on farm income, production, marketable surplus, and employment. The 1988 workplan will develop the scope of work for the impact evaluation studies. During each evaluation, the baseline data will be updated by data gathered by structured interviews of a sample number of farmers in the project region. Annex 11 discusses the baseline survey.

f. Counterpart Support and Involvement

INRA will be invited to have a representative on both evaluation teams. In addition, the INRA director and Aridoculture Center staff will be fully involved in discussions with evaluation team members and in responding to evaluation team concerns.

g. The Budget

The project budget has set aside $80,000 for project evaluation. This will finance three consultants for a one month period for each evaluation as well as as participant observer who will visit the project area at least once each year for a minimum of two weeks each. The evaluation teams will most likely include an agricultural institutional specialist, a research specialist, and a technology transfer specialist.

VI. Project Analyses

A. Institutional Analysis Summary

Appendix 3, Report of the Institutional Sustainability Team, contains an indepth institutional analysis of INRA and the Aridoculture Center conducted during the design of this project extension. In addition, an exhaustive institutional analysis of INRA was conducted by ISNAR in January, 1984. A report of this analysis is available in the project files. Appendix 3, together with the ISNAR report form the basis for institution building activites proposed for the project extension and discussed in detail in Section III. of this PPS. This section will highlight major aspects of INRA and Aridoculture Center organizational structure and function, which provide the basis for project activities described in Section III.

The National Institute for Agricultural Research (INRA) was established April 8, 1981, as a public entity with legal status and financial autonomy. It replaced the Direction de la Recherche Agronomique (DRA). The main difference between the two organizations is that the DRA was under the direct line authority of the Ministry of Agriculture and Agrarian Reform (MARA) and received its funding through MARA. INRA reports to MARA but it is functionally semi-autonomous. It receives its funding directly from the Ministry of Finance.

Under the law by which it was established, INRA has the mandate to:

- carry out scientific, technical, and economic research related to agriculture and livestock production;
- conduct prospective studies, especially concerning the natural environment or relating to the improvement of plant or animal production;
- undertake, on its own initiative or at the request of other individuals or organizations, tests of new crops and crops to be improved and on animal production, and in general to conduct all forms of agricultural experimentation;
- monitor research, studies, or other work conducted on behalf of public agencies. within its field of competence;
- disseminate documentation on its own research and research carried on outside Morocco;
- examine and determine scientifically the practical procedures for application of research results and, in this context, to advise bodies responsible for agricultural extension to farmers;
- to market the results of its research, studies, and other work.

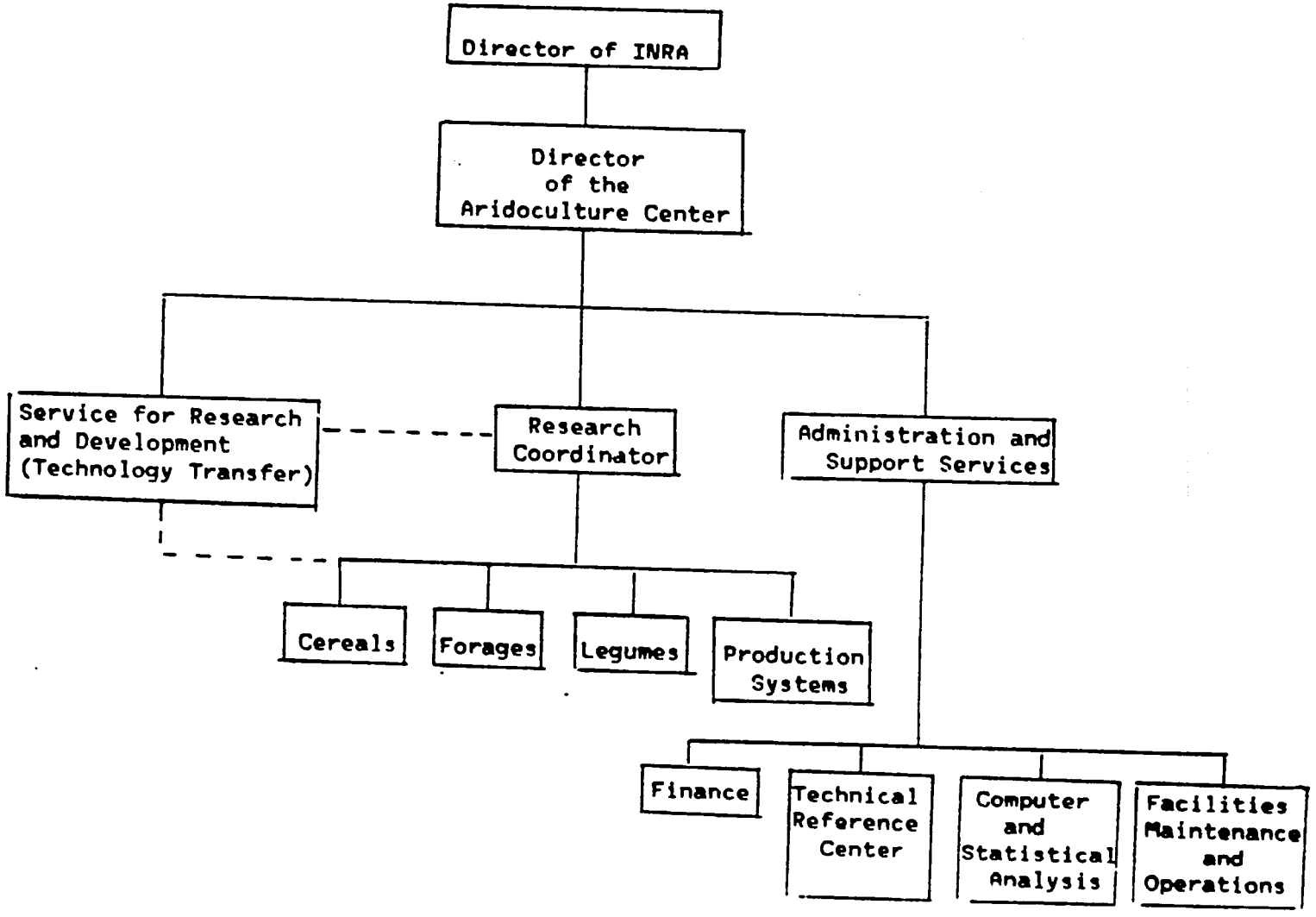
As mentioned previously in this paper, INRA is currently reviewing its organization and seeking improved structures and processes. Management, which has been criticized for being too compartmentalized into specific research units, will be integrated between research disciplines under the Programming by Objectives approach, already discussed in this PPS. Under PBO, the management of INRA as well as the Aridoculture Center will follow multi-disciplinary lines and should result in an organization with more lateral communication linkages and a less hierarchical structure.

Until PBO is fully implemented, INRA is operating on the basis of a provisional organizational structure which has four divisions: research and experimentation, regional services, administrative services, and studies and data processing services.

The Aridoculture Center is one of seven regional centers of INRA. The director of the Aridoculture Center reports directly to the director of INRA. Under proposed organizational changes, the director of the Aridoculture Center will have three clusters of professional staff reporting to him: research staff, support staff, and technology transfer staff (who, in fact, are also members of the research staff). The following chart illustrates the organizational structure at the Center. The dotted line represents the overlap between the research and the technology transfer program.

The Aridoculture Center has access to five research stations with varying agro-climatic conditions. The most important is the Sidi El Aydi station. Its proximity to Settat allows researchers to visit the station on a daily basis. The land is uniform and representative of the Chaouia plain. However, with only slightly more than 30 hectares of land, this station is not big enough to meet research needs. Plans to acquire additional land are being made. The Jemaa Shaim station has over 200 hectares of land in a region for which the mean annual rainfall is 30 percent less than that at Sidi El Aydi. This station is used for large scale trials and the evaluation of improved production systems. The 700 hectare Khemis Zemamra station serves both irrigated and dryland agriculture. Consequently, about half of the station's activities are unrelated to the Aridoculture Center. Major forage and livestock trials will be conducted at Khemis Zemamra once technicians can be placed to provide daily oversight. The Dar Bouazza station with only 24 hectares will be used for disease screening trials by plant pathologists. The 40 hectare Annaceur Station, located in the Mid Atlas Mountains, is at a higher elevation than the other stations. It will be used primarily as a summer nursery for the cereal breeding program and for seed multiplication.

TABLE VI-1


Director of INRA
Director of the Aridoculture Center
Service for Research and Development (Technology Transfer)
Research Coordinator
Administration and Support Services
Cereals
Forages
Legumes
Production Systems
Finance
Technical Reference Center
Computer and Statistical Analysis
Facilities Maintenance and Operations

B. Social Soundness Analysis Summary

Information of the social conditions of the project beneficiary has been and will continue to be collected during the project in order to assure us of two major facts: (1) that the technologies proposed and disseminated by the project do not disrupt or harm existing social arrangements, and (2) that the technology dissemination strategies build on the existing social structure and use that structure to increase adoption and spread of new technologies.

The major project beneficiaries are small and medium farmers in the project region. Secondary beneficiaries are scientists and support staff at the Aridoculture Center. The social characteristics of the target farmer population are important determinants of how successfully new agricultural technology will be transferred and applied. A MIAC sociologist has been studying this population for a number of years, especially in the Abda and Chaouia regions. His reports are available and have been summarized in the Social Soundness Analysis which is found as Annex 8 to this paper. In this section, key farmer beneficiary characteristics are summarized which project experience to date has found are the most critical to the adoption and dissemination of technology. The Social Soundness Analysis of the original Project Paper contains a more general discussion of the beneficiaries.

Social organizations, including the family, tribe, and community, are still very important to Moroccan farmers. Farmer identity continues to be linked up to these structures and communication flows almost exclusively within them. Sociological studies and field observations to date in the project region have shown that Moroccan farmers are most comfortable with field trials and testing when proposals and plans for trials are introduced through these established channels, primarily through leaders who then convince others to accept and diffuse the information and recommendations.

In addition, farm size has proven to be a key determinant of the acceptance rate of technology. Medium to large farmers adopt new technologies first for several reasons. One, larger farmers can employ almost all of the new technologies because their land size can accommodate them. Two, larger farmers generally have the income to support improved technologies and have an easier access to credit. Three, larger farmers often have a higher level of education and hence are more receptive to trying new approaches. Four, small farmers generally farm to supplement family income which is earned from off-farm activities. Hence, increased production is less important to them. The possibility of increased income is, of course, critical for farmers who farm for their livelihood. Medium-sized farmers, who have land between 5 and 50 ha, are the primary clients of this project. They are generally full-time farmers and have less proportion of sharecropped land than small farmers. They have proven to be receptive to innovations which carry moderate risk. Farmers who are members of cooperatives, although making up a small proportion of the total, are also being targetted. These farmers fall into the medium categories.

Women in the project region play an important role in the feeding and care of livestock and will be targets for the diffusion of improved technology in this area. In addition, a study will be initiated with AID Program Development and Support Funds of the role of women in agriculture in the project region. Depending upon the findings of this study, technologies generated by the project which will assist women perform their role will be diffused in appropriate ways to reach women.

C. Economic Analysis

1. Introduction

By their very nature, agriculture research efforts in developing countries do not lend themselves easily to ex ante cost-benefit analyses. Even ex post analyses of the economic returns to agricultural research have labored under serious methodological and empirical limitations. (See Arndt, Thomas and Vernon W. Ruttan, "Research Allocation and Productivity in National and International Agricultural Research," Seminar Report, Agricultural Development Research Council, Sept. 1975, p. 5).

The primary problem with ex ante economic analysis of agricultural research is the difficulty of estimating the size of the benefit stream that will result from such research. There are several reasons for this difficulty:

a) By its very nature, research is risky. Research efforts often lead to dead ends or economically non-viable results. At the same time, when a line of research does pay off, the returns from that research could be enormous, compensating for all of the costs incurred in fruitless research efforts. Unfortunately, one cannot predict in advance which lines of research will lead somewhere. Nor can one accurately estimate how long it will take before a given research goal is achieved.

b) It is difficult to take into account serendipity in research, i.e. the potential returns to discoveries that are made quite by accident.

c) It is difficult to calculate beforehand the potential "synergistic" benefits resulting from the combined impact of discrete research discoveries. The benefits of introducing fertilizer in combination with a new seed variety may greatly exceed the benefits that would have been derived from introducing either fertilizer or new seed alone.

Investment in research alone is rarely sufficient to generate benefits for farmers, particularly in developing countries. Thus, comparing the gross benefits from research against only the direct costs of research, omitting implementation costs (including extension) can give spurious results. It is very difficult to estimate the incremental costs that would be incurred in extending new technologies to small farmers in dryland areas. Consequently, these costs tend to be underestimated, and the speed of adoption

overestimated. The cost of disseminating new technology will depend upon the efficiency of the current extension system (either private or public) and the nature of the research results themselves. Some research findings may lead to relatively straight forward recommendations, thus minimizing the marginal costs entailed in extension and increasing the diffusion rate. Other results, just as potentially valuable, may require greater education, both of farmers and extension agents. The introduction of still other research recommendations may proceed more slowly than expected due to the presence of constraints faced by the farmer but not the researcher (e.g. inadequate cash reserves).

Nevertheless, Agricultural Research in Morocco, and indeed in the rest of the world, typically has a very high payoff. Rates of return on investment, as evidenced by sound, scientifically designed studies carried out for 37 countries of the world in recent years ranged from 20 to 90 percent. This high rate of return on investment suggests that countries tend to underinvest in agricultural research in the sense that marginal returns to investment greatly exceed returns possible in alternative investments. Private firms in industrial countries, for example, generally consider a real rate of return of 10 to 15 percent to be adequate to attract investment.

Direct evidence that the GOM is underinvesting in agricultural research is found in comparing investment in agricultural research as a percentage of agricultural GDP among countries having a range of income levels. Low-income countries invested 0.36% of agricultural GDP, middle-income countries (of which Morocco is one) invested 0.44% and high-income countries 1.10%. Thus, Morocco, which invests about 0.30% of its agricultural GDP in research, lags most countries in the rate of investment in agricultural research.

While there is considerable uncertainty over the potential payoff of research, the areas retained for support under this applied research project are believed to have a high potential payoff in terms of increasing farm incomes and total output. None of the crop varieties or techniques under study are marginal to the farming system. Another way to state this principle is to say that a successful research outcome is expected to yield not only a high (20 to 90% or higher) rate of return, but also to have a significant, widespread application in Morocco farming systems.

There are a number of lines of research being undertaken as part of the Dryland Agriculture Applied Research Project which show promise of providing economic benefits relatively soon. These include research on the following:

- Cereal varieties that have a higher grain yield and are of higher nutritional quality.

- Cereal varieties that are resistent to drought, diseases, and insect damage. Of particular interest is research on Hessian Fly resistant cereals.

- Soil test calibrations that would permit greater accuracy in making fertilizer recommendations.

- Improved water management and conservation practices. Research to date indicates potentially large increases in cereal yields with the use of minimum tillage techniques that reduce soil moisture loss.

- Improved weed control techniques. Weed control in wheat has resulted in 5-20 percent increases in yield in on-farm trials. The application of readily available herbicides in combination with early planting could increase cereals yields even more.

- Improved cultivation techniques (including more effective tillage, planting and harvesting).

- Improved forage production systems, including the adaptation of a cereals/forage legume rotation system (the "ley farming system").

- Winter varieties of chickpeas that are resistant to aschochyta blight. Shifting to winter chickpeas rather than spring varieties has doubled and tripled yields in research tests conducted on the experiment station.

The economic analysis that follows (paragraph 3, below) examines only one of the numerous lines of research being undertaken under the project. The development of Hessian Fly resistant wheat varieties was chosen because the research is somewhat farther along and because it is a technology that should be relatively easy to disseminate (hence the problems of estimating extension costs are minimized). It will be seen that the potential economic returns to the Hessian Fly resistance alone are adequate to justify the project in its entirety.

2. Specific Program Benefit-Cost Analysis

A promising bread wheat being studied at the Aridoculture Center is SD 8036 (Saada) which has both Hessian fly and rust resistance. During the 1985-86 growing season, research was conducted which analyzed the yields of this variety in comparison to the currently cultivated Nesma and Potam wheats which are susceptible to the Hessian fly. In addition, another study was conducted which analyzed the extent of Hessian fly infestation in the bread wheat varieties on 36 different farmer fields. Together these data provide information to estimate the initial impact of the introduction of this new variety into Moroccan agriculture. A note of caution is appropriate because this partial analysis is based upon only one year of agronomic tests and is limited by the economic analysis issues described above.

Yields of Saada exceeded the Nesma and Potam varieties during the last two years of on-farm testing. Experiments were conducted by the project in the 1985-1986 season in which percent yield loss was related to percent Hessian Fly infestation. Surveys were conducted throughout the project region to estimate fly infestation in different parts of the region. The yield "loss function" and infestation survey data were then applied to provincial yield data as reported by DPA's, in order to estimate provincial yields in absence of fly.

The initial "loss function" estimated that a 35% loss, on the average, occurred in 1985-1986. Assuming a 10q x ha average yield on farmers field, this indicated that 5.4q x per ha could be gained with Hessian Fly resistant varieties. Infestation survey data indicated approximately 80% infestation on Nesma and Potom varieties after the second generation fly attack. Using these estimates and given the approximately 310,000 hectares planted to bread wheat in the project arrea, one can estimate that adoption of Saada could potentially increase annual production by 1,329,200 qx (310qx 8 x 5-4). This would have an economic value of 200,880,000 Dirham (24 million dollars) assuming a cost of $150 per metric ton (a value which estimates the long run marginal cost of wheat production).

The above calculation underestimates the economic value for the following reasons. It underestimates percent grain loss under limited moisture (drought) conditions. Data indicates that under moisture or fertility shortage, the percentage loss function will be higher. Research Data also show substantial reduction in straw production under heavy fly infestation. Barley grain loss is also substantial due to the Hessian Fly. In addition, official government statistic's reported average yields at 14.2qx/ha rather than 10qx/ha. None of these potential additive economic gains have been included in the above estimate of 24 million dollars.

Although the magnitude of this change is impressive, it is reduced in part by (1) the rate of adoption by farmers assumed for SD 8036, (2) the extent farmers will use improved fertilizer and herbicide practices along with the new variety (experimental plots, for both control and treatment, use fertilizer and herbicide at higher levels than most farmers), and (3) increased costs to the farmer associated with the new variety and the improved package of associated inputs.

If one assumes 5% of the acreage is planted to the new variety during the first year (1989) and the acreage planted to it doubles every year, then 80% of the acreage in the dryland region would be planted to SD 8036 in 1993. If the fertilizer and herbicide practices are adopted at the same rate as seed adoption, an estimate can be made of the impact of this new variety by year. The increased production would begin at 131,750 qx in 1989 and increase to approximately 2,108,000 qx of additional bread wheat in 1993. This would be approximately 10% of the total annual demand deficit for cereals reported in the period 1980-83. The discounted present value of the stream of annual net

revenues for this new bread wheat from 1989 through the year 2000 would be 1,357,000,000 DH for the 12 year period at the 8% discount rate and a wheat value of 130 DH per qx. Although the current farmgate price for wheat is approximately 200 DH per qx, the lower value is used to account for estimated additional input costs. The dollar value (8.5 DH = 1 dollar) of the discounted stream of net benefits would be $160 million. This is more than double the total cost of the entire AID and INRA research program at Settat over the past ten years. This assumes the new variety does survive successfully after additional years of testing under Moroccan conditions.

In addition, several other promising research projects are underway which will impact Moroccan agriculture in this dryland area in the future. Hessian fly resistance is being added to durum wheats, with potential returns being of the same order of magnitude as that indicated for bread wheat. Fertilizer response to nitrogen in wheat shows increase in yield of up to 190% on various farms in Settat Province. Weed control in wheat has resulted in 5-20% increases in yield during on-farm trials. Shifting to winter chickpeas rather than spring plantings has increased yields by 200-300% in experiment station trials. Each of these new technologies could be economically analyzed to determine the net present value of benefits just as was done in the illustration above. These benefits could be added to others when comparing the benefits of research to the cost of the total research program at the Aridoculture Center.

3. Rate of Return for Agricultural Research Investments

Studies by scientists in many nations over several years have documented the high rates of return to agricultural research. The rate of return suggested for SD 8036 is not at all unusual for investments in research work on agricultural commodities. One of the foremost authorities on the returns from agricultural research, Dr. Vernon W. Ruttan at the University of Minnesota states:

"The results of a large number of studies of the contribution of research to productivity growth have been assembled in Table 10.3. Almost all of the studies indicate high rate of return to investment in agricultural research - well above the 10 to 15 percent (above inflation) that private firms consider adequate to attract investment. It is hard to imagine many investments in either private or public sector activities that would produce more favorable rates of return." V. W. Ruttan. Agricultural Research Policy. U. of Minn. Press. 1982. p. 241.

Table 10.3 that Dr. Ruttan refers to is a multi-page list of 37 research studies on the rate of return to agricultural technological developments. The rates of return typically determined in these studies are between 20% and 90% annually. Clearly, agricultural research investments in Morocco have the potential for high rates of return for each dirham invested.

4. Plan for Continued Economic Analysis

Economic analysis is an integral part of the research plan of this project. The MIAC agricultural economics adviser has already developed a set of baseline, farm-level statistics and assists the researchers in designing trials that include an economic component. These data are to be continuously updated throughout the life of the project.

Each formal evaluation (see evaluation plan) will include an expanded economic analysis based on data generated by research and technology transfer activities. As each line of research reaches the stage of maturity that would allow reasonable estimates of yield changes, adoption rates, and costs of technology tranfer, benefits and costs will be computed and the ongoing economic analysis modified to incorporate the new information.

Following the 1987-1988 harvest sufficient research data will be available to carry out a preliminary economic analysis of the cereal production package. The package includes 1) the Hessian fly resistant variety of wheat, 2) minimum tillage, 3) early planting, 4) weed control and 5) proper fertilization. Economic analysis of this package, to be carried out by the resident agricultural economist assisted by consultants with specialized skills will provide benchmark data for adjusting the research program and improving measures of potential benefits of the research project.

D. Technical Analysis

The technical interventions proposed under the project are based on an extensive analysis of the conditions in the project regions. These conditions are summarized herein. The project is structured such that all new technologies proposed must undergo rigorous review, both by the Scientfic Research Panels and by the MARA, before they are released to the target farmers. A feedback system, discussed in Section III. of this PPS assures that technologies are developed in close collaboration with actual farmers so they are relevant to and not destructive of the existing farming systems. More extensive technical analyses exist in the 1984 report by ISNAR, available in the project files, and in Appendices 1 and 3 of this PPS.

Agriculture is a dominant sector of Morocco's economy. About 55 percent of the population lives in rural areas, and agriculture provides employment for approximately 40 percent of the nation's labor force (down from over 55 percent in 1970). Over half of the agricultural population is fully dependent on rainfed agriculture; about one-fifth depends entirely on livestock; a little over one-fourth depends on irrigated agriculture.

1. Agricultural Land Resources and Utilization

There is approximately 69 million hectares (ha) of land in Morocco, excluding the Sahara. Of this area, almost half (31 million ha) is considered of no use agriculturally; 5.2 million ha is in forest; 20.9 million ha in range; and 2.6

million ha in grass areas. Only 8.3 million ha is arable land. Over half of the arable land (4.7 million ha) produces grain crops, 0.7 million ha is in orchards and vineyards, and 0.8 million ha in other crops. About 2.1 million ha of arable land is idle or fallow.

Use of the cultivated land in 1982/83 was as follows:

Crop Practice	ha	ha
Barley	2,151,000	
Durum Wheat	1,286,000	
Bread Wheat	690,000	
Maize	435,000	
TOTAL MAJOR CEREALS		4,562,000
Other Grains	141,000	
TOTAL GRAINS		4,703,000
Orchards and Vineyards	725,000	
Other crops	774,000	
TOTAL CROPS		6,202,000
Idle or Fallow	2,137,000	
TOTAL CULTIVATED		8,339,000

Dryland areas are found scattered over Morocco. The largest contiguous area is the region where the Aridoculture Center is located (Settat to Marrakech, Safi to Beni Mellal). Another is in the northeast around Nador and Oujda. There is a large area south and east of the High Atlas Mountains, but this area is too dry for crop agriculture. The dryland areas contain about 51 percent of the total major cereal area (2.2 million ha). If the fallow area is added to this (and nearly all idle and fallow land is found in the lower rainfall areas), the dryland regions make up approximately 4.3 million ha (or 64 percent) of land in cereals or being prepared for cereals.

2. Production Constraints

Agriculture production is restricted in many parts of Morocco and especially in the drylands by a number of natural and man-induced factors. Such things as low and erratic rainfall; shallow, infertile soils with high lime content; presence of insects, diseases, and weeds; unsuitable and/or insufficient tillage, planting, and harvesting equipment; very limited agricultural research leading to the continuing use of inferior crop varieties, inadequate and faulty crop and soil management practices; excessive removal of plant residues from cultuivated fields; excessive numbers of livestock in relation to land carrying capacity; and inadequate distribution network for crop seeds, fertilizers, and insecticides all mitigate against high and stable crop yields.

Climate: In most areas of Morocco, precipitation is received mainly in the period October to April or May with most falling between January and April. Generally only about 10 percent of a year's rain is received between May and

October. Highest rainfall in the country is in excess of 1500 mm/year; lowest in the non-desert area is about 50 mm/year.The Dryland Agriculture Applied Research Project was designed to benefit the areas in which precipitation is less than 200-450 mm/year.

Rainfall in the dryland regions is not only low in total amount, it is highly variable from year to year and even from month to month. In any year it may vary as much as 50 percent above or below the mean for the location. For example, for the 68 years of record at Settat, the average precipitation has been 389 mm. In five years precipitation was more than 50 percent above average; in 10 years it was more than 33 percent above average; in three years it was less than 50 percent of the average; and in ten years it was less than 67 percent of the average. Uncertainty of precipitation increases as one moves south across the project area.

Soils: The soils of the project area are quite variable, ranging from sands to self-mulching clays (vertisols). Many areas contain shallow soils with indurated lime deposits with six to eighteen inches of the surface. This shallow nature restricts water percolation and root penetration, making these soils especially droughty. Soils are generally alkaline in reaction with some depressional soils containing excessive amounts of soluble salts. Organic matter of the cultivated soils is generally low and is being reduced by the complete removal of crop residues by farmers for use as animal feed (stacked straw) and/or by grazing livestock. Some medium textured soils have weak structure and they crust easily in rainstorms. sealing the soil survface and causing excessive runoff.

Plant Pests: Several insects and plant diseases cause serious crop losses. The most serious insect pest is the Hessian fly which causes large yield reductions in barley and especially in wheat. The larval maggot exudes an enzyme that slows or stops shoot development and stunts the infected culm. Wheat stem sawfly, at present, is a lesser pest. Many bacterial and fungal crop diseases, septoria, leaf spot, and root rot are also widespread and common and cause crop damage, often severe, especially in dry years. Weeds in great variety are also common, difficult to control, and can cause large yield losses.

Agricultural Machinery: Mechanization of crop production is occurring at a relatively rapid rate, but only slowly on smaller and hilly farms. In the semi-arid regions 80 percent or more of the land is tilled at least once a year by tractor drawn implements. There are many tractors in the country but adequate tillage, cultivation and seeding equipment is lacking. Planting of the winter cereals is accomplished with tractor power on many farms either by means of drills or by covering broadcast seed by discing, but spring seeded crops seem to be almost exclusively hand seeded behind animal-drawn plows. Very few tillage tools are used to weed growing crops. Combines are being used for wheat and barley harvest on most farms, but hand labor is still employed for harvest operations by some farmers.

Agricultural Research: An active applied agricultural research program is only now getting started so that there has been little information available on the best methods for growing cultivated crops, tillage practices to employ, fertilizer kinds and rates to use, methods to control plant pests, and few crop varieties that have special resistance to drought and pest attack. Farmers have had to make do with the materials and practices handed down by preceding generations. These often do not meet the changed conditions facing the farmers today. As a result, weather and pests continue to be problems, soils deteriorate at an accelerating rate, and the smaller farmers' positions become increasingly precarious.

Livestock: Numbers of livestock in Morocco are in excess of the carrying capacity of the land. Many animals are in poor condition at the best of times and suffer severely each dry season when feed reserves become depleted. With farmer emphasis on livestock numbers, not on quality or market value, there appears to be little chance soon for numbers to be reduced to those matching the carrying capacity of the land.

Potential for Increased Production: As a result of these problems, crop yields in the project area are low. Average cereal grain yields in Settat Province over the period 1973/1974 to 1984/1985 were only 7.5 quintals/hectare (11.2 bushels/acre). Yields were as low as 1.8 (2.7) and 0.7 (1.0) in the severe drought years 1980/1981 and 1982/1983, respectively.

The agricultural sector as a whole has contributed little to overall economic growth in the last few years with production increases in the range of 1 percent per year. The potential for increasing agricultural production, however, is substantial. The FAO/MARA Cereals Plan states that cereal output alone can be increased by as much as 80 percent through the adaption of existing technologies.

3. Crop Production

Total annual production of the four major cereals (durum wheat, bread wheat, barly, and maize) averaged about 4 million metric tons over the period 1974 to 1984 (1.3 mt of durum, 0.5 mt of bread wheat, 1.9 mt of barley, and 0.3 mt of maize). Except for bread wheat, there was no apparent trend (either up or down) in terms of area planted, average yields, or total production. The area planted in bread wheat increased 52 percent between 1981 and 1984 in response to a government subsidy program. Consequently, production of bread wheat also increased.

About 75 percent of all Moroccan cereal production normally comes from rainfed agriculture. This includes 78 percent of barley production, 76 percent of durum wheat production, 63 percent of maize production, and 62 percent of bread wheat production. The proportion of cereal production credited to dryland regions (less than 450 mm rainfall) is about 40 percent overall, with 54 percent and 53 percent of the national production of barley and maize

respectively coming from the drylands and 23 percent and 21 percent respectively of durum and bread wheat. These production figures for the drylands vary widely with weather conditions. In better years, drier rainfed areas account for nearly 50 percent of the total cereal production, but in dry years, cereal harvests can drop to less than one-third of total production.

VII. CONDITIONS PRECEDENT AND COVENANTS

A. The following Conditions Precedent to signature of the Project Agreement will be conveyed to the GOM by letter:

1. Prior to signing the FY 88 Agreement, the Government of Morocco shall provide evidence acceptable to USAID that:

   a. The budgetary amounts listed in Table VII-1 below for 1988-1994 have been accepted in principal by the Government of Morocco; and

   b. At least the annual budget amounts for 1988, shown in Table VII-1 below, have been allocated[1] to the Aridoculture Center.

TABLE VII-1

(Millions of Dirham)

Calendar Year	Operating	Investment	Salaries[2]	Total
1988	4.1	6.5	--	10.6 + salaries
1989	4.7	7.3	--	12.0 + salaries
1990	5.0	5.1	--	10.1 + salaries
1991	5.5	6.0	--	11.5 + salaries
1992	6.0	3.9	--	9.9 + salaries
1993	6.0	3.7	--	9.7 + salaries
1994	6.0	2.9	--	8.9 + salaries

1 The phrase "allocated to INRA" shall mean that the Ministry of Finance has issued a mise en place de crédits des paiements de l'Année en cours in the amount shown in the Schedule for the budget year in question.

2 Salaries will be paid in accordance with staffing plan requirements for research and necessary support staff as agreed to for the Aridoculture Center. This will include provision for retaining the current number of scientists and providing 12 new scientists as follows:

1988	6
1989	4
1990	2

2. Prior to signing the FY 88 Agreement, the GOM shall:

Develop a modified budgetary process, acceptable to USAID, which meets minimal requirements of timelines and flexibility of use for research expenditures, and "Delegates Authority" to the INRA Aridoculture Center Station Director to utilize the funds. It is anticipated that this can realistically be accomplished by June, 1988.

3. Prior to signing the FY 88 Agreement, the GOM shall:

Lease on a long term basis, on purchase or otherwise make available at least 40 ha of land adjacent to Sidi El Aydi Station near Settat which is suitable for experiment station purposes for the duration of the project.

B. The following covenants will be written into the Project Agreement:

1. The GOM agrees to adopt in a timely manner a personnel policy for researchers which puts researchers' salaries and incentives on a par with other professional civil servants with equivalent qualifications and responsibilities and provides for flexibility in hiring, firing, and promotion on the basis of performance.

2. The modified budgetary system as it applies to the Project will be reviewed annually by USAID and INRA to determine whether or not the budgetary process is functioning satifactorily.

3. Prior to the signature of each subsequent Project Agreement, the GOM will:

   a. Demonstrate that the amounts shown in Table VII-I for the current year have been allocated to the Aridoculture Center; and

   b. Demonstrate that at least the amounts listed in Table VII-I for the previous year have been expended by the Aridoulture Center [1].

1 The phrase "expended by INRA" refers to the official. published report of budgetary expenditures (emissions) by INRA for the past operating year. This report will be submitted by the Director of the Aridoculture Center to USAID and will be certified by the "Agent Comptable" of INRA. This report will be submitted prior to June of the following year.

68

ANNEXES

for

THE DRYLAND AGRICULTURE APPLIED RESEARCH PROJECT
608-0136

ANNEX 1

LOGICAL FRAMEWORK

LOGICAL FRAMEWORK

Project Title and Number: Dryland Agriculture Applied Research 608-0136

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project goal The goal is to increase food production in order to meet the needs of Morocco's fast growing population and to improve the incomes of farmers with small and medium sized land holdings.	Measure of goal achievement - On-farm and on-station crop yields indicate 30% increase; - Incomes forsmall, mediumand large land holdings increase; - Trends in food consumption in relation to population growth, indicate. improvement in diet.	- MARA data on food production and incomes; - Survey data from farmers, souks and distributors of agriculture inputs; - Population/consumption/production data.	- Market incentives will be favorable for the production of crops assumping increased cost of production associated with adoption of improved inputs. - GOM agricultural service agencies such as the extension service, parastatals, seed multiplication/ distribution authority, credit banks and cooperatives make improve production inputs known and available to farmers throughout the semi-arid region. - Persistent drought does not occur.
Project Purpose: To establish a sustainable applied research capacity that is relevant to the dryland farming systems and natural resource constraints of the 250-450 mm. rainfall region of southern Morocco, capable of providing technologies to improve farmer productivity.	End of Project Status - The Aridoculture center is receiving Moroccan political and financial support that provides a sustainable level of effort consistent with MARA and INRA national agricultural research priorities. - The amount and balance of Moroccan scientists, technicians, support staff, laboratories and other facilities are properly focused, managed and organized to produce useful technology. - The research capacity of the Center is recognized by Moroccan national leadership, by farmers and other clients, and by international agriculture research centers as an important contributor to agricultural development in the region. - Certain constraints to food production are removed through socially and economically viable technologies.	Project documents; interviews with key USAID, project, INRA, GOM officials, international donors and IARC's and target farmers; review of research priorities.	- The GOM, particularly MARA, INRA and MOF are able to provide resource allocations to the center in relation to national priorities. - INRA and MOF continue to positively reform internal management of budget allocations affecting the center operations. - Moroccan staff are receiving appropriate incentives to make long-term committment at the Center.

LOGICAL FRAMEWORK

Project Title and Number: Dryland Agriculture Applied Research 608-0136

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Outputs	Magnitude of outputs		
1. A functioning and sustainable National Regional Research Station (The Aridoculture Center);	1. Fully equipped center with forty eight trained professional Moroccan staff, including 40 scientists, four technical support specialists and four administrative staff.	1. AID project work plans, and annual reports, INRA reports/records, interviews, on-site inspection tours, annual scientic panel reviews, and other GOM and donr reports;	1. Schedule for selection, training and integration of Moroccan staff into center programs is maintained as planned. Land and equipment is being utilized effectively;
2. A functioning and sustainable network of supporting satellite research substations for the Center;	2. Five fully equipped satellite research substations complementing the Center's applied research programs;	2. Same as "1." above;	2. Schedule for selection, training and integration of Moroccan staff into center programs is maintained as planned. Land and equipment is being utilized effectively;
3. A functioning management system in place to carry out effective research programs and develop budgets, accountablility and evaluation;	3. All research subprograms and staff are actively engaged and receiving operational support;	3. Same as "1." above;	3. INRA continues to improve its management capability at headquarters that support the center's programs;
4. Agronomic technologies and farming systems practices developed that are appropriate to samll and medium scale dryland farmers;	4. Demonstrable improved agronomic technologies verified on-station and on-farm in the three sub-regions;	4. Same as "1." above;	4. The balance of on-station and on-farm agronomic research trials is appropriate;
5. Farming equipment developed that is suitable for small and medium-scale farmers;	5. Demonstrable improved mechanization technologies verified on-station and on-farm in the three sub-regions;	5. Same as "1." above;	5. Balance of on-station and on-farm mechanization research testing is appropriate for private sector and farmers;

22

LOGICAL FRAMEWORK

Project Inputs:

AID: 1. Resident TA Team
2. Short-term consultants
3. Commodities
4. Short and long-term training
5. Operating budget

GOM: 1. Construction
2. Commodities
3. Salaries of Moroccan staff
4. Operating budget

IMPLEMENTATION TARGETS

	person/years		U.S. $000		GOM $000	
	existing agreement	new agreement	existing agreement	new agreement*	existing agreement	new agreement
U.S. Personnel						
Resident consultants and home office support staff	99.85	90.48	11,274	15,420		
Short-term consultants	(86.50)	(84.00)	(9,433)			
Moroccan Personnel	(13.35)	(6.48)	(1,841)			
Training						
Long-term			2,479	1,681	2,551	6,330
Short-term			(1,690)		1,861	72
Commodities			(789)			
Operation expenses			3,481	2,796	446	1,500
Construction				2,080		3,906
Other and indirect costs			6,488.4		4.405	1,898
Inflation			2,601	2,907	1,320	2,589
Evaluation/Audit/Contingency				1,002		
TOTAL			26,323.4	25,886	11,936.4	16,295

*New agreement includes carry-over of approximately $2.2 that will be unutilized from existing agreement. Total U.S. project funding will not exceed $50,000,000.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
6. A functioning and sustainable technology transfer unit that is transmitting new technology information to clients;	6. Technology packages being developed by the SRD and effectively communicated to technology transfer clients including farmers;	6. Same as "1." above, plus interview of extension agents, survey of farmers;	6. Both the SRD unit and the technology transfer clients are effectively supporting technology dissemination;
7. Direct links between researchers and representative farmers established that provide a) basic understanding of targeted farming systems, b) baseline information for evaluation and feedback of research programs and c) a model for evaluating economic and social viability of alternative technologies.	7. a) Representative farming systems are adequately profiled, b) Research programs both on-farm and on-station adequately address farmer constraints, c) Social and economic evaluation of all released technology packages demonstrates their viability.	7. Same as "1." above, plus survey of farmers.	7. a) Socio-economic studies properly focussed b) management and research priority setting is targeted to farmer problems, c) sociology and economics are properly integrated into program.

ANNEX 2

GOM REQUEST FOR ASSISTANCE

OFFICIAL F

Royaume du Maroc

INSTITUT NATIONAL
DE LA
RECHERCHE AGRONOMIQUE

Boîte postale n° 415
RABAT

المملكة المغربية

المعهد الوطني
للبحث الزراعي

الصندوق البريدي رقم 415
الرباط

N° 3530 INRA

RABAT, le 1 DEC. 1987 في

/_e Ministre de l'Agriculture
et de la Réforme Agraire-

608-0136

/)

/)/)onsieur le Directeur de
l'U. S. A. I. D.-
-R A B A T-

ACTION : AGR
DUE DATE: 12/08
INFO: DIR - DIDIR - PROG -
RLA - EXO - CONT - CHRON - RF

Objet/: Prolongation du Projet
Aridoculture n° 608-0136-

/_e Projet Aridoculture installé à Settat, a pris une bonne orientation et les résultats enregistrés jusqu'à présent par les différents programmes de recherche sont très encourageants. Il reste cependant beaucoup à faire. La première phase de ce projet couvrant la période 1978-1988 expirera en Aout 1988.

En fait, une bonne partie de cette phase a été utilisée pour l'établissement de l'infrastructure matérielle et humaine et le projet n'a commencé à être opérationnel qu'à partir de 1983 de sorte qu'une seconde phase parait nécessaire comme le recommande d'ailleurs le rapport du Comité d'Evaluation du Projet constitué en 1986 à votre diligence.

Aussi, ai-je l'honneur de vous demander de bien vouloir envisager une seconde phase allant au minimum jusqu'en 1994 et dont les coûts sont évalués à 24 Millions de Dollars pour la partie américaine et 120 Millions de Dirhams pour la partie marocaine.

Quant aux mesures proposées dans votre lettre du 15 Septembre 1987 en vue de faciliter cette extension, elles ont fait l'objet d'un examen approfondi lors de la réunion du 9 Octobre 1987 tenue au siège de l'INRA en présence de vos représentants ainsi que ceux du MIAC et il a été convenu des dispositions ci-après :

- Accroissement du Budget annuel du Centre Aridoculture.

- La part allouée au Centre Aridoculture sera augmentée au sein du budget de l'INRA conformément au calendrier discuté.

- Assouplissement des procédures de gestion.

Un projet de réorganisation de la gestion comptable et financière de l'I.N.R.A. a été proposé au Ministère des Finances dans le cadre du prêt recherche envisagé par la Banque Mondiale. La réorganisation

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demandée, qui est soutenue par la Banque et qui bénéficie d'un accord de principe de la part du Ministère des Finances, entrainera l'assouplissement voulu.

- Amélioration des conditions matérielles des chercheurs :

Un Projet de statut du chercheur est à l'étude à l'heure actuel le au niveau du Gouvernement.

- Extension du domaine expérimental de Sidi El Aïdi.

Une proposition a été faite au Ministère de la Justice pour l'utilisation d'une partie du domaine du pénitentier de AIn Ali Moumen proche du Centre.

- Diffusion de la variété de blé tendre SAADA (SD 8036) resistanc à la cecidomie :

Une réunion a été tenue avec les services du catalogue officiel et le MIAC en vue d'activer l'inscription de la variété et d'entamer sa multiplication durant la campagne agricole en cours, avec pour objectif sa distribution aux agriculteurs en Automne 1988.

Je vous prie d'agréer, Monsieur le Directeur, l'expression de mes salutations les meilleures.-

Le Ministre de l'Agriculture
et de la Réforme Agroire

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Signé : Othman DEMNATI

ACTION TAKEN

No Action Necessary ✓

Replied by : RBS 12/4/87

Initials & Date

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ANNEX 3

STATUTORY PROJECT CHECKLIST

5C(2) PROJECT CHECKLIST

Listed below are statutory criteria applicable to projects. This section is divided into two parts. Part A. includes criteria applicable to all projects. Part B. applies to projects funded from specific sources only: B.1. applies to all projects funded with Development Assistance loans, and B.3. applies to projects funded from ESF.

CROSS REFERENCES:	IS COUNTRY CHECKLIST UP TO DATE? HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?	(a) Prepared by AID/W yearly (b) Yes

A. GENERAL CRITERIA FOR PROJECT

1.	FY 1986 Continuing Resolution Sec. 524; FAA Sec. 634A. Describe how authorizing and appropriations committees of Senate and House have been or will be notified concerning the project.	Congressional notification submitted June 4, 1957
2.	FAA Sec. 611(a)(1). Prior to obligation in excess of $500,000, will there be (a) engineering, financial or other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?	(a) Yes (b) Yes
3.	FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?	N/A
4.	FAA Sec. 611(b); FY 1986 Continuing Resolution Sec. 501. If for water or water-related land resource construction, has project met the principles, standards, and	N/A

	procedures established pursuant to the Water Resources Planning Act (42 U.S.C. 1962, et seq.)? (See AID Handbook 3 for new guidelines.)	
5.	FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?	N/A Project does not involve construction financed by U.S.
6.	FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	No
7.	FAA Sec. 601(a). Information and conclusions whether projects will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; and (c) encourage development and use of cooperatives, and credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.	(a) No (b) Yes (c) No (d) No (e) Yes (f) No
8.	FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	N/A

9.	FAA Sec. 612(b), 636(h); FY 1986 Continuing Resolution Sec. 507. Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.	CP to Project Agreement
10.	FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?	U.S. does not own excess foreign currency of Morocco
11.	FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?	Yes Sole-Source waiver was obtained for MIAC
12.	FY 1986 Continuing Resolution Sec. 522. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?	N/A
13.	FAA 118(c) and (d). Does the project comply with the environmental procedures set forth in AID Regulation 16. Does the project or program take into consideration the problem of the destruction of tropical forests?	Yes
14.	FAA 121(d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (dollars or local currency generated therefrom)?	N/A

15. FY 1986 Continuing Resolution Sec. 533. Is disbursement of the assistance conditioned solely on the basis of the policies of any multilateral institution?

No

16. ISDCA of 1985 Sec. 310. For development assistance projects, how much of the funds will be available only for activities of economically and socially disadvantaged enterprises, historically black colleges and universities, and private and voluntary organizations which are controlled by individuals who are black Americans, Hispanic Americans, or Native Americans, or who are economically or socially disadvantaged (including women)?

MIAC occasionally subcontracts with these.
ESF funding

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(a), 111, 113, 281(a). Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward

(a) Purpose of project is to provide new technologies to poor farmers.

(b) Not as project objective.

(c) Project will assist Morocco direct its own agriculture research program.

(d) Women farmers will be beneficiaire of project.

(e) Under project, Morocco will cooperate with a variety of other countries where regional research centers are.

82

	better life, and otherwise encourage democratic private and local governmental institutions. (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status, (e) utilize and encourage regional cooperation by developing countries?	
b.	FAA Sec. 103, 103A, 104, 105, 106. Does the project fit the criteria for the type of funds (functional account) being used?	Yes
c.	FAA Sec. 107. Is emphasis on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)?	Yes
d.	FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed country)?	Yes
e.	FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?	Yes

f.	FAA Sec. 128(b). If the activity attemps to increase the institutional capabilities of private organizations or the government of the country, or if it attempts to stimulate scientific and technological research, has it been designed and will it be monitored to ensure that the ultimate beneficiaries are the poor majority?	Yes
g.	FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.	See project paper, Section III.C. "AID-Financed Project Inputs"

2. Development Assistance Project Criteria (Loans Only)

a.	FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, at a reasonable rate of interest.	N/A
b.	FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?	N/A

3. Economic Support Fund Project Criteria

a.	FAA Sec. 531(a). Will this assistance promote economic and political stability?	Yes
	To the maximum extent feasible, is this assistance consistent with the policy directions, purposes, and programs of part I of the FAA?	Yes
b.	FAA Sec. 531(c). Will assistance under this chapter be used for military, or paramilitary activities?	No
c.	ISDCA of 1985 Sec. 207. Will ESF funds be used to finance the construction of, or the operation or maintenance of, or the supplying of fuel for, a nuclear facility? If so, has the President certified that such country is a party to the Treaty on the Non-Proliferation of Nuclear Weapons or the Treaty for the Prohibition of Nuclear Weapons in Latin America (the "Treaty of Tlatelolco"), cooperates fully with the IAEA, and pursues nonproliferation policies consistent with those of the United States?	No
d.	FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?	N/A

ANNEX 4

ACTION MEMORANDA FOR THE ADMINISTRATOR

FOR AD HOC REDELEGATION OF AUTHORITY TO AMEND THE PROJECT

AND SOLE SOURCE WAIVER

AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON D.C. 20523

ASSISTANT
ADMINISTRATOR

ACTION MEMORANDUM FOR THE ADMINISTRATOR

THRU: AA/PPC, Richard E. Bissell

FROM: AA/ANE, Charles W. Greenleaf, Jr.

SUBJECT: Ad Hoc Redelegation of Authority to Amend the Dryland Agriculture Applied Research Project (608-0136)

Problem: USAID/Morocco requests an ad hoc redelegation of authority to amend the Dryland Agriculture Applied Research Project (608-0136), to increase A.I.D. funding to a maximum of 50 million dollars, and to extend the PACD from 10 years to a maximum of 20 years.

Summary: USAID/Morocco will shortly begin preparing a Project Paper Amendment for the Dryland Agriculture Applied Research Project (608-0136) and requests ad hoc redelegation of authority from the A/AID to the Mission Director for approval of the Project Paper Amendment in the field. This Project Paper Amendment involves no change to the original project goal and purpose and does not contain any significant policy issues. Pursuant to DOA 654 (formerly Redelegation of Authority 113.9), missions may approve project amendments of funding for a cumulative life of project funding (LOP) total of 30 million dollars, provided the amendment does not cause the total LOP, from date of initial obligation to amended LOP date, to be in excess of ten years. In cases such as this one, in which the mission's delegated authority is exceeded, and in which there are no significant policy issues, the guidance states that the mission may request an ad hoc redelegation of approval authority by cable, indicating the nature of the proposed amendment.

Background:

1. Government of Morocco and USAID Focus on the Dryland Sector: Morocco is undertaking a major adjustment of the agricultural sector, involving deregulation of prices, elimination of subsidies and monopolies, and redirection of public sector investment to the dryland sector. USAID is supporting this strategy through several key projects. The long-term core project is the Dryland Agriculture Applied Research Project (608-0136). This project is critical to the achievement of sectoral objectives described in the Mission's recently

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approved (FY 1987-1991) CDSS. The overall long-term target is to reach a cereals output level whereby future cereals imports will not exceed current levels. While this strategy is directed primarily at increasing cereals production, it also addresses other basic foodstuffs. The strategy recognizes that food production in Morocco's rainfed region takes place in the context of complex farming systems which integrate crop, livestock and forage production.

The project goal is "to increase basic food production in order to meet the needs of Morocco's fast growing population and to improve income of traditional small dryland farmers." The project purposes are:

(1) to establish an applied agronomic research program which will (a) adapt existing technology to local conditions in order to increase the productivity of dryland farmers; (b) train adequate Moroccan staff to operate the program and transmit the results to farmers and; (c) develop a program whereby suitable farming equipment can be made accessible to small farmers; and

(2) to establish a socioeconomic research program which will give a better understanding of the behavior of dryland farmers and thus provide a basis for effective extension programs.

2. Project History: In 1978, USAID signed the initial project grant agreement with the Government of Morocco (GOM) for implementation of the project. Mid-America International Agriculture Consortium (MIAC) was selected as principal contractor, with the Institute of Agronomic Research (INRA) as the implementing agency. The project was evaluated and redesigned in 1983, with a resulting PACD extension to August 1988 and with a revised life of project funding of 26.3 million dollars. The project goal and purpose for the 1983 expanded project remained the same as in the original Project Paper. The expanded project provided additional technical assistance and related funding to enable a more complete treatment of the identified constraints for increasing agricultural production and improving productivity in the semi-arid zones.

Meanwhile, Morocco was hit by serious drought in 1981. While research trials were planted beginning in 1981, there were four successive crop failures due to the worst drought in the last 300 years.

3. Evaluation Findings: The purpose of the evaluation conducted in May 1986 was to determine the extent to which the project's purpose and goal were being achieved, following the redesign of 1983. The results are being used by USAID as a basis for adjusting activities where necessary within the

project time frame and to determine the need, potential, and benefits of extending the project beyond the current PACD (August 31, 1988). The evaluation summary (ES) has been approved by all concerned parties and forwarded to AID/W. In summary, the evaluation findings are as follows:

a. Despite the drought which hampered research activities, the project has made excellent progress since 1983. All MIAC resident technical assistance positions are filled and the staff, along with the staff of INRA and participant trainees, are actively engaged in applied research pertinent to the development needs of dryland farming in Morocco.

b. It is too early in project implementation to determine whether the project goal, i.e. increased food production, is being achieved. However, progress has been made toward attainment of the project purpose as illustrated by the following example of technological improvements under development at the Aridoculture Center:

(1) Disease resistant winter chickpeas;
(2) Wheat varieties resistant to Hessian fly;
(3) Weed control through crop rotations and proper herbicide use; and
(4) Prototype tillage and planting equipment.

c. Technology is being developed and evaluated under local conditions. Moroccan staff are being trained and farming equipment is being developed. The contributions of the socioeconomic component have been limited and must be improved. A good technological base for implementing a farming systems/extension program is being developed. However, the transfer methodology is unclear.

d. There is a cooperative relationship between the MIAC team and INRA staff and recognition by the GOM that MIAC is performing well.

e. Finally, although substantial progress has been achieved, the Aridoculture Center will need continued technical assistance and professional development of Moroccan staff beyond the current PACD to reach institutional sustainability.

Six action recommendations were provided in the evaluation summary, of which the first five are already being implemented. Action recommendation six states that "the project should be continued past the PACD in the collaborative

assistance mode with MIAC. This will permit the completion of planned activities in the 1983 design as well as the incorporation of appropriate adjustments consistent with the purpose and goal of the project."

A sole source waiver request for continuing the services of MIAC throughout the life of the project extension is contained in Attachment A. The degree which these services will be contracted for in a collaborative assistance mode is raised as an issue for the Project Paper Amendment to examine.

Project Extension: The Mission intends to extend the project for an additional six to ten years past the PACD. Additional time is needed to complete planned activities of the existing project. Additional funding up to a maximum of 24 million dollars will be required to achieve the expected outputs. The analyses provided in the evaluation report, plus the cumulative experience of MIAC, INRA and USAID, provide compelling evidence to continue the project and to complete activities of the 1983 amendment.

Estimated Cost of Inputs: The following table is an estimate of additional resources required to extend the project for six to ten additional years past the 1988 PACD. The figures are subject to change following a more thorough analysis during preparation of the PP supplement. The total LOP funding, however, will not exceed 50 million dollars. The GOM contribution is estimated at the same relative rate as in the existing project, which is approximately 32 percent.

Project Costs (in $000's)

	Added Funds	Total
Technical assistance	14,000	25,000
Commodities	3,000	8,000
Training	3,000	6,000
Inflation/other	4,000	11,000
Total in dollars	24,000	50,000

Recommendation: That by indicating your approval below, you authorize me to redelegate authority to the Mission Director, USAID/Morocco, to amend the Dryland Agriculture Applied Research Project, to increase funding from 26.3 million to a maximum of 50 million dollars and to extend the life of the project from 10 years to a maximum of 20 years.

That you sign the sole source waiver request (TAB A) to continue the services of MIAC.

Clearance: GC:HFry [illegible] Date 2/2/87

Approved: [illegible]

Disapproved: _____

Date: 2/12/87

Attachment:
A. Sole Source Waiver
B. Rabat 11759 (Request for Sole Source Waiver)
C. Rabat 11676 (Request for A/AID for Redelegation of Authority)

AID/ANE/PD/MNE:THarris:1/17/87:X-79950:docid/4515d

91

AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON D.C. 20523

ASSISTANT
ADMINISTRATOR

Waiver Number ANE/87/6/9/608-0136

ACTION MEMORANDUM FOR THE ADMINISTRATOR

FROM: AA/ANE, Charles W. Greenleaf, Jr.

SUBJECT: Morocco Dryland Agriculture Applied Research Project (608-0136); Sole Source Waiver to Extend Contract with Mid-America International Agriculture Consortium

Action: A sole source waiver is requested under the Dryland Agriculture Applied Research Project (608-0136) to permit procurement of services from the Mid-America International Agriculture Consortium (MIAC) for continued implementation of this project through the extended PACD (up to 1998).

Background: The mission will shortly begin preparing a PP Amendment to extend the Dryland Agriculture Applied Research Project (608-0136) for six to ten additional years past the PACD of 1988 and to increase the funding level from $26.3 million to a maximum of $50 million in order to complete current project activities and make appropriate adjustments consistent with the purpose and goal of the project. A request for ad hoc redelegation of authority to approve the PP Supplement in the field has been submitted under separate memo.

The mid-course evaluation, conducted by Winrock International in May 1986, recommended that the project be continued past the PACD and with MIAC under the collaborative assistance mode. The Government of Morocco (GOM) and USAID agree with this recommendation. Although other U.S. institutions would be capable of providing technical assistance to develop research programs, it is in the best interests of the project, the GOM and the United States that MIAC continue to provide the services needed. The technical requirements of project activities give MIAC a unique capability based on its past experience in dryland agriculture research, current activities in Morocco and the strong linkages already established between Moroccan and MIAC scientists and research programs. Introduction of a new contractor to supply technical assistance to the project would result in; (a) substantial duplication of costs not expected to be recovered through competition, and (b) serious disruptions and delays in overall project implementation and individual research programs. Thus, in

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order to maintain project momentum and avoid unnecessary delays and expenditures, a sole source waiver is required to permit MIAC to continue to serve as the contractor for the additional six to ten years of the project extension.

Discussion: The project is assisting the National Institute for Agronomic Research (INRA) to develop an applied research program for improving rainfed crop production in low rainfall zones (230 mm - 450 mm). The project was originally proposed in 1976 following a feasibility study conducted by MIAC. The contract for this study was awarded to MIAC based on AID/W review of responses to RFTP's, using educational institution selection procedures. The project agreement was signed in August 1978. Based on a non-competitive review board decision in July 1979, MIAC was subsequently awarded a 4.5 million dollar direct collaborative assistance contract in February, 1980 to implement the project.

The project was substantially redesigned in 1983 following an evaluation. The project grant was increased to 26.3 million dollars, with an increase in the MIAC contract to approximately 23 million dollars. With respect to procurement of MIAC services, an evaluation/selection panel, including a representative of BIFAD, determined; (a) that continuation of the collaborative mode of contracting was appropriate, and (b) that based on the quality of MIAC's services under the project and on an evaluation of a source list of other U.S. Title XII institutions, MIAC be retained as the long-term contractor. Further, in its review of the redesigned project, AID/W agreed that MIAC should continue to provide the technical assistance, procurement, and training services for the project.

The recent evaluation concluded that MIAC is providing high quality technical assistance and training and is procuring commodities in a timely, cost effective fashion. Despite five consecutive years (1981-85) of the worst drought in 300 years, compounded by slow start up in the initial years of the project, substantial progress has been made since 1983. Collaboration between the 14 resident U.S. scientists and a cadre of Moroccan Ph.D./M.S. participants is excellent and contributing to the establishment of a solid Moroccan research institution with linkages to MIAC universities and several International Agricultural Research Centers. The project has been gaining momentum as Moroccan participants return from the U.S. and complete their theses, and as MIAC continues to gain more experience in Morocco with the research program.

The current MIAC contract is due to expire in August 1988, but more than half of the professional staff members presently

serving in Morocco will complete their assignments in August, 1987. This means that MIAC has only one year to contract for services through the current PACD. Since it is nearly impossible and extremely costly to recruit quality personnel for one year positions, MIAC needs to know, as soon as possible, that its contract will be extended, enabling it to recruit highly qualified replacements for multi-year assignments. This will help assure uninterrupted quality research programs.

Justification: Achievement of the project purpose is largely dependent upon uninterrupted continuation of the collaborative assistance contract with MIAC to provide technical assistance, training and commodity procurement services. Ample justification exists to waive the requirements for competition in order to retain MIAC as the contractor through project completion. Specific justification follows:

1. The proposed contract is the key to continued development of a major rainfed agricultural research system in Morocco. Activities under the extension will conform with the unchanged goal and purpose of the current project. The contractor will be providing the same basic services.

2. The F.A.A. and A.I.D. policy envisage that this type of project should be implemented by Title XII institutions. MIAC is a consortium of midwestern universities with strong capability in dryland farming and unique experience in Morocco.

3. MIAC has been involved in a collaborative assistance mode in the design and implementation of the project from inception in 1978, gaining eight years of experience in dryland agricultural applied research in Morocco.

4. MIAC was initially selected on a competitive basis in 1976 to conduct the feasibility study for the project and subsequently assisted with initial project design. Following a determination by an ANE non-competitive review board in July 1979, MIAC was awarded a collaborative assistance contract to implement the project. Following the redesign in 1983, an AID/W evaluation/selection panel determined that the project should continue to be classed as collaborative assistance and that MIAC was the most capable on a list of other Title XII institutions to implement the project (10/11/83 memorandum from ANE/TR to Regional Contract Officer). Thus, it has already been determined twice through competition that MIAC is most capable and appropriate for implementing the project.

5. The contract technical assistance team is established in Morocco, gaining valuable experience relative to special conditions and establishing ongoing relations with Moroccan institutions, scientists and staff, all essential for achieving the institution building objective of the project. A new contract team would need to spend a considerable amount of unproductive time and money to duplicate the same level of knowledge and integration into Moroccan conditions. The Moroccan participants have also developed close relations and links with the MIAC scientists in Morocco and the U.S. Thus, to change contractors now would result in additional costs of money and time, not expected to be recovered through competition and would be disruptive of project momentum.

6. AIDAR Section 706.302-70 provides that full and open competition need not be obtained when it would impair or otherwise have an adverse effect on programs conducted under the foreign assistance program. Under sub-part 3,1 of that section, this authority may be used when the Administrator makes a formal determination, with supporting findings, that open competition procedures would impair foreign assistance objectives, and would be inconsistent with the fulfillment of the foreign assistance program.

Recommendation: That based upon the authority of AIDAR 706.302-70 and the justification contained herein, the Administrator waives the requirement for competitive procurement. This will permit the Mission to retain the services of MIAC for the implementation of the amended project for an additional six to ten years beyond August 1988, and, in conjunction with the amendment, to increase the contract funding level from 23 million dollars to approximately 45 million dollars.

GC:Howard M. Fry _____ Date 2/3/87
M/AAA/SER:JOwens _____ Date 1/27/87

Approved _____

Disapproved _____

Date 2/12/87

ANE/PD/MNE:THarris:1/16/87:X-79950:4514d

ANNEX 5

CABLE TO MISSION GRANTING AD HOC REDELEGATION AND WAIVER

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PP RUFHRA
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BT
UNCLAS STATE 079207

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LOC: 093 440
18 MAR 87 0812
CN: 14286
CHRG: AID
DIST: AIDA

AIDAC

108 E.O. 12356: N/A
TAGS: N/A
SUBJECT: MOROCCO DRYLAND AGRICULTURE APPLIED RESEARCH PROJECT (608-0136) AD HOC REDELEGATION OF AMENDMENT AUTHORITY TO FIELD AND SOLE SOURCE WAIVER

REF: RABAT 11676

1. THE AIMINISTRATOR HAS GRANTED APPROVAL TO THE AA/ANE TO REDELEGATE AUTHORITY TO AID/MOROCCO MISSION DIRECTOR FOR AMENIMENT OF THE DRYLAND AGRICULTURE APPLIED RESEARCH PROJECT; TO INCREASE FUNDING FROM 26.3 MILLION
100 TO A MAXIMUM OF 50 MILLION DOLLARS AND TO EXTEND THE LIFE OF PROJECT FROM 10 YEARS TO A MAXIMUM OF 20 YEARS. AA/ANE HEREBY REDELEGATES AUTHORITY TO DIRECTOR JOHNSON FOR CARRYING OUT THESE ACTIONS.

2. AUTHORIZATON OF AMENDMENT IS SUBJECT TO INCLUSION OF FOLLOWING:

-- A. POLICY CONSTRAINTS FACED IN AGRICULTURAL RESEARCH EFFORTS MUST BE STATED IN PP AMENDMENT AND HOW MISSION FORESEES ADDRESSING THEM THROUGH THE AGRICULTURE PROGRAM SHOULD BE INCLUDED.

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-- B. MID-AMERICA INTERNATIONAL AGRICULTURE CONSORTIUM (MIAC) CONTRACT SHOULD BE A FLEXIBLE INSTRUMENT AND ALLOW MISSION TO ADJUST IT ACCORDING TO NEED. MISSION MAY NOT WANT TO TIE MIAC COOPERATIVE AGREEMENT TO ALL ACTIVITIES UNDERTAKEN BY PROJECT AND AGREEMENT COULD BE COUCHED IN TERMS ALLOWING A PHASED APPROACH TO MIAC TECHNICAL SUPPORT.

-- C. ACTUAL RESEARCH ACTIVITIES UNDER AMENDMENT CAN BE BROADENED IN LIGHT OF EXPERIENCE OVER LAST SEVERAL YEARS AND MAY GO BEYOND THOSE STATED IN EARLIER PP
000 AMENDMENT. AID/W FEELS SUCH CHANGES SHOULD BE REFLECTED IN REVISED PROJECT. MISSION SHOULD NOT BE CONSTRAINED FROM INCLUSION OF ACTIVITIES BEYOND THOSE ALREADY BEING CARRIED OUT AND MAY CONSIDER OTHERS THAT ARE IN KEEPING WITH PROJECT GOAL AND PURPOSE.

03.18.06

-- D. PP SUPPLEMENT MUST DELINEATE EXPENDITURES OVER A SPECIFIED TIME-FRAME AND ADDRESS BOTH TIGHT BUDGETS AND

CONSTRAINTS NOW PREVALENT FOR DA ACTIVITIES.

3. ADMINISTRATOR APPROVED SOLE SOURCE WAIVER TO PERMIT PROCUREMENT OF SERVICES FROM MID-AMERICA INTERNATIONAL CONSORTIUM FOR SUBJECT PROJECT.

4. DOCUMENTS HAVE BEEN POUCHED TO MISSION. SHULTZ
BT
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ANNEX 6

INITIAL ENVIRONMENTAL EXAMINATION

INITIAL ENVIRONMENTAL EXAMINATION

Project Location:	Morocco
Project Title:	Dryland Agricultural Applied Research
Funding:	$50,000,000
Life of Project:	Sixteen Years
IEE prepared by:	Ronald Stryker, Mission Environmental Officer, USAID/Morocco
Date:	February 29, 1988

Discussion: This amendment is an extension of project 608-0136 signed in 1978. Nothing in the extension changes the conclusion of the original IEE. Small experimental activities will be conducted in a manner consistent with accepted methodology within the limits of research stations and the confines of small, carefully monitored areas on farmers' fields. The project is, therefore, categorically excluded from any environmental action as per AID's environmental procedures set forth in regulation 16, section 216.3. Fertilizer and pesticides used in the conduct of research will have FAO/WHO clearances. To the extent improved cultivation practices retard soil erosion and to the extent increased production on existing agricultural land discourages encroachment on the more marginal lands, the project will, in the long run, have a positive environmental impact.

Action Recommended: Mission recommends a negative determination on the grounds that this project will not have a significant effect on the environment as defined in Regulation 16.

Signed:

Ronald B. Stryker
Environmental Officer

March 7, 1988
Date

Concurred:

Charles W. Johnson
Mission Director

March 9, 1988
Date

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ANNEX 7

VEHICLE WAIVER

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DE RUFHRA #0480/01 016 **
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TO SECSTATE WASHDC PRIORITY 5961
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UNCLAS SECTION 01 OF * RABAT 00480

CLASS: UNCLASSIFIED
CHRGE: AID 1/14/87
APPRV: DIR:CWJOHNSON
DRFTD: DADO:RSTRYKER
CLEAR: 1.ADO 2.RLA 3
4.CONT 5.PROG
DISTR: AID-5 AMB DCM

608-013

AIIAC

FOR MARK STERNE, ANE/MENA; TIM HARRIS, ANE/PD

E.O. 12356: N/A
SUBJECT: DRYLAND AGRICULTURAL APPLIED RESEARCH PROJECT 608-0136 - PROCUREMENT SOURCE ORIGIN WAIVER

INFO: DIR - DIDIR - ARR - EXD - CONT - PROG - RU
CHRON - RF

REF: (A) RABAT 11676, (B) STATE 49685

1. MISSION REQUESTED IN REF A ADHOC REDELEGATION OF AUTHORITY TO AMEND THE DRYLAND AGRICULTURE APPLIED RESEARCH PROJECT (608-0136) AND WAS GRANTED AUTHORITY PER REF B. DURING THE DESIGN OF THE AMENDED PROJECT, IT WAS DETERMINED THAT VEHICLES FROM GEOGRAPHIC CODE 935 (SPECIAL FREE WORLD) WOULD BE NEEDED IN ORDER TO HELP ACHIEVE PROJECT OBJECTIVES. IT HAS BEEN DETERMINED BY RLA THAT A WAIVER FOR THE VEHICLES SHOULD BE OBTAINED PRIOR TO AUTHORIZATION OF THE AMENDED PROJECT. MISSION REQUESTS AID/W ASSISTANCE IN PREPARING THE FOLLOWING ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR ANE.

2. PROBLEM: THE IMPLEMENTATION OF THE SIX YEAR EXTENDED DRYLAND AGRICULTURE APPLIED RESEARCH PROJECT THROUGH 1994 REQUIRES THE PROCUREMENT OF VEHICLES OF NON-U.S MANUFACTURE. YOU ARE REQUESTED TO GRANT A SOURCE ORIGIN WAIVER FROM GEOGRAPHIC CODE 000 TO CODE 935 (SPECIAL FREE WORLD) TO PERMIT THE PROCUREMENT OF 34 VEHICLES AND SPARE PARTS AT A COST OF APPROXIMATELY 520,000 DOLLARS. THE VEHICLES ARE ALL ASSEMBLED IN MOROCCO FROM IMPORTED PARTS, 90 PERCENT OF WHICH HAVE THEIR ORIGIN IN FRANCE AND SPAIN.

(A) COOPERATING COUNTRY:	MOROCCO
(B) AUTHORIZING DOCUMENT:	PROJECT AGREEMENT
(C) PROJECT:	DRYLAND AGRICULTURE APPLIED RESEARCH PROJECT 608-0136
(D) NATURE OF FUNDING:	GRANT
(E) DESCRIPTION OF GOODS:	EIGHTEEN RENAULT R4 VANS, ONE RENAULT R9, NINE PEUGEOT 504 PICKUPS, THREE LANDROVERS,

102340Z FEB 88
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TO AMEMBASSY RABAT IMMEDIATE 3348
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CHRG: AID
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DIR - DIDIR -
MGT - CONT -
RCN - CIRCUL

AIDAC

E.O. 12356: N/A
TAGS: N/A
SUBJECT: MOROCCO DRYLAND AGRICULTURE APPLIED RESEARCH (608-0136) VEHICLE SOURCE AND ORIGIN WAIVER

SOURCE AND ORIGIN WAIVER FOR PROCUREMENT OF VEHICLES AND SPARES FROM GEOGRAPHIC CODE 935 IN AN AMOUNT UP TO DOLS 520,000 WAS GRANTED BY AA/ANE ON FEBRUARY 9. MISSION MAY PROCEED TO PROCURE VEHICLES AND SPARES UNDER WAIVER NO. ANE/88/3/8/608-0136. AUTHORIZING DOCUMENT BEING POUCHED. SHULTZ
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103

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-- FICS, AND SPARE

(F) APPROXIMATE VALUE: 520,000 DOLLARS
(G) PROBABLE SOURCE: MOROCCO
(H) PROBABLE ORIGIN: FRANCE AND SPAIN

3. DISCUSSION: THE DRYLAND AGRICULTURE APPLIED RESEARCH PROJECT (608-0136) IS ASSISTING THE NATIONAL INSTITUTE FOR AGRONOMIC RESEARCH (INRA) TO DEVELOP AN APPLIED RESEARCH PROGRAM TO IMPROVE RAINFED CROP PRODUCTION IN LOW RAINFALL (250-450 MM) REGIONS OF SOUTHERN MOROCCO. THE PROJECT REGION COVERS OVER 35,000 SQUARE KILOMETERS WITH APPROXIMATELY 2.2 MILLION HECTARES OF ARABLE LAND IN EIGHT PROVINCES. CURRENTLY, FOURTEEN U.S. RESEARCH SCIENTISTS FROM MIAMERICA INTERNATIONAL AGRICULTURAL CONSORTIUM (MIAC) AND TWENTY SIX MOROCCAN RESEARCHERS ARE ACTIVELY CONDUCTING ON-STATION AND ON-FARM RESEARCH THROUGHOUT THE REGION. USAID INTENDS TO EXTEND THE PROJECT BY SIX YEARS THROUGH 1994. THE MISSION DIRECTOR HAS BEEN DELEGATED AUTHORITY TO AUTHORIZE THE PROJECT PAPER AMENDMENT. WE PLAN TO AUTHORIZE THE PROJECT EXTENSION AS SOON AS POSSIBLE PENDING APPROVAL OF THIS WAIVER. THE NEW EXTENDED PROJECT WILL CONTINUE TO EMPHASIZE THE SAME ACTIVITIES BUT WILL INCREASINGLY EXPAND THE AMOUNT OF ON-FARM RESEARCH AND RESEARCH AT OUTLYING RESEARCH SUB-STATIONS, SOME OF WHICH ARE UP TO 100 KILOMETERS FROM THE CENTRAL STATION. THE NEW EXTENDED PROJECT WILL ALSO INCREASE THE NUMBER OF U.S. RESIDENT STAFF TO SIXTEEN SCIENTISTS DURING 1989 THROUGH 1990. TWENTY SIX ADDITIONAL MOROCCAN SCIENTISTS WILL ALSO BE ADDED TO THE PROJECT. TO DATE, FIFTY-THREE VEHICLES HAVE BEEN PURCHASED UNDER THE PROJECT SINCE 1978. FIVE OF THESE VEHICLES HAVE BEEN TURNED OVER TO THE GOVERNMENT OF MOROCCO FOR SALVAGE. NINE VEHICLES ARE FOR SPECIAL PURPOSE USE SUCH AS SOIL SAMPLING AND TRANSPORT

104

OF HEAVY EQUIPMENT. OF THE REMAINING THIRTY-NINE GENERAL PURPOSE VEHICLES, FOURTEEN ALREADY HAVE OVER 100,000 KILOMETERS, AND BY THE END OF 1988, TWENTY SEVEN WILL HAVE OVER 100,000 KILOMETERS. THE TWENTY-SEVEN VEHICLES WITH HIGH KILOMETRAGE WILL HAVE TO BE REPLACED DURING THE EXTENDED PROJECT. THUS, OF THE THIRTY-FOUR NEW VEHICLES TO BE PURCHASED UNDER THIS WAIVER, TWENTY-SEVEN ARE REPLACEMENTS FOR THE EXISTING FLEET AND TWELVE ARE FOR PROJECTED REPLACEMENTS DURING THE EXTENDED PROJECT.

4. JUSTIFICATION: THE FOLLOWING POINT WITH RESPECT TO VEHICLE AVAILABILITY AND USE IN MOROCCO IS RELEVANT TO THIS WAIVER. BASED ON USAID/RABAT CONSULTATION WITH U.S. REPRESENTATIVES IN MOROCCO FOR GENERAL MOTORS, FORD AND JEEP, WE HAVE DETERMINED THAT NO SUCH U.S. VEHICLES ARE SOLD IN MOROCCO AND THAT NO SPARE PARTS OR SERVICE CAPABILITY EXISTS IN MOROCCO FOR U.S. VEHICLES AT THE PRESENT TIME. ANY SUCH VEHICLES WHICH DO EXIST HAVE BEEN BROUGHT IN ON A CASE-BY-CASE BASIS AND HAVE PROVEN DIFFICULT TO MAINTAIN. THE SITUATION IS NOT LIKELY TO IMPROVE IN THE FORESEEABLE FUTURE. SINCE PROJECT VEHICLES ARE REQUIRED TO BE FREQUENTLY DRIVEN TO VERY REMOTE AREAS, RELIABLE VEHICLES THAT CAN BE SERVICED QUICKLY AND MAINTAINED LOCALLY ARE A NECESSITY. VEHICLES OF CODE 935 ORIGIN, WHICH ARE ASSEMBLED IN MOROCCO, ARE USED EXTENSIVELY; AND SERVICE FACILITIES AND SPARE PARTS ARE READILY AVAILABLE IN EVEN THE REMOTEST RURAL AREAS OF THE PROJECT ZONE. ALL OF THE VEHICLES CURRENTLY IN USE BY THE PROJECT WERE ASSEMBLED IN MOROCCO. IT IS IN THE BEST INTEREST OF THE PROGRAM, FOR EASE OF MAINTENANCE AND INTERCHANGEABILITY OF SPARE PARTS, TO STANDARDIZE THE PROJECT FLEET AS MUCH AS POSSIBLE. THE INTRODUCTION OF U.S. MADE VEHICLES INTO THE PROJECT MOTOR POOL, WHICH WOULD BE VERY DIFFICULT TO SERVICE, WOULD THEREFORE HINDER PROJECT SUCCESS. THE INABILITY TO SERVICE ADEQUATELY VEHICLES OF U.S. MANUFACTURE NECESSITATES THE USE OF VEHICLES OF CODE 935 ORIGIN IN ORDER TO ATTAIN U.S. FOREIGN POLICY OBJECTIVES.

5. PURSUANT TO HANDBOOK 1, SUPPLEMENT B, SECTION 4 C2D, YOU ARE AUTHORIZED TO WAIVE SOURCE AND ORIGIN REQUIREMENTS UNDER FAA SECTION 636 (I) FOR MOTOR VEHICLES, IF YOU FIND THAT SPECIAL CIRCUMSTANCES EXIST. IN THIS CASE, THE SPECIAL CIRCUMSTANCES ARE THE LACK OF ADEQUATE SERVICE, FACILITIES AND SUPPLY OF SPARE PARTS FOR U.S. MANUFACTURED VEHICLES. SOURCE AND ORIGIN WAIVERS ARE PERMITTED AFTER CONSULTATION WITH GC AND SER/COM UNDER CIRCUMSTANCES DEEMED CRITICAL TO THE SUCCESS OF PROJECT OBJECTIVES. ACCORDING

105

TO DELEGATION OF AUTHORITY NO. 405, YOU HAVE THE AUTHORITY TO WAIVE THE AUTHORIZED SOURCE/ORIGIN REQUIREMENT FOR VEHICLES UP TO FIVE MILLION U.S. DOLLARS PER TRANSACTION (EXCLUSIVE OF TRANSPORTATION COSTS).

6. RECOMMENDATIONS: THAT, BASED UPON YOUR AUTHORITY UNDER DELEGATION OF AUTHORITY NO. 405 AND THE ABOVE JUSTIFICATION, BY YOUR SIGNATURE BELOW YOU:
(1) WAIVE THE SOURCE/ORIGIN FROM CODE 000 TO CODE 935 TO PERMIT THE PROCUREMENT OF 34 VEHICLES AND SPARE PARTS AT A COST OF APPROXIMATELY 520,000 DOLLARS FROM COUNTRIES IN CODE 935.
(2) CERTIFY THAT EXCLUSION OF PROCUREMENT FROM THE FREE WORLD COUNTRIES OTHER THAN THE COOPERATING COUNTRY AND COUNTRIES INCLUDED IN CODE 941 WOULD SERIOUSLY IMPEDE ATTAINMENT OF U.S. FOREIGN POLICY OBJECTIVES OF THE FOREIGN ASSISTANCE PROGRAM; AND
(3) CERTIFY THAT SPECIAL CIRCUMSTANCES EXIST TO WAIVE AND DO HEREBY WAIVE SECTION 636 (I) OF THE FOREIGN ASSISTANCE ACT OF 1961, AS AMENDED.

7. SOLID JUSTIFICATION SUPPORTS THIS REQUEST FOR

106

A VEHICLE PROCUREMENT SOURCE ORIGIN WAIVER. SIMILAR WAIVERS HAVE ALREADY BEEN GRANTED FOR THIS PROJECT BY THE AA. YOUR PROMPT ASSISTANCE IN ATTAINING WAIVER APPROVAL ON THIS REQUEST IS GREATLY APPRECIATED AS PROJECT TRANSPORTATION NEEDS ARE URGENT AND CONTINUE TO EXPAND AS THE RESEARCH PROGRAM EXPANDS AND MOROCCAN PARTICIPANTS RETURN TO THE PROJECT. MOREOVER, AUTHORIZATION OF THE EXTENDED PROJECT MUST AWAIT APPROVAL OF THIS WAIVER.

8. PLEASE ADVISE WAIVER APPROVAL. NASSIF
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ANNEX 8

SOCIAL SOUDNESS ANALYSIS

SOCIAL SOUNDNESS ANALYSIS

The social environment on the project region appears to be very complex, with considerable variation. During implementation of the project since its conception in 1978 through 1988, considerable information has been collected, principally in the Abda and Chaouia regions. A number of reports are available with the project officer in USAID that provide detailed information on various aspects from those two regions. The information presented here is a summary of information collected both in the Abda and Chaouia regions during the current project and also a summary of the historical perspective of the Moroccan farmer in the dryland project region.

1. Socio-Cultural Overview

Since the beginning of the twentieth century the tribe has been the most significant administrative and social force in Morocco. A web of kinship binds the rural individual to his tribal territory, to his immediate family, and to his more distant kin. Tribal organization is based on the principle of the segmentary lineage system, a group of kinsmen tracing their descent through the male line to a common ancestor. Kinsmen who mass together as descendants of a common ancestor at each level view themselves as united in opposition to all other groups formed in that tribe at the same level. That is, the grandsons of brothers form groups in opposition to other groups.

The structure of the tribe and the relationships within it are fluid. An opponent for some purposes might be an ally for others. People tend to exploit this fluidity, emphasizing the ties deemed the most beneficial and maneuvering among the relationships. Tribal patterns were upset during the colonial period when the French attempted to incorporate existing institutions into colonial bureaucracy. Some individuals and groups rose to positions of unaccustomed prestige and power.

Tribal life was changed again in the 1960s as the Moroccan government organized the countryside into "communes" in order to establish more efficient administrative units.

However, in spite of these upheavals much of the tribal structure remains in rural Morocco and it must be taken into account when planning for the introduction and adoption of new technology at the farm level. It can, in fact, accelerate technology innovation with proper strategies.

2. A brief History of the Evolution of Land Tenancy in Morocco

An understanding of the present structures of rural Moroccan society cannot be adequately grasped without a consideration of their historical evolution. The use of the land and the patterns of land tenancy have played a very important role in the evolution of farming practices in the cereal-producting plains.

a. Land Tenancy in the Past

Although it is difficult to ascertain exactly what relations previously existed between the land and its occupants, historians have characterized these as relatively loose ties, a state of affairs which corresponded to the preponderance of a pastoral orientation and a type of agriculture which featured long periods of fallow. Population density was low. The nomadic way of life and frequent shifts in the balance of tribal powers fostered geographic mobility.

Because of the overall abundance of land, uncultivated areas were common. Any individual or group could take possession of a field by marking it off and using it. The principle of "vivification" of "dead" land was the only recognized basis for establishing possession. Land was not considered to be held if active cultivation was terminated. Individual or private control of a plot was not dependent on the value of the land itself as much as on the amount of work and capital invested in it. At the end of the nineteenth century landed property was considered to be the land which an individual and the members of his social unit such as the family or tribe (the distinction between the two being somewhat vague) could cultivate or use as pasturage for their livestock herds and which could be defended from the encroachments of others. The power of individuals or social units to control their domain was the important factor. Limits were not definite. The dimensions of such holdings around a central cultivated core could increase or diminish according to the strength of its "owner" or occupant. Beyond the limits of effective control, vast areas of uncultivated land and common pasture land existed which were very fluid in legal status and which offered room for unlimited expansion.

About the turn of the twentieth century, true private freehold property (juridically referred to as "melk" made its appearance. Melk landholdings have their origin in lands that had previously been acquired through the "vivification" practice discussed previously. Use of the land was continued without interruption and held by the same individual or group. Subsequently, through a series of sales or other legal transactions, the land acquired the new legal status of melk (freehold) property. The total amount of melk land was still quite small at this time. Most of it was centered in the vicinity of permanently established villages or tribal groups that were relatively sedentary and who repeatedly used the same land. The familial or patriarchal aspect of landholdings was reflected in the concept of indivisibility as regards inheritance. This indicated the cohesion of the patriarchal plan on the one hand and a relative weakness of the concept of individual possession on the other. The practice of indivisibility occurs in a limited fashion today with more than one descendant inheriting joint title to a parcel of land. This is done to prevent further fragmentation of parcels of land.

A category of land to be distinguished from melk land is bled jemaa, or collective lands. These are "lands of cultivation and pasturage used by tribes, villages or other indigenous groups under collective title, following traditional modes of production and use", as defined by a dahir (decree) of 1919. Some have argued that there was no such collective land with a special legal status before the intrusion of European influence, and that bled jemaa was in fact a creation of the Protectorate that gave the state, and entity that did not exist previously, ultimate guardianship of this land.

b. Changes in the Land Tenure System following European Penetration

The intrusion of European colonials into Morocco was accompanied by a great increase in melkisation, the conversion of untitled land into privately held property with legal title. Early accounts attributed this increase in titled and to a reduction of internal strife brought about by the Protectorate, a necessary condition for the development of a private landholding system. More recent studies, however, have attributed much of the movement toward melkisation to a defensive reaction on the part of the Moroccan peasants who quickly saw that land without clear title was subject to appropriation by Europeans as well as by other Moroccans who possessed both the means and the power necessary for enlarging their holdings. The notion of an "establishment of order" may have expressed the viewpoint of the colonizer, but for the Moroccan peasant the insecurity associated with tribal quarrels and shifts in power was replaced by an insecurity that was due to colonial manipulations.

Melkisation rapidly accelerated the division of former common lands into privately held fragments. The distribution and configuration of plots reflected the location and relative power of families and individuals at the particular time of this development. This occurred between World War I and World War II. It was by no means the result of a gradual evolution of land ownership.

The period between the two world wars was also marked by an increasing differentiation between large and small landowners. A process of increasing fragmentation continued among small landowners resulting from Islamic laws requiring equal inheritance and from demographic growth in limited space. This fragmentation contributed to a growing disparity between large and small landowners. Farms that fell below a minimum size for viability were often purchased by the larger proprietors, especially during periods of drought. The larger proprietor then became the most important source of land for sharecropping. This source is now beginning to decline as the larger farmers can afford to mechanize and move toward owner operation.

By the time of World War II, the picture of immense amounts of untilled land, which characterized the situation at the turn of the century had changed drastically. The limits of potentially arable land had been reached. By the end of the Protectorate, Europeans had acquired about a million hectares of the best land which is about on-fourth of the total arable land in Morocco. The amount of land available for the Moroccan peasant had diminished considerably. In addition, rapid demographic growth began to be acutely felt just at the time when horizontal expansion was no longer possible. The average amount of land surface per person was decreasing rapidly.

3. The Agricultural Work Force in Morocco

The problem presented by the increased number of workers is perhaps more complex in agricultural areas than in the urban areas in Morocco. The rapid growth in manpower tends not only to create problems in employment but also to multiply the number of individual farming operations, creating a serious regressive evolutionary pattern in size of operation. A fuller understanding of the effects of this demographic pressure requires a closer examination of the patterns of employment. Attention will first be given to a brief general description of various employment categories, followed by a more detailed review of prevailing forms of work contracts found in the traditional Moroccan agricultural sector.

a. Types of Employment - a brief description

The farmer-worker (fellah) is a man, using the help of his immediate family, who works the land which belongs to him or which he is entitled to use according to contractual agreements (rent or association). The farmer-worker has more control of his own activities than do those in other forms of farming, participates directly in production, and is rewarded with benefits from his own labor. These farmers make their own decisions in attempting to achieve the often times precarious balance among the various production sub-systems of their farming operations which are necessary to maintain their level of living.

The associated-employee (khammes) executes the order of his patron, and is reimbursed for his labor with one-fifth of the harvest that he has directly participated in producing. This form of relationship is an old one and bears a strong resemblance to patronage relationships found in feudal societies. The khammes is not provided with a salary but often enjoys some benefits accruing from the patronage relationship that the salaried employee lacks such as greater employment security. Now that the traditional agricultural sector is increasingly being drawn into a money economy, however, the khammesat relationship is on the wane as an increasing number of agricultural workers choose salaried positions, even though they may be less secure.

The salaried agricultural worker first appeared during the period of colonization when European forms of production organization were introduced and quickly assumed a great importance. Salaried workers can be considered as consisting of two basic categories: permanent workers and occasional or seasonal workers.

A major characteristic of work in the traditional sector is the amount of time that is devoted to finding and setting up working arrangements. The large numbers of men who appear to be idle along the roads or at the souks (markets) are often engaged in this sort of unproductive but essential activity. Such negotiations are often of a subtle and delicate, time-consuming nature.

It is interesting to note that a farmer and his family will often refrain from harvesting activity so long as the employed harvestors are working in his fields, although the farmer and his family may do some harvesting in the afternoon after the workers have left. Social rank plays an important role even here.

b. Types of Contractual Arrangements in the Traditional Sector

Agricultural household heads who have at their disposal the total means for accomplishing their farming work are rare. Almost all farming households must enter into contracts in order to procure the means they are lacking as well as to commit those that they have in excess. A landowner can either rent his land to someone who wants to work it or cultivate it himself by acquiring that which he lacks, such as labor or additional tillage equipment. The farmer who possesses no land or other means of production can either enter into a khammesat contract with a landowner or sell his labor as an agricultural worker. He might also be able to obtain land, work, or livestock to tend through a rental or sharecropping arrangement. These are simplified examples; there are innumerable variations in relation to the different aspects of rural productive activity.

Contracts of Association (Bel Khobza): As has been noted previously, farming association play an important role in traditional Moroccan agriculture. Under the general title of the Bel Khobza, or cultivation association, there is great diversity ranging from sharecropping contracts with large landowners to more cooperative agreements between small farmers of more or less equal stature in relation to the means of production they contribute to the association.

Formally, the duration of such associations is limited to only one growing season, although in practice they can be repeated between the same partners for several successive years. The contract is always renewed in a formal manner, however, and never continued in a tacit and informal way. The contracts of association are considered terminated when the grain from the harvest has been divided on the threshing floor into the respective shares of the landowner and the associate(s).

Recent developments indicate that the total amount of land let out in association or to sharecroppers by big landowners has diminished as the larger landowners adopt more modernized management practices and mechanization. The large landowners, although the last numerous, are those who have let out most of the acreage to smaller sharecropping farmers in the past. Over the past several years an increasing number of large landowners have purchased tractors and now cultivate the land themselves. This development has had the effect of either depriving former sharecroppers of adequate land to till or of changing their status to one of salaried employees. An overall effect has been to provoke disequilibrium in the traditional agricultural system. The small farmer who needs to supplement his agricultural base to maintain a subsistence level is the victim of this change. The present situation suggests that associations are more exclusively contracted among small peasant farmers, while the larger iellahs are operating all the land they own. Mechanization greatly changes the relations which formerly existed between the large and small landed farmers. It increases the social distance between the two groups.

4. The Role of Livestock in Farming Operations

a. The System of Livestock Production

Livestock production has always been of importance in Moroccan traditional agriculture. In fact many of the contradictions or tensions which today characterize the traditional agricultural sector originated through the adaptation of agricultural production practices to a nomadic, pastoral way of life. The relative tenuousness of ties between man and the land is one example.

Today most small farming households own some livestock, perhaps one or two draft animals and a small herd of cattle, sheep or goats. These animals play a very important and integral role in the small farmer's attempt to balance the various components of production in his total farming operation.

Problems arise from traditional livestock production practices because of the many functions that these animals serve. Livestock serve as capital, a savings account, and a source of income. They also supply power for land tillage, provide milk, wool and meat, and finally function as a primary criterion of social prestige.

The combination of economic and social functions prevents the adoption of more specialized animal husbandry techniques. Livestock which satisfy the greatest number of functions are usually the ones acquired, even though each of these functions may be poorly accomplished. It is essential to gain a thorough knowledge of the various functions livestock perform in the maintenance of the economic equilibrium of the farming operation if there is to be an attempt to change the behavior of the farmer in the direction of more rational livestock management. Suppose, for example, one wanted to introduce

pure-bred cattle into a small farming operation, such as cattle bred for milk production. The farmer would have to add the purchase cost of additional animals for draft power to the credit and new costs involved in the care and maintenance of pure-bred cows. The replacing of a "traditional" cow with a more specialized one is not a perfect substitution. The farmer will assure, even if poorly, the accomplishment of the functions which the latter one won't, especially if it is forbidden because of credit agreements to sell the pure-bred cattle at harvest time.

b. Livestock as a Source of Power

Draft animals play an important role in farming systems in Morocco. The Ministry of Agriculture and Land Reform (1983) estimated the population of draft animals as 1.36 million which includes 160 thousand horses, 445 thousand mules, 724 thousand donkeys and 39 thousand camels. these animals are used extensively for farm operations and transportation. Statistics available from surveys conducted in 1982 and prior to that show that about 30 per cent of the cultivated land in Morocco is entirely managed by the use of draft animals. Out of the remaining 70% tilled the first time by tractors, a considerable proportion is sown and weeded by the use of draft animals.

A unique feature of the use of draft animals for farm work in Morocco is that the teaming of different species of animals. One can find almost all possible combinations among the types of animals mentioned above to form a team of two. Obviously, farmers may have their own considerations based on the purchase and maintenance costs of these animals in the context of the present level of economic output from them. The usefulness of draft animals can be ameliorated by improving their efficiency and work output. This project is aimed at generating baseline data on various engineering and physiological parameters of work animals which can be useful in designing improved animal-drawn machinery and improving the output.

c. Livestock as a Source of Income

Cattle and sheep are the primary income producing livestock. Not all of this livestock is sold. A portion is consumed by the farm household itself. Except in suburban areas, milk production is a non-market product. Milk and butter are almost entirely consumed by the family. This is not surprising when one considers that an average milk cow produces only two to four liters of milk daily during lactation, and the average size of a family is five.

Both meat and wool are marketed products from sheep. Formerly wool are almost entirely used or processed by the family. Today it is increasingly sold in raw form destined for urban centers. A very significant amount of wool, however, is still accumulated and saved by the family and used to stuff mattresses and other furniture in the home. This collected wool constitutes a form of savings and an insurance against variations in the purchasing power of money.

d. Livestock is a Savings Account

Decisions on the sale of livestock are determined by the financing needs of the farming operation rather than market prices. In traditional agriculture an animal is sold to meet an urgent need for liquid assets. The traditional herd is sometimes referred to as a kind of bank. It is in fact a savings account that is very well adapted to the rudimentary level of capitalization in the traditional agricultural sector. Replacing this function of the herd would certainly be among the first requirements in instituting a more rationalized pattern of livestock management. This would necessitate profound changes in the current system of banking and credit at the level of the small farmer. An entire banking network would have to be created along with a whole host of banking personnel, etc. Thus the herd, for better or for worse, satisfies many of the functions of a banking system when complemented by the local moneylender who provides some intermediate term credit.

5. The Diffusion of Innovation

The project goal implies achievement of a significant increase in food production in Morocco. Given that there are 3.8 million rural people in the project area (more than one-half million farm families) distributed over some 35,000 km2 of land, it is clear that an effective "spread effect" is necessary to effect changes in technology. Without changes in technology at the farm level there can be little impact on food production.

Several communication strategies have been suggested to accomplish this spread effect. The extension service (DV) through its extension agents (CTs) will be relied upon, in part, to facilitate the diffusion process. The DV is at present, considering an internal reorganization and a loan from the World Bank. The Aridoculture Project proposes an interface with the DV and farmers to transfer technology adapted for farming systems in the project area. The major proponent of the "spread effect" will be the CT program of Train and Visit in which each CT will have 35 contact farmers. He will visit each farmer once per month at which time he brings information about new technology. Each farmer, in turn, will contact 10 other farmers. Through this "spread effect" 350 farmers will be reached. Other communications such as radio scripts, newsletters, and TV programs will be employed to support the program of personal interaction.

Project experience from the past five years indicates that farm families' values and beliefs are compatible with accepting new technologies. Studies by the Aridoculture Center have shown that Moroccan farmers are no more risk averse than other farmers in the world (including American farmers). The plant varieties and cultural practices being proposed are well within the limits of yield variability acceptable to most Moroccan farmers.

There are a number of agricultural innovations, e.g. seed of new varieties, herbicides and fertilizer recommendations, which, based on recent project experience, farmers accept readily. It is projected that these technologies can be diffused rapidly through the farm population by contacts of the 350 farmers in the CTs network.

Sociological studies and observations indicate that Moroccan farmers are comfortable with field trials and testing when the proposals and plans for trials are properly introduced through community, tribal, and family channels. As a matter of fact, the tribal/family structure provides an effective communications channel through which farmers can be involved in the research planning process and by which proven, beneficial technology can be diffused. The Aridoculture Center sociologists have observed that support from respected leaders is a powerful driving force in getting information accepted and communicated. In cases where Center staff have been successful in identifying and convincing opinion leaders, ideas have spread rapidly.

A convincing example of this process is the ground swell of interest in a variety of bread wheat, resistant to Hessian fly damage, which has recently been identified by Center scientists. A small amount of this wheat was released for multiplication on the western boundary of the project region. Its qualities have been quickly recognized by farmers and there are more requests for seed than can be filled. If a seed source was now available, the variety could be spread throughout the project area in a short time.

6. Benefits Related to Farm Size in the Project Area.

Ecological differences have an important impact on the area's land tenure structure. The more arid the region and the poorer the soils, the larger the average size of the farms. Not only are farms in dry regions larger, but they also rely more on livestock production.

There is very little reliable data for the project area as a whole regarding farm size or farm types. The reliable data are limited to the regions of Chaouia and Abda.

Official data for the Province of Settat shows the following land tenure structure for the Chaouia region.

Ha	Percentage of Farm Area by Category	Accumulated Percentage of Farm Area	Percentage of Farms by Category	Accumulated Percentage of Farms
0 - 5	16.8	16.8	60.6	60.6
5 - 10	27.1	43.9	21.4	82.0
10 - 20	27.6	71.6	13.8	95.8
20 - 50	19.1	90.6	3.5	99.3
50+	9.4	100.0	0.7	100.0

The equivalent official figures for the Abda region area:

Ha	Percentage of Farm Area by Category	Accumulated Percentage of Farm Area	Percentage of Farms by Category	Accumulated Percentage of Farms
0 - 5	35.0	35.0	66.0	66.0
5 - 10	15.0	50.0	19.0	85.0
10 - 20	17.0	67.0	9.0	94.0
20 - 50	14.0	81.0	3.0	97.0
50+	19.0	100.0	3.0	100.0

It would be erroneous to identify project beneficiaries strictly in terms of farm size. This is especially true for the smaller producers because they often sharecrop land in addition to their own land; thus their production unit size can often be twice as large as their farm size.

Small farmers, those with less than five ha, often supplement their farm income with off-farm income sources. They are not likely to benefit immediately from project outputs, especially if the outputs require capital investments. It seems most likely that these farmers may ultimately adopt new technologies only by selectively adopting improvements already tested and accepted by their larger neighbors. However, special efforts have been made under the project to, whenever feasible, address problems that are unique to the small farmer. For example, an agricultural engineer was assigned to work on improving animal traction systems when the Center determined that many small farmers needed assistance in that area.

Medium-sized farmer, those operating between 5 and 50 ha, are the primary clients of the project. These farmers are also apt to sharecrop land but the proportion of such land is lower than that of small farmers. These farmers are mostly full-time farmers and have the best potential for profiting from project technologies. They are receptive to innovations which carry moderate risk.

Large farmers, those with 50 ha or more, are not very important numerically, but they control between ten and twenty percent of the project area farmland. Such farmers are often wont to be absentee owners who entrust the farm to a manager. This is especially true of the largest farmers. They are perhaps most likely to adopt project technologies directly, especially complex technologies such as packages of improved inputs and practices.

Farmers belonging to cooperative organizations are usually medium-sized farmers. Such farmers do not represent an important percentage of the total project area farm population. However, because they have access to collective resources, they may represent an important target group for technology dissemination. As in the case with the large farmers, farmers belonging to production cooperatives may be more apt to adopt some of the more complex or capital-intensive technologies.

7. Project Beneficiaries

The major project beneficiaries are medium and small farmers will be project beneficiaries. All research supported at the Aridoculture Center will take into consideration the special technology needs of these two groups. Realistically, however, many of the technologies developed will also benefit the small percentage of large farmers in the dryland regions.

The secondary beneficiaries of project activities will be the scientists and support staff at the Aridoculture Center whose capabilities will be upgraded by the expanded training opportunities; the increased exposure to procedures, processes, and technologies not yet introduced or widely known in Morocco; and the increased availability of modern equipment to facilitate more effective job performance. INRA will benefit as an effective research institution is added to its existing network of institutions. INRA will further benefit because the Aridoculture Center will demonstrate the effectiveness of programming by objective as well as a research methodology that actively solicits farmer participation. The extension service and other technology disseminators will benefit from the continuous flow of effective, relevant technologies.

8. The Role of Women

The importance of the work done by women in agriculture must be given greater attention in the future. Available comments on women's work activities usually cite the complementary nature of their work to that of men. In farm operations women commonly tend livestock, wee the crops, and assume responsibility for getting firewood and water.

Considerable time is taken for the performance of domestic activities associated with rearing children, cooking, etc., all of which must be accomplished through very labor-intensive techniques.

The care of animals is the most demanding work for women. For an hour or more every evening women must cut grass, weeds or lucerne to feed the livestock. Some of the forage must be dried and stored to feed the animals during the dry summer and barren, early winter period.

The processing of plant and animal products involves the weeding of wheat fields from March to May and feeding the animals. Women may be employed winnowing wheat in June and stripping maize cobs in October. Women are also responsible for milking goats and cows.

Morocco is a Moslem state characterized by considerable variation in behavior and values, both among and within different sectors of the society. Some urban areas have adopted many features of European culture in life-style and attitudes. Much of the rural population continues to respect and adhere to those values which have developed from the contact and intermingling of different Islamic and, more specifically, Moroccan cultures. These sets of values are rich in tradition. Variable contributions of European, Islamic, and Moroccan cultural features are reflected in cultural differences that exist among the several regions.

Variation in behavior and values can be observed in the role of women in various sectors of the society. They range from an educated, professional role to a minimally educated, secluded and highly restricted role. The overall configuration of roles appears to be changing rapidly, especially in the urban areas. Differences between generations in dress and other outward manifestations are sometimes quite striking. It is not unusual to see a veiled mother accompanied by her teen-aged daughter dressed in the latest European style.

In rural areas, tradition remains strong. There is a high degree of differentiation between the roles of men and women which is articulated throughout many aspects of rural life. There are symbolically significant differences in dress and sexually differentiated kinds of social organizations for men and women. According to Moslem tradition, women are confined to the home and domestic activities: cooking, child rearing, and helping to tend livestock (see the section on Women's Work Activities under The Agricultural Work Force in Morocco). The proportion of women engaged in labor-intensive work, some of which may be outside the home, is much higher in lower socio-economic conditions than among middle-income groups. The seclusion of women may be an ideal which can be adhered to by those with an adequate income, but economic conditions necessitate compromises with the ideal. An interesting result of this situation is that the role of the woman and the amount of productive work done by her may very well decrease as a family's socio-economic situation improves and as the ideal of seclusion becomes more economically attainable

Past development plans in Morocco have devoted considerable attention to the mechanization of agriculture, irrigation projects, banking, etc., but only a few devoted to the family and the condition of women. Development must thoroughly examine all the potentials already present in the society or social group concerned as well as all forms of work being done, including those for which there may be no remuneration and much of which appears unproductive. Such a thorough examination must also devote attention to the condition of women in the society, their roles and the work they do as well as patterns of social organization in which they participate. This increase in comprehensiveness could well reveal important potential alternatives that are already present within the society and upon which aspects of a development program can be based. Approaches should be used which seek to discover and then build upon existing potentials rather than those which impose formulas from above that may be in serious disjuncture with existing social relations and values. They will have much greater chances for success in achieving the overall goal of improved living conditions and greater productivity in the social group concerned.

9. Women as Project Beneficiaries

Moroccan women have a more limited role in agriculture, particularly in terms of decision making, than the women in many other developing countries. Moreover, any decision making role that they might play appears to decline as the scale and profitability of the production system

increases. Even in cases in which Moroccan women own agricultural land, it tends to be farmed and managed by male relatives, let out for sharecropping, or leased. Male migration to the urban areas has meant that an increasing number of rural households are managed by women for much of the year. However, in most of these situations, the remaining male members of the family continue to dominate the farm management decision making process.

Nevertheless, women are directly involved in agricultural activities, particularly the care of livestock. Women collect weeds from the fields for fodder, clean stables, and water and feed animals. Women are also sometimes employed as field laborers. Although women are preferred to men as field laborers because they are cheaper to hire, only 8 percent of village girls and women participate in this type of labor. It is physically exhausting and very low status.

Given the limited role of women in Moroccan agriculture, it is difficult to argue that the project will have a significant direct impact on women, either of a positive or a negative nature. Women who own and/or care for livestock will benefit from technologies that will be developed to increase forage production. Improvements in agricultural machinery will result in a lower requirement for field labor but, because the percentage of women involved in field labor is low and the demand for female laborers high, this will not have an adverse impact on female employment opportunities. Through socio-economic studies conducted at the Aridoculture Center, scientists will increase the body of knowledge on the role of women in Moroccan agriculture. This information will be useful to agencies responsible for planning and implementing programs designed to enhance the status of women, such as education programs, employment generation programs, etc.

To date, one woman scientist has received M.Sc. training in weed science under the project. This same woman will be sent onward for Ph.D. training under the project extension. INRA has agreed to continue making its best effort to identify women for professional positions and, hence training slots.

ANNEX 9

BACK-UP TABLES AND JUSTIFICATION FOR BUDGET

ANNEX 9

BACK-UP TABLES AND JUSTIFICATION FOR BUDGET:
A READER'S GUIDE

This Annex contains back-up tables and justification for the project budgets shown in Section IV. of the Project Paper Supplement. Each of the various GOM and USAID contributions shown here add up to TABLE IV-2, the Master Budget, presented in Section IV. A Guide to interpreting these back-up tables is provided below:

The GOM Contribution:

The GOM contribution is figured for the Aridoculture Center itself and for each of the five satellite stations, Sidi El Aydi, Jemaa Shaim, Kemis Zemamra, Dar Bouzza, and Annaceur. The budget categories used include Operating Budget, (Budget de Fonctionnement) and Capital Budget (Budget d'Equippement). The Operating Budget is divided into operating Expenses and Salaries. The Capital Budget is divided into Construction and Commodities.

GOM construction costs are laid out in Table 1 in this Annex, the total of which is shown in the Master Budget IV-2 in the PPS under the construction line item.

GOM commodities costs are laid out in Table 2, Table 3, Table 4, and Table 5, the total of which is shown in the Master Budget IV-2 in the PPS under the commodities line item.

GOM salaries costs are laid out in Table 6, Table 7, Table 8, and Table 9, the total of which is shown in the Master Budget IV-2 in the PPS under the salaries line item.

GOM operating expenses are laid out in Table 6 and Table 7, the total of which is shown in the Master Budget IV-2 in the PPS under the operations line item.

The USAID Contribution

The USAID contribution to the project is laid out in Tables 10, 11, and 12 in this Annex. The assumptions for each line item are laid out on the four pages prior to these Tables.

Procedure for Estimating Required GOM Construction and Commodities Budget Categories within the Budget d'Equippement

A. CONSTRUCTION

1. Construction at Aridoculture Center - line 1-11, Table 1.

2. Construction at Sidi El Aydi - line 12-14, Table 1.

3. Construction at Jemaa Shaim - line 15 - 18, Table 1.

4. Construction at Kemis Zemamra - line 19-25, Table 1. (40% covered by project).

5. Construction at Dar Bouazza - line 26-29, Table 1.

6. Construction at Annaceur - line 30, Table 1.

* Total of items 1-6 equals construction line item in PPS and is part of Budget d'Equippement.

B. COMMODITIES

1. Mobilier et Materiel de Bureaux at Center and at all satellite stations - line 1-6, Table 2.

2. Materiel Special (scientific supplies) at Center and at all satellite stations - line 1-11, Table 3.

3. Vehiles at Center and at all satellite stations - line 1-7, Table 4.

4. Chaptel at Center and at all satellite stations - line 1-6, Table 5.

* Total of items 1-4 above equals commodities line item in PPS and is part of Budget d'Equippement.

* Total of all items in A and B above equal total Budget d'Equippement.

Procedures for Estimating Required GOM Salary Categories
within Budget de Fonctionnement

A. PROFESSIONAL STAFF AT ARIDOCULTURE CENTER

1. Salaries for Aridoculture Center scientists - line 1, Table 8.

2. Salaries for Aridoculture Center administration - line 2, Table 8.

3. Salaries for professional technicians and midlevel administrative staff - line 3, Table 8.

4. Secretaries and logistical support staff - line 4, Table 8.

B. PROFESSIONAL STAFF AT SATELLITE STATIONS

1. Salaries for satellite station scientists - line 1, Table 9.

2. Salaries for satellite station technicians - line 2, Table 9.

3. Salaries for logistical support staff (secretaries, administrative, etc.) - line 3, Table 9.

C. WAGES FOR ARIDOCULTURE CENTER

Day laborers and temporary help - line 1, Table 6.

D. WAGES FOR SATELLITE STATION

Day laborers and temporary help - line 1, Table 7.

Total estimated salaries and wages were obtained for each FY (1988-94) using the above line items. Totals were adjusted to reflect an approximate 4% increase each year to allow for new project scientific staff. Salary scales for scientists are based on equivalent levels for MARA (see next page). Other categories of staff salaries and wages were provided by INRA.

In order to assess the magnitude of the pay scale problem the official regulations for INRA salaries (Official Bulletin No. 3801, September 4, 1985) and the official regulations for MARA salaries (Official Bulletin No. 3771, February 6, 1985) were evaluated. Comparisons were made of gross salaries for four selected scientist positions at the Aridoculture Center according to both official pay scales.

Procedure for Estimating Required GOM Operating Budget
Categories within Budget de Fonctionnement

1. Center fuel for research and administration - line 3, Table 6.

2. Center materials for research and administration - line 4, Table 6.

3. Satellite station fuel and repairs - line 2, Table 7.

4. Satellite station consumables - line 5, Table 7.

6. Per diem and travel related expenditures for Center - line 2, Table 6.

7. Per diem and travel related expenditures for satellite stations - line 4, Table 7.

* The above line items were totalled for each FY (1988-94). In addition, it is estimated that approximately 150 thousand dollars per year of operational costs currently being financed by USAID should be born by the GOM. This amount (150,000 x 6 years) was deducted from the USAID budget estimates (see table 10 and 11) and added to the GOM operational budget in progressive increments.

The table below shows the derivation of GOM operating budget.

(-000- of dollars)

	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94
From line 3, Table 6	73	80	87	95	103	112
From line 4, Table 6	104	113	123	134	14	158
From line 2, Table 7	38	44	45	49	54	58
From line 3, Table 7	31	33	36	40	43	47
From line 5, Table 7	68	74	81	88	96	204
From line 2, Table 6	46	50	55	60	65	71
From line 4, Table 7	12	13	14	15	16	18
SUBTOTAL	372	407	441	481	523	568
Adjustment *	181	181	206	225	183	138
TOTAL	553	588	647	706	706	706

* Adjustment to reach sustained AID operational budget ($880,000 deducted from AID budget plus increase of 234,000).

Annual Gross Salary for INRA Scientists Compared to Equivalent MARA Positions

Position	MARA Pay Scale	INRA Pay Scale	Percent INRA/MARA
	----------DH/yr.	---------	%
Senior Scientist (Ph.D.)	125,023	51,844	41
Junior Scientist (M.S.)	68,814	36,953	54
Senior Research Associate (B.S.)	46,177	33,057	72
Junior Research Associate (B.S.)	42,000	29,162	69

Note: The tax on these salaries is 20-25 percent which reduces take home pay accordingly.

TABLE 1

CONSTRUCTION AMENAGEMENT DES BATIMENTS

Operations	1989	1990	1991	1992	1993	1994	Total
CENTRE ARIDOCULTURE							
1. Amenagement batiments	90000	60000	90000	100000	130000	120000	590000
2. Extention reseau electrique"3e tr."	300000						300000
3. Extention voirie et assainissement	300000						300000
4. Logements gardiens			300000				300000
5. Maison d'hotes			400000				400000
6. Poste transformateur electrique		300000					300000
7. Creusement d'un puits						200000	200000
8. Construction chateau d'eau						200000	200000
9. Construction hangar		500000					500000
10. Construction abri pour engins			500000				500000
11. Extention des laboratories	800000						800000
s/total	1490000	860000	1290000	100000	130000	520000	4390000
SIDI EL AYDI							
12 Amenagement des batiments	150000	100000	150000	100000	100000	150000	750000
13 Achat de terrain (40 ha)	2000000						2000000
14. Cloture		500000	500000	500000			1500000
s/total	2150000	600000	650000	600000	100000	150000	4250000
JEMAA SHAIM							
15. Branche telephonique		200000					200000
16. Amenagement des pistes			150000	150000	150000	150000	600000
17. Clotture		500000	500000	500000	500000		2000000
18. Logement		500000	500000				1000000
s/total	0	1200000	1150000	650000	650000	150000	3800000
KHEMIS ZEMAMRA							
19. Adduction d'eau postale				2000000			2000000
20. Hangar		700000					700000
21. Amenagement des pistes		150000	150000	150000	150000		150000
22. Amenagement des batiments	50000	50000		80000		100000	280000
23. Magasin de stockage de semences					600000		600000
24. Branchement telephonique		200000			700000		900000
25. Electrification station de pompage		150000					150000
s/total	50000	1250000	150000	2230000	1450000	100000	5230000
(.6)	30,000	750,000	90,000	1,338,000	870,000	60,000	3,138,000
DAR BOUAZZA							
26. Amenagement des batiments	60000		60000		100000		220000
27. Construction d'un bloc bureau	300000						300000
28. Const. d'un lab de phytiatrie	200000						200000
29. Magasin de conserv. des semences				300000			300000
s/total	560000	0	60000	300000	100000	0	1020000
(.7)	[illegible]	0	42,000	[illegible]	70,000		714,000
ANNACEUR							
30. Construction & amenagement	500000		500000			300000	1300000
s/total	500000	0	500000	0	0	300000	1300000
TOTAL	4750000	3910000	3800000	3880000	2430000	1220000	19990000
	−30	−750	−90	−1,338	−870	−60	−3,138
	−292	0	−42	−210	−70	0	−714
(000 DH)	4,228	3,160	3,669	2,332	1,490	1,160	16,138
($ 000) (1/8.5)	$ 509	372	432	274	175	136	$ 1,899

TABLE 2

MOBILIER ET MATERIEL DE BUREAUX

Locations	1989	1990	1991	1992	1993	1994	Total
1. CENTRE ARIDOCULTURE	180000	70000	60000	70000	70000	80000	530000
2. SIDI EL AYDI	20000	20000	30000	30000	30000	40000	170000
3. JEMAA SHAIM	20000	20000	20000	20000	20000	20000	120000
4. KHEMIS ZEMAMRA	20000	20000	20000	20000	20000	10000	110000
5. DAR BOUAZZA	10000	20000	20000	20000	10000	10000	90000
6. ANNACEUR	15000	15000	15000	15000	15000	15000	90000
TOTAL	265000	165000	165000	175000	165000	175000	1110000
Kh. Zemamra x .6	-12,000	-12000	-12000	-12000	12000	-12000	[illegible]
Dar Bouazza x .7	-7,000	-14,000	-14,000	-14000	-7000	[illegible]	[illegible]
	246,000	139,000	139,000	149,000	146,000	156,000	[illegible]
($000)	29	16	16	18	17	18	114

TABLE 3

MATERIEL SPECIAL

Locations	1989	1990	1991	1992	1993	1994	Total
CENTRE ARIDOCULTURE							
1. Materiel scientifique	800000	800000	800000	800000	800000	800000	4800000
s/total	800000	800000	800000	800000	800000	800000	4800000
SIDI EL AYDI							
2. Gros materiel d'exploitation	250000		100000			200000	550000
3. Materiel scientifique	10000		10000			10000	30000
s/total	260000	0	110000	0	0	210000	580000
JEMAA SHAIM							
4. Gros materiel d'exploitation	200000		200000		200000		600000
5. Materiel scientifique	10000		10000		10000	20000	50000
s/total	210000	0	210000	0	210000	20000	650000
KHEMIS ZEMAMRA							
6. Materiel special d'irrigation	500000	300000		100000		200000	1100000
7. Gros materiel d'exploitation	200000	200000	200000	500000	200000	200000	1500000
8. Materiel scientifique		100000	200000			100000	400000
s/total	700000	600000	400000	600000	200000	500000	3000000
(.6)	- 420,000	- 360,000	- 240,000	- 360,000	- 120,000	- 300,000	- 1,800,000
DAR BOUAZZA							
9. Gros materiel d'exploitation	200000		150000		150000		500000
10. Materiel scientifique	200000	300000	50000		50000		600000
s/total	400000	300000	200000	0	200000	0	1100000
(.7)	- 280,000	- 210,000	- 140,000	0	- 140,000	0	- 770,000
ANNACEUR							
11. Materiel special	300000		300000		300000		900000
s/total	300000	0	300000	0	300000	0	900000
TOTAL	2670000	1700000	2020000	1400000	1710000	1530000	11030000
	1,970	1,130	1,640	1,000	1,450	1,230	8,460
(# 000)	232	133	193	122	171	145	996

TABLE 4

VEHICULES

Locations		1989	1990	1991	1992	1993	1994	Total
CENTRE ARIDOCULTURE								
1, Rech. & developpement (2 R4 + P.U.)		270000	270000	270000	270000	270000	270000	1620000
2, Service administratif		130000	130000	65000		200000		525000
subtotal		400000	400000	335000	270000	470000	270000	2145000
SIDI EL AYDI								
3, Land rover + R4			150000				65000	215000
JEMAA SHAIM								
4, Land rover + R4			150000		65000			215000
KEMIS ZEMAMRA								
5, Land rover + R4 + P.U.		150000		65000	140000			355000
	(.6)	- 90,000		- 39,000	- 84,000			213,000
BAR BOUAZZA								
6, P.U. + R4		200000				65000		265000
	(.7)	- 140,000				- 45,500		185,500
AMMACEUR								
7. Vehicules		65000		140000		65000		270000
TOTAL		815000	700000	540000	475000	600000	335000	3465000
	(000 DA)	582	700	501	391	555	335	3,067
	($ 000)	69	82	59	46	65	39	360

TABLE 5

CHEPTEL

Locations	1989	1990	1991	1992	1993	1994	Total
ARIDOCULTURE CENTER							
1, Programme zootechnic	150000		20000		20000		190000
SIDI EL AYDI							
2, Mulet + chameau						20000	20000
JEMAA SHAIM							
3, Mulet	7000					7000	14000
KHEMIS ZEMAMRA							
4, Mulet	7000					7000	14000
DAR BOUAZZA							
5, Mulet			7000				7000
ABBACEUR							
6, Cheptel	7000					7000	14000
TOTAL	171000	0	27000	0	20000	41000	259000
(\$ 000)	20	0	3	0	2	5	30

TABLE 6

Operating Budget for Center - Settat

Projected Operating Budget for the Center - Settat

	1989	1990	1991	1992	1993	1994	Notes
RESEARCH							
1. Day laborers	216,000	235,174	256,050	278,780	303,527	330,470	3/4 laborer/res @ 800 dh/season
2. Travel exp.	320,000	348,406	379,334	413,007	449,669	489,586	7000 dh/yr/res;4000 dh/yr/tech
3. Fuel	448,000	487,769	531,067	578,210	629,537	685,420	Not including chemical products
4. Materials	480,000	522,609	569,001	619,510	674,504	734,379	30000 km/vehicle; 2 vehicles for each 3 researchers
Subtotal	1,464,000	1,593,958	1,735,452	1,889,506	2,057,236	2,239,855	
ADMINISTRATION*							
1. Day laborers	160,000	174,203	189,667	206,503	224,835	244,793	Includes those at Ain N'Zagh - 5 secretaries;
2. Travel exp.	72,000	78,391	85,350	92,927	101,176	110,157	Also includes 120,000 dh elect., telephone, etc.
3. Fuel	176,000	191,623	208,634	227,154	247,318	269,272	11 vehicles for admin. & SRD
4. Materials	400,000	435,508	474,167	516,259	562,086	611,982	
Subtotal	808,000	879,725	957,818	1,042,842	1,135,414	1,236,204	
TOTAL	2,272,000	2,473,683	2,693,270	2,932,348	3,192,650	3,476,058	
TRAVEL (000DH)	372	426	464	506	551	600	
($000)	46	50	55	60	65	71	
*SRD included							
Fuel (000DH)	624	980	740	805	877	954	
($000)	73	115	87	95	103	112	
Materials (000DH)	880	959	1,043	1,136	1,237	1,346	
($000)	104	113	123	134	146	158	

TABLE 6

TABLE 7

SATELLITE STATION BUDGET TOTALS

	1989	1990	1991	1992	1993	1994	TOTALS
SIDI EL AYDI							
1. Labor	192000	209044	227600	247804	269801	293751	1440000
2. Vehicle fuel and repairs	112000	121942	132767	144552	157384	171355	840000
3. Equipment repairs	80000	87102	94833	103252	112417	122396	600000
4. Per diem	16000	17421	18967	20650	22483	24479	120000
5. Consumables	120000	130652	142250	154878	168626	183594	900000
subtotal	520000	566161	616417	671136	730711	795575	3900000
JEMMA SHAIM							
1. Labor	128000	139362	151733	165203	179867	195834	960000
2. Vehicle fuel and repairs	152000	165493	180184	196178	213592	232553	1140000
3. Equipment repairs	56000	60971	66383	72276	78692	85677	420000
4. Per diem	32000	34841	37933	41301	44967	48959	240000
5. Consumables	192000	209044	227600	247804	269801	293751	1440000
subtotal	560000	609711	663833	722762	786919	856774	4200000
KH. ZEMEMRA							
1. Labor	160000	174203	189667	206503	224834	244793	1200000
2. Vehicle fuel and repairs (.4)	45	49	53	58	63	68	336
3. Equipment repairs (.4)	26	28	30	33	36	39	192
4. Per diem (.4)	10	10	11	12	14	15	72
5. Consumables (.4)	96	104	114	124	135	147	720
subtotal	600000	653261	711251	774388	843128	917973	4500000
ANNACEUR							
1. Labor	96000	104522	113800	123902	134901	146876	720000
2. Vehicle fuel and repairs	12000	13065	14225	15488	16863	18359	90000
3. Equipment repairs	80000	87102	94833	103252	112417	122396	600000
4. Per diem	32000	34841	37933	41301	44967	48959	240000
5. Consumables	100000	108877	118542	129065	140522	152996	750000
subtotal	320000	348406	379334	413007	449669	489586	2400000
DAR BOUAZZA							
1. Labor	136000	148073	161217	175528	191109	208073	1020000
2. Vehicle fuel and repairs (.3)	4	4	4	5	5	5	27
3. Equipment repairs (.3)	19	21	23	25	27	29	144
4. Per diem (.3)	10	11	11	12	13	14	71
5. Consumables (.3)	71	77	84	92	100	108	532
subtotal	480000	522609	569001	619510	674504	734376	3600000
ANNUAL TOTALS	2480000	2700148	2939835	3200803	3484931	3794284	
					GRAND TOTAL	18600000	
Vehicle fuel and repairs (000 DH)	325	370	384	419	456	495	2449
($000)	38	44	45	49	54	58	288
Equipment repairs (000DH)	211	284	309	336	366	398	1,954
($000)	31	33	36	40	43	47	230
Consumables 600 DH)	579	630	687	748	815	886	4,345
($000)	68	74	81	88	96	104	511
Per diem (0000H)	100	108	117	127	139	150	743
($000)	12	13	14	15	16	18	88

Table 8. **SALARIES FOR ARIDOCULTURE CENTER**

Operations	No.	1989	1990	1991	1992	1993	1994	Total
32 → 48 1. INGENIEURS	[redacted]	3498796	3564053	3615890	3912799	4061647	4104040	22757225
2. ADMINISTRATION	(3)	334662	334662	334662	340570	340570	340570	2025696
3. TECHNICIAN MID ADM +	(30)	827600	827600	827600	827600	827600	827600	4965600
4. SEC & AGT. P.	(15)	619600	619600	619600	619600	619600	619600	3717600
TOTAL		5280658	5345915	5397752	5700569	5849417	5891810	33466121
(1000)		621	629	635	671	688	693	3,937

10 1

TABLE 8

Table 9. Salaries for Experiment Station Staff

Unit	1989 #	1989 Total	1990 #	1990 Total	1991 #	1991 Total	1992 #	1992 Total	1993 #	1993 Total	1994 #	1994 Total	Notes
SIDI EL AYDI													
Ingenieurs	1	54,000	1	54,000	1	54,000	1	54,000	1	54,000	1	54,000	Ing. d'appl.
Adjoint Techniques	5	138,000	5	138,000	6	165,600	6	165,600	6	165,600	6	165,600	
Others	13	187,200	13	187,200	13	187,200	13	187,200	13	187,200	13	187,200	
Subtotal		379,200		379,200		406,800		406,800		406,800		406,800	2,385,600
JEMAA SHAIM													
Ingenieurs	1	54,000	1	54,000	1	54000	1	54000	1	54000	1	54000	
Adjoint Techniques	6	165,600	6	165,600	7	193,200	7	193,200	7	193,200	7	193,200	
Others	25	360,000	25	360,000	25	360,000	25	360,000	25	360,000	25	360,000	
Subtotal		579,600		579,600		607,200		607,200		607,200		607,200	3,588,000
KHEMIS ZEMAMRA													
Ingenieurs	1	54,000	2	108,000	2	108,000	2	108,000	2	108,000	2	108,000	
Adjoint Techniques	6	165,600	6	165,600	7	193,200	8	220,800	8	220,800	8	220,800	
*Others	25	360,000	25	360,000	25	360,000	25	360,000	25	360,000	25	360,000	
Subtotal		579,600		633,600		661,200		688,800		688,800		688,800	3,940,800
DAR BOUAZZA													
Ingenieurs	3	162,000	3	162,000	3	162,000	3	162,000	3	162,000	3	162,000	
Adjoint Techniques	7	193,200	7	193,200	7	193,200	7	193,200	7	193,200	7	193,200	
Others	12	172,800	12	172,800	12	172,800	12	172,800	12	172,800	12	172,800	
Subtotal		528,000		528,000		528,000		528,000		528,000		528,000	3,168,000
ANNACEUR													
Ingenieurs	1	54,000	2	108,000	2	108,000	2	108,000	2	108,000	2	108,000	
Adjoint Techniques	3	82,800	4	110,400	4	110,400	4	110,400	4	110,400	4	110,400	
Others	33	475,200	33	475,200	33	475,200	33	475,200	33	475,200	33	475,200	
Subtotal		612,000		693,600		693,600		693,600		693,600		693,600	4,080,000
TOTAL		2,678,400		2,814,000		2,896,800		2,924,400		2,924,400		2,924,400	17,162,400

*Includes additional personnel (5) probably coming from El Machrek

* [illegible] to reflect [illegible] Project [illegible] of [illegible] station

** [illegible] 75% " " " "

[illegible] 243 251 252 252 252 1,480

TABLE 9

Procedures and Budget Assumptions for Estimating USAID Budget for Table 10 and 11 and 12 (PPS)

I. Salaries and wages in Morocco

1. US. field staff
- $ 53,000 beginning average across all TA Positions .
- After 1988/89, each time a TA position is refilled, 1% increase in base pay.
- 5% increase in base pay for each TA July 1 of any year in which they were employed before Jan. 1 of that year and they are not terminating.
- Staff overlap of 3 months each position as it is refilled.
- Changeover occurs Jan. 1, 1988 for soil management, soil fert. & ag. eng. dev. Assume TAs refilling tis positions will stay approx. 2 1/2 years to put them on Aug. to Aug. cycle.
- Current sociologist remains till Jan. 1, 1988, position budgeted through FY 1989/90.
- No entomology position in 1987/88 when current Sabbatical departs until fall of 1988, thereafter until FY 1991/92.
- Increase Europe Assist insurance policy by 5% each year.
- Add 3 months average salary for cont. of DGW salary to Jan. 1, 1988.
- Assume all positions for two years except as note in (e) and (k).
- 3 year terms for Cereal Breeder/Research Coordinator (Fall, 1987 to Fall 1990; Soil Fert. to Fall 1993; Team Leader, Admin. Officer, Ag. Eng. Maint. (all Fall 1991 to Fall 1994).
- No home leaves
- Benefits = 20% of base salary

2. Sabbatical scientists
- Starks departs Nov., 1987, Bansal departs Jan. 1988, but returns. Keep sabbatical scientists during 1987/88, 88/89, 89/90, 90/91.
- One sabbatical per year during 91/92, 92/93 and 93/94 at one-half base salary for the year plus benefits; assume arrive and depart in same year.

3. Research Associates
- Riddle (sociology RA) depart in Jan. 1988. No other RA in 87/88.
- Electronics technician @$35,000/yr. for one year in 88/89. No lang. training. No salary increase. 20% benefits.

4. Graduate and Post doc.
- AbdelMonem (soil fertility post doc) depart at end of 87/88.
- No other graduates or post docs scheduled.

5. Local hire U.S. staff
- Maintain 86/87 est. cost level through 88/89; drop TRC coord, Computer Center Dir. & Maint. Coord in 89/90; drop Sec. 1 in 93/94.

6. Moroccan Nationals
- Estimate 87/88 cost at $75,000; increase by 5% per year.

7. Consultants
- No change in salaries throughout life of project.

a) Part. Advisors - 10 days each ($180/day); 20% benefits; see list for #s per year.

b) Prof./Tech. - 14 days each ($200/day) except Management consultant @ 60 days per year: 20% benefits; see list for #s per year;

c) Recruitment - 7 days each ($200/day); 20% benefits; number of positions to be filled plus one

d) Scientific Panel - Pay 5 of the 7 members for 7 days ($250/day)

II. Travel

A. International travel (+ per diem)

- Costs for 87/88: Airfare (1 way - $900; round trip - $1100) & per diem ($50 Morocco, $75 U.S., $83 Europe; increase costs by 5% per year thereafter

1. Field staff to & from post
   - Depart from post - as per schedule; assume all couples plus children as per schedule
   - Arrival at post - as per schedule; assume all couples plus children as per schedule
   - No one takes home leave

2. Dependent student travel (usually college students)
   - as per schedule

3. Consultants
   a) Part. Advisors - 10 days of per diem
   b) Prof/Tech - 14 days of per diem except management consultant @ 60 days per year.
   c) Recruiting - 7 days of per diem
   d) Sci Panel - 7 @ 7 days (pay expenses of all 7 members)

4. Emergency
   - Keep level @ 8 trips per year (NOTE: perhaps this should be reduced the last two years)

5. Field Staff Prof. meetings
   - #s as per schedule; travel, per diem for 7 days, $500 registration

6. To 3rd country or U.S. for research contacts
   - $10,000 per year

7. To & from project (home office & Settat admin)
   - Assume 4 trips of 10 days each (2 from each office)

8. MIAC/Lead institution admin support
   - 1 trip of 10 days per year

9. Invitational travel
   - $ 25,000 per year.

10. Morocco/MIAC shared - # participants scheduled for travel each year + 2 technician 2 way - $350/NY Lincoln one way fare (NOTE: This has no increase planned in fare)

B. Travel in Morocco

1. Vehicle oper & maint., etc.
   - $150,000 in 87/88; decrease by 20% each year thereafter (see Table 10, 11, 12)
2. Field staff food & lodging
   - 86/87 proj. costs ($1582/MIAC TA {includes RA, sab, post doc}) plus Mor. MIAC staff costs ($6515/year for all) with 5% increase per year

3. Participant hotel - hold level w/ 86-87

III. Freight & Storage

1. Household goods, baggage, vehicles
   - Freight for departures & arrivals of TA staff; cost held same as 86/87 per family (no sabbatical or RA)
   - Storage for # of TAs; cost held level with 86/87
   - Air freight only for sabbatical staff, RAs, post docs; cost held level with 86/87

2. 33% of commodities budget

IV. Allowances

1. Quarters
   - 86/87 average rent per family ($4327/yr) + 5% increase per year
   - 86/87 average utility cost per family ($1885/yr) + 5% increase per year

   c) 86/87 average maint. cost per family ($300/yr) + 5% increase per year
   d) No non-exp furniture ordered
   e) $1000/year for replacements of exp. furn. items

2. Temp. housing
   - 6 days @ $50/day for about 75% of arrivals and departure per year

3. Dependent education
   - 87/88 costs (fees of $14,600 for H.S.; avg. $4252 for G.S.; $3000 transport for grade schoolers) with 5% increase per year

V. Commodities

1. Laboratory & station dev. (non-expendables)
   - $300,000/year for 87/88; 88/89; 89/90 then reduce by $100,000 in 90/91 and 10% per year thereafter (see reduction in Table 10, 11, 12)

2. Materials & supplies (expendables)

   a) Lab & field stat operation
      - $250,000 for 87/88; decrease by 20%/year thereafter (see Table 10, 11, 12)
   b) Maintenance of sci equip & res fac (see Table 10,11,12).
      - $20,000/year - held level
   c) Office & admin supplies
      - $68,048 (86/87 costs) - held level 87/88; 88/89 and 89/90; then reduce by 10% per year

3. Fac. mod & imp.
   - $50,000 - held level 87/88; 88/89 and 89/90; then reduce by 20% per year (see Table 10, 11, 12)

TABLE 10
PROJECTED BUDGETS – 1988 to 1994

Projected 1988 to 1994 Budget Summaries

Note: Inflation is not included

BUDGET SUMMARY	Values
I. Salaries and wages in Morocco (excluding benefits)	
1. U.S. field staff	[illegible]
2. Statistical scientists	[illegible]
3. Research Associates	[illegible]
4. Graduate and Post doc	[illegible]
5. Local hire U.S. staff	[illegible]
6. Moroccan nationals	[illegible]
7. Consultants	
a) Participant advisors	[illegible]
b) Professional	[illegible]
c) Recruitment	[illegible]
d) Scientific Panel	[illegible]
e) Programming by Objective	[illegible]
II. Travel	
A. International travel, incl. per diem where appropriate	
1. Field staff to & from post, plus home leave	[illegible]
2. Dependent student travel	[illegible]
3. Consultants	
a) Participant advisors	[illegible]
b) Professional–Technical	[illegible]
c) Recruitment	[illegible]
d) Scientific Panel	[illegible]
4. Emergency	[illegible]
5. Field staff professional meetings	[illegible]
6. MIAC staff to 3rd country institutions or U.S. institutions for research contacts	[illegible]
7. Team leader, admin officer, res coord. coordinator and associate coordinator	[illegible]
8. MIAC administrative support	[illegible]
9. Invitational travel	[illegible]
10. Moroccan/MIAC source	[illegible]
B. Travel in Morocco	
1. Vehicle operation and maintenance, mileage on personal cars & car rental	[illegible]
2. Field staff room and lodging	[illegible]
3. Participant hotel bills	[illegible]
III. Freight and storage	
1. Household goods, baggage, vehicles	[illegible]
2. Commodities	[illegible]

Best Available Document

Item V.2.a. Deduct all ($120,000) and add to Goat operations.

Item V.2.b. Deduct all ($[illegible]) and add to Goat operations.

Item V.3 Deduct $60,000 and add to Goat operations

Item VI. Deduct all ($[illegible]) and add to Goat operations.

TABLE 11.

Report Resources which Need Year Funds; Projection Report FY00 to FY04

	00/01 Dollars	00/01 $ and Dr	01/02 Dollars	01/02 $ and Dr	02/03 Dollars	02/03 $ and Dr	03/04 Dollars	03/04 $ and Dr	04/05 Dollars	04/05 $ and Dr
A. U.S. Increased Assistance										
a. Long Term Reserves (Lt 7										
b. Short Term Reserves (Lt 7										
c. Support Costs (Elder-Ed, Illicit Drug-Interdict, a										
B. Government of Marshall Reserves										
C. Training (Lt 9-10; Vt 1-2										
D. Commodities (v 1- 3,4,5; Lt 1-2										
E. Operations (Lt 3-Medlt 1-3; Vt 3,4; Vt 1-2,3										
F. Construction										
G. Support Costs (Medlt 3-4; Lt 1-2; 3										
Totals										

TABLE 12. Reduction of accumulated surplus from Part C of Table 11.

D. Commodities																		
E. Operations																		

	03/04 Dollars	03/04 $ and Dr	04/05 Dollars	04/05 $ and Dr	Totals, for 1988-04 Dollars	Totals, for 1988-04 $ and Dr	
A. U.S. Increased Assistance							
a. Long Term Reserves (Lt 3-4; Vt 1-2)							
b. Short Term Reserves (Lt 3.							
c. Support Costs (Elder-Ed, Illicit Drug-Interdict, a							
B. Government of Marshall Reserves							
C. Training (Lt 9-10; Vt 1-2							
D. Commodities (v 1- 3,4,5; Lt 1-2							Deduct $ 430,000 which will be added to some operations functions
E. Operations (Lt 3-Medlt 1-3; Vt 3,4; Vt 1-2,3							Deduct $ 430,000 which will be added to some operations functions
F. Construction							
G. Support Costs (Medlt 3-4; Lt 1-2; 3							
Totals							

D. Commodities																		ENTER new total here into PFS commodity line
E. Operations																		ENTER new total here into PFS operations line

Vehicles

- 3 R4s @ $5000, 2 P.U. @ $10,000, 1 car @ $12,000 in 87/88 = $47,000; same purchases in all succeeding years with 5% increase in cost

VI. Training

1. Long Term
   - Assume $1650/person/month for 87/88 with 5% increase per year thereafter
   - Study grants for Ph.D.s @ $5500 and M.S. @ $2200 - no budgeted increases
   - English lang training costs (87/88) of fees ($920/1 person/month; $1220/2-5 persons/month; $35/person/month; $250/person/month lodging) for 6 months with 5% increase in costs each year thereafter

2. Short-Term
   - $50,000 for 87/88 with 5% increase per year thereafter

VII. Other Direct Costs

1. Equip maint, etc.
   - 86/87 costs increased by 5% each year thereafter (see Table 10,11)

2. Postage and communications
   - $50,000 for 87/88; 88/89; 89/90; 90/91; decrease by 10% per year thereafter

3. Seminars, etc.
   - $15,000 per year - held level

4. Language training of new staff
   - 87/88 costs of $3200/person/month for fees for 2.5 months; $75 per couple per day for rm & bd; $500/person for transport
   - Costs all for couples for 2.5 months training
   - Increase of 5% per year for each year after 87/88

5. Other (miscellaneous)
   - $20,000 per year - held level

6. Defense Base Act. Workman's Compensation
   - Long term U.S. citizen staff and short term consultants - $2.49/100 on salary

VIII. Home office

- 86/87 costs + 5%; decreased by $35,000 in 91/92 but with continued adding of 5%
- All Defense Base moved to Direct Costs

IX. Indirect Costs

- 37% of home office, lang training of new staff and Defense Base on short term consultants minus non-expendables, facility mod, vehicles
- 22% of field costs minus non-expendables, facility mod., vehicles

G&A

- 6.6% of all costs minus non-expendables, facility mod., vehicles

X. For preparing budget summaries, line items were grouped together for PPS (see Table 11, 12 and 13 for explanation).

ANNEX 10

BIBLIOGRAPHY

BIBLIOGRAPHY

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ANNEX 11

SUMMARY OF BASELINE SURVEY

BASELINE INFORMATION FOR ARIDOCULTURE PROJECT IMPACT EVALUATION

MIAC Project
B.P. 290
Settat, Morocco

February, 1988

143

INTRODUCTION

The Aridoculture Center Applied Research Project purpose is to increase cereal, forage and food legume production and improve farm income through the development of new and improved technologies. Interdisciplinary research currently involves seven agricultural sciences. A technology transfer mission which began in 1987/88 has responsibility for training and to otherwise engage the Moroccan Extension Service and farmers directly in the Center's efforts.

PROJECT AREA

The Center's region of responsibility is Morocco's 250 mm to 450 mm precipitation zone. From west to east it encompasses a flat to rolling interior plain and rolling upland plateau. The entirety of eight provinces (El Jadida, El Kalaa, Essaouira, Khouriba, Marrakesh, Safi, Casablanca and Settat) parts of two others (Ben Slimane - 40%, and Beni Mellal - 30%). Soils vary from thin rocky upland reds in the south to relatively deep blacks in the north: Nevertheless, they are sufficiently intermingled across the Project region to make generalization difficult. The following map illustrates the project region and sub-regions[1].

The major crops are cereals and food legumes. Sheep are raised in substantial numbers, with other livestock present but assuming lesser overall importance. The following table summarizes the provincial shares of national cereals production in the 1985/86 Crop Year, which approximates "average" conditions.

1 Sampling sub-regions were identified to simultaneously reflect the linkage of major agro-ecological zones with farming systems which reflect agriculturalists' responses to their surroundings, economic circumstance, and cultural imperatives. Boundaries have been drawn based on present information and may change somewhat as baseline surveys and subsequent inquiries proceed.

EXECUTIVE SUMMARY

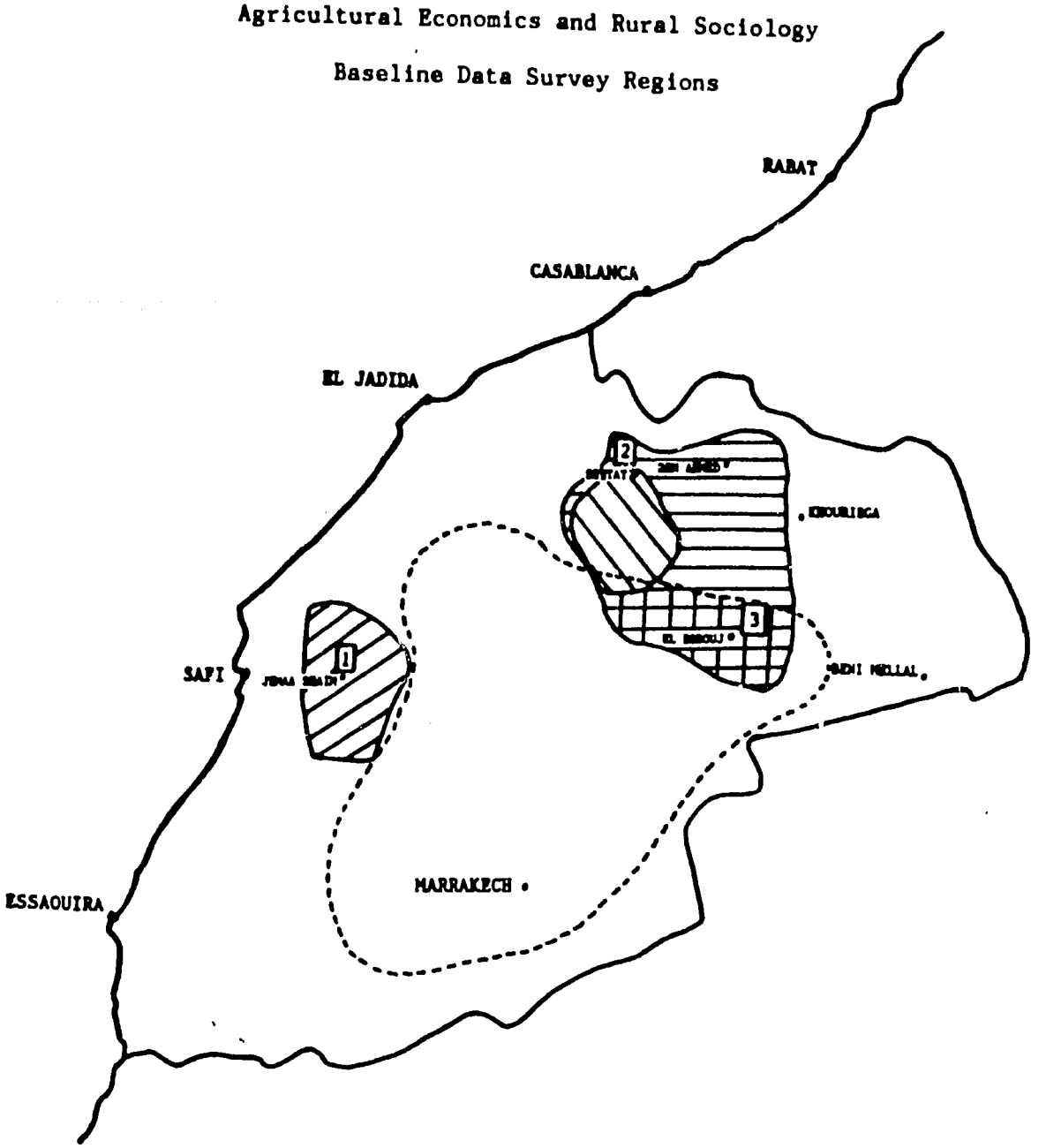
The Aridoculture Center's region of responsibility is roughly described by the Atlantic Coast from Rabat to Safi and then southeast to Marrakesh and from there east to Oued Zem and north to Rabat. This area includes most of Morocco's dryland agricultural production which is carried out under 250 mm to 450 mm of annual precipitation. The Center's mission is the development of new and improvement of existing production technologies to enhance cereal, forage and food legume production and ultimately, to improve farm income.

In recognition that these technologies must be profitable and socially acceptable, agricultural economics and rural sociology programs were initiated in 1985. Intensive studies based on statistically valid sampling techniques are being conducted for three subregions - the Abda of Safi Province, the Beni Meskine and the Chaouia, both of Settat Province. Economic and sociological parameters which define farming systems in these major agro-ecological zones are being identified and quantified.

Beyond economic and social acceptability, the aggregate data set defines the basis from which Project effectiveness will be evaluated in 1990 and 1994. With the assistance of statistical consultants, two extensive studies will be conducted to identify changes in production techniques and efficiencies attributable to the adoption of innovations created by Center scientists.

Agricultural Economics and Rural Sociology

Baseline Data Survey Regions



1 Target area for Abda semi-arid zone farm enterprise budget survey (N=154)

2 Target area for Chaouïa farm moderate zone enterprise budget survey

3 Target area for Beni Meskine arid zone farm enterprise budget survey

Region included in the Chaouïa Project survey (N=51)

Region included in the Abda semi-arid zone sociology survey (N=25)

Region of proposed sociology Chaouïa moderate zone survey

Region of proposed sociology Beni Meskine arid zone survey

--- 200 - 300 mm rainfall zone

The provisional identification of moderate, semi-arid, and arid zones is made to reflect major agro-ecological sub-regions as defined by average annual rainfall, soil characteristics, topography, and the associated agro-pastoral farming systems.

Table. Provincial Shares of National Cereals Production, in the 1985/86 Crop Year.

Province*	Crops (% Nation)			
	Barley	Corn	Hard Wheat	Soft Wheat
Ben Slimane	--	1.0	1.0	3.0
Beni Mellal	1.0	--	1.0	--
El Jadida	8.0	42.0	2.7	2.8
El Kalaa	4.1	0.8	1.7	2.2
Essaouira	8.0	4.0	1.0	1.0
Khouribga	3.0	0.0	1.2	1.1
Marrakesh	8.0	0.3	2.3	1.6
Safi	6.3	24.6	3.4	2.0
Settat	9.3	8.8	9.6	7.6
Percent of National Crop	17.7	81.5	23.9	23.3

* Prefecture de Casablanca

ARIDOCULTURE CENTER AUDIENCES

There are three audiences for agricultural economics and rural sociology data. The first consists of farmers interested in comparing their businesses' profitabilities and production practices with average farm performance, to determine the desirability and acceptability of changing their production systems. The second group is composed of agricultural scientists engaged in improving existing production technologies and developing new ones. These professionals need to know by how much innovations must increase productive efficiency to be economically useful and what characteristics must obtain to promote social acceptability. The third group includes policy analysts and management specialists engaged in quantifying public policy impacts and appropriate managerial responses.

BASELINE INFORMATION

Due to the Center region's heterogeneity, a study area within each of three major sub-regions has been chosen for intensive analysis. Sub-region locations are also shown on the map refered to previously. These three areas form centroids at which to draw economic information for development of farmer response models and profitability comparisons between present technologies and improvements or innovations, and sociological information to assess social acceptabilities. The areas also define starting points from which to proceed with mid-term and final evaluations of project performance.

Agricultural Economics Data

Abda Sub-region in Safi Province to the south contains the first 200 square kilometer study area. Initiated in early 1986, the study of this aea was completed in early 1988, with the publication of seven major reports. The

157

area, north of the town of Jemaa Shaim, is flat to slightly rolling, and contains mostly black soils. A statistically valid ten percent random sample of 154 farmers was chosen for interview. Twenty-seven farmers owned tractors, operated between 10 and 250 hectares, and sold custom services. Twenty operated between 10 and 30 hectares and purchased custom services as did the 107 farmers, each operating less than 10 hectares. Only one of the 154 did not use any mechanized production practices. Data was gathered from each farmer on production of cereals (barely, corn, hard wheat, soft wheat) and food legumes (chickpeas, fababeans, lentils, and peas) from which crop enterprise budgets and tables of technical production coefficients were developed. Local souk prices were obtained for each crop and net returns calculated.

To characterize the farming systems in place a second data set was collected on the number and sizes of each field, which fields each farmer allocated to each crop and to fallow, all capital equipment, and a complete farm family census by age, gender, place of habitation, and place of work. The average tractor owner operated 54 hectares, 66 percent in cereals, 14 percent in food legumes, and the rest fallowed. Two family members were employed full time on the farm. The average small farmer operated 6.5 hectares with 75 percent in cereals, 23 percent in food legumes, and two percent fallowed. The 27 largest of these farmers had 5 family members engaged in farm labor, while the remaining 107 had 3 family workers on the farm. It should also be noted that dwellings were relatively concentrated into small villages.

Chaouia Sub-region in northern Settat Province is the site of the second study area, in which work replicating that in Abda was initiated in early 1988, to be completed and summarized in 1989. The same series of reports on crop enterprise budgets and technical coefficients, cost summaries, farming systems, and risk analysis models will be prepared. The data will be in hand and ready for summary analysis in late 1988. This 200 square kilometer study area also has predominantly black soils, but substantially higher rainfall which may change the composition of preferred crop portfolios. The random sample includes 142 farmers in dwellings far more dispersed than the previous case.

The Beni Meskine Sub-region, in southeastern Settat Province, is the third study site in which identical analyses will be performed. To date, this sub-region has not been studied in any respect. Given its aridity and marginality in crop production, livestock is almost certainly of greater significance. Population density will probably be much lower than in either previous study area. Work in Beni Meskine will be initiated in early 1989 with intended completion by the end of that year.

Rural Sociology Data

Past sociology/economics research efforts have been conducted according to different methodologies, resulting in collection of data sets with incompatible formats. The sociology sample that was established for Abda is too small for technology transfer and project evaluation applications. No baseline data are available for the Chaouia and Beni Meskine sub-regions. Baseline sociological data collection efforts for these three sub-regions, using statistically valid sampling methods, are being designed and implemented in support of technology transfer and project evaluation efforts.

A 25 farm survey in Abda Sub-region, Safi Province was conducted in 1985-86. The results of this survey are available in reports on crop production

systems and their component agricultural practices. This initial database will be greatly expanded by drawing a sample conforming to those envisioned for the Chaouia and Beni Meskine Sub-regions of Settat province discussed below. It will further refine identification of production systems. Consultation with outside specialists will be required to ensure statistical validity and congruence with other detailed surveys.

The Chaouia and Beni Meskine Sub-regions were initially studied by Moroccan researchers at the Institut Agronomique et Vétérinaire Hassan II. This Chaouia Project concentrated on an area of the Upper Chaouia plateau from Oulad Saïd southward, including the northern part of Beni Meskine. A sample of 51 farms from 26 different villages was drawn which showed on average farm size of 7.4 hectares, of which 6.2 were privately owned. An intensive survey in 1980 through 1982 collected data on general household composition and finances, capital and land resources controlled, and five year cropping histories. A limited livestock production survey was also accomplished. During the 1981-82 Crop Year regional cereal and livestock souk prices were collected periodically. The results of these surveys are summarized in the report, L'agriculture en situation aléatoire, Chaouia 1977-1982. A program of regularly monitoring these 51 farms was initiated in 1985, leading to the report La céréaliculture en Haute-Chaouia 1977-1985, tendences et évolutions (1985).

As a result of this situation, further baseline sampling of farms in the Chaouia and Beni Meskine sub-regions' provincial cercles of Settat, Ben Ahmed, and El Borouj is being undertaken. The stratified random sample being drawn will be of sufficient size to support valid representations of the types of farming systems in place. The purpose behind this research is to assist Aridoculture Center scientists with assessment of new technology packages and practices social acceptabilities. This work will be completed and summarized by the end of 1989. This sample will cover areas in which the remaining two intensive economic crop production surveys will be conducted by the Project agricultural economist. Through mutual consultations concerning sampling criteria and questionnaire design, commonalities will be established which tie the two works together. Evaluation of certain dimensions of household economy and rural labor, going beyond the Center's sociology section's present review of Chaouia Project documents, may also require consulting assistance from from outside professionals.

PROJECT EVALUATION STRATEGY

The 1990 mid-term and 1994 final project evaluation activities will be driven by two sets of data. The first is project generated, the second exogenous.

The most useful outside data set appears to be Province level information on crop production collected by the Service des statistiques et de la documentation in the Ministry of Agriculture and Agrarian Reform. Statistically valid estimates of cereals production in the Provinces are made annually. In addition, for each point in the sample set, data are collected on variable input use such as fertilizer and family labor. Taken together, these may provide an annual monitoring device whereby Project impacts can be

154

discerned through shifts in parameters over time. The second set of data consists of that collected in the three study areas discussed previously. This information represents production practices is conducted within the major farming systems in the project area's major agro-ecological zones and associated the social ramifications.

Although detailed evaluation techniques remain to be designed through consultations with research evaluation experts, several points may be made. First, the evaluation process must consider both spatial and temporal change, that is, across the project region and through time. In 1990 only the spatial aspect can be addressed. The 1994 study will consider both geographic and time dimensions. The exact form of the evaluation process will be based on a sampling technique as dictated by required statistical tests. This evaluation will monitor changes in production practices and levels of crop output throughout the key sub-regions in the Project region. Second, while changes are being monitored, the baseline data sets for the study areas will be updated and the geographic extent of their validity determined. Third, further information will be obtained to evaluate farmer responses to shifts in production environments.