

645-0212

~~PD AAL-472~~

PD AAL-472

UNCLASSIFIED

SWAZILAND CROPPING SYSTEMS  
RESEARCH AND EXTENSION TRAINING (645-0212)

UNCLASSIFIED

ACTION MEMORANDUM FOR THE ADMINISTRATOR

AUG 17 1981

THRU: ES

THRU: AA/PPC, Larry Smucker (Acting) *LS*

FROM: AA/AFR, F. S. Ruddy *F. Ruddy*

SUBJECT: Project Authorization - Swaziland Cropping Systems Research and Extension Training (645-0212)

Problem: Your approval is required for a grant of \$12,900,000 from the Section 103 Food and Nutrition appropriation to the Government of Swaziland (GOS) for the Cropping Systems Research and Extension Training Project (645-0212). It is planned that a total of \$3,406,000 will be obligated in FY 1981.

Discussion: The proposed Cropping Systems Research and Extension Training Project represents AID's response to improving low productivity and income levels of the small farmers on Swazi Nation Land (SNL), which covers 60 percent of Swaziland's total land area. The project will contribute to the goal of increasing the economic viability of farming on Swazi Nation Land. The design of the project reflects the success which USAID/Swaziland has had in reorienting the GOS's agricultural policy. To date, this policy has focussed on agricultural research to support crop production on private and large estate farms. In implementing this project, however, the GOS will be shifting that focus to increasing crop production on SNL small holder farms and supporting this shift with a redirected research and strengthened extension program. It is anticipated that, over time, small farmer income can be increased to the point that farming on Swazi Nation Land may become more economically attractive and capable of absorbing the large numbers of people coming into the labor force. The purpose of the project, therefore, is to improve and expand the capacity of the GOS Ministry of Agriculture and Cooperatives (MOAC) to develop and extend cropping systems recommendations relevant to the needs of the SNL small farmer. The project design also recognizes the importance of, and incorporates measures to monitor, the marketing structure and the interrelationship between livestock and cropping on SNL. The project will provide the resources required to assist the MOAC to (a) redirect its research efforts to a systems approach for identifying the constraints and advising solutions to SNL on-farm crop production problems, (b) strengthen the capability of the Agricultural Information Section to present research recommendations in a manner understandable to both the extension staff and the SNL farmer, and (c) institutionalize a structured, continuous extension in-service training program capable of keeping field workers informed of the latest research findings and improving their supervisory and management skills.

In order to accomplish the purpose and outputs of this project, a total of \$3,406,000 is requested for obligation in FY 1981. The life-of-project funding is \$12,900,000, which will be expended over a period of six years. The following table illustrates the inputs and functional areas in which funds will be required.

127744

AUG 13 1981

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR AFRICA

FROM: AAA/AFR/DR, <sup>yw/ka b. in.</sup> John W. Koehring

SUBJECT: Project Authorization

**Problem:** Your signature is required for the attached Action Memorandum to the Administrator recommending a grant of \$12,900,000 from Section 103, Food and Nutrition appropriation, to the Government of Swaziland (GOS) for the Swaziland Cropping Systems Research and Extension Training Project (645-0212). It is planned that a total of \$3,406,000 will be obligated in FY 1981.

**Discussion:** The purpose of the project is to improve and expand the capacity of the GOS Ministry of Agriculture and Cooperatives to develop and extend cropping systems recommendations which are relevant to the needs of the small farmer on Swazi Nation Land. This is essentially an institution-building project, and it is estimated that it will require a long-term commitment, especially in participant training, to result in functioning and effective agricultural research, extension in-service training and agricultural information services.

Approval of source/origin waivers from AID Geographic Code 000 (U.S. only) to Code 935 (Special Free World) is requested to permit the procurement of (a) audio-visual equipment (\$36,450), (b) 14 motorcycles and spare parts (\$33,000) and (c) construction materials (\$352,000). Approval is also requested for a geographic source/origin waiver to permit the procurement of up to \$300,000 of shelf items imported from other than Code 941 Free World Countries. All waiver justifications are contained in Annex M of the Project Paper. An Initial Environmental Examination was submitted with the PID and a Negative Determination was approved by the AA/AFR on May 8, 1980. The proposed project has been thoroughly reviewed by the appropriate committees and the analyses are found to be acceptable in all respects. On July 29, 1981, the ECPR recommended that the project be submitted to the Administrator for authorization.

**Recommendation:** That you sign the Action Memorandum to the Administrator recommending authorization of the project and the requested waivers. Also, please clear the Project Authorization (attached).

Attachments:

Action Memorandum for the Administrator  
Project Authorization  
Project Paper

Clearances:

DAA/AFR:WHNorth WH  
AAA/AFR/DP:lCoker LC  
AFR/DR:NCohen NC  
AFR/DR/SA:WWolff WW  
AFR/DR/ARD:DSchaefer DS  
GC/AFR:TBork TB  
AFR/SA:TMorse TM  
AFR/DR/SA:PRianeire PR

A.I.D. Funding by Input and Functional Component  
(\$000)

<u>Input</u>	<u>Cropping Systems Research</u>	<u>Extension Training</u>	<u>Agricultural Information</u>	<u>TOTAL</u>
Technical Services	\$ 6,138	\$ 1,001	\$ 1,001	\$ 8,140
Training	613	1,057	111	1,781
Construction	388	---	252	640
Equipment/Commodities	437	65	390	892
Vehicles	76	9	53	138
Local Costs	<u>75</u>	<u>---</u>	<u>---</u>	<u>75</u>
Sub-Total (%)	\$ 7,727(66)	\$ 2,132(18)	\$ 1,807(16)	\$11,666(100)
Contingency				1,181
External Evaluation				<u>53</u>
		<b>GRAND TOTAL</b>		<b>\$12,900</b>

The GOS will contribute the equivalent of \$4,354,000, or 25.2% of the total cost of the project. This contribution will cover salaries for counterparts, plus other professional and support staff who will be engaged in the project through 1987; vehicle operation and maintenance; the research facilities and office space to be used by the U.S. technical advisors and their counterparts; housing and furnishings; travel costs for participants; and commodities and supplies. In addition to the AID and GOS contributions to the project, the Peace Corps will provide the services for four volunteers for two years each to assist with the on-farm research program.

It has been concluded from the analyses in the Project Paper that:

(1) the project approach is technically and economically sound, socially acceptable and administratively feasible;

(2) the technical design and cost estimates are reasonable and adequately planned, thereby satisfying the requirements of Section 611(a) of the Foreign Assistance Act, as amended;

(3) the timing and funding of project activities are appropriately scheduled;

(4) sufficient planning has been made for the monitoring and evaluation of the project; and

(5) all statutory criteria have been satisfied.

The Initial Environmental Examination was reviewed by my staff, and a Negative Determination for this project was approved at the time the PID was approved.

There is one condition precedent which must be met. Prior to the disbursement of funds, for each construction activity the GOS must furnish to AID (1) evidence that adequate sites have been identified and provided for each construction activity and (2) final plans and specifications for each construction activity.

There are six covenants which can be found in the attached Project Authorization (Attachment A).

Approval of source/origin waivers from AID Geographic Code 000 (U.S. only) to Code 935 (Special Free World) is requested to permit the procurement of (a) audio-visual equipment (\$36,450), (b) 14 motorcycles and spare parts (\$33,000) and (c) construction materials (\$352,000). Approval is also requested for a geographic source/origin waiver to permit the procurement of up to \$300,000 of shelf items imported from other than Code 941 Free World Countries. All waiver justifications are contained in Annex M of the Project Paper (Attachment B).

This project has been designed and will be implemented under the Title XII Collaborative Assistance mode. On a competitive basis, Pennsylvania State University (Penn State) was selected for the award. Penn State collaborated with Tennessee State University for the design of the project, and it is expected that the relationship between the two universities will continue for the implementation of the project.

The Project Review was held on July 21, 1981 and the ECPR was held on July 29, 1981. There are no unresolved issues. A Congressional Notification advising Congress of a program change in the estimated total AID contribution to the project was forwarded on July 28, 1981; the waiting period will expire on August 11, 1981. The responsible AID officer in the field will be the Mission Director, or his designee, and the AID/W backstop officer will be Dianne Blane, AFR/DR/SA.

There are presently no human rights issues in Swaziland.

Recommendation: That you sign the attached Project Authorization and thereby authorize the proposed project and the requested waivers.

Attachments:

- A. Project Authorization
- B. Project Paper

Clearance:

General Counsel: J. Bolton *KCK/m* Date 8-19-81  
AAA/PPC/PDPR: J. Ericksson *JER* Date 8-18-81

Clearance:

DAA/AFR:WHNorth	<u>[Signature]</u>	Date	<u>8/13/81</u>
GC/AFR:TBork	<u>[Signature]</u>	Date	<u>8/7/81</u>
GC/AFR:EDragon	<u>[Signature]</u>	Date	<u>8/10/81</u>
AAA/AFR/DP:JCoker	<u>[Signature]</u>	Date	<u>8/10/81</u>
AAA/AFR/DR:JWKoefring	<u>[Signature]</u>	Date	<u>8/10/81</u>
AFR/SA:TMorse	<u>[Signature]</u>	Date	<u>8/10/81</u>
AFR/DR/SA:WWolf	<u>[Signature]</u>	Date	<u>8/10/81</u>
SER/COM/ALI:EDragon	<u>[Signature]</u>	Date	<u>8/15/81</u>

AFR/DR/SA:DBlune:rej:8/7/81, x-28818

PID Submission Date:	March 13, 1980
PID Approval Date:	May 8, 1980
PP Submission Date:	July 6, 1981
PP Final Review Meeting Date:	July 29, 1981

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY  
AGENCY FOR INTERNATIONAL DEVELOPMENT  
WASHINGTON D.C. 20521

PROJECT AUTHORIZATION

Name of Country: Swaziland

Name of Project: Cropping Systems  
Research and Extension  
Training

Number of Project: 645-0212

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended (the "Act"), I hereby authorize the Cropping Systems Research and Extension Training Project for Swaziland ("Cooperating Country") involving planned obligations of not to exceed \$12,900,000 in grant funds over a six year period from date of authorization, subject to availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the project. In addition, I hereby authorize a six year life of project.

2. The project consists of redirecting the focus of agricultural research in Swaziland toward the small farmer, improving the training of extension workers and improving the agricultural information service through the provision of technical assistance, training, equipment, vehicles and commodities.

3. The Project Agreement which may be negotiated and executed by the officer to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

a. Source and Origin of Goods and Services

Goods and services, except for ocean shipping and except as provided in paragraph d. below, financed by A.I.D. under the project shall have their source and origin in the Cooperating Country or in the United States except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States.

b. Conditions Precedent

The Grant Agreement shall contain a condition precedent in substance as follows:

Prior to the disbursement of funds, or to the issuance of documentation pursuant to which disbursement will be made, for each construction activity the Cooperating Country will furnish to A.I.D. in form and substance acceptable to A.I.D.:

- (1) evidence that adequate sites have been identified

and provided for each construction activity; and  
(2) final plans and specifications for each construction activity.

c. Covenants

The Cooperating Country shall covenant in substance as follows:

1) Establishment of Positions

The Cooperating Country covenants to establish and fill the new positions and the positions currently unfilled as set forth in Annex A to the Grant Agreement.

2) Participants

The Cooperating Country covenants that candidates for participant training will be selected on a timely basis as set forth in the implementation plan in Annex A to the Grant Agreement.

3) Counterparts

The Cooperating Country covenants to assign counterparts to each of the technical assistants.

4) Recurrent Budget

The Cooperating Country covenants to assume the recurrent budget costs for the project as set forth in Annex A to the Grant Agreement.

5) Vehicles

The Cooperating Country covenants that all project vehicles will be used solely for this project unless A.I.D. otherwise agrees in writing. The Cooperating Country further covenants that it will replace all project vehicles as required.

6) Housing

Except as otherwise agreed to by A.I.D. in writing, title to houses financed by A.I.D. under this Agreement will be vested in the Cooperating Country. Notwithstanding that title is so vested, the Cooperating Country covenants that : 1) the house for the Agricultural Information Specialist will be reserved for the exclusive use of A.I.D.-financed technical assistance personnel

working on this Project or other A.I.D.-financed projects in Swaziland, until such time as the Parties agree that this house is no longer required for the support of this or any other A.I.D.-financed projects in Swaziland; and ii) that the 14 houses for the field research assistants and Peace Corps Volunteers will be reserved for the exclusive use of this or a follow-on Project until such time as the Parties agree that these houses are no longer required.

The Cooperating Country further covenants that it will provide permanent housing at Malkerns for all other A.I.D.-financed technical assistance personnel under this project.

In the event that A.I.D.-financed housing or other permanent housing is not available for use by A.I.D.-financed technicians upon their arrival in Swaziland, the Cooperating Country covenants to provide suitable temporary housing for such technicians and their families until such time as permanent housing is available.

d. Waivers

Based upon the justification contained in Annex M of the Project Paper, I hereby:

- (1) Approve source/origin procurement waivers from AID Geographic Code 000 (U.S.) to Code 935 (Special Free World) to permit procurement of (a) project equipment at an approximate cost of \$36,450, (b) 14 motorcycles at an approximate cost of \$33,000, (c) construction materials at an approximate cost of \$352,000, and (d) imported shelf items at an approximate cost of \$300,000;
- (2) Certify that exclusion of procurement from Free World Countries other than the Cooperating Country and countries included in Code 935 would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program; and

(3) Certify that special circumstances exist to waive, and do hereby waive, the requirements of Section 636(i) of the Act.

M. Peter McPherson  
M. Peter McPherson

Administrator

Aug 21 1981  
Date

Clearance:

AA/AFR: ESRuddy	<u>ESR</u>	Date: AUG 17 1981
General Counsel: JBolton	<u>KEE</u>	Date: 8-19-81
A-AA/PPC: LSmucker	<u>J</u>	Date: 8/20/81

Drafter: RLA/S: AWilliams/TESW

PROJECT DATA SHEET

1. TRANSACTION CODE

**A** A - Add  
C - Change  
D - Delete

Amendment Number

DOCUMENT CODE

3

2. COUNTRY/ENTITY

SWAZILAND

4. BUREAU/OFFICE

AFR

06

3. PROJECT NUMBER

645-0212

5. PROJECT TITLE (maximum 40 characters)

Cropping Systems Research & Ext. Training

6. PROJECT ASSISTANCE COMPLETION DATE (PACD)

MM DD YY  
09 30 87

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

A. Initial FY **81** B. Quarter **4** C. Final FY **86**

8. COSTS (\$000 OR EQUIVALENT \$1 - )

A. FUNDING SOURCE	FIRST FY <b>81</b>			LIFE OF PROJECT		
	B. FX	C. I/C	D. Total	F. FX	F. I/C	G. Total
AID Appropriated Total	3130	276	3406	12,387	513	12,900
(Grant)	( 3130 )	( 276 )	( 3406 )	( 12,387 )	( 513 )	( 12,900 )
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1. <b>U.S. Peace Corps</b>	0	0	0	29	26	55
Host Country	0	1223	1223	0	4354	4354
Other Donor(s)						
<b>TOTALS</b>	<b>3130</b>	<b>1499</b>	<b>4629</b>	<b>12,416</b>	<b>4893</b>	<b>17,309</b>

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROPRIATION PURPOSE	B. PRIMARY CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) FN	140	080		0		12,900		12,900	
(2)									
(3)									
(4)									
<b>TOTALS</b>				<b>0</b>		<b>12,900</b>		<b>12,900</b>	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)

030

11. SECONDARY PURPOSE CODE

180

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

A. Code R/AG BS  
B. Amount 8500 12,900

13. PROJECT PURPOSE (maximum 180 characters)

To improve and expand the capacity of the MOAC research and extension programs to develop and effectively extend cropping systems recommendations relevant to the needs of the Swazi Nation Land farmer.

14. SCHEDULED EVALUATIONS

Initial MM YY MM YY and MM YY  
07 83 07 84 and 07 85

15. SOURCE/ORIGIN OF GOODS AND SERVICES

000  911  Local  Other (Specify) 935

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

17. APPROVED BY

Signature

Julius E. Coles

*Julius E. Coles*

Title

Director, USAID/Swaziland

Date Signed

MM DD YY  
06 29 81

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

MM DD YY  
07 06 81

## ACRONYMS

AID	Agency for International Development
AIS	Agricultural Information Section of the Ministry of Agriculture and Cooperatives
CDSS	Country Development Strategy Statement
CID	Consortium for International Development
CSR	Cropping systems research
CTC	Certificate Training Course
CY	Crop year
E	Emalangeni (Swazi currency)
GOS	Government of Swaziland
IADS	International Agricultural Development Service
ITF	Individual Tenure Farms
MOAC	Ministry of Agricultural and Cooperatives
PID	Project Identification Document
PP	Project Paper
REDSO/EA	Regional Economic Development Services Office/ East Africa (Nairobi, Kenya)
RDA	Rural Development Area
SNL	Swazi Nation Land
UCS	University College of Swaziland
USAID/S	U.S. AID Mission to Swaziland

## EQUIVALENCIES

E1	= US\$1.30
US\$1.00	= E.769
1 kilo (kg.)	= 2.2 pounds
1 hectare (ha.)	= 2.471 acres

## PROJECT PAPER DESIGN TEAM

<u>USAID/Swaziland</u>	-	Gene Morris, Project Officer (Team Leader) Willie Cook, Agricultural Development Officer Ann Williams, Regional Legal Advisor
<u>REDSO/EA, Nairobi</u>	-	John Lewis, Regional Supply Management Officer Carolyn Barnes, Sociologist
<u>USAID/Botswana</u>	-	Stafford Baker, Engineer
<u>Pennsylvania State University</u>	-	Dean Jansma, Agricultural Economist (PSU Team Leader) John Ayers, Cropping Systems Specialist (Horticulture) James Stallings, Cropping Systems Specialist (Economics) (from Auburn University) Handy Williamson, Agricultural Education Specialist (from Tennessee State University) Vernaline Watson, Sociologist (from Tennessee State University)

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## Cropping Systems Research and Extension Training Project

### I. Project Recommendations and Summary

#### A. Recommendations

Authorization of a grant of \$12,900,000 and approval of the following waivers is recommended: source/origin waivers from AID Geographic Code 000 (U.S.) to Code 935 (Special Free World) to permit procurement of (a) project equipment at an approximate cost of \$36,450; (b) 14 motorcycles at an approximate cost of \$33,000; (c) construction materials at an approximate cost of \$352,000; and (d) imported shelf items at an approximate cost of \$300,000. Furthermore, approval is requested to exceed the five-year project implementation period and allow a six-year project.

#### B. Problem

The problem addressed by this project is one of low productivity and income levels of the small farmers on Swazi Nation Land (SNL), 60 percent of total land area. Currently, 73 percent of these farmers earn less than \$200 per capita per year in stark contrast to the incomes earned on large estates and other privately owned farms (40 percent of total land area). Until recently, it has been fairly easy to obtain wage employment off-farm, which has led to a situation where about 70 percent of the rural homesteads have absentee workers (58 percent of the adult male work force and 28 percent of the adult female work force). However, the modern sector is now absorbing far fewer workers. Only 3,500 new jobs are created annually, while 7,000 new school leavers a year are seeking wage employment in the modern sector. Within such a framework and given that Swaziland's most abundant resources include good agricultural land and plentiful water, farming and agricultural processing appear to be the key to future economic growth. In fact, agricultural growth rates over the last decade have been impressive on the private farms and estates, but SNL farmers continue to be primarily subsistence cultivators. Less than 10 percent of them are involved primarily in commercial agriculture.

One of the Government of Swaziland's (GOS) highest priorities is the transition of farming on Swazi Nation Land from a subsistence to a commercial basis. GOS and donor agencies programs cover a broad range of agricultural activities from the provision of production inputs to land conservation and the construction of irrigation schemes. However, a critical

constraint to increasing incomes of SNL farmers is the lack of research recommendations relevant to their farming context. To date, research carried out in Swaziland has been more attuned to the needs of the larger, private farms. A new focus to identify and address the problems actually faced by the homesteads with limited cropland is an absolute necessity if farming is to become economically attractive and capable of absorbing the large numbers of people coming into the labor force. In addition, the extension service must be strengthened in order to more effectively disseminate research recommendations, and an agricultural information system to assist both the research and extension efforts must be established. Currently, field level extension staff are graduates of a one-year course in agriculture and receive little in-service training to enhance their performance and bring them up to date on recent research findings. Extension workers do not now receive enough instruction in extension methodology and program development. Furthermore, the Agricultural Information Section of the Ministry of Agriculture and Cooperatives (MOAC) is presently incapable of translating research findings into a form usable by extension staff and understandable by the farmer on the scale needed.

### C. Project Description

The project consists of three major components:

1. Cropping Systems Research. The project will assist the MOAC to redirect its research efforts toward the SNL farmer. It involves a systems approach to the identification of farm problems as well as the research trials and recommendations that will emanate from the problem identification stage. On-farm research trials will be conducted by teams of Research Assistants, extension staff and farmers following a review of past research in Swaziland, a socio-economic base-line survey, and a technical survey of present cropping patterns and practices. The information gathering process will be a continuous one that will feed back to technical Research Officers at the various research stations. These Research Officers will provide the overall direction for the on-farm program and will conduct some applied research on-station as dictated by the findings of the field trials. A U.S. technical assistance team will design the research program and process in conjunction with the Chief Research Officer and other MOAC staff. Counterpart and on-the-job training will be provided and facilities constructed to help institutionalize a cropping systems research program. Also, equipment and commodities will be provided to support research efforts.

2. Agricultural Information. Before research recommendations reach the farmer, they must be written and presented in an understandable manner. Extension staff must be able to grasp the new cropping concepts and apply them to the various conditions faced by the farmers with whom they work. Also, extension staff must have adequate backup support in the form of extension aids if they are to effectively deliver the message to the farmer. This project will assist the MOAC to substantially expand and improve the capacity of the Agricultural Information Section to accomplish these critically important tasks. With a few exceptions, the Agricultural Information Section is currently staffed by Swazis, but additional training is needed to bring the staff to the desired level of competence. Also, equipment and facilities are totally inadequate to produce the quality and quantity of materials to support the research and extension programs. This project will provide a long-term technical advisor who will assist in establishing an effective agricultural information program by designing and instituting a process for the flow of information from research to the extension service. Short-term and academic training will be provided in such areas as agricultural information systems development, equipment maintenance, and audio-visual techniques. A U.S. advisor will work with the staff of the Section to test the acceptability of various methods of communicating research recommendations to farmers and develop an extension support program and extension aids which are based on this assessment. An important function of this component will be an active collaboration with both the cropping systems research team and the extension service.

3. Extension Training. While field level extension staff are reasonably well prepared academically, there is no structured, continuous in-service training program capable of keeping field workers informed of the latest research findings and improving their supervisory or management skills. Under the project, a technical advisor will assist the GOS to design and implement a comprehensive in-service training program that will include formal courses at the University's agricultural facilities during term breaks as well as informal sessions at Farmers' Training Centers and the central research station and substations. A substantial training component is provided to upgrade the staff of an In-Service Training Section to be created under the project. Training for Swazis to staff the Crop Production Section, which provides the technical support needed by extension workers, is also provided. A limited amount of commodities will be provided to the Faculty of Agriculture for the training of future extension staff. An important element of this component of the project will be the introduction of new extension methodologies and teaching

aids to students in the Certificate Training Course by the In-Service Training Section.

4. Project Funding. Research, agricultural information, and extension are closely interrelated functions, and a comprehensive approach to improving and expanding the capacity of the GOS to perform these functions effectively is proposed in this project. While it is anticipated that the project's institution building purpose will be achieved with respect to the agricultural information and extension training components, it is likely that a follow-on project will be required beyond FY 87 to achieve the objectives of the cropping systems research component.

In summary, the GOS, U.S. Peace Corps, and AID will provide the following project inputs:

<u>AID Grant</u>	\$12,900,000
Technical Assistance	8,140,000
Training	1,781,000
Construction	640,000
Equipment/Commodities	892,000
Vehicles	138,000
Evaluation	48,000
Other	75,000
Contingency	1,186,000
<u>GOS</u>	\$4,354,000
Salaries	1,758,000
Vehicle Support	437,000
Facilities and Furnishings	1,592,000
Participants' Air Fare	122,000
Commodities	336,000
Contingency	109,000
<u>US Peace Corps</u>	\$55,000
Four Volunteers x 2 years each	
TOTAL COST OF PROJECT	<u>\$17,309,000</u>

D. Summary of Findings

It has been concluded from the analyses included in this Project Paper that:

1. The project approach is technically, socially, and

economically sound; administratively feasible; and environmental concerns are fully addressed (see IEE);

2. the technical design and cost estimates are reasonable and adequately planned pursuant to Section 611A of the Foreign Assistance Act;

3. the timing and funding of project activities are appropriately scheduled;

4. sufficient planning has been made for the monitoring and evaluation of the project;

5. all statutory criteria have been satisfied; and

6. the Government of Swaziland can meet the recurrent costs associated with the project and those costs required to continue the research, agricultural information, and extension in-service training programs after termination of USAID/S assistance.

## II. Background

### A. Agriculture in Swaziland

#### 1. General

Modern intensive agricultural expansion has provided the impetus for the impressive economic growth record of Swaziland during the past decade (real GDP grew at approximately 4.7 percent per year during this period). Agriculture's share of GDP has increased from 19 to 31 percent since 1968, and the sector is characterized by its diversity as well as its striking dualism. For example, agricultural activities range from the production of sugarcane, citrus, pineapple, and timber on large estates and Individual Tenure Farms (ITF) to subsistence production, primarily maize, on the small Swazi Nation Land farms. While ITF land accounts for only 40 percent of the total land area, 60 percent of total agricultural output is produced there; the production growth on ITFs has averaged 7 to 10 percent per annum during the last ten years compared to less than 3 percent on SNL farms.

Swaziland has a higher percentage of its labor force engaged in wage employment than any other developing country in Africa, and about 37 percent of these wage earners work in the large agricultural estates (including processing), on private farms, and in forestry. This modern agriculture sector is export oriented and dominated by non Swazis, with the exception of some cotton farmers on SNL and a few small irrigation schemes on which sugarcane and some vegetables are grown for the market.

#### 2. Farming on Swazi Nation Land

Approximately 373,000 people (66 percent of the resident population) reside in 42,000 dispersed homesteads on SNL. About 10 percent of SNL is under cultivation; and three percent is either fallow or taken up by homestead structures. The average holding is 2.75 hectares, but this varies by topographic zone, with the relatively under-populated lowveld having an average farm size almost twice the national average. Slightly more than one quarter of homesteads are less than one hectare in size, and only 12 percent have farms exceeding 5 hectares (even on these larger farms the average size is only 8 hectares). Fragmentation of land holdings is common.

Of the total amount of land controlled by each homestead, 80 percent is in cropland, of which 70 percent is devoted to maize production. A recent survey indicates that 96 percent of SNL farmers grow maize (the other 4 percent are most likely cotton farmers in the lowveld), and a substantial number intercrop pumpkins, groundnuts, beans, or sweet potatoes with maize. Although cotton and tobacco are the primary commercial crops grown on SNL, there

are also a small irrigated sugarcane growers cooperative and a tomato scheme in the Northern Rural Development Area which sell to a nearby cannery in the Republic of South Africa. Only 41 percent of the SNL farms sell any crops at all, and less than 10 percent produce primarily for the market economy. The majority of small farmers who market crops are involved in selling unanticipated maize surpluses in the immediate area of the homestead.

Due to topography and low rainfall in certain areas, eighty-seven percent of SNL is used for communal grazing of livestock and accommodates 546,000 cattle and 281,000 sheep and goats. These figures reflect the prominent role of cattle as the most financially viable store of wealth for the majority of rural homesteads.

Seventy-three percent of the families living on SNL earn less than \$200 per capita annually from all sources. Of those families involved in the sale of crops, most earn less than \$25 per capita from this source (the exception is the few SNL farmers growing sugarcane, cotton or tobacco). Some twenty-two percent of the homesteads in a recent survey reported receiving some cash income from livestock, and over half receive supplemental income from such activities as beer brewing and handicrafts. Under the best of conditions, a typical SNL homestead (excluding those growing cotton or tobacco) involved in all three of the above farm activities would probably earn about \$55 in cash income per capita.

Productivity is low on SNL farms for a multitude of complex, interrelated reasons. As discussed in the FY 82 Swaziland CDSS, agricultural prices in Swaziland are linked to South African prices and are low; wage rates in the modern sector are high, causing large-scale off-farm employment; and farm sizes are small. Within this framework, the agricultural system on SNL is one where much of the labor force migrates from the farm to obtain higher paying wage employment in the modern sector while leaving just sufficient labor on farm to maintain a claim to land by cultivating it and to retain grazing rights. The remaining labor is insufficient to grow the most profitable crops, and even the less profitable crops such as maize are produced in a less than optimal manner (e.g., proper weeding, row planting, proper spacing are often neglected). The situation is difficult even for those homesteads involved in full-time farming. Given the small size of holdings and large homestead sizes, there is little inclination to risk substituting cash crops for the staple foodstuff, maize, under current conditions and farming practices.

There are exceptions to the above scenario, however. Tobacco is being grown on small SNL farms in the southern highveld, and cotton is being grown in the lowveld. These crops yield gross margins per hectare of approximately \$824 and \$652 (E1=\$1.30), respectively, but are labor intensive and, therefore, require a considerable commitment to farming by the homestead. Additionally, recent surveys indicate that the larger farms (5-12 hectares) form the majority of the tobacco and cotton growers. Other exceptions include the Vuvulane Irrigation Scheme, where small farmers lease irrigated land from the Commonwealth Development Corporation. The principal crop grown at Vuvulane is sugarcane (the scheme is adjacent to a large sugar estate), but vegetable productivity is increasing. A recent survey indicated that the average homestead income at Vuvulane from sale of crops was \$3,570 in 1979. Additionally, a cooperative irrigation scheme is underway on SNL near another sugar estate where small farmers are also growing sugarcane and vegetables.

Within the Rural Development Areas (RDAs), small irrigation systems are being established with assistance from AID, the World Bank, the European Economic Community, the African Development Bank, and the United Kingdom. These lands are allocated within the traditional system by the chiefs in the areas to be irrigated. In the Northern RDA, for example, there are two functioning irrigation schemes of 41 and 18 acres involving approximately fifty farm families (an additional 250 acre irrigation scheme is currently being developed and should be ready for the next crop season). Generally, on unterraced land, a farmer who has been allotted an acre of irrigated land will grow maize during the summer rainy season on both the irrigated plot and the homestead's other land. After the maize harvest in February to April, farmers will begin a vegetable crop on the irrigated plots. Farmers in the Northern RDA are currently growing tomatoes, cabbages, onions, green maize, and beans on the irrigation schemes, almost exclusively for the market.

## B. Focus on Research and Extension

### 1. Introduction

As described in the FY 82 CDSS, USAID/Swaziland's agricultural strategy is based on the conversion of SNL farms from a subsistence to a commercial basis; a principal vehicle for such a conversion will be the expansion of small scale irrigation systems. The strategy is based on the hypothesis that an irrigated farm which allows double or triple cropping and higher yields per crop will provide a sufficient jump in income to retain labor. As previously mentioned, labor is currently a constraint on many SNL farms -- a phenomenon ascribable to the ease with which the modern sector could absorb labor over the past

10-12 years since independence. However, the major sources of demand for wage labor (e.g. civil service, estate farms and processing facilities, South African mines) are growing much more slowly; of the 7,000 school leavers who enter the labor force each year, only about 3,500 are able to find modern sector employment.

Within such a scenario, it is critical that farming become an economically viable enterprise. The U.S. Army Corps of Engineers has recently completed a Water and Related Land Resources Framework Plan for Swaziland which indicates that the potential exists to substantially increase the amount of SNL under irrigation (see Economic Analysis for details). While the larger-scale river basin development projects will require additional donor assistance (a World Bank team is currently investigating the possibility of an irrigation project based on the Corps of Engineers study), the capacity for on-farm irrigation systems is already being developed under the RDA Program. AID is currently providing technical assistance and training to the Land Use Planning Section of the Ministry of Agriculture and Cooperatives. That section will design the irrigation systems. Equipment already provided under an AID loan will be utilized for the construction of small irrigation systems in RDAs. Other donors involved in the RDA Program are providing capital funding for expanding small irrigation schemes in RDAs, and USAID/Swaziland is planning a pilot small farmer irrigation project to begin in FY 83.

Currently, the availability of inputs such as credit, seeds, fertilizer, pesticides, etc. does not appear to be a major constraint to SNL farmers. The Swaziland Development and Savings Bank has initiated a small farmer loan program for SNL farmers, and the sale of production inputs through the cooperative system has increased 234 percent since 1976.

A major remaining factor is the ability of the marketing system to absorb a substantial increase in commercial production by Swaziland's farmers. To date, the evidence is mixed. For example, in some RDAs where tobacco growing has been promoted, production has actually been stagnant or falling even though adequate access roads, input services, and marketing facilities exist. Additionally, the favorable pricing situation that currently exists for vegetables appears to have stimulated an increase in production on some RDA irrigation schemes, but it is too early to detect the degree, if any, of marketing problems the farmers will face at harvest time. In any event, other donor agencies are exploring the possibility of assisting the GOS to develop an adequate market infrastructure. The International Fund for Agricultural Development fielded a team in early 1981 to prepare a preliminary project identification document which included a marketing component. The project will probably involve the establishment of a vegetable marketing organization and the construction of additional collection, storage, and grading facilities. In addition, the World Bank has offered assistance in marketing.

Presently, Swazi farmers on SNL are beginning to respond to the favorable market demands for vegetables by increasing production. Individual farmers, private traders, and the cooperatives are currently handling the marketing of vegetables and surplus maize. USAID/S will continue to encourage other donors to provide assistance to establish a more formal marketing structure to handle the increase in production brought about by this project and other development activities. In addition, the Agricultural Economist advisor on the implementation team (see III.A.4., AID Inputs) will continually monitor and assess the market situation the impact which market conditions are having on production. Also, a short-term marketing specialist(s) can be provided under this project to do any recommended marketing studies and to make recommendations to the GOS and USAID/S concerning market development needs.

Given the above conditions, the major missing elements in a program to expand SNL commercial agriculture are: (1) an agricultural research program capable of analyzing small farmers' problems from a systemic viewpoint and making recommendations relevant to the conditions and constraints under which SNL farmers operate; and (2) an extension service capable of more effectively delivering research recommendations to the farmer. These two areas require immediate attention if the GOS' agricultural strategy to promote commercial farming is to succeed.

## 2. Current Status

### a. Agricultural Research

Agricultural research was officially begun in Swaziland with the establishment of the Research Division of the Ministry of Agriculture in 1959. The National Agricultural Research Center was established at Malkerns in 1962 and consists of approximately 400 hectares of land, an administration building, various laboratories (for chemical analysis of soils and plants, entomology and plant pathology), greenhouses, and staff housing. Sub-stations were later established at Big Bend in the Lowveld, Nhlangano and Luvu in the Middleveld, and Mangcongco and Hebron in the Highveld. In 1972, responsibility for research was transferred to the University of Botswana Lesotho and Swaziland Faculty of Agriculture, where it remained until 1978, when it was transferred back to the MOAC.

Research has been carried out mainly on research stations by an expatriate staff for the past several years, and has met the need of estates and the Individual Tenure Farms more than it has the needs of farmers living on and farming small plots on SNL. Also, the research has focused on monocropping while, traditionally, SNL farmers have practiced inter-cropping. Statistics reflect that 36 percent of the SNL farmers practice inter-cropping; however, discussions with senior Swazi agricultural officials and visual observations strongly indicate that this figure is more likely to approach 60-70 percent. Yet, there is no record of significant research on which to base recommendations to accomplish efficient production under inter-cropping practices. Neither is there a record of

significant research on which to base recommendations for multi-cropping.

Fourteen disciplines have made up the areas of agricultural research in Swaziland. Those areas are: (1) Crop Agronomy, (2) Horticulture, (3) Veld and Pasture Management (has been limited in scope), (4) Dryland Crop Production (only established in recent years), (5) Soil Fertility and Crop Nutrition, (6) Soil Chemistry, (7) Soil Physics, (8) Plant Pathology, (9) Entomology, (10) Cotton Breeding, (11) Cotton Entomology, (12) Biometry, (13) Forestry, and (14) Pineapples. Both forestry and pineapple research are fully financed by the private sector. Technically, some excellent work has been done over the past ten years, and facilities and equipment are adequate with some minor exceptions (the research library is inadequate and the soils laboratory needs remodelling). However, although this past research has been of high quality, much of it is inapplicable in its present form to the needs of SNL farmers.

The expatriate staff that had been responsible for carrying out the research program departed in early 1979 after the transfer of the research function back to the MOAC. During the lengthy process of creating the required number of government posts and establishing the Research Division as a government unit, the contracts of the researcher officers expired, and all but one left the country.

In 1978, the GOS established 13 professional positions in the Agricultural Research Division. Of the 13 positions, two are currently filled by Swazis (Chief Research Officer and Rural Sociologist), and a Swazi is being trained to replace an expatriate working in plant pathology. The remaining 10 positions are unfilled, and there are no Swazis in the training pipeline for these positions.

In summary, while some good research has been carried out in the past, two main problems are impeding the effectiveness of the research program in meeting the needs of SNL farmers: (1) a lack of trained Swazis and (2) the absence of a research approach that addresses the conditions and constraints faced by SNL farmers.

#### b. Extension Training

The agricultural extension cadre is the largest single personnel component of the MOAC. Services of extension personnel embrace livestock extension, crop extension, home economics and nutrition, youth programs and other aspects of integrated rural development. The Swaziland Establishment Register (1981-1982)

carried the following distribution of posts for selected extension positions (excluding several professional levels, clericals, technicians, drivers, etc.)

Agricultural Officer	10
Extension Officer	35
Assistant Extension Officer	75
Field Officer	<u>140</u>
TOTAL	260

The extension workers are primarily generalists by training and are backed up by the Crop Production Section which includes five Swazi subject area specialists (all with B.Sc. degrees in general agriculture). The Crop Production Section conducts special courses and field exercises for extension workers but is severely hampered by a lack of relevant research findings and the fact that the staff, in spite of specialized assignments, have degrees in general agriculture.

In an attempt to train Field Officers and place them rapidly, the MOAC reestablished the Certificate Training Course in agriculture, a one year program, in 1977. The course had been dropped by the Faculty of Agriculture in 1972 but is now the source of new field officers. The MOAC leases facilities from the University, and 40 students are enrolled in the certificate course each year. Instruction is provided by a teaching staff of two full time instructors (one of whom is USAID-funded), two full time field practice supervisors, and approximately 17-20 subject matter specialists drawn from the MOAC, Faculty of Agriculture, and the private sector. Students are receiving 40 percent technical instruction and 60 percent field practice.

Given the emphasis on achieving the desired ratio of one Field Officer to every 200 farms nationwide (the current ratio is about 1:300), students are trained to be Officers in a one-year course (see Annex G, Summary Certificate Training Course Curriculum) covering a comprehensive range of topics. It is unlikely that the course will be lengthened in the near future, and the present program is considered adequate given current time pressures. The major weakness in the training program results from only eight percent of the total course work being devoted to extension methods. Such a weakness could be overcome in the field without changing the course content if supervisors of Field Officers were skilled in the program development process and in supervision.

Supervision is a problem, however, and field supervisors need training in management and program development. Another weakness of the Certificate Training Course is its failure to link extension training to agricultural research efforts, and the entire range of problems is compounded by the lack of adequate backup support from the Agricultural Information Section of the MOAC.

In summary, while graduates of the Certificate Training Course are reasonably well prepared and motivated, the lack of adequate field supervision; inadequate support in the form of extension aids; and the lack of structured, continuous in-service training in such areas as improved communications skills and recent research findings serve to diminish the effectiveness of the Field Officers.

### c. Agricultural Information

The role of the Agricultural Information Section (AIS) in the MOAC is to produce technical and agricultural news publications that are translated into terms that can be understood and used by field staff and farmers; they also produce visual-aid materials to backstop the extension staff in their efforts to educate and train farmers in the use of more modern, advanced production technologies. Also, staff of the AIS (by means of mobile units) are supposed to assist the field staff by providing special film presentations of a technical nature.

For extension field staff to perform at the maximum level of their capability it is essential that they have the latest technical information resulting from research. This research data and information must be translated into terminology easily understood by the extension field staff and the farmer. It must be published in the form of technical bulletins, manuals, leaflets, flip charts, posters, etc., in sufficient quantity to meet the needs of the extension field staff for use in farmer meetings and training programs.

For the past few years the AIS has periodically been without leadership. Expatriates have been provided by donor agencies to fill this leadership role from time to time, usually on a two-year tenure basis; however, there has been no continuity or overlap of assignments, nor has there been any Swazi trained to assume this role. As a consequence, the recurrent operating budget for this section has been allowed to decrease each year to the point that now only a minimum of activities are carried out by the section. Positions have been created for the section and, while most are filled, personnel suffer from a lack of training and support that renders the program almost dormant. Currently,

three small offices for professional staff plus a crowded farm broadcast room, small darkroom, and a minuscule printing room comprise the entire AIS.

Present publications consist mainly of one Rural Development News Bulletin which is published on a quarterly basis and contains approximately 30-35 pages, and a few posters. These publications are sent out for printing at a high cost; news bulletins cost approximately \$1.95 each. Previously, one-page instructional leaflets were produced for distribution to the extension staff and to farmers but have now been discontinued.

As a result of the above, extension staff have, for the most part, no teaching aids to assist them in the presentation of research recommendations to the farmers. With the very limited level of training most extension field staff have received, it is essential that they be provided with well prepared technical materials that present easily followed step-by-step procedures in such areas as crop production, pest and disease control, and irrigation management. In view of their limited training, it is also essential that extension staff receive technical bulletins and manuals that will keep them apprised of current technical developments.

### III. Project Description

#### A. Logical Framework Narrative

##### 1. Goal

While the ultimate goal of most AID agricultural projects is to improve the standard of living of the rural poor, a more specific project goal has been identified for this project in order to more accurately draw the linkages between project activities and objectives. Specific productivity goals were considered but rejected on the grounds that simply increasing productivity potential may or may not affect the standard of living of the rural Swazi. In the past, for example, certain practices that could improve productivity were not adopted due to the existence of other constraints. Since the proposed project is directed toward viewing the entire farm environment with its complex set of constraints, it was concluded that to increase the economic viability of farming on Swazi Nation Land is the appropriate project goal. Such an objective will allow a more dynamic approach to research and extension - one that is responsive to the changing conditions on SNL and the problems farmers face. Naturally, other variables will interact with the accomplishments of this project to determine the degree of goal achievement. Such conditions as an adequate marketing system, availability of farm inputs, and the expansion of the land area under irrigation are discussed under purpose to goal assumptions and others are described in the Background Section of the PP.

While major emphasis of the project will be on providing a body of research information relevant to the socio-economic needs and technical capabilities of the small farmer, supporting activities to enhance the capacity of the MOAC to deliver research recommendations to farmers are also integral to goal achievement.

Goal Measurement. At the project goal level, an increase in the economic viability of farming will be measured by the percentage of SNL farms producing a marketable surplus above subsistence needs. Currently, less than 10 percent of the SNL farms produce primarily for the market; the goal of this project is to increase that figure to 20 percent by 1992 and to 30 percent by 1997. It is further expected that the percentage of farms producing at least a partial surplus for the market will increase from the currently estimated 41 percent to 60 percent by 1992 and 80 percent by 1997.

The project base-line survey, current MOAC Monitoring and Evaluation Unit surveys, and such studies as the Swazi Rural Homestead (see Social Soundness Analysis) will be used as the base for the measurement of goal level success; project evaluations and follow-on surveys, in addition to future Monitoring and Evaluation Unit surveys and agricultural censuses, will be used to gather comparative data for evaluation purposes.

## 2. Purpose

The purpose of the project is to improve and expand the capacity of the MOAC research and extension programs to develop and effectively extend cropping systems recommendations relevant to the needs of the SNL farmer.

Purpose to Goal Linkages. As noted in the FY 82 Swaziland CDSS, the lack of appropriate cropping systems recommendations for small farmers is a serious constraint to increasing productivity and income levels. Institutional weaknesses pose a serious constraint to addressing the needs of the small holder on SNL, and without institutional support it is unlikely that current GOS programs can achieve the desired shift from subsistence to commercial agriculture. The institutional components of the project will establish an ongoing capability to (1) identify the constraints impeding progress on SNL farms as well as the expressed needs of the farmer; (2) respond to the situation through a program of on-farm research to identify crops and cropping practices relevant to these needs and constraints; (3) develop appropriate information tools that are understandable and usable by extension agents and farmers; and (4) provide in-service training courses to improve the technical and motivational skills of the extension service staff.

The institution building emphasis of this project is predicated on the fact that a systemic approach to agricultural research is an ongoing process which will require continual modification as social, economic, and environmental conditions change on SNL. Technical recommendations that are valid in one crop year may have to be modified during following years due to changing price relationships, for example. Likewise, extension is an ongoing process that must be responsive to research innovations as well as the changing farm environment. This will require a capacity to mount in-service training programs to continue to develop the technical knowledge of extension staff as well as their awareness of the socio-economic factors that will play an important role in motivating farmers. Also, to support the research and extension program, adequate teaching and extension aids must be prepared by the agricultural information staff.

End of Project Status. By September 30, 1987, when AID assistance under this project terminates, it is expected that the Research Division will be well on its way to becoming a fully functioning unit with trained Swazi personnel serving as Research Officers. However, a follow-on effort may be required to address the additional or different constraints identified in a cropping systems research project of this type. Possible components might include (1) more work on livestock and/or marketing research (2) additional training for Research Division staff and/or (3) limited technical assistance in advanced systems research. The external evaluation in July 1985 will provide the information on which a decision to begin planning for a Phase II project will be based. At that time, progress toward the achievement of the project's purpose will be evaluated and recommendations will be made for inputs into a second phase. The final PP for the follow-on project, if required, will be designed in July-August 1986. In the case of the extension training and agricultural information, it is anticipated that all institution building efforts will be completed at the end of the first phase project in 1987.

Specifically, the following conditions will determine end of project status:

- the Agricultural Research Division will be capable of (1) conducting economic, social, and technical research on a continuing basis; (2) conducting 100 on-farm research trials yearly; (3) producing research recommendations annually that are designed to provide useful results to extension agents and farmers, and (4) developing linkages with appropriate IARC's, i.e. germplasm exchange, utilizing research results and reciprocal scientist visits with appropriate international agricultural research institutions and programs.

- the extension program of the MOAC will be capable of (1) conducting an ongoing in-service training program reaching 50 percent of the extension staff yearly (covering such areas as the latest research findings, motivation techniques, use of improved extension aids, and socio-economic characteristics of the farmers with whom they work); (2) assisting field research staff conduct 100 on-farm research trails yearly and conducting an additional 160 on-farm demonstrations of research findings during each year; (3) conducting eight farmer field days annually; and (4) reaching 75 percent of SNL farms yearly with research recommendations.

- the Agricultural Information Section of the MOAC will be capable of (1) putting research recommendations into a form understandable and usable by both extension workers and farmers; (2) supporting extension workers by producing adequate teaching/extension aids; and (3) supporting direct extension efforts with a program providing such services as radio broadcasts, etc.

Purpose to Goal Assumptions. The following assumptions are considered critical if the project is to have the desired goal level impact:

- GOS policies will continue to encourage cash cropping through such efforts as the Rural Development Area Program;
- production inputs will continue to be available in adequate amounts and on a timely basis;
- the marketing system will be able to accommodate the increase in SNL production for the market; and
- the amount of SNL under irrigation will continue to increase.

### 3. Outputs

Research. During the first year of the project a base-line survey of a cross section of SNL farms will be conducted to provide data for future evaluations as well as information critical to the formulation of the on-farm research program and the in-service training curriculum for extension workers. Socio-economic research will continue during the remainder of the project in order to provide updated information to the agriculturists designing the research trials. By the end of the project, 350 on-farm trials will have been conducted, five annual research reports will have been prepared, and specific recommendations will have been made based on the findings of the research efforts. In addition to the on-farm research, applied research will be conducted on the research stations as needed.

Through the efforts of the technical assistance team and the Swazi staff, linkages between the Research Division, Extension Division, Agricultural Information Section, and the Faculty of Agriculture will be strengthened. A process for conducting cropping systems research will be designed and implemented, including the direct participation of extension field officers as well as Research Division staff. Senior Research Division staff will teach some special courses at the University on an invitational basis and assist in conducting in-service training courses for extension personnel. Additionally, relationships will be established with various international research centers and research organizations in other African countries.

Fifteen participants will receive formal training under the research component of the project. Nine will obtain M.Sc. degrees and return to fill research officer positions at Malkerns and the research sub-stations, and six will receive short-term

training in the U.S. and third countries in such areas as agricultural statistics and field research methodology. In addition, Swazi research officers and research assistants will receive on the job training and be working effectively by the end of the project.

To support the technical assistance and training efforts of the Research Division, additional equipment will be procured and in use, and a new Library/Conference room plus an extension to the soils lab will be constructed.

Extension. During the course of the project, an in-service training program will be designed to meet the continuing needs of the extension service. During the first year, the training needs of extension workers will be determined through an assessment of the Faculty of Agriculture curriculum and interviews with the workers themselves. A formal in-service training program will be established, the curriculum will be developed, and all extension staff will have attended at least one course by the end of the project. The in-service training program will include formal, specialized training at the Faculty of Agriculture during school breaks and less formal sessions at farmer training centers, research stations, and on-farm research locations. The role of the in-service training function will be clearly defined during the project, and the organizational and administrative position of the training section will be formalized. A relationship will be established with the Faculty of Agriculture; the technical advisor for in-service training will assist the permanent staff by introducing students and faculty to new techniques and training aids developed during the project.

Two Swazis will receive training under the in-service training component of the project and return to fill positions in the MOAC's Extension In-Service Training Section. One participant will return to direct the program after obtaining an M.Ed. in agricultural education and extension training, while an assistant training officer will attend a short-term work/study program in either the U.S. or a third country. Eight Swazis will receive B.Sc. degrees in specialized agricultural disciplines and return to staff the Crop Production Section of the MOAC. These area specialists will play an important role in establishing an effective extension program by conducting in-service courses at research stations and in the field and providing the technical back-up for the generalists in the field. The Crop Production Section is currently staffed by five Swazis with B.Sc. degrees in general agriculture. These generalists will be

transferred to the Research Division during the first year of the project to serve as counterparts to the U.S. technical assistance research team and will receive M.Sc. training in specialized research fields. Upon completion of training, the M.Sc. graduates will return to fill Research Officer positions. The MOAC has proposed this method of providing research trainees on the basis that sound research is a prerequisite to the development of a Crop Production Section.

Training is included under this project to re-staff the Crop Production Section with area specialists since extension generalists and farmers will need technically specific assistance as the research program produces new recommendations. B.Sc. level graduates are suitable for the Section but graduates from the University College of Swaziland receive B.Sc. degrees in general agriculture and are not subject area specialists. Therefore, eight Diploma of Agriculture holders or new B.Sc. graduates, if available, will be sent for specialist subject area training in the U.S. or third countries where a subject area major can be obtained.

trials and

Finally, 320 on-farm/demonstrations of research recommendations will be conducted during the last two years of the project and sixteen farmers field days will be held during the same period.

Agricultural Information. The U.S. technical advisor and short-term consultants working with the Agricultural Information Section will develop a system for converting research recommendations into extension packages that will include not only step-by-step procedures for field officers but back-up support such as posters, flip charts, slide shows, farm bulletins, and other extension aids. During the first two years of the project, organizational improvements will be implemented; a new facility will be constructed, equipped, and made operational; and staff will receive on the job training in such areas as materials production, audio-visual techniques, etc. During this time, various communications techniques will be tested to determine the most effective way of reaching farmers.

By the time results are forthcoming from the Research Division, the AIS will be ready to support the extension effort, and recommendations will actually be converted into extension manuals. Additionally, the results of the pilot communications effort will be used to develop supporting extension aids during the project, and four mobile units will be operating (one in each of the four administrative districts). Three participants will receive formal training and return to fill key positions in the AIS during the project. One will receive an M.Ed. in Agricultural Information and return to head the Section, and two will receive short-term training in such areas as audio-visual techniques and equipment maintenance and repair.

Output to Purpose Linkages. As discussed in the Background Section, the major constraints to the development of an effective research and extension process are: (1) a lack of trained manpower; (2) the absence of a systematic approach to the development of relevant research recommendations, extension packages, and supporting services such as teaching aids; (3) an inadequate in-service training program; (4) no integration of the research, extension, and support functions; and (5) a lack of adequate equipment and, in some cases, facilities. This project has been specifically designed to alleviate the above constraints and thereby set the conditions necessary for the MOAC to continue the research, extension training, and information support functions.

#### 4. Inputs

The following discussion and tables describe the inputs that will be required to produce project outputs and achieve the project's purpose:

##### a. USAID (\$12,900,000)

(1) Technical Assistance (\$8,140,000). The project will provide 40.75 person years of long-term technical assistance and 90 person months of short-term consultancies. The specific areas of technical assistance and the duration of services are listed in Table III.1., and job descriptions are included as Annex J. All long-term consultants will work with Swazi counterparts who will be trained under the project.

TABLE III.1.

#### Technical Assistance Schedule

<u>Personnel</u>	<u>Time Frame</u>	<u>Staff Years</u>
Cropping Systems Specialist (Chief of Party)	Jan. 82 - April 87	5.25
Rural Sociologist	Jan. 82 - April 87	5.25
Agricultural Economist	Jan. 82 - April 87	5.25
Extension Training Specialist	Jan. 82 - Jan. 87	5
Agronomist	Apr. 82 - April 87	5
Horticulturist	Apr. 82 - April 87	5
Irrigation Specialist	Apr. 82 - April 87	5
Agricultural Information Specialist	Jun. 82 - June 87	5
Consultants (e.g., small farm mechanization, weed control, library science, agricultural policy economics, in-service training, audio-visual techniques, livestock management)		7.50
	<b>TOTAL STAFF YEARS</b>	<b>48.25</b>

See Annex J for Job Descriptions

(2) Training (\$1,781,000). Fifty-four study years of academic training has been included in the project, and an additional 57 months of short-term and work/study training is planned. Most of the academic training will be conducted in the U.S., but research participants will also receive training at an international research institution such as the International Rice Research Institute before returning to Swaziland. Undergraduate training and short-term training will be conducted in African and other third countries to the maximum extent practicable. Table III.2. depicts the participant training program planned for the project, including the time frame and length of study.

TABLE III.2.  
Participant Training Schedule\*

Discipline	Time Frame	Study Months
M.Sc. Rural Sociology	May 1982-May 1984	24
M.Sc. Agronomy	May 1982-May 1984	24
M.Sc. Agricultural Economics	May 1982-May 1984	24
B.Sc. Agronomy	May 1982-May 1986	48
B.Sc. Horticulture	May 1982-May 1986	48
B.Sc. Agricultural Economics	May 1982-May 1986	48
B.Sc. Agronomy/Soils	May 1982-May 1986	48
Short-term/Audio-Visual Equipment	June 1982-Dec 1982	6
Short-term Agricultural Statistics	May 1982-May 1983	12
M.Sc. Horticulture	May 1983-May 1985	24
M.Sc. Agricultural Irrigation Technology	May 1983-May 1985	24
M.Sc. Agricultural Extension Education	May 1983-May 1985	24
M.Sc. Agricultural Informa- tion Systems	May 1983-May 1985	24
B.Sc. Irrigation Technology	May 1983-May 1987	48
B.Sc. Entomology	May 1983-May 1987	48
B.Sc. Small Farm Mechaniza- tion	May 1983-May 1987	48
B.Sc. Plant Pathology	May 1983-May 1987	48
Work Study/Extension Training	Sept 1983-Aug 1984	12
M.Sc. Horticulture	May 1984-May 1986	24
M.Sc. Agronomy	May 1984-May 1986	24
M.Sc. Dairy Science	May 1984-May 1986	24
M.Sc. Agricultural Engineering Small Farm Mechanization	May 1984-May 1986	24

\*NOTE: See Participant Training Flow Chart in Annex O.

TABLE III.2.

Participant Training Schedule

<u>Discipline</u>	<u>Time Frame</u>	<u>Study Months</u>
Work Study/Ag. Info. Systems	Sept 1984-Aug 1985	12
Short-term Cropping Systems		
Research Methods (Third Country):		
2 persons x 3 months	Jun 1983-Aug 1983	6
2 persons x 3 months	Jun 1984-Aug 1984	6
1 person x 3 months	Jun 1985-Aug 1985	3
	<b>TOTAL STUDY MONTHS</b>	<b>705</b>

(3) Construction (\$640,000). The construction component of the project consists of a research library/conference room and an extension to the soils laboratory at the Malkerns Research Station; a new building to house the AIS; one house for a U.S. technical advisor in Mbabane (by the time the implementation team arrives, one house previously constructed by AID will be available for the other U.S. technician in Mbabane; the GOS is providing six houses for the research advisors at the Malkerns Research Station); 14 houses for field research teams; and 10 field research storage sheds. An Engineering Analysis is contained in Annex H.

(4) Equipment (\$280,000). Equipment will be provided to support the three major activities under the project. Lab, farm, and office equipment will be provided to support the research effort; various items such as a photocopier, projectors, production equipment, and some office equipment will be provided for the Agricultural Information Section (AIS); and a limited amount of teaching equipment will be provided for the Certificate Training Course. Equipment provided to the AIS will be used to support the in-service training program. The equipment to be provided under this project represents a shortfall in the current equipment pool that must be provided if the project's objectives are to be met. A detailed list of the equipment, including prices, is included in Annex L. Procurement procedures for the equipment to be provided under the project are described in Section VI, Implementation Plan.

(5) Commodities (\$612,000). Commodity support will be provided to ensure timely implementation of project activities. Commodities to be purchased include: (1) fertilizers, seeds, plot markers, fencing, etc. for research trails; (2) office supplies; (3) books, reference materials, and other

research publications; (4) production materials (posters, flip charts, slides, films, etc.) and experimentation materials for use by the small farm mechanization consultant. Annex L provides a listing of commodities, including prices; Annex K lists commodity expenditures by project component and fiscal year; Section VI., Implementation Plan, describes the commodity procurement procedures to be followed.

(6) Vehicles (\$138,000). Vehicles (8) will be bought to support the technical assistance effort's demanding travel schedule. Research officers will closely supervise the on-farm trials and will, therefore, be required to cover the entire country. Likewise, the agricultural information and extension training advisors will be travelling extensively in support of their programs and will require vehicles. Four panel vans will be purchased and fitted with equipment for the Agricultural Information Section in support of the extension service. Finally, 14 motorcycles will be bought for the field teams (all Research Assistants and Peace Corps Volunteers). A list of vehicles is included in Annex L; expenditures by fiscal year can be found in Annex K; and Section VI, Implementation Plan describes the procurement procedures to be followed. Seven of the motorcycles will be purchased in FY 82, and the remaining seven in FY 83.

(7) Other (\$1,309,000). \$17,000 in local costs will be provided for the base-line survey; \$58,000 will pay for the services of a local administrative assistant for the Title XII implementation team; \$48,000 has been budgeted for the external evaluation; and \$1,186,000 has been added as a 10 percent contingency (15 percent on equipment).

b. GOS (\$4,354,000)

(1) Vehicle Maintenance and Operation (\$437,000). The GOS will provide for all fuel and maintenance of project vehicles. Under the current system, petrol is purchased at a government pump; the price includes the cost of the fuel, a maintenance allowance, and a depreciation/replacement allowance. The vehicles bought by AID at the initiation of the project will be replaced by the GOS in 1985 and 1986, or as required.

(2) Salaries (\$1,758,000). This component includes salaries for counterparts plus other professional and support staff that will be engaged in the project through 1987. Of this total, \$413,000 represents an incremental cost to the GOS over the next six years.

(3) Research Facilities and Office Space (\$1,223,000). This contribution represents facilities constructed at the Malkerns

research station. They were funded from the GOS capital budget. These facilities will be used by the cropping system research technical assistance team and their Swazi counterparts.

(4) Housing and Furnishings (\$369,000). The GOS has built six houses which will be used by the U.S. advisors stationed at the Malkerns Research Station. Furnishings will be provided for these houses and the AID-built house in Mbabane for the agricultural information specialist. (Note: The extension training advisor will occupy a house built under a previous project. It will be vacant prior to his/her arrival in Swaziland.) In addition, furnishings will be provided for the 14 houses to be constructed by AID for the field research teams.

(5) Travel Costs for Participants (\$122,000). The GOS will finance the round trip airfare for all participants.

(6) Commodities and Supplies (\$336,000). The GOS will continue to fund research commodities, production materials and supplies. In addition to current levels of commodity support, an additional \$33,000 will be provided for AIS production materials. In FY 86, the GOS will fund 50 percent of the cost of additional production materials and will pick up the total cost in FY 87. By FY 85 the GOS will be providing \$6,500 for teaching materials to be used in the in-service training program (in addition to the current budget). Commodities for research trials will be funded under current Research Division budget allocations.

(7) Contingency (\$109,000). Annex X breaks the GOS contribution term by fiscal year, component, input, and differentiates between expenditures to be covered under present recurrent budget allocations ascribable to the project and incremental budgetary requirements. Of the total, \$1,213,000 (E933,000) are incremental expenditures which, in addition to present budgetary support, will be required to support the project.

c. U.S. Peace Corps (\$55,000)

The U.S. Peace Corps will provide four volunteers for two years each to assist with the on-farm research program.

## B. Project Approach

This project is designed to overcome three basic constraints to increasing small farmer incomes in Swaziland : (1) lack of relevant research recommendations; (2) the inability of the extension service to effectively motivate farmers to adopt improved farming practices; and (3) the lack of adequate field support for extension workers in the form of extension and teaching aids. Separating the constraints in such a manner is an artificial expedient for the sake of analysis; in fact, they are so interrelated that the insufficiencies of each area are actually part of the problem facing the other two. Therefore, this project, through the provision of the technical assistance, training, equipment, and commodity support described in Section III.B. will address the institutional needs of all three areas in order that the GOS may carry on an effective, on-going research and extension effort.

The research component of the project will focus on an analysis of the systems within which small farmers operate and the development of cropping recommendations relevant to their situation. Research activities during Crop Year (CY) 1982/83 will be planned based on initial observations of cropping constraints in Swaziland and analysis of past research both in Swaziland and at international agricultural research centers. During the first year of the project, the CSR team and Swazi counterparts will conduct and quickly analyze a baseline survey. This survey will be the primary responsibility of the Agricultural Economist and Rural Sociologist. The results will be used to redirect the overall on-station and on-farm research effort during CY 1983/84 and for project evaluations. The program will be carried out by research teams consisting of one Research Assistant (graduate of the two-year Diploma Course in agriculture), two Field Officers from the extension service, and ten farm families (one officer for every five families). Program direction and definition will be provided by the technical assistance research team and their Swazi counterparts (Research Officers), and technical support will be provided by four district-level U.S. Peace Corps Volunteers. During the first year of the project, five Research Assistants and ten Field Officers will receive training in the cropping systems research approach at the research stations and will assist in the gathering of farm data and the selection of participating farmers. During the 1983/84 growing season these teams will work in five RDAs to implement the adaptive research program, while five more Research Assistants are being trained at the research station. During the next crop season (1984/85) the second five field teams will join the adaptive research program. By this time 10 teams consisting of 10 Research Assistants, 20 Field Officers and 100 farmers will be operating to conduct one hundred on-farm adaptive research trials yearly, the level to be maintained for the remainder of the project. Peace Corps Volunteers will continue to provide field level technical support in each administrative district. All field team personnel will be housed in the field at either RDA project centers or other suitable locations.

In addition to continual assessment and modification of the adaptive research program, the technical assistance team will also conduct applied research under controlled conditions at the central and outlying research stations. Some of the research required in this area has been done in Swaziland; however, the technical assistance team will carefully evaluate past research. Based on this analysis, the feedback from the socio-economic

research, and the results of the on-farm trials, it is likely that additional research-station-based applied research (variety screening, timing of irrigation, fertilizer and pesticide rates, etc.) will be necessary.

Based on analysis of present and future manpower requirements, the MOAC's goal of reducing the extension officer:farm ratio to 1:200 will be achieved at the present rate of output without additional assistance. Instead, the project will concentrate on developing the expertise of extension officers in extension methodology and supervision and on improving motivation. Training will encompass cropping systems methodology, including on-farm trials and demonstrations. Special attention will be given to developing approaches and skills for working with farm units with unique features which cause difficulty in carrying out extension work through groups and in developing broad-based research recommendations.

U.S. technical assistance in cooperation with MOAC staff will develop a structured in-service training program. Training needs will be established during the first year of the project and the course content for the first phase of training sessions will be developed. Course content will be based on the needs analysis; courses will range in duration, scope, technical depth, and format depending on those needs.

The technical advisor to the in-service training program will work closely with the Agricultural Information Section (AIS) staff in the planning of training sessions. Audio-visual and other teaching aids developed by the AIS will be used for in-service training to minimize equipment redundancy. Additionally, the U.S. advisor in in-service/extension training will assist the Certificate Training Course faculty by teaching some courses in extension methodologies and the use of extension aids developed under the project. A final element of this component of the project will be academic training for eight Diploma graduates who will staff the Crop Production Section of the MOAC.

To support the efforts in research and extension training, technical assistance, equipment and formal on-the-job training will be provided to establish an effective system for the development of agricultural information and extension aids. This component of the project will test various communications techniques to determine those most appropriate for reaching SNL farmers. A systematic approach will be developed for translating research recommendations into extension manuals and farm publications, and linkages will be created through the participation of AIS staff in some research training activities. Production capacity will be created in the AIS, and mobile extension units will be equipped and operators trained to assist research and extension staff (emphasis will be placed in supporting the Certificate Training Course and extension in-service training programs) with research trials, on-farm demonstrations, field days, and in-service training sessions. While much of the informational work will involve the adaptation of material from other countries early in the project, local production of tapes, slides, and other aids will steadily replace the imported materials as Swazi staff are trained in the production and utilization of various information packages.

### C. Project Phasing

It is unlikely that all of the institutional objectives set for this project (see Section III.C. Logical Frame Narrative and Annex I) will be achieved in their entirety during the six years of project implementation. End of project status should be achieved in the extension training and agricultural information components but, given the complexity and magnitude of the research problem, it is expected that a follow-on effort will be required beginning in FY 1987. Five main factors necessitate planning for a second phase research effort. First, research is a slow process that will, by definition, raise questions and possibilities yet unanticipated. For example, the introduction of new intercropping or irrigated cropping practices may cause changes in plant disease patterns that will require further applied and adaptive research. Second, changing economic and technical conditions under expanded irrigation may change the scale of production necessitating further research. Third, as the amount of SNL under irrigation increases, more emphasis will be required on research under irrigated conditions. Fourth, the information collected during the first five years of the project will add substantially to the body of knowledge concerning the complex livestock situation on SNL. Naturally, the project must include a thorough analysis of the interaction between the livestock and crop subsystems as a basis for making appropriate cropping systems recommendations. However, detailed research in such uses as range management, livestock production, and pasture varieties

will not be carried out during the early phase of the program but may be more appropriate at a later date. Therefore, based on the above, a follow-on phase including a moderate level of technical assistance, with a slightly different mix of skills, may be necessary. Finally, and probably most important for this project, given the shortage of candidates for training (coupled with a nationwide shortage of skilled Swazis in technical fields), it is very likely that the training component will require a second phase to complete the institution building process. Therefore, USAID/Swaziland is tentatively planning a second phase effort; the final decision rests with the findings of a July 1985 external evaluation. Should the need for follow-on activity be confirmed, the design of a follow-on project will be conducted in July-August 1986.

#### IV. Project Analyses

##### A. Technical Analysis

##### 1. Cropping Systems Research

Past agricultural research in Swaziland has been primarily directed toward the needs of the estates and the larger title deed land owners. Past reviews suggest that the research that has been done is of a good quality and that it has made major contributions toward increasing agricultural production in Swaziland. However, most of the research has focused on mono-cropping systems, and has not been directly appropriate for the Swazi Nation Land farmer. (Various sources estimate that between 36-70 percent of the SNL farmers practice mixed cropping.) While some of the past research findings have been utilized by small farmers, the research was not designed to investigate and address the constraints faced on SNL.

Farming on SNL consists of communal livestock grazing (mainly cattle and goats), small scale poultry production, and mixed crop production on cultivated land. The cropped land is set apart from the grazing land during the cropping season, but after the harvest it reverts to communal pasture allowing livestock to graze the crop residue. The average farmer has about 2.75 hectares of land on which to grow crops. The major crops grown on SNL are maize, groundnuts, cotton, jujo beans, sorghum, beans, pumpkins, sweet potatoes, and tobacco. Occasionally orchard crops, sugarcane, and pineapples are found. Vegetable crops are only grown on a small fraction of SNL and are primarily for home consumption although there are a few areas of commercial vegetable production.

Several projects are currently being implemented which are designed to assist the SNL farmer (see Background Section), including a small intercropping research project sponsored by the International Development and Research Center and the University College of Swaziland under the direction of the Faculty of Agriculture. While some useful technical data is being generated that can be applied under this project, the program does not include a detailed assessment of farmers' constraints, and farmer involvement in the research trials is minimal.

While the programs previously referred to are making important contributions to improving farming conditions, they are not sufficient to attain the GOS goal of increasing commercial farming on SNL. Research recommendations based on a thorough analysis of the complex set of problems faced by small farmers

are necessary for total program success in the agricultural sector.

The design approach in this project, in agreement with the general outline of the PID and consulting reports of the International Agricultural Development Service (IADS) and the Consortium for International Development (CID), is based on a cropping systems research (CSR) framework. This approach depends on a holistic method of studying a system as an entity made up of all its components and their interrelationships, including the environment within which the system exists.

Cropping systems research does not eliminate the need for traditional experiment station-based research, but it is an attempt to improve the efficiency of such research by promoting a closer coordination between the technology development process and the farmers' needs. Thus the systems approach is complementary to traditional agricultural research.

Philosophically, CSR requires a change in the traditional attitudes and approaches of the individuals conducting the research. That is, research teams are composed of individuals from several disciplines working together to design research appropriate to the small farmer rather than a researcher working on a specific, discipline-oriented problem.

Methodologically, much of the CSR is actually carried out on the land of the small farmer using the inputs and techniques the farmer would use in producing a crop. Experiments are planned and carried out by the CSR team in cooperation with the farmer. Whenever possible, the farmer is involved in physically conducting the experiment. The degree of farmer involvement may not be great in the first year, but as the research process continues over a period of years, farmer involvement and control would increase while the role of the research team would diminish. It must be stressed that CSR programs are designed for individual farmers (or a small number of farmers with similar circumstances and constraints), with the level of farmer input in the conduct of the research varying depending on the farmer's interest, capabilities and understanding.

Target groups of farmers with similar production constraints (e.g., rainfall, soil fertility, economic resources) will be chosen through a series of surveys and discussions by all members of the CSR team. Research will be designed within the constraints of the farmer and will not be a series of highly sophisticated experiments with elaborate experimental designs. Instead, they will be simple, straightforward experiments that are understandable by the farmer and would be replicable by him. Experiments will be placed only on the farms of those farmers willing to participate

in the research.

The long-term implementation (technical assistance) team for the research portion of the project will consist of six individuals (see Annex J for detailed job descriptions):

1. General cropping systems specialist (Chief of Party)
2. Cropping systems agronomist
3. Cropping systems horticulturist
4. Irrigation specialist
5. Agricultural economist
6. Rural sociologist

Consultancies in such areas as small farm mechanization, weed control, library science, rural sociology, and livestock management are anticipated. Of these, the services of the small farm mechanization specialist and the librarian will probably be used the most extensively. The library scientist will spend four months establishing the library system as soon as the new research library is completed and will return for three months at a later date to update the system and train Swazi staff in the maintenance of the library. The small farm mechanization specialist will spend three months during the first year of the project determining research and experimentation needs regarding appropriate farm implements. On the basis of the information gathered, the specialist will collect plans and designs that may be applicable to the conditions on SNL and will return during the second year to test prototypes. Afterwards, the small farm mechanization specialist will return for the analysis of crop season research results and to assist in the formulation of recommendations on the use of farm implements. At that time, new or modified designs may also be proposed for the upcoming research cycle. It is expected that the farm mechanization specialist will be required for about three months each year.

In addition, 10 Research Assistants will be hired by the GOS and will be in direct charge of the field experiments under the supervision of the technical assistance team. Peace Corps Volunteers with a B.Sc. or higher degree in some aspect of agriculture will be used for additional technical help.

The first year of the project, the entire CSR team will be involved in the actual field research. Five Research Assistants will be trained at a research station during the first year and assigned to an RDA the second year. At that time, five more Research Assistants will be employed, trained, and assigned to an RDA the third year. Each Research Assistant will work with two Field Officers from the extension service and 10 farmers. The Peace Corps Volunteers will be trained at a research station and then assigned to an RDA - one in each administrative district

or ecological zone. These volunteers will provide the day to day technical assistance and supervision of the field research teams. By the third year of the project, 10 field teams will be working with 100 farmers to conduct on-farm trials, including some farms outside the RDAs.

Maize will continue to be the dominant crop on the majority of SNL farms. However, increasing the level of vegetable production would provide a new source of income for the SNL farmer. Therefore, the activities of the CSR will be mainly oriented toward increased intercropping with maize and to the introduction of commercial vegetable production. Immediately researchable systems components will include such areas as land preparation, intercropping, building soil fertility, crop rotation, introduction of appropriate farm implements, and cropping sequences under irrigation.

The recently completed water resources study by the Corps of Engineers suggests a large potential for improving agricultural production through irrigation, but it cautions that "significant development of this irrigation potential would require a unified and complete commitment of the many and diverse interests involved." The Corps of Engineers' study concluded that even with Republic of South Africa abstractions an additional 57,100 hectares could be irrigated in Swaziland; of this total, 8,600 hectares of land could be irrigated without the construction of additional reservoirs. Therefore, an important potential for irrigation exists in Swaziland. During this project, most of the research in irrigated cropping will focus on the small schemes in RDAs and other pilot irrigation projects that will be implemented during the next 5-6 years.

The concept of a systems research approach demands that the entire farming system must be studied and not just a subsystem such as cropping or livestock. The surveys and research trials conducted during the project, while emphasizing crop production, will certainly focus on the interrelationships between the crop and livestock subsystems. All recommendations emanating from the research program will be sensitive to the effects that specific changes in cropping practices will have on the total farm system. Consultancies in livestock management have been included in the project to assist the technical assistance team better understand the role of livestock within the SNL farming context. Evaluations conducted in FY 83, FY 84 and FY 85 will include an assessment

of this strategy and make recommendations on the inclusion of an expanded livestock research and extension program, either in the latter stages of this project or in a follow-on activity.

## 2. Agricultural Information

The Agricultural Information Section within the MOAC provides for the crucial linkage between research and extension. That is, data and analyses from the researcher are the inputs into AIS activities and timely, interesting and effective information for various members of the agriculture sector is the unit's output.

Currently the AIS is lacking in space, facilities, equipment and working materials. Fortunately the unit has an allotment of 14 established posts, and 11 positions are now filled. However, the present level of staff performance is substantially below what would be required to support the activities of the cropping systems project and the ongoing work of the MOAC.

The objective of this component of the project is to provide support to assist the AIS attain:

- (1) a level of proficiency in providing technical and "popular" agricultural information in various formats so that the results being reported by the cropping systems research team can be effectively and efficiently utilized;
- (2) expertise in developing educational materials for various age and interest groups;
- (3) proficiency in selecting and adapting material from non-Swazi sources (such as international centers, neighboring countries, etc.) for use by farmers and other residents of rural communities in Swaziland;
- (4) an ability to provide, on a timely schedule, information releases for use by the agriculture extension service.

The approach that will be used to accomplish these objectives has five components. First, technical assistance in general agricultural information organization, procedures and scheduling will be provided for five years. The long-term technician will be supported by consultants at times when specific expertise is needed. Second, a counterpart will be sent for U.S. training to the M.Ed. level and return to serve as Section Chief. Third, short-term training will be provided in certain skill areas for members of staff charged with responsibility for maintaining and repairing the unit's equipment. A fourth component is the construction of a two story building to house the AIS. Con-

solidating the work of the unit in adequate facilities in close proximity to the extension training section in the MOAC will increase coordination between these two highly interrelated units.

The final component of the design is the provision of a selection of basic equipment and substantial stock of working documents and production materials.

During the early stages of the project, in addition to designing and implementing an efficient production and distribution system, the U.S. advisor will work with AIS staff to determine the communications media and informational formats that are most appropriate for reaching SNL farmers. On the basis of this research, four mobile vans will be equipped and AIS staff trained to support extension staff in the field.

### 3. Extension In-Service Training

The cropping systems research unit provides the information for the farmer, and the AIS translates these inputs into a format which the farmer can use. The final link in this process is the delivery of the information to the farmer. Thus the third integral component of this project is a program of in-service training to support the extension worker.

Agricultural extension accounts for the largest number of personnel in the MOAC, although the exact number of people in extension depends on what is classed as an extension activity. In spite of the focus on extension (including technical assistance personnel under a variety of foreign donor projects), the evidence suggests that the extension service is not reaching its goal of assisting all Swazi farmers. Even allowing for significant sampling errors, a recent survey (De Vletter: 1981) found that only 14 percent of Swazi farm households received extension advice and of that only 18 percent felt they benefitted from the information received.

Two constraints to achieving a higher level of performance by the extension personnel are:

- (1) an inadequacy of resources and facilities to provide the extension officer with useful information to extend; and
- (2) the lack of a structured, continuous program for in-service training of extension staff.

AIS will focus on problems arising from the first constraint, while development of a system in support of in-service extension training is the emphasis in this component of the project.

Training for extension officers presently consists of a

one-year certificate training program conducted by the MOAC in facilities leased from the University College of Swaziland. Graduates of this program (designed as 40 percent technical and 60 percent field practice) become the entry level Field Officers of the extension service. There is some discussion of the need to extend the program to two years, but there is general agreement that the one year program is more appropriate at the present time. Also it is agreed that the current level of output, 40 per year, is about the number of graduates that can be absorbed into the extension system. This project will assist the certificate training program through:

- (1) the provision of basic teaching aids (film strips, projectors and slides, flip charts, etc.) to enhance the learning process and also the subsequent use of these materials in extension activities; and
- (2) coordination of the certificate program with in-service training.

The bulk of this project's activities in extension will be for in-service training through the provision of refresher courses for the extension officer currently on the job.

In-service extension training is currently almost nonexistent. Although there is an established post for a training coordinator, the position has gone unfilled for the past two years, and there is little support for materials and programs. Furthermore, the position is established within the Agricultural Information Section since there is no separate in-service training section. Such a section will be established within the Agricultural Division, MOAC.

The project will provide technical assistance for five years to develop and implement an in-service training program. The emphasis will be on competence based training, starting with field level officers but reaching all extension staff over the five year period. Training for extension staff will be directed toward helping them become knowledgeable about cropping systems and about new results which flow from cropping system research. They will also be involved in field demonstrations and be updated on most effective methods of interacting with farmers and leaders while in the process of transmitting knowledge and collecting information.

Courses will be based on an analysis of training needs and will be conducted at Farmer Training Centers, the Malkerns Research Station and sub-stations, and at the University during

term breaks. In addition to senior MOAC extension staff, research team members and Faculty of Agriculture staff will assist in conducting in-service training courses.

Additionally, the cadre of Swazi subject area specialists created through the training included in this project for the Crop Production Section of the MOAC will provide a pool of in-service instructors. The current staff of B.Sc. holders in the Crop Production Section are being transferred to the Research Division and will be trained as Research Officers under the project. Eight diploma graduates will be trained to the B.Sc. level in specialized agricultural fields to re-staff the Crop Production Section by 1987. These specialists' principal role is to provide technical back-up to the extension service, and they will work closely with the cropping systems research program. The Crop Production Section staff will attend sessions at the Research Station to review the results of the previous crop season research and will then, in turn, assist with the in-service training of extension staff.

Finally, a small but important element of the project's in-service training component will be sessions during the first two years for MOAC staff to raise the level of awareness concerning the cropping systems research effort; such courses will include staff at various levels and functions within the MOAC.

## B. Social Soundness Analysis

### 1. The Setting

Background. Sixty-six percent of Swaziland's 565,000 residents live on Swazi Nation Land. This land, held in trust by the King for the Swazi people, accounts for 60 percent of the country's land area; the remaining 40 percent is individually owned. By birth, every Swazi has a right to residency on the community-held land which is administered, for the most part, under a chiefdom. Approximately 200 chiefs allocate land to families through male progeny.

Each Swazi male gains individual entitlement to a parcel of land at the time of marriage. Although the land cannot be sold or traded, it usually remains his to pass on to offspring. The system therefore provides a considerable amount of land security despite empowerment of chiefs to reallocate land. Reallocation normally occurs only when a serious offense has been committed or land has been neglected.

The land and buildings belonging to a given family comprise a homestead, the basic unit of social organization on Swazi Nation Land. The homestead, in turn, may consist of one or more individual families (households) depending upon the structural complexities of marriage (about 20 percent are polygamous) and the organization of various internal kinship groupings. Typically, each homestead has a male head responsible for overall functioning of the unit, and adult resident males have authority over resident females. Males gain ascendancy to homestead/household authority through a seniority system.

SNL homesteads, about 42,000 in number, tend to be widely dispersed such that the organizational entity known as a village does not exist. The landholding of the average homestead is 2.75 hectares; few exceed 12 hectares. Parcels of land are usually fragmented rather than contiguous.

Traditional Farming Practices. About 13 percent of SNL is utilized for cropping and settlement. The remainder is devoted to communal grazing or is mountainous or wasteland. In the past, employment opportunities in the modern sector have led to a situation where a large portion of the adult labor force works off-farm.

Nearly 70 percent of SNL homesteads have absentee workers; 58 percent of the adult male work force and 28 percent of the adult female work force are employed off-farm. Half of the homesteads receive regular migrant cash contributions. Nevertheless, the income of 73 percent of SNL families is less than \$200 per resident member, the poverty line adopted for Swaziland's rural population. Only 41 percent of the homesteads receive a portion of their income from crops. Such crops (primarily maize, groundnuts and beans) average a gross annual homestead income of about \$327 (approximately \$25 per capita).

Ninety-six percent of SNL farmers grow maize, the Swazi staple food. Although this accounts for over three-fourths of the total land under cultivation, it does not meet consumption needs of the growers; 46 percent purchase additional maize during a typical harvest year. Also frequently grown, primarily for consumption, are groundnuts and beans. Few homesteads currently grow high income potential crops such as tobacco and cotton; and those that do tend to be homesteads with five or more hectares of land. Reasons given by SNL farmers for not growing these crops include: lack of knowledge of how to grow the crops; inadequate land; lack of labor; and lack of money, capital or equipment.

Role of Women. Women are the mainstay of SNL homesteads. In addition to their responsibility for most domestic tasks, women often have responsibility for supervising the household when men are away (due to the seasonal nature of some modern sector jobs). In addition, women perform many of the agricultural tasks, even when male members of the homestead are present.

Traditionally, the husband is the head of the family and, consequently, makes all major decisions concerning the farm. If, for example, a production input loan is needed, the husband's consent is required. However, the extended family system provides for a senior relative who can make decisions in the absence of the husband (e.g. act as guarantor on farm loans).

To date, the MOAC has more male than female extension workers (only 12 percent are female) despite the fact that the majority of farmers involved in agricultural production are women. This situation is gradually changing, however, as more women are admitted to the diploma and certificate programs in agriculture. While more men than women currently apply for admission to these courses, students are accepted strictly on an academic basis.

All components of the project will be sensitive

to the role women play in the SNL homestead. By definition, cropping systems research is an approach that identifies problems prior to conducting experiments or proposing solutions. In some cases, the absence of male household members may be identified as a critical constraint, while in other cases it may not. The research program will, therefore, be specifically designed to meet the actual problems facing farmers. Experimentation in support of on-going appropriate technology efforts will be carried out by the small farm mechanization consultant. Also, methods will be devised by the extension service and AIS to more effectively reach women with research recommendations, and women will be instructed in the use and maintenance of the technological innovations introduced by the project. Furthermore, it is a goal of this project that 20 percent of all participants sent for training be women, and women will serve on the field research teams. Finally, the rural sociologist on the research staff will have an input into the design of the research program as well as cropping recommendations resulting from the field trials. Under no circumstances will recommendations be promoted that are considered detrimental to the status of SNL women.

## 2. Spread Effects

The project will involve considerable farmer participation in planning and implementation of cropping systems research. This on-site research will ensure that agricultural inputs and innovations are adapted to the needs of SNL farmers who ultimately will bear responsibility for their adoption and further spread.

Cropping patterns currently in existence indicate that Swazi farmers are receptive to the advice of extension field workers concerning the planting of hybrid maize varieties, application of fertilizer and other improved inputs. The adoption of new technology has, of course, depended on the economic viability of such adoption. Swazi farmers are keenly aware of the opportunity costs involved. This project, by approaching the farmers' environment from a cropping systems standpoint, will ensure that recommendations are based on the cultural and economic factors that affect the acceptance level of improved technologies.

Additionally, the project is expected to improve and expand the capacity of MOAC research and extension programs to develop information relevant to needs of various categories of SNL farmers. Incentives for and motivation of extension agents who work in the MOAC extension service will be a concern of the project.

Special assistance will be provided the MOAC Agricultural Information Section in development and dissemination of visual aids, printed material, and motivational techniques appropriate for farmers' needs. Ongoing studies will focus upon positive and negative reactions of recipients to different forms of information. Agricultural information is also expected to spread through informal interpersonal contacts, improved radio farm broadcasts and other agricultural mass media.

### 3. Social Consequences and Beneficiaries

The project's goal is to make SNL farming more economically viable; ultimate beneficiaries will be the 42,000 SNL families with farm areas averaging 2.75 hectares. It is estimated that by 1992 the percentage of SNL farmers producing primarily for commercial markets will increase to 20 percent, and by 1997, to 30 percent. The percentage of farmers producing marketable surplus above subsistence needs is expected to increase to 60 percent by 1992, and 80 percent by 1997.

Several assumptions have been made which are crucial to the success of the project. It is assumed that the GOS will continue its emphasis on the RDA program, the cooperative movement, and other programs aimed at improving the ability of SNL farmers to make the transition from subsistence to commercial agriculture. It is also assumed that production inputs will be available and that a marketing system will be in place that can accommodate increased agricultural production.

Direct beneficiaries of the project will include 28 Swazi trainees/counterparts who will receive academic training outside Swaziland, and approximately 427 extension service personnel who will receive in-service training (includes current professional staff of 260 plus additional staff over the next five years). The latter, additionally, will benefit from access to improved audio-visual and reference materials made available by the project to the Agricultural Information Section. The 350 farmers reached by on-farm research trials also will receive direct benefits from the project.

Approximately 75 percent of all SNL farmers are expected to benefit yearly from access to recommendations based on cropping systems research. These will have been translated into terms usable by extension field officers and understandable by farmers. Other benefits will include radio broadcasts that relate new, improved farming techniques; and access to increased contact with better trained and better supervised extension field workers.

4. Social Research. Sociological research will play a vital role in providing information on the social soundness of the project. Currently, an FAO rural sociologist is working with the Swazi Research Division sociologist to gather data on farm practices, labor roles, etc. to feed back into the design of future research programs. This information, in addition to research being conducted by another MOAC rural sociologist, will be invaluable to the technical assistance team. The FAO sociologist will be in Swaziland for six months after the arrival of the AID team, thereby providing an opportunity for the team sociologist to become familiar with some of the basic research problems in a short period of time. Future studies will be carried out in different geographic areas to further assess socio-cultural and economic aspects of current cropping practices in order to guide the design of on-farm research trials. Throughout these trials (as well as in demonstrations conducted by extension staff) the Research Division sociologist will monitor the impact of various cropping approaches upon the family, especially women, social customs, beliefs, and overall adoption of farming techniques. This information will be fed back to the technical assistance team to be used in improving its ability to relate to the unique social circumstances of farmers.

In addition to a broad base-line survey which will include a cross section of SNL farmers, follow-up surveys will take place every five years to measure project impact, both upon farmers directly exposed to on-farm trials and upon those exposed through access to cropping systems research recommendations. Results of these studies will be used for project evaluations and for planning purposes of the MOAC. Finally, information obtained will serve to augment the existing body of scientific literature concerning agricultural development.

In summary, the project's approach will be one that focuses on the alleviation of constraints actually faced by SNL farmers. Socio-economic data gathered during the project will provide a key to many of these constraints. The research trials will be planned and conducted with a high degree of farmer participation. Eventual recommendations, including the method of disseminating research findings, will, therefore, be responsive to the actual conditions faced by farmers.

Therefore, given that the project by its very nature will emphasize socio-cultural factors in a research effort that has been primarily technical in the past, this project is considered socially sound.

### C. Administrative Analysis

The cropping systems framework, as applied in this project, will require an integrated approach for reaching SNL farmers with economically viable research recommendations. Two Divisions of the MOAC, one under the Director of Agriculture and one under the Director of Research and Planning, will be the major implementing units of the project. Direct administrative leadership will be provided by the Senior Agriculture Officer at MOAC headquarters who is in charge of extension activities, and the Chief Research Officer at the Malkerns research station. In addition, the Certificate Training Course is administratively the responsibility of the Dean of Agriculture at the University College of Swaziland. Finally, all policy level direction for the research, extension, and information programs is the responsibility of the Permanent Secretary or Undersecretary, MOAC.

The front line administrators (the Senior Agriculture Officer, the Chief Research Officer and the Dean of Agriculture) are articulate, dedicated professionals who work well together. The patterns of cooperation developed by this trio of relatively young professionals should provide the benchmarks for organizational interaction over the next decade.

An area of concern is the need for more junior level administrators. The lack of personnel in this category is indicated by an expressed need from the MOAC for more supervisory level men and women in extension and the inability to recruit trained Research Officers. For this project, the Research Officers who will work as counterparts to the technical assistance team will be transferred from the MOAC's Crop Production Section. The positions vacated by these transfers will subsequently be filled by people trained to the B.Sc. level through this project.

In addition to the training provided within the scope of this project, AID is supporting additional degree training in agriculture through its Southern Africa Manpower Development Project. The people trained through both of these programs will provide the cadre of young professionals from which the future administrators of Swaziland's agricultural programs can be selected.

The GOS is currently designing and implementing programs to help attract and to train more people in agriculture. The Government has, for example, approved and will soon implement a plan to upgrade some of the Research Officers to a more senior category. The concept of a "career ladder" is also being used in other divisions of MOAC.

Another positive step is the opportunity for young Swazi students to advance through the educational system by exhibiting superior performance. For example, the best of the certificate level graduates are now provided the opportunity to enter the diploma course, and the best of these can qualify for the degree program. Thus an incentive system has been put in place to encourage high levels of performance in the agricultural courses at the university.

On the basis of the PP team's analysis of the administrative units involved, it is concluded that the organizational structure and personnel are adequate to support the project.

#### D. Environmental Considerations

An Initial Environmental Examination was submitted with the PID and a negative determination was approved by the AA/AFR on May 8, 1980. At this time, there are no project activities anticipated that deviate from those described in the IEE with regard to the use of pesticides or herbicides. In the event that a decision is made to consider promoting the use of certain pesticides or herbicides by farmers, AID/W assistance will be requested as offered by AID/W in the PID approval cable.

#### E. Economic Analysis

##### 1. Introduction

The long-run objective of this project is to increase the economic viability of farming on SNL. This analysis will cover the potential for increasing SNL farm incomes from two perspectives: (1) the project level using data and rates of return for irrigation estimated in a recent U.S. Army Corps of Engineers study and (2) the farm level by hypothesizing the adoption of certain recommendations.

Recommendations from research and extension are never adopted by all farmers at once, but are usually adopted through a spread effect over a long period of time. Furthermore, it is an extremely difficult task to assign the benefits of agricultural development to the various components (such as extension services) that contribute to increasing farm incomes. Available evidence shows that significant returns to agricultural research have occurred in various countries (see Annex E Table E-1). For example, estimates of the average internal rate of return to public research in agriculture in the U.S. over the past several decades has averaged nearly 40 percent. The record in less developed countries is even more impressive, with average annual returns of 90 percent for wheat in Mexico and 77 percent for

cotton in Brazil. Even the less successful projects have estimated rates of 11 percent for wheat in Colombia and 35 percent for maize in Mexico.

The focus of the project at the purpose level is to assist the MOAC to more effectively direct its research and extension programs toward the small farmer -- under both irrigated and rainfed conditions.

## 2. Benefits

### a. Potential Under Irrigated Conditions

The GOS has recognized the potential for irrigation in Swaziland and has set goals for development of its water resources as follows:

- (1) Maximize employment opportunities;
- (2) Increase government revenue;
- (3) Increase value added;
- (4) Increase foreign exchange earnings;
- (5) Increase import substitution; and
- (6) Protect and enhance the environment for the long-term benefits of the country.

The U.S. Corps of Engineers recently completed a study on the potential for increased irrigation in Swaziland. Data from this study indicate that about 42,000 hectares are now being irrigated, and the nation has a potential for 57,100 hectares more with the surface water now available (see Annex E Table E-2). The Corps of Engineers study did not attempt to estimate ground water potential, but such a study is now planned. The Corps study did, however, identify the amount of land potentially suitable for irrigation, in addition to that potentially irrigable by surface water, and found that an additional 96,517 hectares could be irrigated if water was available from other sources.

The Corps of Engineers study also estimated benefits, costs, internal rates of return, number of on-farm and off-farm jobs created, number of homesteads resettled from project lands, and number of project homesteads created in line with the GOS goals for development (see Annex E Table E-3).

The Lomati River basin (without storage) had the highest internal rate of return (33 percent) from increased irrigation. Two dam sites within the Usutu basin had the lowest internal rate of return (7 percent). The internal rate of return does not tell the whole story, however. The creation of additional farming jobs is also an important factor. An estimated 19,500 on-farm and 39,000 off-farm jobs would be created if irrigation were developed to its potential on land presently suitable for

surface water irrigation. With the development of ground water resources the number of jobs attributable to irrigation would be even higher.

Potential      b. Rainfed and Irrigated SNL - Farm Gross Margin

The CDSS focuses on the importance of irrigated agriculture as a long-term strategy for development of the agricultural sector. Thus, a significant portion of the research effort (the specific percentage will be determined by the implementation team, but will be approximately 50 percent) will be allocated to developing cropping systems under irrigated conditions. However, a major emphasis on rainfed cropping research is included in the project in support of the SNL farmers in the short and intermediate time horizon.

It is not possible to estimate an overall benefit-cost ratio or internal rate of return for projects that are institution-building. However, some evidence of the relative profitability of enterprises using present practices, and the potential for improvement in income with improved practices, is available from studies conducted in the RDAs. Table IV.E.1 shows the "profitability" of maize, beans, cotton, and tobacco under alternative conditions. The concept used to indicate "profitability" is gross margin which is defined as the residual claimant to income after all variable costs have been subtracted from gross income (including imputed value of production used for home consumption). In these examples, the residual claimants are land, unpaid family labor, capital, and management.

TABLE IV E.1

Crop Profitability per Hectare - RDA's

	Maize			Beans	Cotton	Tobacco
	Traditional Local Variety	Traditional Hybrid	Semi- Mechanized	Traditional Techniques	Semi- Mechanized	Semi- Mechanized
Output (kg)	1,000.00	2,700.00	2,500.00	800.00	1,600.00	800.00
Price (E/Kg)	0.12	0.12	0.12	0.59	0.45	1.15
Value of Output (E)	120.00	324.00	420.00	472.00	720.00	880.00
Variable Cost (E)	45.80	125.47	166.26	111.88	271.65	246.28
Gross Margin (E)	74.20	198.53	253.74	360.12	448.35	633.72
Labor Requirements (Days)	22.00	21.00	21.00	122.00	76.00	207.00
Gross Margin/Labor Day	3.37	9.45	12.08	2.95	5.90	3.06

Source: Ministry of Agriculture, Crop Profitability Guide Book, May 1980. E1=\$1.30

A limitation of the gross margin concept is that it does not show profitability per unit of labor, which may be more important to the Swazi farmer than profitability per hectare. For example, semi-mechanized tobacco has the highest gross margin per hectare (E634), but earns only E3.06 per labor day because it is highly labor intensive. In comparison semi-mechanized maize has a gross margin of E254 but earnings per labor day of E12.08 (E1=US \$1.30).

Using data from the Cropping Profitability Guide Book No. 6, January 1980, MOAC, a series of typical case studies were developed to show the possible increase in incomes which could be achieved by SNL farmers.

Under present cropping practices, a three hectare (ha) farm would probably include 2.0 hectares of maize, 0.5 hectares of beans, and 0.5 hectares of groundnuts. The following table, Present Situation, provides an illustration of current gross margins under certain assumptions regarding fertilizer and insecticide usage (columns 3 and 4 show the amount of recommended levels of fertilizer and insecticide application that are actually used by the farmer). The total gross margin to the farm is estimated at E225.80 in the Present Situation table. The examples that follow are based on this table; certain variables and the types of crops grown are changed to depict gross margins under different cropping practices.

#### Present Situation

Crop	Ha	% Fert. Recom.	% Insect. Recom.	Yield/ Ha	GM/HA	GM/LD*	TOTAL GM
Maize	2	50%	50%	1000 Kg	E67.15	E3.12	E134.30
Beans	1/2	0%	0%	300 Kg	138.00	2.77	69.00
Groundnuts	1/2	0%	0%	550 Kg	45.00	.10	22.50
TOTAL GM							E225.80

\* GM - Gross Margin      LD - Labor Day

In Example 1, it is assumed that the farmer decreases the area of maize to 1.5 ha (enough to satisfy home consumption requirements of 1500 to 1750 kg), discontinues the growing of groundnuts and increases the amount of beans to 1.5 ha. With cultural practices assumed to remain the same, the gross margin on the farm would increase to E308 or 36 percent over base conditions.

#### Example 1

Crops	Ha	% Fert. Recom.	% Insect. Recom.	Yield/ Ha	GM/HA	GM/LD	TOTAL GM
Maize	1 1/2	50%	50%	1000 Kg	E67.15	E3.12	E100.72
Beans	1 1/2	0%	0%	300 Kg	138.00	2.77	207.00
Groundnuts	0	-	-	-	-	-	-
TOTAL GM							E307.72

In Example 2, the farmer grows the same crops on the same land area, but applies fertilizer to maize at the recommended level. The gross margin is less than estimated for Example 1, but still shows a 10 percent increase over the present conditions.

#### Example 2

Crop	Ha	% Fert. Recom.	% Insect. Recom.	Yield/ Ha	GM/Ha	GM/LD	TOTAL GM
Maize	2	100%	50%	1500 Kg	E80.00	E3.72	F160.00
Beans	1/2	0%	0%	300 Kg	138.00	2.77	69.00
Groundnuts	1/2	0%	0%	550%	45.00	.70	22.50
TOTAL GM							E251.50

In Example 3, it is assumed that the farmer retains the 1.5 ha of maize for home consumption, plants 1.25 ha in beans, and allocates the remaining 0.25 ha to tobacco. This action more than doubles gross margin for the farm. It must be noted, however, that tobacco is a labor intensive crop and that a significant amount of unpaid family labor is included in the gross margin calculations.

#### Example 3

Crop	Ha	% Fert. Recom.	% Insect. Recom.	Yield/ Ha	GM/Ha	GM/LD	TOTAL GM
Maize	1 1/2	50%	50%	1000 Kg	E67.15	F3.12	E100.72
Beans	1 1/4	0%	0%	300 Kg	138.00	2.77	172.50
Tobacco	1/4	100%	100%	800 Kg	766.81	3.09	191.70
TOTAL GM							E464.92

In Example 4, it is assumed that the farmer is willing to allocate 1.0 ha to improved pasture in order to meet the requirements for receiving 2 dairy cows. In this case, the farm gross margin would increase by E258 and cash income would be available throughout most of the year.

#### Example 4

Crop	Ha	% Fert. Recom.	% Insect. Recom.	Yield/ Ha	GM/Ha	GM/LD	TOTAL GM
Maize	1 1/2	50%	50%	1000 Kg	E67.15	E3.12	E100.72
Beans	1/2	0%	0%	300 Kg	138.00	2.77	69.00
Improved Pasture	1	50%	-	400 lt	314.05	5.65	314.05
TOTAL GM							E483.77

In the final example, it is assumed that the farmer is given the opportunity to be allocated 0.4 ha of irrigated land. The farmer produces the following crops:

Summer

Green Mealies	0.20 ha	E243.00
Tomatoes	0.16 ha	240.00
Carrots	0.04	<u>180.00</u>
		E663.00

Winter

Cabbages	0.20 ha	E334.00
Tomatoes	0.08 ha	120.00
Onions	0.08 ha	480.00
Carrots	0.04 ha	<u>180.00</u>
		E1,114.00

Gross Receipts	E1,777.00
Total Variable Costs	<u>E 368.65</u>
<b>TOTAL GROSS MARGIN</b>	<u><u>E1,408.35</u></u>

The gross margin is more than 5 times that of the farmer's present return from rainfed farming. However, it also assumes the farmer has: (1) the technical knowledge for production of these vegetables; (2) sufficient labor for production of these crops; and (3) a market for the vegetables produced. Thus, the example is indication of future potential rather than a realistic alternative under present conditions.

c. Income Targets for SNL Farms

One method to determine whether small holder farming is economically attractive is to compare farm income and other benefits with those obtained by unskilled laborers. It is estimated that the pineapple industry pays E1.47 per labor day for unskilled labor; the sugar industry pays E1.72. The rate for unskilled labor employed by the Government is around E2.50 per labor day. Assessment of the opportunity cost of remaining in agriculture does, however, require much more than a direct comparison of wage rates. The costs of housing, food, and fuel would be quite different for a family living on wage employment as compared to the family on a small holding.

It was suggested in the ID that a total gross margin of \$1,500 (E1,150) may be a reasonable income target which would begin to stem the flow of labor from the farm. The typical SNL homestead is not now making this target income from crop and live-stock sales.

This project, or indeed this project in conjunction with all currently active agricultural projects in Swaziland, will probably not result in a majority of the farmers reaching the income target of \$1,500 in the near future. Thus, farm-to-town migration is expected to continue. However, this project will help to slow this trend and contribute to the USAID's estimate that 20 to 30 percent of the farmers could reach this target by 1997. Other farmers will be able to achieve smaller increases in income. Perhaps, of more importance, is that even if an estimated 80 percent of farmers do not reach the income target goal, farming will at least become relatively more attractive when compared with off-farm alternatives.

#### d. Other Benefits

The cropping systems research approach is one which first considers the small SNL farmers' resource situations, then adapts present research and designs new research to meet their special needs. Benefits from this approach should result in increased real income for SNL farmers, improved nutrition, and improved living conditions in general. It should benefit the whole economy through improved food self-sufficiency and reduced food imports with less loss of foreign exchange; increased foreign exchange earnings as surpluses are produced for export; and, a multiplier effect on the whole economy by increasing the cash flow from SNL.

These benefits should be achieved with little or no loss to the large farm or estate agriculture; this sector is already advanced and finances its own research. The shifting of scarce research and extension efforts to the SNL should result in marginal returns being greater per unit spent, as this is where land, labor, and other resources are the most underutilized.

### 3. Constraints Analysis and Alternatives

The selection of the cropping system approach as a method of increasing economic viability of SNL farmers was based on an analysis of potential constraints and alternative design approaches. The major alternative project approaches included: (1) an emphasis on the livestock rather than the crop subsector; (2) the broadening of the project to include both the crop and livestock subsectors; and (3) a marketing- rather than a production-oriented approach.

The fact that only 13 percent of SNL is used for crop production and homesteads suggests that a livestock rather than a crop emphasis may be preferable. However, an evaluation of the alternatives indicated that the high percentage of grazing land was due to limited crop production potential under dryland conditions. The returns to the limited water resource would be higher for cropping land than for pasture land. Thus, a cropping systems approach is the better alternative.

A second alternative was to examine a farming systems approach which included both crop and livestock production activities. The basic decision is to not implement this design as it does not provide the critical mass of people needed to effectively implement the program. It would result in spreading people too widely, thus running the risk of a complete collapse of the project. Conversely, the PP design team recognized the interrelationship between the crop and livestock subsectors and the constraints which this imposed on the cropping systems approach. Constraints have been attacked three ways: (1) the decisions made within the cropping systems approach will provide for a direct and specific evaluation of the potential impact on livestock; (2) a relatively large input of short-term consultants will permit the flexibility of bringing livestock specialists to Swaziland for specific problems; and (3) the livestock question will be periodically assessed by the evaluation teams with a potential of shifting to more emphasis on livestock in the later phases of the project.

The third major alternative approach which was considered was implementing a marketing rather than a production-oriented project. The decision to focus on production is based on the belief that marketing follows production in a natural sequence - especially when the project faces the lead-time required for research findings to impact on the cropping practices of the typical SNL farmer. This does not deny the importance of the marketing function, and indeed it must be available in some form for the project to be a success. The constraint is not insurmountable, however, because: (1) there is a rudimentary agricultural marketing system currently available in Swaziland; (2) several other donors are currently active in evaluating potential marketing projects; and (3) the flexibility in this project design will permit the use of marketing consultants to tackle specific marketing problems as they arise.

In addition to meeting the objective of a "critical mass" of personnel working on a realistically defined problem area, the cropping systems approach also was judged to be the most cost-effective of the alternatives considered.

#### Cost-Effectiveness

The decision criteria used in determining a cost-effective approach is the economic maximization of the returns to the scarce inputs in the attainment of a given objective. In the project, the crucial inputs are those needed to increase the economic viability of the farm sector, and, in turn, the income of the farm homesteads. The PP design team considered

that two inputs--labor and water for irrigation--are the crucial inputs, and on the basis of the analysis, it was concluded that the returns to labor allocated to crop production would be higher than if it was assigned to increasing livestock production on the communal grazing land. (The returns to labor in the dairy industry might be higher but there is currently a major dairy project in Swaziland sponsored by the Canadian Government.) The other critical input, water for irrigation, would also be expected to return a higher yield in the production of crops than in livestock. The probable return to irrigated pasture land would tend to be both meager and costly considering the terrain of typical Swazi pasture land.

It is difficult to make direct cost-effective comparisons between production-oriented and marketing-oriented projects. A more realistic comparison is between the proper sequencing of activities, i.e., that the production-related activities must precede the development of an expanded marketing system. In this project, it was the judgement of the PP design team that crop production activities were more cost-effective than marketing-oriented activities.

#### 4. The Internal Rate of Return (IRR)

In order to relate the effect which this project aims to have on SNL farmer/homestead income and the resources used, internal rates of return (IRR) were computed. In all cases, checks were made to test whether or not the non-continuous benefit and cost streams could lead to more than one IRR.

The cost stream is composed of two parts, (a) the AID contribution, which is time-dimensioned on page 54, and (b) GOS/MOAC's recurrent budget contribution which is time-dimensioned on pages 56 and 57. (In Tables V.5 and V.6, only line three is used for the Swazi contribution, i.e., "incremental cost of this project to MOAC" and "cost of expanded research, information and inservice training programs".) It is assumed that the costs to the GOS will rise by 15% each year after 1989/90. All costs given in local currency are converted to U.S. dollars using E1=US\$1.30.

The benefit stream also has two components: (a) the number of homesteads effected by the project and (b) the average level of changed income. In the logical framework (Annex I-2) one objectively verifiable indicator (2.c) is "reaching 75% of the SNL farmers yearly with research recommendations". Since there are 42,000 homesteads, the target is to reach 31,500. In order to be as conservative as warranted, this analysis assumes that only 21,000 homesteads will be reached (67% of the target and 50% of all SNL homesteads). The income targets are discussed on pages 50-51. The analysis assumes that 20-30% of the SNL farmers will have their incomes increased by \$1,500 per year. If we assume that an equal portion of farmers will have no change in their incomes, and an equal distribution between these extremes, then the target for income change per SNL homestead is \$750. Again, in order to be conservative, this IRR analysis assumes that the income change will only be \$400 (53% of the target).

Neither of the above changes are criticisms of the targets, but rather an effort is made to judge the project by a harsh standard.

For both the number of homesteads reached and income changed, a path from project initiation to project goal achievement must be assumed. The standard "S"-shaped learning curve meets the requirements of both in that it indicates very few benefits/beneficiaries in the early years, followed by major changes when the institution is in place and functioning. The "S" is completed by the "maturity" phase when the changes are more again moderate.

The last necessary assumption is the time horizon for project benefits and costs. The basic model uses a ten-year horizon. There is nothing special about this timeframe, and sensitivity analysis, discussed below, also tests alternative horizons.

Using this model, the IRR for this project is 17.25%. There are three conditions, or cases, under which traditional benefit-cost analysis often misestimates the IRR:

1. large-scale unemployment in situations where there is a minimum wage indicates that the social cost of unskilled and semi-skilled labor is lower than actually paid;
2. many LDC foreign exchange rates are overvalued as evidenced by an active illegal trade in currency; and
3. shortages of host government recurrent revenue indicates that the true cost of using limited funds is in excess of actual costs.

In all three cases, this analysis seeks to use the opportunity cost of the item being analyzed.

For case one, this analysis used the figures in the financial tables (Annex K) to derive estimates of Swazi labor costs. Since all assumptions, when there is unemployment in urban areas, tend to lower the social cost of expenditures, they also raise the IRR. For this reason, the analysis chose to only discount the GOS salaries by 30%. This raised the IRR to 19%. If the salaries are discounted by 50%, the IRR rises to nearly 22%.

Case two is not analyzed since the Swazi emalangeni is tied to the South African rand and is not considered over- or undervalued to any significant degree. Some observers feel the rand is slightly undervalued now. Any adjustments would tend to raise the IRR, but by relatively insignificant amounts.

For case three, the analysis needs to be cognizant of the heightened pressure to allocate a scarce resource--GOS recurrent revenue. As this stagnates, the pressure will increase. A very extreme assumption would be that the opportunity cost of GOS recurrent expenditures is twice

actual costs. This change lowers the IRR to 13½%.

Summary: For the three modifications, two tend to increase the IRR and one will reduce it. On balance, it is felt that the over-estimate of wages has a stronger impact than the dampening effect of underestimated recurrent costs. (Foreign exchange costs are not considered significant.) These modifications, as a group, tend to improve the basic model's IRR.

#### Sensitivity Analysis

Three sensitivity tests were done on the data:

1. testing the effect of changes in the number of homesteads affected;
2. testing the effect of changes in the average income per homestead; and
3. testing the effect of change in the time horizon.

If the project affects the 31,500 homesteads, which is its goal, then the IRR rises to 27%. If only 18,000 homesteads are reached, then the IRR falls to 14%. If only 15,000 homesteads (36% of SNL homesteads) are reached, then the IRR is 10%. This sensitivity test illustrates that, even if the project fails to meet its goals, it still makes economic sense.

Only if it cannot even reach half of its own goals does the IRR fall to a critically low 10%.

With income, the project target is an increase of \$750 by 1991. If this is reached, then the IRR would approach 40%. If it can only reach \$350, the IRR is 14%; and reaching a \$300 income change per homestead reduces the IRR to 10%. (This is changing income by only \$33 per person within the homestead.)

In both cases the sensitivity tests show that, even if these analyses' already-conservative adjustments to targets are not met, the project still possesses high IRRs. In fact the project's targets yield IRRs that are just slightly below those of other agricultural research projects elsewhere in the world (see Annex E-1).

The IRR is exceptionally sensitive to the time horizon. For the first seven years, the basic model has a negative IRR, i.e., at all positive discounts rates, costs will exceed benefits. In the eighth year, the project's IRR rises to 1.88%. A eighty-year time horizon boosts the IRR to 11.53%, and a ten-year horizon has the IRR at 17.25%. With a fifteen-year horizon, the IRR jumps to 27.88%, and a twenty-year horizon has the IRR over 30%.

When the project is completed, in 1987, the IRR is still negative. The external evaluation must look beyond already attributable benefits to whether or not the institutional development has taken place to a sufficient degree to allow for increased benefits and beneficiaries after that date.

Summary: Under all reasonably conservative assumptions, the project's IRRs are uniformly high. It is highly unlikely that failure of any one assumption will destroy the economic viability of the project. Of course, if a number of unrelated factors all occur, then the IRR can become not worthwhile: i.e., an exceptional stagnation of recurrent revenues combined with huge increases in urban unemployment, combined with a failure to get information to the households, combined with a failure to get useful information to those households which are affected. If all of these combine, then the IRR will be exceptionally low. Even if the probability of each separately occurring is a very high 70%, the likelihood of all occurring together is only 20%. While possible, this is highly unlikely.

As long as a ten-year time horizon is used for analysis, the project makes economic sense.

## V. Financial Plan and Recurrent Budget Analysis

### A. Project Funding Summary

As currently designed, the total cost of this project is estimated at \$17,309,000. Of this total, AID will finance \$12,900,000; the GOS will provide \$4,354,000; and the US Peace Corps will contribute \$55,000 in volunteer support. A summary of these contributions, identified by major project component, is provided in Tables V.1 and V.2, while Table V.3 provides AID expenditures for each component by fiscal year as well as projected yearly obligations. More detailed cost estimates for both AID and the GOS are contained in Annex K, Financial Tables. Annex L, Equipment List, provides a detailed breakdown of equipment and commodities to be funded by AID.

Table V.1

Source and Use of Funds  
(\$ 000)

<u>Sources</u>	<u>A.I.D.</u>		<u>GOS</u>		<u>U.S. Peace Corps</u>		<u>TOTAL</u>
	<u>FX</u>	<u>LC</u>	<u>FX</u>	<u>LC</u>	<u>FX</u>	<u>LC</u>	
<u>Use</u>							
Cropping Systems							
Research	7387	340	-	3440	26	24	11,217
Agricultural Information	1681	126	-	585	-	-	2,392
Extension Training	2132	-	-	220	-	-	2,352
Evaluation	48	-	-	-	-	-	48
Subtotal FX & LC	11,248	466	-	4245	26	24	16,009
Subtotal FX + LC	11,248			4245		50	16,009
Contingency	1,186			109		5	1,300
<b>TOTAL PROJECT</b>	<b>12,900</b>		<b>4354</b>		<b>55</b>		<b><u>17,309</u></b>
(% of Total)	(74.5%)		(25.2%)		(.3%)		

Table V.2

A.I.D. Funding by Input and Project Component (\$ 000)

<u>Input</u>	<u>Research</u>	<u>Extension Training</u>	<u>Agricultural Information</u>	<u>TOTAL</u>
Technical Assistance	6138	1001	1001	8,140
Training	613	1057	111	1,781
Construction	388	-	252	640
Equipment/Commodities	437	65	390	892
Vehicles	76	9	53	138
Other (Local)	75	-	-	75
Subtotal (t)	7727 (66)	2132 (18)	1807 (16)	11,666 (100)
Contingency (15% on equipment, 10% on all other items)				1,181
Add: External Evaluation (Includes 10% contingency)				53
TOTAL				12,900

- Inflation factors for both tables are included in line items.
- See Annex D for details including base cost estimates, inflation factors, and yearly expenditures for both A.I.D. and GOS.

TABLE V.3  
Expenditures and Obligations by Fiscal Year (\$ 000)

<u>Expenditures</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>	<u>FY 86</u>	<u>FY 87</u>	<u>TOTAL</u>
Technical Assistance	-	900	1354	1516	1590	1776	1004	8140
Training	-	79	288	484	502	324	104	1781
Construction	-	346	136	158	-	-	-	640
Equipment/Commodities	-	399	90	83	93	105	122	892
Vehicles	-	108	14	16	-	-	-	138
Other Local Costs	-	16	19	10	11	12	7	75
Evaluation	-	-	-	-	48	-	-	48
Contingency	-	200	190	227	225	221	123	1186
<b>TOTAL EXPENDITURES</b>	<b>0</b>	<b>2048</b>	<b>2091</b>	<b>2494</b>	<b>2469</b>	<b>2438</b>	<b>1360</b>	<b>12,900</b>
<u>Obligations</u>	<b>3406</b>	<b>-0-</b>	<b>1410</b>	<b>3000</b>	<b>3000</b>	<b>2084</b>	<b>-0-</b>	<b>12,900</b>
Pipeline	<b>3406</b>	<b>1358</b>	<b>677</b>	<b>1183</b>	<b>1714</b>	<b>1360</b>	<b>-0-</b>	<b>-0-</b>

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## B. The MOAC Recurrent Budget

The total GOS recurrent budget has increased in recent years from E45.0 million in FY 77/78 (April 1, 1977 through March 31, 1978) to E98.2 million in FY 81/82 (E1=US \$1.30), an increase of 117 percent over the period ( a compound annual rate of 21.5 percent). At the same time, the MOAC budget has increased by 117 percent as well, from E4.1 million to E8.9 million. Therefore, the MOAC's share of the total GOS recurrent budget has remained constant at approximately 9 percent.

A breakdown of the FY 77/78 and FY 81/82 MOAC recurrent budget by major activity center is as follows:

Table V.4

### MOAC Budget by Activity Center

	1977/78		1981/82	
	E (000)	% of Total	E (000)	% of Total
Minister	43	1.0	81	.9
Ministry Administration	383	9.4	1354	15.2
Livestock	1978	48.6	3204	36.0
Crops	801	19.7	1468	16.5
Fisheries	61	1.5	94	1.1
Forestry	38	.9	136	1.5
RDA	276	6.8	662	7.4
Land	270	6.6	512	5.7
Research <u>1/</u>	-	-	722	8.1
Home Economics	121	3.0	231	2.6
Economic Planning	103	2.5	102	1.1
Cooperatives <u>2/</u>	-	-	347	3.9
<b>TOTAL</b>	<b>4074</b>	<b>100.0</b>	<b>8913</b>	<b>100.0</b>

1/ Research was transferred from the University College of Swaziland in 1979/80 to the MOAC; E442,000 was budgeted by the MOAC for research in that year.

2/ Until FY 1979/80, Cooperatives were part of the Ministry of Commerce and Cooperatives before being transferred to the MOAC in that year.

The three activity centers that will be involved in this project are Ministry Administration (which includes the Agricultural Information Section), Crops (which includes the extension in-service training function), and Research. Since 1977/78, the relative budgetary position of Ministry Administration has increased from 9.4 to 15.2 percent of the total MOAC budget while that of Crops has declined slightly from 19.7 to 16.5 percent. The recurrent budget for the Research Division is currently 8.1 percent.

Assuming that the total GOS recurrent budget will continue to grow at 21.5 percent per year and that the MOAC's share will remain, at minimum, constant at 9.1 percent, the following table depicts probable MOAC total recurrent budget levels and the recurrent costs associated with this project:

Table V.5

MOAC Recurrent Budget Estimates (E 000)

	<u>FY 1981/82</u>	<u>82/83</u>	<u>83/84</u>	<u>84/85</u>	<u>85/86</u>	<u>86/87</u>
1. MOAC Recurrent Budget	8913	10,857	13,192	16,028	19,474	23,660
2. Increase from Previous FY	-	1,944	2,335	2,836	3,446	4,186
3. Incremental Costs of this Project to MOAC		99	156	164	156	170
4. Project incremental cost as percentage of total MOAC recurrent budget increase		5.1	6.7	5.8	4.5	4.1

(Figures do not include contingency or partial year funding in 1987/88.)

The recurrent budget increase resulting from project activities is well within the anticipated MOAC allocations. Even assuming a decline in the total GOS recurrent budget growth rate to 15 percent (with the MOAC share of the that budget remaining at 9.1 percent), the costs associated with this project do not exceed 10.1 percent of the MOAC's incremental budget in any given year. On the other hand, assuming the GOS total recurrent budget continues to grow at 21.5 percent but the MOAC's share of the total recurrent budget declines to, for instance, 8.0 percent, project costs account for only 7.6 percent (at the maximum) of the MOAC's total incremental budget.

Some of the costs in the above analysis are associated with activities that will not be continued after AID assistance is terminated (e.g. participants' air fare, house furnishings), and some commodity costs funded by AID during the project must be included in future MOAC budgets. The following table depicts the recurrent budget implications of the expanded research, information, and extension in-service training programs after FY 1986/87.

Table V.6  
MOAC Recurrent Budget After Project Termination (E000)

	<u>FY 1987/88</u>	<u>88/89</u>	<u>89/90</u>
1. MOAC Recurrent Budget	28,747	34,928	42,437
2. Increase from Previous Year	5,087	6,181	7,509
3. Cost of Expanded Research, Information, and In-Service Training Programs	216	248	285
4. 3 as a percentage of 2	4.2	4.0	3.8

As can be seen from Table V.6, maintenance of the research, agricultural information, and extension in-service programs at the level institutionalized by this project (including a 15 percent/year inflation rate), requires a constantly diminishing share of the MOAC's recurrent budget increments (figures do not reflect levels of activity beyond those created during the project nor the possibility of follow-on AID project funding). Care was taken during the project design to utilize existing MOAC resources and staff positions to the extent possible. Few new positions will be required under the project; for the most part, Swazis will be trained to fill existing posts for which budget allocations are available. Furthermore, the efficiencies that will result from a better trained and supported extension service should result in cost savings that will offset some of the incremental costs associated with the project.

The MOAC, Ministry of Finance, and the Department of Economic Planning and Statistics have reviewed the recurrent budget implications of the project and agree with the PP design team that the future recurrent costs are well within the GOS' financial capacity.

## VI. Implementation Plan

### A. Implementation Schedule

The following schedule presents the major implementation actions to take place during the project along with the responsible agent.

<u>Date</u>	<u>Action</u>	<u>Responsibility</u>
Aug 81	Grant Agreement signed	USAID/GOS
Sept 81	Preliminary planning for all facilities to be constructed, including designs for Ag. Info. Bldg. and Malkerns facilities	GOS
Sept 81	Tender document issued for construction of TA House	GOS/USAID
Oct 81	Contract negotiated with contracting university	AID/W/Contractor
Oct 81	Two station wagons and two pickup trucks ordered for technical assistance team	GOS/USAID
Oct 81	Tenders for Ag. Info. Bldg. and Malkerns facilities	GOS/USAID
Dec 81	Ag. Info. Bldg., Malkerns Soils Lab, Library, and TA House contracts awards	GOS/USAID
Dec 81	Three pickup trucks ordered for technical assistance team	GOS/USAID
Jan 82	Chief of Party, Rural Sociologist, Extension Training Specialist and Economist arrive in Swaziland	Contractor
Feb 82	3 candidates selected for US training; applications submitted to universities	GOS/USAID/ Contractor
Feb 82	One pickup truck ordered for technical assistance team	GOS/USAID
Mar 82	First contingent of equipment and supplies ordered	Contractor
Mar/Apr 82	Swazi counterparts identified (and posts established, if necessary) for each U.S. technician on project and transferred to specific positions	GOS

<u>Date</u>	<u>Action</u>	<u>Responsibility</u>
Mar 82	3 candidates selected to enroll in refresher course in University College of Swaziland (UCS)	GOS/USAID/ Contractor
Apr 82	All remaining members of technical assistance team arrive Swaziland (except Agricultural Information Specialist)	Contractor
Apr 82	Rural Sociologist and Agricultural Economist provide leadership in designing and conducting base-line survey	Contractor/ GOS
Apr/June 82	Research staff observe harvest and begin detailed planning for 1982/83 cropping season	Contractor/GOS
May 82	3 Swazis leave for M.Sc. program in US	GOS/Contractor
May 82	4 Swazis leave for B.Sc. program	GOS/Contractor
Jun 82	TA house and Malkerns facilities completed	GOS/USAID
Jun 82	Agricultural Information Specialist arrives in Swaziland	Contractor
Jun 82	Tender for first seven field research houses and five storage sheds	GOS/USAID
Jun 82	Ag Information technician selected; departs for 6 months training	GOS/Contractor
Aug 82	Contracts awarded for seven field houses and five storage sheds	GOS/USAID
Aug 82	Second contingent of equipment ordered	Contractor
Aug 82	Four vans for AIS ordered	GOS/USAID
Sept 82	Start of program for first crop season under project	Contractor
Aug 82	First group of five Research Assistants begin training at research station	GOS/Contractor
Nov 82	Ag. Info. Bldg. completed	GOS/USAID
Dec 82	Ag. Information technician returns from training	Contractor
Feb 83	4 candidates selected for training in US; applications submitted to universities	GOS/Contractor

Date	Action	Responsibility
Mar 83	4 candidates for training enrolled in UCS for refresher courses	GOS/Contractor
May/Jun 83	Data from base-line survey collected and preliminary analysis completed	Contractor
Apr 83	Equipment and motorcycles for first field team ordered	Contractor
Apr/Jul 83	Research team analyzes results from first crop season	Contractor
May 83	4 Swazis leave for training in U.S. (2 M.Sc., 2 M.Ed.)	GOS/Contractor
May 83	Start of program for first irrigated crop season	Contractor
May 83	4 Swazis leave for B.Sc. training	GOS/Contractor
Jun 83	Completion of first seven field houses and five storage sheds	GOS/USAID
Jun 83	Tender for remaining seven field houses and five storage sheds	GOS/USAID
Jun 83	First five field research teams transferred to field sites	GOS/Contractor
Jul 83	Internal Evaluation (PES)	USAID
Aug 83	Second group of five Research Assistants begin training at research station	GOS/Contractor
Aug 83	Contract awards for remaining seven field houses and five storage sheds	GOS/USAID
Aug/Sept 83	Analysis of irrigated crop season results	Contractor
Sept 83	Results of research findings published in annual report	Contractor/GOS
Sept 83	Start of new crop season program	Contractor
Feb 84	4 candidates selected for training in US; applications sent to universities	GOS/Contractor
Mar 84	4 candidates for advanced training enroll in refresher courses at UCS	GOS/USAID
Apr 84	Equipment and motorcycles for second field team ordered	Contractor
May 84	3 students complete M.Sc. training, return to Swaziland and start work with TA counterparts	GOS/Contractor

Date	Action	Responsibility
May 84	4 M.Sc. trainees depart for US	GOS/Contractor
Apr/Jul 84	Data and preliminary analysis of first annual update of socio-economic information completed	Contractor/GOS
Apr/Jul 84	Team analyzes results of previous crop season	Contractor/GOS
May 84	Start of irrigated crop season program	Contractor
Jun 84	Remaining seven field houses and five storage sheds completed	GOS/USAID
Jun 84	Second five field research teams transferred to field sites	GOS/Contractor
Jul 84	Internal Evaluation (PES)	USAID
Aug/Sept 84	Analysis of irrigated crop season results	Contractor
Sept 84	3 Swazis assume responsibility of position with TA as advisors	GOS/Contractor
Sept 84	Research findings published in annual report	GOS/Contractor
Sept 84	Start of new crop season program	Contractor
May 85	4 students complete M.Sc. training; return to Swaziland and start work with TA counterparts	GOS/Contractor
Apr/Jul 85	Team analyzes results of previous crop season	Contractor
Apr/Jul 85	Data for 2nd annual update of socio-economic information; in conjunction with previous information the research program's overall direction is re-examined	Contractor/GOS
May 85	Start of irrigated crop season program	Contractor
May/Aug 85	On-farm demonstration program of research findings under irrigated conditions	GOS/Contractor
Jul 85	External Evaluation	REDBSO/EA/Consultants
Aug/Sept 85	Analysis of irrigated crop season results	Contractor
Sept 85	4 Swazis assume responsibility of positions with TA as advisors	Contractor
Sept 85	Research findings published in annual report	GOS/Contractor

Date	Action	Responsibility
Sept 85	Start of new crop season program	Contractor
Sept 85 - Apr 86	On-farm demonstrations of research findings	GOS/Contractor
Jan 86	Start decision process for determining whether a phase II will be implemented	USAID/GOS/ Contractor
May 86	4 students complete M.Sc. training in US and return to start work with counterparts	GOS/Contractor
May 86	4 B.Sc. graduates return to work in Crop Production Section	GOS/Contractor
Apr/Jul 86	Team analyzes results of previous crop season	Contractor/GOS
Apr/Jul 86	Socio-economic team gathers new data, analyzes 4 years of data, and makes comparisons	Contractor/GOS
May 86	Start of final irrigated crop season program	Contractor/GOS
May/Aug 86	On-farm demonstrations of irrigated research findings	GOS/Contractor
Jul/Aug 86	Follow-on PP Design, if required	USAID/Contractor; GOS
Aug/Sept 86	Analyses of final irrigation crop season results	Contractor/GOS
Sept 86	4 Swazis assume responsibility of position with TA as advisors	GOS/Contractor
Sept 86	Research findings published in annual report	GOS/Contractor
Sept 86	Start of final crop season program	Contractor/GOS
Sept 86 - Apr 87	On-farm demonstrations of research findings	GOS/Contractor
Oct 86	Phase II PP Approval	AID/W
Jan 87	Contract signed for implementation of Phase II	AID/W/Contractor
Apr 87	Summary report of research findings during first five years	Contractor/GOS
Apr/Jul 87	Research staff analyze results of previous crop season	GOS/Contractor

## B. Implementation Responsibilities

### 1. GOS

a. Agricultural Research Division. The GOS will transfer five Crop Production Specialists from the Crop Production Section of the MOAC to the Research Division to serve as counterparts to AID-funded technical assistance team. In addition, the GOS will establish five positions in 1982 and five in 1983 for Research Assistants. The first five positions will be filled by April 1982 either by recruiting new diploma graduates or transferring experienced Research Recorders who are diploma holders into those positions. The remaining five Research Assistant positions will be filled by April 1983.

b. Extension In-Service Training Section. The GOS will formally establish an Extension In-Service Training Section in the Agriculture Division of the Ministry of Agriculture and Cooperatives. The existing post for the Extension In-Service Training Coordinator will be transferred from the Agricultural Information Section to the new section and an additional position will be created for an Assistant Coordinator. A position will also be established for one secretary/typist and all three positions will be filled in FY 82/83.

c. Agricultural Information Section. The GOS will fill one existing Farm Radio Broadcaster position, and two of the existing three projectionist positions (one is already filled). A fourth projectionist position will be established and filled in 1983.

d. Other. The GOS will be responsible for the timely selection of participants with adequate academic qualifications for training in disciplines as illustrated in Table III.2 of this PP and in accordance with the time frames illustrated in this table.

In conjunction with commodity support from AID, the GOS will be responsible for providing adequate recurrent budget support to implement and carry out the programs in Agricultural Research, agricultural information, and extension in-service training. The GOS will also be responsible for providing facilities for research and extension in-service training.

The Public Works Department of the Ministry of Works, Power and Communications will be responsible for coordinating all project construction activities. The Public Works Department will prepare final plans and specifications, tender documents, and will select and supervise contractors. Plans, contracts and construction will be inspected and approved by AID engineers; these approvals will be formalized in Project Implementation Letters submitted to the GOS.

## 2. AID

USAID/Swaziland will be responsible for project monitoring, and the USAID/S project manager will serve as the primary contact point for the contract team's Chief of Party and will be responsible for obtaining decisions on contract and project matters. USAID/S will prepare necessary PIO/Ts and Project Implementation Letters and will be responsible for the preparation of one Project Evaluation Summary in addition to the supervision of the one external evaluation. USAID/S will issue Source and Origin Waivers to permit Code 935 procurement under Mission Director Authority, or request such waivers from AID/W if required.

USAID/S will disburse funds for local costs on a reimbursable basis following procedures to be defined in the Grant Agreement and Project Implementation Letters. Funds for construction will be disbursed on a Fixed Amount Reimbursement (FAR) basis with disbursement levels and procedures for advances to be established with assistance from USAID engineers and set forth in Project Implementation Letters.

## 3. Contractor

The design of this project was carried out through the collaborative mode with assistance provided by a Title XII Institution; it is planned that the project will be implemented by the same institution, Pennsylvania State University (Penn State). AID/W, in coordination with USAID/S, will contract with Penn State to provide the technical assistance proposed for the project. Penn State (referred to in most of this PP as the contractor) will be responsible for the timely provision of the required technical assistance personnel as well as all administrative arrangements related to recruitment, transportation, shipment of household effects, etc.

The technical assistance team, under the leadership of the Chief of Party, will be responsible for implementing project activities as described in the Project Paper (detailed job descriptions are included as Annex J). In addition to in-country and on-the-job training responsibilities, the technical assistance team will also assist the GOS in the selection and evaluation of participant trainees, and will be primarily responsible for securing placement of participants sent for U.S. and third country training. Since participant training is grant funded under the contract, the technical assistance team will prepare all PIO/Ps, with USAID/S guidance and assistance as needed, and will furnish copies of PIO/Ps to USAID/S.

Project commodities will be procured under the contract; therefore, Penn State's procurement office, and the technical assistance team will be responsible for all commodity procurement, following AID procurement regulations. However, before equipment and/or commodities are procured, the technical assistance team must obtain USAID/S approval of types and prices of non-expendable items.

The technical assistance team will be required to submit annual work plans to be approved by MOAC and USAID. Requisite reports consist of quarterly progress/status reports and a final, end of project report.

### C. Procurement Plan

#### 1. Authorized Source of Procurement

The authorized source of procurement under the project will be the Geographic Code 000 (U.S. only) and Swaziland, except for those items covered by the source waivers, included as Annex M, and the light duty vehicles, which will be procured from Code 935 sources under the existing blanket vehicle waiver for southern Africa.

#### 2. Responsibility

It is planned that all procurement under the project will be carried out by Penn State, with all A.I.D. rules and regulations concerning procurement being applicable. Exceptions to the foregoing are: (1) the light duty vehicles will be purchased by the GOS Central Transport Authority, in order for transportation to be available to the implementation team upon its arrival in Swaziland and (2) since all construction will be under the FAR method of financing, the contractor hired by the GOS will procure all construction materials. The contract with Penn State will clearly specify its procurement responsibilities, including a requirement that all transactions for non-expendable items must be reviewed and approved by USAID/S prior to placement of orders.

#### 3. Imported Shelf Items

Within the limits authorized, some items of other than Geographic Code 941 origin will be purchased off-shelf in Swaziland. Included among these items will be relatively small quantities of fertilizers and pesticides required at intermittent periods during the life of the project; equipment, such as photocopiers, for which local service is essential; and production materials and supplies, including flip charts, film and printing materials. Penn State will also be responsible for the procurement of these items, taking into consideration all AID rules and regulations concerning commodity eligibility.

#### 4. Mini-Computer

A computer equal to the Wang Model 2200T-6 and related accessories is required for the efficient implementation of the project. The detailed specifications for the computer will be prepared by specialists at Penn State, based on the following requirements:

- (1) the social science members of the team will need computer facilities with adequate storage and software to store and analyze data from the base-line survey, annual updates and the end of project survey;
- (2) the agricultural scientists need the computer facilities for recording and analyzing the results of field trials and farm demonstrations; and
- (3) the functional efficiency of the soil testing and plant tissue laboratories (and other related activities) will be greatly increased if some of the routine analyses are performed by computer.

A consultant will be provided under the project to assist in the start-up of computer operations; the long-term technical advisors in research will be familiar with computer analysis techniques and computer operation. (The only computer in Swaziland with significant storage and operational functions is located in the Ministry of Finance and already has a very high level of use.)

## VII. Evaluation Plan

### A. Internal Evaluations

Two AID Project Evaluation Summaries (PES) will be undertaken during the life of the project. The first one, scheduled in July 1983 (FY 1983) to allow for completion of the preceding crop season and subsequent data collection and analysis, will examine progress toward achieving project objectives and the performance of the contractor, USAID and the GOS in meeting project commitments.

The second internal evaluation is scheduled for July 1984 (FY 1984). Composition of the evaluation team will be determined in March 1984 on the basis of the July 1983 evaluation and consultation between the GOS and USAID. This evaluation will focus on: (a) institutional relationships and support for the project within the GOS, particularly in the MOAC; (b) adequacy and utility of the baseline survey; and (c) timeliness and effectiveness of participant training.

Both evaluations will (a) assess MOAC capacity to provide livestock research and extension; (b) assess the links to the cropping systems research; and (c) make recommendations, if appropriate, on whether or not an expanded livestock research and extension program should be included either in the latter stages of this project or in a follow-on effort. This will insure that if the livestock aspect of the farming system appears to be a major constraint to expanded crop production, this project and the existing agricultural research structure will have the capacity to address the problem.

The evaluations will be conducted jointly by the GOS and USAID in accordance with standard AID procedures.

### B. External Evaluation

A major, external evaluation is scheduled for July 1985. The evaluation will be conducted by a RFDSO/EA evaluation officer and three outside consultants over a four week period. The appropriateness and timeliness of the provision of project inputs will be evaluated at this stage along with an assessment of output achievement. The evaluation team will compare actual achievements to the targets projected in the Project Paper and evaluate progress toward reaching the end of project status. If necessary, the evaluation team will recommend modifications regarding project inputs that may be required to accomplish the project purpose. Additionally, using the project base-line survey and subsequently gathered data, the evaluation team will assess any progress toward achieving the 1992 goal level indicators, if possible.

The external evaluation will also serve as the basis for deciding the need for a follow-on effort. An explicit recommendation on this question will be required of the evaluation team as well as preliminary recommendations on the direction that a second phase project should take.

### VIII. Conditions and Covenants

The Project Grant Agreement will contain, in substance, the following conditions and covenants:

Condition Precedent. Prior to the disbursement of funds, or to the issuance of documentation pursuant to which disbursement will be made, for each construction activity the Cooperating Country will furnish to AID in form and substance acceptable to AID: (1) evidence that adequate sites have been identified and provided for each construction activity; and (2) final plans and specifications for each construction activity.

#### Covenants

A. Establishment of Positions. The Cooperating Country covenants to establish and fill the new positions and the positions currently unfilled as set forth in Annex A to the Grant Agreement.

B. Participants. The Cooperating Country covenants that candidates for participant training will be selected on a timely basis as set forth in the implementation plan in Annex A to the Grant Agreement.

C. Counterparts. The Cooperating Country covenants to assign counterparts to each of the technical assistance personnel.

D. Recurrent Budget. The Cooperating Country covenants to assume the recurrent budget costs for the project as set forth in Annex A to the Grant Agreement.

E. Vehicles. The Cooperating Country covenants that all project vehicles will be used solely for this project unless AID otherwise agrees in writing. The Cooperating Country further covenants that it will replace all project vehicles as required.

F. Housing. Except as otherwise agreed to by AID in writing, title to houses financed by AID under this Agreement will be vested in the Cooperating Country. Notwithstanding that title is so vested, the Cooperating Country covenants that: (1) the house for the Agricultural Information Specialist will be reserved for the exclusive use of AID-financed technical assistance personnel working on this project or other AID-financed projects in Swaziland, until such time as the Parties agree that this house is no longer required for the support of this or any other AID-financed projects in Swaziland; and (2) that the 14 houses for the field research assistants and Peace Corps Volunteers will be reserved for the exclusive use of this or a follow-on project until such time as the Parties agree that these houses are no longer required.

The Cooperating Country further covenants that it will provide permanent housing at Malkerns for all other AID-financed technical assistance personnel under this project.

In the event that AID-financed housing or other permanent housing is not available for use by AID-financed technicians upon their arrival in Swaziland, the Cooperating Country covenants to provide suitable temporary housing for such technicians and their families until such time as permanent housing is available.

G. Pesticides. The Cooperating Country covenants that the procurement or use of pesticides in connection with this project will be for research or limited field evaluation purposes only and that such procurement or use will be undertaken in accordance with Section 216.3(b)(2)(iii) of the AID Environmental Procedures.

ANNEXES

- A. GOS Application for Assistance
- B. PID Approval Cable
- C. Draft Project Authorization
- D. Social Soundness Analysis
- E. Economic Analysis Tables
- F. Local Cost Financing Determination
- G. Summary of Certificate Training Course Curriculum
- H. Engineering Analysis
- I. Log Frame
- J. Job Descriptions
- K. Financial Tables
- L. Equipment List
- M. Waiver Justifications
- N. Statutory Checklist
- O. Participant Training Time Flow Chart
- P. Initial Environmental Examination

SWAZILAND



GOVERNMENT

Prime Minister's Office,  
 Department of Economic Planning  
 and Statistics,  
 P. O. Box 602,  
 Mbabane,  
 SWAZILAND.

Ref: ECO/08/2

29th June, 1981

The Director,  
 U.S.A.I.D.,  
 P. O. Box 750,  
 MBABANE.

Dear Sir,

CROPPING SYSTEMS RESEARCH AND EXTENSION TRAINING PROJECT

On behalf of the Ministry of Agriculture and Cooperatives this Department submits the attached project document proposal entitled "Cropping Systems Research and Extension Training Project" for U.S.A.I.D. funding as indicated in the Document.

As the proposed project complements the work of other donors and other U.S.A.I.D. assistance with respect to assisting subsistence farmers in moving from subsistence to semi-commercial and commercial agriculture, this Department fully supports this request because of the vital assistance the proposal offers to agricultural and rural development.

We are conscious of the work and joint co-operation between officials of your Agency and the Ministry of Agriculture and Cooperatives in the formulation of this Research Proposal which is in keeping with the development needs of our fast expanding agricultural sector.

In supporting this project we are prepared to commit the local resources necessary to implement the project estimated at approximately E 900 000 over the life of the project within our budgetary constraints. The counterpart staffing component will be taken care-of by the Swaziland Government.

Our understanding is that Government will control the use of vehicles which will be purchased with U.S.A.I.D. assistance for use by Research Officers and maintained by Government as well as providing fuel for their operation.

<u>Date</u>	<u>Action</u>	<u>Responsibility</u>
Apr 87	Phase II implementation begins	USAID/ GOS/ Contractor
May 87	4 B.Sc. graduates return to work in Crop Production Section	GOS/Contractor

We appreciate very much the consistent support provided by your staff and other members of the United States Agency for International Development for the time spent with us in formulating this complex but critically important project proposal.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'E. Bhembe', written in a cursive style.

E. BHEMBE

for : PERMANENT SECRETARY



(B) USAID/S NEEDS TO EXAMINE FURTHER THE VALIDITY OF THE ASSUMPTION THAT A POTENTIAL INCOME LEVEL OF 1,500 DOLS PER YEAR FOR THE AVERAGE TWO TO THREE HECTARE SWAZI NATION LAND (SNL) FARM WILL ENTICE MALE LABOR TO REMAIN WITH AGRICULTURE IN PREFERENCE TO JOINING THE URBAN OR MIGRANT LABOR FORCE. HOW DOES THIS LEVEL RELATE TO THE 3,500 DOLS PER YEAR INCOME NOTED IN THE CDSS AS BEING APPARENTLY SUFFICIENT TO MINIMIZE MIGRATION OF SMALL FARMERS GROWING IRRIGATED SUGAR CANE (FY 82 CDSS, PAGE 43)? IF MALE LABOR IS TO BE INDUCED TO RETURN TO AGRICULTURE, THERE MAY BE SOCIOLOGICAL AS WELL AS ECONOMIC STIMULI REQUIRED.

(C) USAID/S SHOULD EXPLICITLY ADDRESS THE IMPACT OF THE PROPOSED PROJECT ON THE ALREADY VULNERABLE ROLE OF WOMEN IN SWAZI SOCIETY. A PROJECT SUCH AS THIS ONE, WHICH WILL CHANGE TRADITIONAL FARMING PRACTICES, HAS THE POTENTIAL FOR ADVERSELY INFLUENCING THE BENEFITS WHICH TRADITIONALLY ACCRUE TO WOMEN FROM THEIR ROLE IN AGRICULTURE. THE SPECIFIC SAFEGUARDS TO ENSURE THAT THIS PROJECT AFFECTS WOMEN ONLY IN A POSITIVE MANNER SHOULD BE PROVIDED IN DETAIL IN THE PP. IF, AS INDICATED IN ANNEX A OF THE PID, THERE ARE TO BE MORE WOMEN TRAINED AS AGRICULTURAL EXTENSION FIELD OFFICERS, IS THIS DECISION BASED UPON PRACTICAL CONSIDERATIONS? ARE THERE WOMEN READILY QUALIFIED TO UNDERTAKE THE TRAINING PROGRAM AT THE AGRICULTURAL COLLEGE? ARE THERE SUFFICIENT DORMITORY SPACES FOR WOMEN TRAINEES AT THE AGRICULTURAL COLLEGE? THE SWAZICAND 1982 CDSS STATES, QUOTE: WHILE WOMEN ARE NOT FORMALLY DENIED OPPORTUNITIES IN AGRICULTURE, THERE IS A FAILURE TO PROMOTE THE UTILIZATION OF FEMALE RESOURCES IN AGRICULTURE, TO TRAIN WOMEN IN

AGRICULTURAL SKILLS, AND TO ENCOURAGE FULL FEMALE PARTICIPATION IN AVAILABLE AGRICULTURAL PROGRAMS (E.G., EXTENSION; CREDIT). UNQUOTE. AID/W WISHES TO EMPHASIZE THE NEED TO ACTIVELY PROMOTE THE UTILIZATION OF FEMALE RESOURCES IN THIS PROJECT AND TO REACH RURAL WOMEN THROUGH MASS MEDIA IN ORDER TO ADDRESS THE PROBLEM AS PRESENTED IN THE CDSS.

(D) THE PID PROPOSES A FIVE YEAR EFFORT OF CROPPING SYSTEMS RESEARCH AND EXTENSION TRAINING. THE PROJECT PAPER SHOULD EXAMINE THE RELATIONSHIP OF THIS PROJECT TO THE EXISTING MARKETING STRUCTURE AND ITS ADEQUACY, AND TO POSSIBLE COMPLEMENTARY ACTIVITIES SUCH AS THE PROVISION OF VEGETABLE MARKETING INFRASTRUCTURE (INCLUDING COLD STORAGE) AND THE PROVISION OF IRRIGATION INFRASTRUCTURE. ALTHOUGH THESE AND OTHER RELATED ACTIVITIES MAY BE FINANCED LARGELY BY DONORS OTHER THAN A.I.D., THEIR INTERDEPENDENCE AND THE RELATIONSHIP OF ALL OF THE PROPOSED ACTIVITIES TO SWAZI-LAND'S RURAL DEVELOPMENT AREAS PROGRAM REQUIRE DETAILED ANALYSIS. THIS SHOULD INCLUDE A COMPLETE DISCUSSION OF THE PHASING OF THE VARIOUS ACTIVITIES, WITH THE PROVISION

FOR A REVIEW OF THE ENTIRE SCHEME IF THE RESULTS OF A NATIONAL WATER RESOURCES SURVEY DO NOT INDICATE THAT SIGNIFICANT EXPANSION OF IRRIGATION IS PRACTICAL.

(E) THE COMMITTEE EXPRESSED CONCERN THAT THE PARTICIPANT TRAINING BEING PROPOSED IS UNLIKELY TO PROVIDE A SUFFICIENT BASIS FOR A STRONG CROPPING SYSTEMS RESEARCH INSTITUTION, AND THAT THE IN-SERVICE TRAINING BEING PROPOSED APPEARS INADEQUATE TO THE TASK OF UPGRADING THE CAPABILITY OF THE CURRENTLY UNDERQUALIFIED 177-MEMBER EXTENSION STAFF. IT WAS AGREED DURING THE MEETING THAT THE PROPOSED TRAINING INPUT SHOULD BE REVIEWED, BALANCING THE AID/M SUGGESTION TO DOUBLE OR TRIPLE THE AMOUNT OF TRAINING AGAINST THE REALITY OF A LIMITED POOL OF POTENTIAL TRAINEES IN EACH SPECIFIC PROFESSIONAL DISCIPLINE IN SWAZILAND. AID/M ALSO SUGGESTS THAT USAID/S CONCENTRATE ON UPGRADING THE QUALIFICATIONS OF THE EXISTING EXTENSION STAFF BEFORE DEVOTING RESOURCES TO DOUBLING THE SIZE OF THE STAFF.

(F) THE PID'S DISCUSSION OF IMPACTS, SECTION II, APPENDIX A, IS QUITE THOROUGH IN REGARD TO PESTICIDES. AID/M NOTES THAT PESTICIDES MAY BE USED FOR RESEARCH PURPOSES UNDER STRICT SUPERVISION OF PROJECT PERSONNEL FOR CONTROL PURPOSES ON ACTUAL SWZ FARMS AS WELL AS ON RESEARCH STATION PLOTS. AID/M WILL ASSIST IN PROVIDING AN INSECTICIDE EXPERT IF AND WHEN THE DECISION IS MADE TO CONSIDER PROVIDING INSECTICIDES TO FARMERS OR PROMOTING THEIR USE BY FARMERS.

THE GOS A MIXTURE OF LOAN AND GRANT FUNDING FOR THIS PROJECT. FOR EXAMPLE, COMMODITIES, VEHICLES AND CONSTRUCTION, WITH INFLATION AND CONTINGENCY FACTORS ADDED, TOTAL APPROXIMATELY 1.3 MILLION DOLS AND MAY BE APPROPRIATE FOR LOAN FUNDING.

(H) THIS PROJECT FITS THE CRITERIA FOR THE COLLABORATIVE ASSISTANCE APPROACH TO DESIGN AND IMPLEMENTATION AS OUTLINED IN PARA 3, A.I.D. HANDBOOK 14. THE INVOLVEMENT OF U.S. EDUCATIONAL INSTITUTIONS AND INTERNATIONAL RESEARCH INSTITUTIONS IS APPROPRIATE IN ACCORDANCE WITH THE PROVISIONS OF TITLE XII, F.A.A. AID/M WILL EXPAND UPON THE SHORT LIST OF TITLE XII INSTITUTIONS ALREADY PROVIDED BY RIFAD UPON RECEIPT FROM USAID/SWAZILAND OF THE PID/T FOR PROJECT DESIGN, INCLUDING THE SCOPE OF WORK AND SUGGESTED CRITERIA FOR USE IN THE SELECTION OF AN APPROPRIATE INSTITUTION TO UNDERTAKE THE COLLABORATIVE DESIGN OF THE PROJECT. ONLY IF NO INTERESTED AND APPROPRIATELY QUALIFIED TITLE XII INSTITUTION IS FOUND MAY CONSIDERATION BE GIVEN TO ALTERNATIVE METHODS FOR DESIGN AND IMPLEMENTATION. HOWEVER, MISSION MAY CONTRACT SEPARATE TECHNICAL SERVICES TO ASSIST MISSION IN MONITORING AND EVALUATING PROJECT AT APPROPRIATE INTERVALS. SIMILARLY, SINCE CONTRACTING PROCESS MAY REQUIRE SOME FOUR OR FIVE MONTHS, MISSION, IF NECESSARY TO CONTINUE PROJECT DEVELOPMENT PROGRESS, MAY CONTRACT FOR TECHNICAL SERVICES TO ADDRESS PRIMARILY PRE-DESIGN ISSUES.

4. FY11: THERE IS ALREADY EVIDENCE OF CONSIDERABLE INTEREST IN SWAZI PROJECT WITHIN TITLE XII COMMUNITY. CHRISTOPHER

PROJECT AUTHORIZATION

Name of Country: Swaziland

Name of Project: Cropping Systems  
Research and Extension  
Training

Number of Project: 645-0212

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended (the "Act"), I hereby authorize the Cropping Systems Research and Extension Training Project for Swaziland ("Cooperating Country") involving planned obligations of not to exceed \$12,900,000 in grant funds over a six year period from date of authorization, subject to availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the project. In addition, I hereby authorize a six year life of project.

2. The project consists of redirecting the focus of agricultural research in Swaziland toward the small farmer, improving the training of extension workers and improving the agricultural information service through the provision of technical assistance, training, equipment, vehicles and commodities.

3. The Project Agreement which may be negotiated and executed by the officer to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

a. Source and Origin of Goods and Services

Goods and services, except for ocean shipping and except as provided in paragraph d. below, financed by A.I.D. under the project shall have their source and origin in the Cooperating Country or in the United States except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States.

b. Conditions Precedent

The Grant Agreement shall contain a condition precedent in substance as follows:

Prior to the disbursement of funds, or to the issuance of documentation pursuant to which disbursement will be made, for each construction activity the Cooperating Country will furnish to A.I.D. in form and substance acceptable to A.I.D.:

- (1) evidence that adequate sites have been identified

and provided for each construction activity; and  
(2) final plans and specifications for each construction activity.

c. Covenants

The Cooperating Country shall covenant in substance as follows:

1) Establishment of Positions

The Cooperating Country covenants to establish and fill the new positions and the positions currently unfilled as set forth in Annex A to the Grant Agreement.

2) Participants

The Cooperating Country covenants that candidates for participant training will be selected in a timely basis as set forth in the implementation plan in Annex A to the Grant Agreement.

3) Counterparts

The Cooperating Country covenants to assign counterparts to each of the technical assistants.

4) Recurrent Budget

The Cooperating Country covenants to assume the recurrent budget costs for the project as set forth in Annex A to the Grant Agreement.

5) Vehicles

The Cooperating Country covenants that all project vehicles will be used solely for this project unless A.I.D. otherwise agrees in writing. The Cooperating Country further covenants that it will replace all project vehicles as required.

6) Housing

Except as otherwise agreed to by A.I.D. in writing, title to houses financed by A.I.D. under this Agreement will be vested in the Cooperating Country. Notwithstanding that title is so vested, the Cooperating Country covenants that : i) the house for the Agricultural Information Specialist will be reserved for the exclusive use of A.I.D.-financed technical assistance personnel

645-0212

~~PD AAL-472~~

PD AAL-472

UNCLASSIFIED

SWAZILAND CROPPING SYSTEMS  
RESEARCH AND EXTENSION TRAINING (645-0212)

UNCLASSIFIED

ACTION MEMORANDUM FOR THE ADMINISTRATOR

AUG 17 1981

THRU: ES

THRU: AA/PPC, Larry Smucker (Acting) *LS*

FROM: AA/AFR, F. S. Ruddy *F. Ruddy*

SUBJECT: Project Authorization - Swaziland Cropping Systems Research and Extension Training (645-0212)

Problem: Your approval is required for a grant of \$12,900,000 from the Section 103 Food and Nutrition appropriation to the Government of Swaziland (GOS) for the Cropping Systems Research and Extension Training Project (645-0212). It is planned that a total of \$3,406,000 will be obligated in FY 1981.

Discussion: The proposed Cropping Systems Research and Extension Training Project represents AID's response to improving low productivity and income levels of the small farmers on Swazi Nation Land (SNL), which covers 60 percent of Swaziland's total land area. The project will contribute to the goal of increasing the economic viability of farming on Swazi Nation Land. The design of the project reflects the success which USAID/Swaziland has had in reorienting the GOS's agricultural policy. To date, this policy has focussed on agricultural research to support crop production on private and large estate farms. In implementing this project, however, the GOS will be shifting that focus to increasing crop production on SNL small holder farms and supporting this shift with a redirected research and strengthened extension program. It is anticipated that, over time, small farmer income can be increased to the point that farming on Swazi Nation Land may become more economically attractive and capable of absorbing the large numbers of people coming into the labor force. The purpose of the project, therefore, is to improve and expand the capacity of the GOS Ministry of Agriculture and Cooperatives (MOAC) to develop and extend cropping systems recommendations relevant to the needs of the SNL small farmer. The project design also recognizes the importance of, and incorporates measures to monitor, the marketing structure and the interrelationship between livestock and cropping on SNL. The project will provide the resources required to assist the MOAC to (a) redirect its research efforts to a systems approach for identifying the constraints and advising solutions to SNL on-farm crop production problems, (b) strengthen the capability of the Agricultural Information Section to present research recommendations in a manner understandable to both the extension staff and the SNL farmer, and (c) institutionalize a structured, continuous extension in-service training program capable of keeping field workers informed of the latest research findings and improving their supervisory and management skills.

In order to accomplish the purpose and outputs of this project, a total of \$3,406,000 is requested for obligation in FY 1981. The life-of-project funding is \$12,900,000, which will be expended over a period of six years. The following table illustrates the inputs and functional areas in which funds will be required.

127744

AUG 13 1981

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR AFRICA

FROM: AAA/AFR/DR, <sup>yw/ka b. in</sup> ~~John W. Koehring~~

SUBJECT: Project Authorization

**Problem:** Your signature is required for the attached Action Memorandum to the Administrator recommending a grant of \$12,900,000 from Section 103, Food and Nutrition appropriation, to the Government of Swaziland (GOS) for the Swaziland Cropping Systems Research and Extension Training Project (645-0212). It is planned that a total of \$3,406,000 will be obligated in FY 1981.

**Discussion:** The purpose of the project is to improve and expand the capacity of the GOS Ministry of Agriculture and Cooperatives to develop and extend cropping systems recommendations which are relevant to the needs of the small farmer on Swazi Nation Land. This is essentially an institution-building project, and it is estimated that it will require a long-term commitment, especially in participant training, to result in functioning and effective agricultural research, extension in-service training and agricultural information services.

Approval of source/origin waivers from AID Geographic Code 000 (U.S. only) to Code 935 (Special Free World) is requested to permit the procurement of (a) audio-visual equipment (\$36,450), (b) 14 motorcycles and spare parts (\$33,000) and (c) construction materials (\$352,000). Approval is also requested for a geographic source/origin waiver to permit the procurement of up to \$300,000 of shelf items imported from other than Code 941 Free World Countries. All waiver justifications are contained in Annex M of the Project Paper. An Initial Environmental Examination was submitted with the PID, and a Negative Determination was approved by the AA/AFR on May 8, 1980. The proposed project has been thoroughly reviewed by the appropriate committees and the analyses are found to be acceptable in all respects. On July 29, 1981, the ECPR recommended that the project be submitted to the Administrator for authorization.

**Recommendation:** That you sign the Action Memorandum to the Administrator recommending authorization of the project and the requested waivers. Also, please clear the Project Authorization (attached).

Attachments:

Action Memorandum for the Administrator  
Project Authorization  
Project Paper

Clearances:

DAA/AFR:WHNorth WHN  
AAA/AFR/DP:JCoker JCoker  
AFR/DR:NCohen NCohen  
AFR/DR/SA:WWolff WWolff  
AFR/DR/ARD:DSchaer DSchaer  
GC/AFR:TBork TBork  
AFR/SA:TMorse TMorse  
AFR/DR/SA:DRianeire DRianeire

A.I.D. Funding by Input and Functional Component  
(\$000)

<u>Input</u>	<u>Cropping Systems Research</u>	<u>Extension Training</u>	<u>Agricultural Information</u>	<u>TOTAL</u>
Technical Services	\$ 6,138	\$ 1,001	\$ 1,001	\$ 8,140
Training	613	1,057	111	1,781
Construction	388	---	252	640
Equipment/Commodities	437	65	390	892
Vehicles	76	9	53	138
Local Costs	<u>75</u>	<u>---</u>	<u>---</u>	<u>75</u>
Sub-Total (%)	\$ 7,727(66)	\$ 2,132(18)	\$ 1,807(16)	\$11,666(100)
Contingency				1,181
External Evaluation				<u>53</u>
		<b>GRAND TOTAL</b>		<b>\$12,900</b>

The GOS will contribute the equivalent of \$4,354,000, or 25.2% of the total cost of the project. This contribution will cover salaries for counterparts, plus other professional and support staff who will be engaged in the project through 1987; vehicle operation and maintenance; the research facilities and office space to be used by the U.S. technical advisors and their counterparts; housing and furnishings; travel costs for participants; and commodities and supplies. In addition to the AID and GOS contributions to the project, the Peace Corps will provide the services for four volunteers for two years each to assist with the on-farm research program.

It has been concluded from the analyses in the Project Paper that:

- (1) the project approach is technically and economically sound, socially acceptable and administratively feasible;
- (2) the technical design and cost estimates are reasonable and adequately planned, thereby satisfying the requirements of Section 611(a) of the Foreign Assistance Act, as amended;
- (3) the timing and funding of project activities are appropriately scheduled;

(4) sufficient planning has been made for the monitoring and evaluation of the project; and

(5) all statutory criteria have been satisfied.

The Initial Environmental Examination was reviewed by my staff, and a Negative Determination for this project was approved at the time the PID was approved.

There is one condition precedent which must be met. Prior to the disbursement of funds, for each construction activity the GOS must furnish to AID (1) evidence that adequate sites have been identified and provided for each construction activity and (2) final plans and specifications for each construction activity.

There are six covenants which can be found in the attached Project Authorization (Attachment A).

Approval of source/origin waivers from AID Geographic Code 000 (U.S. only) to Code 935 (Special Free World) is requested to permit the procurement of (a) audio-visual equipment (\$36,450), (b) 14 motorcycles and spare parts (\$33,000) and (c) construction materials (\$352,000). Approval is also requested for a geographic source/origin waiver to permit the procurement of up to \$300,000 of shelf items imported from other than Code 941 Free World Countries. All waiver justifications are contained in Annex M of the Project Paper (Attachment B).

This project has been designed and will be implemented under the Title XII Collaborative Assistance mode. On a competitive basis, Pennsylvania State University (Penn State) was selected for the award. Penn State collaborated with Tennessee State University for the design of the project, and it is expected that the relationship between the two universities will continue for the implementation of the project.

The Project Review was held on July 21, 1981 and the ECPR was held on July 29, 1981. There are no unresolved issues. A Congressional Notification advising Congress of a program change in the estimated total AID contribution to the project was forwarded on July 28, 1981; the waiting period will expire on August 11, 1981. The responsible AID officer in the field will be the Mission Director, or his designee, and the AID/W backstop officer will be Dianne Blane, AFR/DR/SA.

There are presently no human rights issues in Swaziland.

Recommendation: That you sign the attached Project Authorization and thereby authorize the proposed project and the requested waivers.

Attachments:

- A. Project Authorization
- B. Project Paper

Clearance:

General Counsel: JBolton *KCK* Date 8-19-81  
AAA/PPC/PDPR: J.Ericksson *J.E* Date 8-18-81

Clearance:

DAA/AFR:WHNorth	<u>[Signature]</u>	Date	<u>8/13/81</u>
GC/AFR:TBork	<u>[Signature]</u>	Date	<u>8/12/81</u>
GC/AFR:EDragon	<u>[Signature]</u>	Date	<u>8/11/81</u>
AAA/AFR/DP:JCoker	<u>[Signature]</u>	Date	<u>8/10/81</u>
AAA/AFR/DR:JWKoehring	<u>[Signature]</u>	Date	<u>8/10/81</u>
AFR/SA:TMorse	<u>[Signature]</u>	Date	<u>8/10/81</u>
AFR/DR/SA:WWolff	<u>[Signature]</u>	Date	<u>8-10-81</u>
SER/COM/ALI:PHagan	<u>[Signature]</u>	Date	<u>8/15/81</u>

AFR/DR/SA:DBlane:rcj:8/7/81, x-28818

PID Submission Date:	March 13, 1980
PID Approval Date:	May 8, 1980
PP Submission Date:	July 6, 1981
PP Final Review Meeting Date:	July 29, 1981

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY  
AGENCY FOR INTERNATIONAL DEVELOPMENT  
WASHINGTON D.C. 20521

PROJECT AUTHORIZATION

Name of Country: Swaziland

Name of Project: Cropping Systems  
Research and Extension  
Training

Number of Project: 645-0212

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended (the "Act"), I hereby authorize the Cropping Systems Research and Extension Training Project for Swaziland ("Cooperating Country") involving planned obligations of not to exceed \$12,900,000 in grant funds over a six year period from date of authorization, subject to availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the project. In addition, I hereby authorize a six year life of project.

2. The project consists of redirecting the focus of agricultural research in Swaziland toward the small farmer, improving the training of extension workers and improving the agricultural information service through the provision of technical assistance, training, equipment, vehicles and commodities.

3. The Project Agreement which may be negotiated and executed by the officer to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

a. Source and Origin of Goods and Services

Goods and services, except for ocean shipping and except as provided in paragraph d. below, financed by A.I.D. under the project shall have their source and origin in the Cooperating Country or in the United States except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States.

b. Conditions Precedent

The Grant Agreement shall contain a condition precedent in substance as follows:

Prior to the disbursement of funds, or to the issuance of documentation pursuant to which disbursement will be made, for each construction activity the Cooperating Country will furnish to A.I.D. in form and substance acceptable to A.I.D.:

- (1) evidence that adequate sites have been identified

and provided for each construction activity; and  
(2) final plans and specifications for each construction activity.

c. Covenants

The Cooperating Country shall covenant in substance as follows:

1) Establishment of Positions

The Cooperating Country covenants to establish and fill the new positions and the positions currently unfilled as set forth in Annex A to the Grant Agreement.

2) Participants

The Cooperating Country covenants that candidates for participant training will be selected on a timely basis as set forth in the implementation plan in Annex A to the Grant Agreement.

3) Counterparts

The Cooperating Country covenants to assign counterparts to each of the technical assistants.

4) Recurrent Budget

The Cooperating Country covenants to assume the recurrent budget costs for the project as set forth in Annex A to the Grant Agreement.

5) Vehicles

The Cooperating Country covenants that all project vehicles will be used solely for this project unless A.I.D. otherwise agrees in writing. The Cooperating Country further covenants that it will replace all project vehicles as required.

6) Housing

Except as otherwise agreed to by A.I.D. in writing, title to houses financed by A.I.D. under this Agreement will be vested in the Cooperating Country. Notwithstanding that title is so vested, the Cooperating Country covenants that : i) the house for the Agricultural Information Specialist will be reserved for the exclusive use of A.I.D.-financed technical assistance personnel

working on this Project or other A.I.D.-financed projects in Swaziland, until such time as the Parties agree that this house is no longer required for the support of this or any other A.I.D.-financed projects in Swaziland; and ii) that the 14 houses for the field research assistants and Peace Corps Volunteers will be reserved for the exclusive use of this or a follow-on Project until such time as the Parties agree that these houses are no longer required.

The Cooperating Country further covenants that it will provide permanent housing at Malkerns for all other A.I.D.-financed technical assistance personnel under this project.

In the event that A.I.D.-financed housing or other permanent housing is not available for use by A.I.D.-financed technicians upon their arrival in Swaziland, the Cooperating Country covenants to provide suitable temporary housing for such technicians and their families until such time as permanent housing is available.

d. Waivers

Based upon the justification contained in Annex M of the Project Paper, I hereby:

- (1) Approve source/origin procurement waivers from AID Geographic Code 000 (U.S.) to Code 935 (Special Free World) to permit procurement of (a) project equipment at an approximate cost of \$36,450, (b) 14 motorcycles at an approximate cost of \$33,000, (c) construction materials at an approximate cost of \$352,000, and (d) imported shelf items at an approximate cost of \$300,000;
- (2) Certify that exclusion of procurement from Free World Countries other than the Cooperating Country and countries included in Code 935 would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program; and

(3) Certify that special circumstances exist to waive, and do hereby waive, the requirements of Section 636(i) of the Act.

M. Peter McPherson  
M. Peter McPherson

Administrator

Aug 21 1981  
Date

Clearance:

AA/AFR: FSkuddy	<u>ISR</u>	Date:	<u>AUG 17 1981</u>
General Counsel: JBolton	<u>RCEA</u>	Date:	<u>8-19-81</u>
A-AA/PPC: LSnucker	<u>JL</u>	Date:	<u>8/20/81</u>

Drafter: RLA/S: AWilliams/TE

PROJECT DATA SHEET

2. COUNTRY/ENTITY  
**SWAZILAND**

4. BUREAU/OFFICE

**AFR**

**06**

1. TRANSACTION CODE

**A** Add  
C Change  
D Delete

Amendment Number

DOCUMENT CODE

**3**

3. PROJECT NUMBER

**645-0212**

5. PROJECT TITLE (maximum 40 characters)

**Cropping Systems Research & Ext. Training**

6. PROJECT ASSISTANCE COMPLETION DATE (PACD)

MM DD YY  
**09 30 87**

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

A. Initial FY **81** B. Quarter **4** C. Final FY **86**

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

A. FUNDING SOURCE	FIRST FY <b>81</b>			LIFE OF PROJECT		
	B. FX	C. I/C	D. Total	E. FX	F. I/C	G. Total
AID Appropriated Total	<b>3130</b>	<b>276</b>	<b>3406</b>	<b>12,387</b>	<b>513</b>	<b>12,900</b>
(Grant)	( <b>3130</b> )	( <b>276</b> )	( <b>3406</b> )	( <b>12,387</b> )	( <b>513</b> )	( <b>12,900</b> )
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1. <b>U.S. Peace Corps</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>29</b>	<b>26</b>	<b>55</b>
Host Country	<b>0</b>	<b>1223</b>	<b>1223</b>	<b>0</b>	<b>4354</b>	<b>4354</b>
Other Donor(s)						
<b>TOTALS</b>	<b>3130</b>	<b>1499</b>	<b>4629</b>	<b>12,416</b>	<b>4893</b>	<b>17,309</b>

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROPRIATION PURPOSE	B. PRIMARY CODE	C. PRIMARY TECH CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) <b>FN</b>	<b>140</b>	<b>080</b>		<b>0</b>		<b>12,900</b>		<b>12,900</b>	
(2)									
(3)									
(4)									
<b>TOTALS</b>				<b>0</b>		<b>12,900</b>		<b>12,900</b>	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)

**030**

11. SECONDARY PURPOSE CODE

**180**

12. SPECIAL CONCERNS CODES (maximum 7 codes of 3 positions each)

A. Code **R/AG** B. Amount **12,900**

13. PROJECT PURPOSE (maximum 180 characters)

To improve and expand the capacity of the MOAC research and extension programs to develop and effectively extend cropping systems recommendations relevant to the needs of the Swazi Nation Land farmer.

14. SCHEDULED EVALUATIONS

MM YY MM YY and MM YY  
**07 83 07 84 and 07 85**

15. SOURCE/ORIGIN OF GOODS AND SERVICES

000  911  Local  Other (Specify) **935**

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

17. APPROVED BY

Signature

**Julius E. Coles**

*Julius E. Coles*

Title

**Director, USAID/Swaziland**

Date Signed

MM DD YY  
**06 29 87**

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

MM DD YY  
**07 06 87**

## ACRONYMS

AID	Agency for International Development
AIS	Agricultural Information Section of the Ministry of Agriculture and Cooperatives
CDSS	Country Development Strategy Statement
CID	Consortium for International Development
CSR	Cropping systems research
CTC	Certificate Training Course
CY	Crop year
E	Emalangeni (Swazi currency)
GOS	Government of Swaziland
IADS	International Agricultural Development Service
ITF	Individual Tenure Farms
MOAC	Ministry of Agricultural and Cooperatives
PID	Project Identification Document
PP	Project Paper
REDSO/EA	Regional Economic Development Services Office/ East Africa (Nairobi, Kenya)
RDA	Rural Development Area
SNL	Swazi Nation Land
UCS	University College of Swaziland
USAID/S	U.S. AID Mission to Swaziland

## EQUIVALENCIES

E1	= US\$1.30
US\$1.00	= E.769
1 kilo (kg.)	= 2.2 pounds
1 hectare (ha.)	= 2.471 acres

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## Cropping Systems Research and Extension Training Project

### I. Project Recommendations and Summary

#### A. Recommendations

Authorization of a grant of \$12,900,000 and approval of the following waivers is recommended: source/origin waivers from AID Geographic Code 000 (U.S.) to Code 935 (Special Free World) to permit procurement of (a) project equipment at an approximate cost of \$36,450; (b) 14 motorcycles at an approximate cost of \$33,000; (c) construction materials at an approximate cost of \$352,000; and (d) imported shelf items at an approximate cost of \$300,000. Furthermore, approval is requested to exceed the five-year project implementation period and allow a six-year project.

#### B. Problem

The problem addressed by this project is one of low productivity and income levels of the small farmers on Swazi Nation Land (SNL), 60 percent of total land area. Currently, 73 percent of these farmers earn less than \$200 per capita per year in stark contrast to the incomes earned on large estates and other privately owned farms (40 percent of total land area). Until recently, it has been fairly easy to obtain wage employment off-farm, which has led to a situation where about 70 percent of the rural homesteads have absentee workers (58 percent of the adult male work force and 28 percent of the adult female work force). However, the modern sector is now absorbing far fewer workers. Only 3,500 new jobs are created annually, while 7,000 new school leavers a year are seeking wage employment in the modern sector. Within such a framework and given that Swaziland's most abundant resources include good agricultural land and plentiful water, farming and agricultural processing appear to be the key to future economic growth. In fact, agricultural growth rates over the last decade have been impressive on the private farms and estates, but SNL farmers continue to be primarily subsistence cultivators. Less than 10 percent of them are involved primarily in commercial agriculture.

One of the Government of Swaziland's (GOS) highest priorities is the transition of farming on Swazi Nation Land from a subsistence to a commercial basis. GOS and donor agencies programs cover a broad range of agricultural activities from the provision of production inputs to land conservation and the construction of irrigation schemes. However, a critical

constraint to increasing incomes of SNL farmers is the lack of research recommendations relevant to their farming context. To date, research carried out in Swaziland has been more attuned to the needs of the larger, private farms. A new focus to identify and address the problems actually faced by the homesteads with limited cropland is an absolute necessity if farming is to become economically attractive and capable of absorbing the large numbers of people coming into the labor force. In addition, the extension service must be strengthened in order to more effectively disseminate research recommendations, and an agricultural information system to assist both the research and extension efforts must be established. Currently, field level extension staff are graduates of a one-year course in agriculture and receive little in-service training to enhance their performance and bring them up to date on recent research findings. Extension workers do not now receive enough instruction in extension methodology and program development. Furthermore, the Agricultural Information Section of the Ministry of Agriculture and Cooperatives (MOAC) is presently incapable of translating research findings into a form usable by extension staff and understandable by the farmer on the scale needed.

### C. Project Description

The project consists of three major components:

1. Cropping Systems Research. The project will assist the MOAC to redirect its research efforts toward the SNL farmer. It involves a systems approach to the identification of farm problems as well as the research trials and recommendations that will emanate from the problem identification stage. On-farm research trials will be conducted by teams of Research Assistants, extension staff and farmers following a review of past research in Swaziland, a socio-economic base-line survey, and a technical survey of present cropping patterns and practices. The information gathering process will be a continuous one that will feed back to technical Research Officers at the various research stations. These Research Officers will provide the overall direction for the on-farm program and will conduct some applied research on-station as dictated by the findings of the field trials. A U.S. technical assistance team will design the research program and process in conjunction with the Chief Research Officer and other MOAC staff. Counterpart and on-the-job training will be provided and facilities constructed to help institutionalize a cropping systems research program. Also, equipment and commodities will be provided to support research efforts.

2. Agricultural Information. Before research recommendations reach the farmer, they must be written and presented in an understandable manner. Extension staff must be able to grasp the new cropping concepts and apply them to the various conditions faced by the farmers with whom they work. Also, extension staff must have adequate backup support in the form of extension aids if they are to effectively deliver the message to the farmer. This project will assist the MOAC to substantially expand and improve the capacity of the Agricultural Information Section to accomplish these critically important tasks. With a few exceptions, the Agricultural Information Section is currently staffed by Swazis, but additional training is needed to bring the staff to the desired level of competence. Also, equipment and facilities are totally inadequate to produce the quality and quantity of materials to support the research and extension programs. This project will provide a long-term technical advisor who will assist in establishing an effective agricultural information program by designing and instituting a process for the flow of information from research to the extension service. Short-term and academic training will be provided in such areas as agricultural information systems development, equipment maintenance, and audio-visual techniques. A U.S. advisor will work with the staff of the Section to test the acceptability of various methods of communicating research recommendations to farmers and develop an extension support program and extension aids which are based on this assessment. An important function of this component will be an active collaboration with both the cropping systems research team and the extension service.

3. Extension Training. While field level extension staff are reasonably well prepared academically, there is no structured, continuous in-service training program capable of keeping field workers informed of the latest research findings and improving their supervisory or management skills. Under the project, a technical advisor will assist the GOS to design and implement a comprehensive in-service training program that will include formal courses at the University's agricultural facilities during term breaks as well as informal sessions at Farmers' Training Centers and the central research station and substations. A substantial training component is provided to upgrade the staff of an In-Service Training Section to be created under the project. Training for Swazis to staff the Crop Production Section, which provides the technical support needed by extension workers, is also provided. A limited amount of commodities will be provided to the Faculty of Agriculture for the training of future extension staff. An important element of this component of the project will be the introduction of new extension methodologies and teaching

aids to students in the Certificate Training Course by the In-Service Training Section.

4. Project Funding. Research, agricultural information, and extension are closely interrelated functions, and a comprehensive approach to improving and expanding the capacity of the GOS to perform these functions effectively is proposed in this project. While it is anticipated that the project's institution building purpose will be achieved with respect to the agricultural information and extension training components, it is likely that a follow-on project will be required beyond FY 87 to achieve the objectives of the cropping systems research component.

In summary, the GOS, U.S. Peace Corps, and AID will provide the following project inputs:

<u>AID Grant</u>	\$12,900,000
Technical Assistance	8,140,000
Training	1,781,000
Construction	640,000
Equipment/Commodities	892,000
Vehicles	138,000
Evaluation	48,000
Other	75,000
Contingency	1,186,000
<u>GOS</u>	\$4,354,000
Salaries	1,758,000
Vehicle Support	437,000
Facilities and Furnishings	1,592,000
Participants' Air Fare	122,000
Commodities	336,000
Contingency	109,000
<u>US Peace Corps</u>	\$55,000
Four Volunteers x 2 years each	
TOTAL COST OF PROJECT	<u>\$17,000,000</u>

#### D. Summary of Findings

It has been concluded from the analyses included in this Project Paper that:

1. The project approach is technically, socially, and

economically sound; administratively feasible; and environmental concerns are fully addressed (see IEE);

2. the technical design and cost estimates are reasonable and adequately planned pursuant to Section 611A of the Foreign Assistance Act;

3. the timing and funding of project activities are appropriately scheduled;

4. sufficient planning has been made for the monitoring and evaluation of the project;

5. all statutory criteria have been satisfied; and

6. the Government of Swaziland can meet the recurrent costs associated with the project and those costs required to continue the research, agricultural information, and extension in-service training programs after termination of USAID/S assistance.

## II. Background

### A. Agriculture in Swaziland

#### 1. General

Modern intensive agricultural expansion has provided the impetus for the impressive economic growth record of Swaziland during the past decade (real GDP grew at approximately 4.7 percent per year during this period). Agriculture's share of GDP has increased from 19 to 31 percent since 1968, and the sector is characterized by its diversity as well as its striking dualism. For example, agricultural activities range from the production of sugarcane, citrus, pineapple, and timber on large estates and Individual Tenure Farms (ITF) to subsistence production, primarily maize, on the small Swazi Nation Land farms. While ITF land accounts for only 40 percent of the total land area, 60 percent of total agricultural output is produced there; the production growth on ITFs has averaged 7 to 10 percent per annum during the last ten years compared to less than 3 percent on SNL farms.

Swaziland has a higher percentage of its labor force engaged in wage employment than any other developing country in Africa, and about 37 percent of these wage earners work in the large agricultural estates (including processing), on private farms, and in forestry. This modern agriculture sector is export oriented and dominated by non Swazis, with the exception of some cotton farmers on SNL and a few small irrigation schemes on which sugarcane and some vegetables are grown for the market.

#### 2. Farming on Swazi Nation Land

Approximately 373,000 people (66 percent of the resident population) reside in 42,000 dispersed homesteads on SNL. About 10 percent of SNL is under cultivation; and three percent is either fallow or taken up by homestead structures. The average holding is 2.75 hectares, but this varies by topographic zone, with the relatively under-populated lowveld having an average farm size almost twice the national average. Slightly more than one quarter of homesteads are less than one hectare in size, and only 12 percent have farms exceeding 5 hectares (even on these larger farms the average size is only 8 hectares). Fragmentation of land holdings is common.

Of the total amount of land controlled by each homestead, 80 percent is in cropland, of which 70 percent is devoted to maize production. A recent survey indicates that 96 percent of SNL farmers grow maize (the other 4 percent are most likely cotton farmers in the lowveld), and a substantial number intercrop pumpkins, groundnuts, beans, or sweet potatoes with maize. Although cotton and tobacco are the primary commercial crops grown on SNL, there

are also a small irrigated sugarcane growers cooperative and a tomato scheme in the Northern Rural Development Area which sell to a nearby cannery in the Republic of South Africa. Only 41 percent of the SNL farms sell any crops at all, and less than 10 percent produce primarily for the market economy. The majority of small farmers who market crops are involved in selling unanticipated maize surpluses in the immediate area of the homestead.

Due to topography and low rainfall in certain areas, eighty-seven percent of SNL is used for communal grazing of livestock and accommodates 546,000 cattle and 281,000 sheep and goats. These figures reflect the prominent role of cattle as the most financially viable store of wealth for the majority of rural homesteads.

Seventy-three percent of the families living on SNL earn less than \$200 per capita annually from all sources. Of those families involved in the sale of crops, most earn less than \$25 per capita from this source (the exception is the few SNL farmers growing sugarcane, cotton or tobacco). Some twenty-two percent of the homesteads in a recent survey reported receiving some cash income from livestock, and over half receive supplemental income from such activities as beer brewing and handicrafts. Under the best of conditions, a typical SNL homestead (excluding those growing cotton or tobacco) involved in all three of the above farm activities would probably earn about \$55 in cash income per capita.

Productivity is low on SNL farms for a multitude of complex, interrelated reasons. As discussed in the FY 82 Swaziland CDSS, agricultural prices in Swaziland are linked to South African prices and are low; wage rates in the modern sector are high, causing large-scale off-farm employment; and farm sizes are small. Within this framework, the agricultural system on SNL is one where much of the labor force migrates from the farm to obtain higher paying wage employment in the modern sector while leaving just sufficient labor on farm to maintain a claim to land by cultivating it and to retain grazing rights. The remaining labor is insufficient to grow the most profitable crops, and even the less profitable crops such as maize are produced in a less than optimal manner (e.g., proper weeding, row planting, proper spacing are often neglected). The situation is difficult even for those homesteads involved in full-time farming. Given the small size of holdings and large homestead sizes, there is little inclination to risk substituting cash crops for the staple foodstuff, maize, under current conditions and farming practices.

There are exceptions to the above scenario, however. Tobacco is being grown on small SNL farms in the southern highveld, and cotton is being grown in the lowveld. These crops yield gross margins per hectare of approximately \$824 and \$652 (E1=\$1.30), respectively, but are labor intensive and, therefore, require a considerable commitment to farming by the homestead. Additionally, recent surveys indicate that the larger farms (5-12 hectares) form the majority of the tobacco and cotton growers. Other exceptions include the Vuvulane Irrigation Scheme, where small farmers lease irrigated land from the Commonwealth Development Corporation. The principal crop grown at Vuvulane is sugarcane (the scheme is adjacent to a large sugar estate), but vegetable productivity is increasing. A recent survey indicated that the average homestead income at Vuvulane from sale of crops was \$3,570 in 1979. Additionally, a cooperative irrigation scheme is underway on SNL near another sugar estate where small farmers are also growing sugarcane and vegetables.

Within the Rural Development Areas (RDAs), small irrigation systems are being established with assistance from AID, the World Bank, the European Economic Community, the African Development Bank, and the United Kingdom. These lands are allocated within the traditional system by the chiefs in the areas to be irrigated. In the Northern RDA, for example, there are two functioning irrigation schemes of 41 and 18 acres involving approximately fifty farm families (an additional 250 acre irrigation scheme is currently being developed and should be ready for the next crop season). Generally, on unterraced land, a farmer who has been allotted an acre of irrigated land will grow maize during the summer rainy season on both the irrigated plot and the homestead's other land. After the maize harvest in February to April, farmers will begin a vegetable crop on the irrigated plots. Farmers in the Northern RDA are currently growing tomatoes, cabbages, onions, green maize, and beans on the irrigation schemes, almost exclusively for the market.

## B. Focus on Research and Extension

### 1. Introduction

As described in the FY 82 CDSS, USAID/Swaziland's agricultural strategy is based on the conversion of SNL farms from a subsistence to a commercial basis; a principal vehicle for such a conversion will be the expansion of small scale irrigation systems. The strategy is based on the hypothesis that an irrigated farm which allows double or triple cropping and higher yields per crop will provide a sufficient jump in income to retain labor. As previously mentioned, labor is currently a constraint on many SNL farms -- a phenomenon ascribable to the ease with which the modern sector could absorb labor over the past

10-12 years since independence. However, the major sources of demand for wage labor (e.g. civil service, estate farms and processing facilities, South African mines) are growing much more slowly; of the 7,000 school leavers who enter the labor force each year, only about 3,500 are able to find modern sector employment.

Within such a scenario, it is critical that farming become an economically viable enterprise. The U.S. Army Corps of Engineers has recently completed a Water and Related Land Resources Framework Plan for Swaziland which indicates that the potential exists to substantially increase the amount of SNL under irrigation (see Economic Analysis for details). While the larger-scale river basin development projects will require additional donor assistance (a World Bank team is currently investigating the possibility of an irrigation project based on the Corps of Engineers study), the capacity for on-farm irrigation systems is already being developed under the RDA Program. AID is currently providing technical assistance and training to the Land Use Planning Section of the Ministry of Agriculture and Cooperatives. That section will design the irrigation systems. Equipment already provided under an AID loan will be utilized for the construction of small irrigation systems in RDAs. Other donors involved in the RDA Program are providing capital funding for expanding small irrigation schemes in RDAs, and USAID/Swaziland is planning a pilot small farmer irrigation project to begin in FY 83.

Currently, the availability of inputs such as credit, seeds, fertilizer, pesticides, etc. does not appear to be a major constraint to SNL farmers. The Swaziland Development and Savings Bank has initiated a small farmer loan program for SNL farmers, and the sale of production inputs through the cooperative system has increased 234 percent since 1976.

A major remaining factor is the ability of the marketing system to absorb a substantial increase in commercial production by Swaziland's farmers. To date, the evidence is mixed. For example, in some RDAs where tobacco growing has been promoted, production has actually been stagnant or falling even though adequate access roads, input services, and marketing facilities exist. Additionally, the favorable pricing situation that currently exists for vegetables appears to have stimulated an increase in production on some RDA irrigation schemes, but it is too early to detect the degree, if any, of marketing problems the farmers will face at harvest time. In any event, other donor agencies are exploring the possibility of assisting the GOS to develop an adequate market infrastructure. The International Fund for Agricultural Development fielded a team in early 1981 to prepare a preliminary project identification document which included a marketing component. The project will probably involve the establishment of a vegetable marketing organization and the construction of additional collection, storage, and grading facilities. In addition, the World Bank has offered assistance in marketing.

Presently, Swazi farmers on SNL are beginning to respond to the favorable market demands for vegetables by increasing production. Individual farmers, private traders, and the cooperatives are currently handling the marketing of vegetables and surplus maize. USAID/S will continue to encourage other donors to provide assistance to establish a more formal marketing structure to handle the increase in production brought about by this project and other development activities. In addition, the Agricultural Economist advisor on the implementation team (see III.A.4., AID Inputs) will continually monitor and assess the market situation the impact which market conditions are having on production. Also, a short-term marketing specialist(s) can be provided under this project to do any recommended marketing studies and to make recommendations to the GOS and USAID/S concerning market development needs.

Given the above conditions, the major missing elements in a program to expand SNL commercial agriculture are: (1) an agricultural research program capable of analyzing small farmers' problems from a systemic viewpoint and making recommendations relevant to the conditions and constraints under which SNL farmers operate; and (2) an extension service capable of more effectively delivering research recommendations to the farmer. These two areas require immediate attention if the GOS' agricultural strategy to promote commercial farming is to succeed.

## 2. Current Status

### a. Agricultural Research

Agricultural research was officially begun in Swaziland with the establishment of the Research Division of the Ministry of Agriculture in 1959. The National Agricultural Research Center was established at Malkerns in 1962 and consists of approximately 400 hectares of land, an administration building, various laboratories (for chemical analysis of soils and plants, entomology and plant pathology), greenhouses, and staff housing. Sub-stations were later established at Big Bend in the Lowveld, Nhlangano and Luvu in the Middleveld, and Mangcongco and Hebron in the Highveld. In 1972, responsibility for research was transferred to the University of Botswana Lesotho and Swaziland Faculty of Agriculture, where it remained until 1978, when it was transferred back to the MOAC.

Research has been carried out mainly on research stations by an expatriate staff for the past several years, and has met the need of estates and the Individual Tenure Farms more than it has the needs of farmers living on and farming small plots on SNL. Also, the research has focused on monocropping while, traditionally, SNL farmers have practiced inter-cropping. Statistics reflect that 36 percent of the SNL farmers practice inter-cropping; however, discussions with senior Swazi agricultural officials and visual observations strongly indicate that this figure is more likely to approach 60-70 percent. Yet, there is no record of significant research on which to base recommendations to accomplish efficient production under inter-cropping practices. Neither is there a record of

significant research on which to base recommendations for multi-cropping.

Fourteen disciplines have made up the areas of agricultural research in Swaziland. Those areas are: (1) Crop Agronomy, (2) Horticulture, (3) Veld and Pasture Management (has been limited in scope), (4) Dryland Crop Production (only established in recent years), (5) Soil Fertility and Crop Nutrition, (6) Soil Chemistry, (7) Soil Physics, (8) Plant Pathology, (9) Entomology, (10) Cotton Breeding, (11) Cotton Entomology, (12) Biometry, (13) Forestry, and (14) Pineapples. Both forestry and pineapple research are fully financed by the private sector. Technically, some excellent work has been done over the past ten years, and facilities and equipment are adequate with some minor exceptions (the research library is inadequate and the soils laboratory needs remodelling). However, although this past research has been of high quality, much of it is inapplicable in its present form to the needs of SNL farmers.

The expatriate staff that had been responsible for carrying out the research program departed in early 1979 after the transfer of the research function back to the MOAC. During the lengthy process of creating the required number of government posts and establishing the Research Division as a government unit, the contracts of the researcher officers expired, and all but one left the country.

In 1978, the GOS established 13 professional positions in the Agricultural Research Division. Of the 13 positions, two are currently filled by Swazis (Chief Research Officer and Rural Sociologist), and a Swazi is being trained to replace an expatriate working in plant pathology. The remaining 10 positions are unfilled, and there are no Swazis in the training pipeline for these positions.

In summary, while some good research has been carried out in the past, two main problems are impeding the effectiveness of the research program in meeting the needs of SNL farmers: (1) a lack of trained Swazis and (2) the absence of a research approach that addresses the conditions and constraints faced by SNL farmers.

#### b. Extension Training

The agricultural extension cadre is the largest single personnel component of the MOAC. Services of extension personnel embrace livestock extension, crop extension, home economics and nutrition, youth programs and other aspects of integrated rural development. The Swaziland Establishment Register (1981-1982)

carried the following distribution of posts for selected extension positions (excluding several professional levels, clericals, technicians, drivers, etc.)

Agricultural Officer	10
Extension Officer	35
Assistant Extension Officer	75
Field Officer	<u>140</u>
TOTAL	260

The extension workers are primarily generalists by training and are backed up by the Crop Production Section which includes five Swazi subject area specialists (all with B.Sc. degrees in general agriculture). The Crop Production Section conducts special courses and field exercises for extension workers but is severely hampered by a lack of relevant research findings and the fact that the staff, in spite of specialized assignments, have degrees in general agriculture.

In an attempt to train Field Officers and place them rapidly, the MOAC reestablished the Certificate Training Course in agriculture, a one year program, in 1977. The course had been dropped by the Faculty of Agriculture in 1972 but is now the source of new field officers. The MOAC leases facilities from the University, and 40 students are enrolled in the certificate course each year. Instruction is provided by a teaching staff of two full time instructors (one of whom is USAID-funded), two full time field practice supervisors, and approximately 17-20 subject matter specialists drawn from the MOAC, Faculty of Agriculture, and the private sector. Students are receiving 40 percent technical instruction and 60 percent field practice.

Given the emphasis on achieving the desired ratio of one Field Officer to every 200 farms nationwide (the current ratio is about 1:300), students are trained to be Officers in a one-year course (see Annex G, Summary Certificate Training Course Curriculum) covering a comprehensive range of topics. It is unlikely that the course will be lengthened in the near future, and the present program is considered adequate given current time pressures. The major weakness in the training program results from only eight percent of the total course work being devoted to extension methods. Such a weakness could be overcome in the field without changing the course content if supervisors of Field Officers were skilled in the program development process and in supervision.

Supervision is a problem, however, and field supervisors need training in management and program development. Another weakness of the Certificate Training Course is its failure to link extension training to agricultural research efforts, and the entire range of problems is compounded by the lack of adequate backup support from the Agricultural Information Section of the MOAC.

In summary, while graduates of the Certificate Training Course are reasonably well prepared and motivated, the lack of adequate field supervision; inadequate support in the form of extension aids; and the lack of structured, continuous in-service training in such areas as improved communications skills and recent research findings serve to diminish the effectiveness of the Field Officers.

### c. Agricultural Information

The role of the Agricultural Information Section (AIS) in the MOAC is to produce technical and agricultural news publications that are translated into terms that can be understood and used by field staff and farmers; they also produce visual-aid materials to backstop the extension staff in their efforts to educate and train farmers in the use of more modern, advanced production technologies. Also, staff of the AIS (by means of mobile units) are supposed to assist the field staff by providing special film presentations of a technical nature.

For extension field staff to perform at the maximum level of their capability it is essential that they have the latest technical information resulting from research. This research data and information must be translated into terminology easily understood by the extension field staff and the farmer. It must be published in the form of technical bulletins, manuals, leaflets, flip charts, posters, etc., in sufficient quantity to meet the needs of the extension field staff for use in farmer meetings and training programs.

For the past few years the AIS has periodically been without leadership. Expatriates have been provided by donor agencies to fill this leadership role from time to time, usually on a two-year tenure basis; however, there has been no continuity or overlap of assignments, nor has there been any Swazi trained to assume this role. As a consequence, the recurrent operating budget for this section has been allowed to decrease each year to the point that now only a minimum of activities are carried out by the section. Positions have been created for the section and, while most are filled, personnel suffer from a lack of training and support that renders the program almost dormant. Currently,

three small offices for professional staff plus a crowded farm broadcast room, small darkroom, and a minuscule printing room comprise the entire AIS.

Present publications consist mainly of one Rural Development News Bulletin which is published on a quarterly basis and contains approximately 30-35 pages, and a few posters. These publications are sent out for printing at a high cost; news bulletins cost approximately \$1.95 each. Previously, one-page instructional leaflets were produced for distribution to the extension staff and to farmers but have now been discontinued.

As a result of the above, extension staff have, for the most part, no teaching aids to assist them in the presentation of research recommendations to the farmers. With the very limited level of training most extension field staff have received, it is essential that they be provided with well prepared technical materials that present easily followed step-by-step procedures in such areas as crop production, pest and disease control, and irrigation management. In view of their limited training, it is also essential that extension staff receive technical bulletins and manuals that will keep them apprised of current technical developments.

### III. Project Description

#### A. Logical Framework Narrative

##### 1. Goal

While the ultimate goal of most AID agricultural projects is to improve the standard of living of the rural poor, a more specific project goal has been identified for this project in order to more accurately draw the linkages between project activities and objectives. Specific productivity goals were considered but rejected on the grounds that simply increasing productivity potential may or may not affect the standard of living of the rural Swazi. In the past, for example, certain practices that could improve productivity were not adopted due to the existence of other constraints. Since the proposed project is directed toward viewing the entire farm environment with its complex set of constraints, it was concluded that to increase the economic viability of farming on Swazi Nation Land is the appropriate project goal. Such an objective will allow a more dynamic approach to research and extension - one that is responsive to the changing conditions on SNL and the problems farmers face. Naturally, other variables will interact with the accomplishments of this project to determine the degree of goal achievement. Such conditions as an adequate marketing system, availability of farm inputs, and the expansion of the land area under irrigation are discussed under purpose to goal assumptions and others are described in the Background Section of the PP.

While major emphasis of the project will be on providing a body of research information relevant to the socio-economic needs and technical capabilities of the small farmer, supporting activities to enhance the capacity of the MOAC to deliver research recommendations to farmers are also integral to goal achievement.

Goal Measurement. At the project goal level, an increase in the economic viability of farming will be measured by the percentage of SNL farms producing a marketable surplus above subsistence needs. Currently, less than 10 percent of the SNL farms produce primarily for the market; the goal of this project is to increase that figure to 20 percent by 1992 and to 30 percent by 1997. It is further expected that the percentage of farms producing at least a partial surplus for the market will increase from the currently estimated 41 percent to 60 percent by 1992 and 80 percent by 1997.

The project base-line survey, current MOAC Monitoring and Evaluation Unit surveys, and such studies as the Swazi Rural Homestead (see Social Coundness Analysis) will be used as the base for the measurement of goal level success; project evaluations and follow-on surveys, in addition to future Monitoring and Evaluation Unit surveys and agricultural censuses, will be used to gather comparative data for evaluation purposes.

## 2. Purpose

The purpose of the project is to improve and expand the capacity of the MOAC research and extension programs to develop and effectively extend cropping systems recommendations relevant to the needs of the SNL farmer.

Purpose to Goal Linkages. As noted in the FY 82 Swaziland CDSS, the lack of appropriate cropping systems recommendations for small farmers is a serious constraint to increasing productivity and income levels. Institutional weaknesses pose a serious constraint to addressing the needs of the small holder on SNL, and without institutional support it is unlikely that current GOS programs can achieve the desired shift from subsistence to commercial agriculture. The institutional components of the project will establish an ongoing capability to (1) identify the constraints impeding progress on SNL farms as well as the expressed needs of the farmer; (2) respond to the situation through a program of on-farm research to identify crops and cropping practices relevant to these needs and constraints; (3) develop appropriate information tools that are understandable and usable by extension agents and farmers; and (4) provide in-service training courses to improve the technical and motivational skills of the extension service staff.

The institution building emphasis of this project is predicated on the fact that a systemic approach to agricultural research is an ongoing process which will require continual modification as social, economic, and environmental conditions change on SNL. Technical recommendations that are valid in one crop year may have to be modified during following years due to changing price relationships, for example. Likewise, extension is an ongoing process that must be responsive to research innovations as well as the changing farm environment. This will require a capacity to mount in-service training programs to continue to develop the technical knowledge of extension staff as well as their awareness of the socio-economic factors that will play an important role in motivating farmers. Also, to support the research and extension program, adequate teaching and extension aids must be prepared by the agricultural information staff.

End of Project Status. By September 30, 1987, when AID assistance under this project terminates, it is expected that the Research Division will be well on its way to becoming a fully functioning unit with trained Swazi personnel serving as Research Officers. However, a follow-on effort may be required to address the additional or different constraints identified in a cropping systems research project of this type. Possible components might include (1) more work on livestock and/or marketing research (2) additional training for Research Division staff and/or (3) limited technical assistance in advanced systems research. The external evaluation in July 1985 will provide the information on which a decision to begin planning for a Phase II project will be based. At that time, progress toward the achievement of the project's purpose will be evaluated and recommendations will be made for inputs into a second phase. The final PP for the follow-on project, if required, will be designed in July-August 1986. In the case of the extension training and agricultural information, it is anticipated that all institution building efforts will be completed at the end of the first phase project in 1987.

Specifically, the following conditions will determine end of project status:

- the Agricultural Research Division will be capable of (1) conducting economic, social, and technical research on a continuing basis; (2) conducting 100 on-farm research trials yearly; (3) producing research recommendations annually that are designed to provide useful results to extension agents and farmers, and (4) developing linkages with appropriate IARC's, i.e. germplasm exchange, utilizing research results and reciprocal scientist visits with appropriate international agricultural research institutions and programs.

- the extension program of the MOAC will be capable of (1) conducting an ongoing in-service training program reaching 50 percent of the extension staff yearly (covering such areas as the latest research findings, motivation techniques, use of improved extension aids, and socio-economic characteristics of the farmers with whom they work); (2) assisting field research staff conduct 100 on-farm research trails yearly and conducting an additional 160 on-farm demonstrations of research findings during each year; (3) conducting eight farmer field days annually; and (4) reaching 75 percent of SNL farms yearly with research recommendations.

- the Agricultural Information Section of the MOAC will be capable of (1) putting research recommendations into a form understandable and usable by both extension workers and farmers; (2) supporting extension workers by producing adequate teaching/extension aids; and (3) supporting direct extension efforts with a program providing such services as radio broadcasts, etc.

Purpose to Goal Assumptions. The following assumptions are considered critical if the project is to have the desired goal level impact:

- GOS policies will continue to encourage cash cropping through such efforts as the Rural Development Area Program;

- production inputs will continue to be available in adequate amounts and on a timely basis;

- the marketing system will be able to accommodate the increase in SNL production for the market; and

- the amount of SNL under irrigation will continue to increase.

### 3. Outputs

Research. During the first year of the project a base-line survey of a cross section of SNL farms will be conducted to provide data for future evaluations as well as information critical to the formulation of the on-farm research program and the in-service training curriculum for extension workers. Socio-economic research will continue during the remainder of the project in order to provide updated information to the agriculturists designing the research trials. By the end of the project, 350 on-farm trials will have been conducted, five annual research reports will have been prepared, and specific recommendations will have been made based on the findings of the research efforts. In addition to the on-farm research, applied research will be conducted on the research stations as needed.

Through the efforts of the technical assistance team and the Swazi staff, linkages between the Research Division, Extension Division, Agricultural Information Section, and the Faculty of Agriculture will be strengthened. A process for conducting cropping systems research will be designed and implemented, including the direct participation of extension field officers as well as Research Division staff. Senior Research Division staff will teach some special courses at the University on an invitational basis and assist in conducting in-service training courses for extension personnel. Additionally, relationships will be established with various international research centers and research organizations in other African countries.

Fifteen participants will receive formal training under the research component of the project. Nine will obtain M.Sc. degrees and return to fill research officer positions at Malkerns and the research sub-stations, and six will receive short-term

training in the U.S. and third countries in such areas as agricultural statistics and field research methodology. In addition, Swazi research officers and research assistants will receive on the job training and be working effectively by the end of the project.

To support the technical assistance and training efforts of the Research Division, additional equipment will be procured and in use, and a new Library/Conference room plus an extension to the soils lab will be constructed.

Extension. During the course of the project, an in-service training program will be designed to meet the continuing needs of the extension service. During the first year, the training needs of extension workers will be determined through an assessment of the Faculty of Agriculture curriculum and interviews with the workers themselves. A formal in-service training program will be established, the curriculum will be developed, and all extension staff will have attended at least one course by the end of the project. The in-service training program will include formal, specialized training at the Faculty of Agriculture during school breaks and less formal sessions at farmer training centers, research stations, and on-farm research locations. The role of the in-service training function will be clearly defined during the project, and the organizational and administrative position of the training section will be formalized. A relationship will be established with the Faculty of Agriculture; the technical advisor for in-service training will assist the permanent staff by introducing students and faculty to new techniques and training aids developed during the project.

Two Swazis will receive training under the in-service training component of the project and return to fill positions in the MOAC's Extension In-Service Training Section. One participant will return to direct the program after obtaining an M.Ed. in agricultural education and extension training, while an assistant training officer will attend a short-term work/study program in either the U.S. or a third country. Eight Swazis will receive B.Sc. degrees in specialized agricultural disciplines and return to staff the Crop Production Section of the MOAC. These area specialists will play an important role in establishing an effective extension program by conducting in-service courses at research stations and in the field and providing the technical back-up for the generalists in the field. The Crop Production Section is currently staffed by five Swazis with B.Sc. degrees in general agriculture. These generalists will be

transferred to the Research Division during the first year of the project to serve as counterparts to the U.S. technical assistance research team and will receive M.Sc. training in specialized research fields. Upon completion of training, the M.Sc. graduates will return to fill Research Officer positions. The MOAC has proposed this method of providing research trainees on the basis that sound research is a prerequisite to the development of a Crop Production Section.

Training is included under this project to re-staff the Crop Production Section with area specialists since extension generalists and farmers will need technically specific assistance as the research program produces new recommendations. B.Sc. level graduates are suitable for the Section but graduates from the University College of Swaziland receive B.Sc. degrees in general agriculture and are not subject area specialists. Therefore, eight Diploma of Agriculture holders or new B.Sc. graduates, if available, will be sent for specialist subject area training in the U.S. or third countries where a subject area major can be obtained.

trials and

Finally, 320 on-farm/demonstrations of research recommendations will be conducted during the last two years of the project and sixteen farmers field days will be held during the same period.

Agricultural Information. The U.S. technical advisor and short-term consultants working with the Agricultural Information Section will develop a system for converting research recommendations into extension packages that will include not only step-by-step procedures for field officers but back-up support such as posters, flip charts, slide shows, farm bulletins, and other extension aids. During the first two years of the project, organizational improvements will be implemented; a new facility will be constructed, equipped, and made operational; and staff will receive on the job training in such areas as materials production, audio-visual techniques, etc. During this time, various communications techniques will be tested to determine the most effective way of reaching farmers.

By the time results are forthcoming from the Research Division, the AIS will be ready to support the extension effort, and recommendations will actually be converted into extension manuals. Additionally, the results of the pilot communications effort will be used to develop supporting extension aids during the project, and four mobile units will be operating (one in each of the four administrative districts). Three participants will receive formal training and return to fill key positions in the AIS during the project. One will receive an M.Ed. in Agricultural Information and return to head the Section, and two will receive short-term training in such areas as audio-visual techniques and equipment maintenance and repair.

Output to Purpose Linkages. As discussed in the Background Section, the major constraints to the development of an effective research and extension process are: (1) a lack of trained manpower; (2) the absence of a systematic approach to the development of relevant research recommendations, extension packages, and supporting services such as teaching aids; (3) an inadequate in-service training program; (4) no integration of the research, extension, and support functions; and (5) a lack of adequate equipment and, in some cases, facilities. This project has been specifically designed to alleviate the above constraints and thereby set the conditions necessary for the MOAC to continue the research, extension training, and information support functions.

#### 4. Inputs

The following discussion and tables describe the inputs that will be required to produce project outputs and achieve the project's purpose:

##### a. USAID (\$12,900,000)

(1) Technical Assistance (\$8,140,000). The project will provide 40.75 person years of long-term technical assistance and 90 person months of short-term consultancies. The specific areas of technical assistance and the duration of services are listed in Table III.1., and job descriptions are included as Annex J. All long-term consultants will work with Swazi counterparts who will be trained under the project.

TABLE III.1.

#### Technical Assistance Schedule

<u>Personnel</u>	<u>Time Frame</u>	<u>Staff Years</u>
Cropping Systems Specialist (Chief of Party)	Jan. 82 - April 87	5.25
Rural Sociologist	Jan. 82 - April 87	5.25
Agricultural Economist	Jan. 82 - April 87	5.25
Extension Training Specialist	Jan. 82 - Jan. 87	5
Agronomist	Apr. 82 - April 87	5
Horticulturist	Apr. 82 - April 87	5
Irrigation Specialist	Apr. 82 - April 87	5
Agricultural Information Specialist	Jun. 82 - June 87	5
Consultants (e.g., small farm mechanization, weed control, library science, agricultural policy economics, in-service training, audio-visual techniques, livestock management)		7.50
	<b>TOTAL STAFF YEARS</b>	<b>48.25</b>

See Annex J for Job Descriptions

(2) Training (\$1,781,000). Fifty-four study years of academic training has been included in the project, and an additional 57 months of short-term and work/study training is planned. Most of the academic training will be conducted in the U.S., but research participants will also receive training at an international research institution such as the International Rice Research Institute before returning to Swaziland. Undergraduate training and short-term training will be conducted in African and other third countries to the maximum extent practicable. Table III.2. depicts the participant training program planned for the project, including the time frame and length of study.

TABLE III.2.  
Participant Training Schedule\*

Discipline	Time Frame	Study Months
M.Sc. Rural Sociology	May 1982-May 1984	24
M.Sc. Agronomy	May 1982-May 1984	24
M.Sc. Agricultural Economics	May 1982-May 1984	24
B.Sc. Agronomy	May 1982-May 1986	48
B.Sc. Horticulture	May 1982-May 1986	48
B.Sc. Agricultural Economics	May 1982-May 1986	48
B.Sc. Agronomy/Soils	May 1982-May 1986	48
Short-term/Audio-Visual Equipment	June 1982-Dec 1982	6
Short-term Agricultural Statistics	May 1982-May 1983	12
M.Sc. Horticulture	May 1983-May 1985	24
M.Sc. Agricultural Irrigation Technology	May 1983-May 1985	24
M.Sc. Agricultural Extension Education	May 1983-May 1985	24
M.Sc. Agricultural Informa- tion Systems	May 1983-May 1985	24
B.Sc. Irrigation Technology	May 1983-May 1987	48
B.Sc. Entomology	May 1983-May 1987	48
B.Sc. Small Farm Mechaniza- tion	May 1983-May 1987	48
B.Sc. Plant Pathology	May 1983-May 1987	48
Work Study/Extension Training	Sept 1983-Aug 1984	12
M.Sc. Horticulture	May 1984-May 1986	24
M.Sc. Agronomy	May 1984-May 1986	24
M.Sc. Dairy Science	May 1984-May 1986	24
M.Sc. Agricultural Engineering Small Farm Mechanization	May 1984-May 1986	24

\* NOTE: See Participant Training Flow Chart in Annex O.

TABLE III.2.

Participant Training Schedule

<u>Discipline</u>	<u>Time Frame</u>	<u>Study Months</u>
Work Study/Ag. Info. Systems	Sept 1984-Aug 1985	12
Short-term Cropping Systems		
Research Methods (Third Country):		
2 persons x 3 months	Jun 1983-Aug 1983	6
2 persons x 3 months	Jun 1984-Aug 1984	6
1 person x 3 months	Jun 1985-Aug 1985	3
	<b>TOTAL STUDY MONTHS</b>	<b>705</b>

(3) Construction (\$640,000). The construction component of the project consists of a research library/conference room and an extension to the soils laboratory at the Malkerns Research Station; a new building to house the AIS; one house for a U.S. technical advisor in Mbabane (by the time the implementation team arrives, one house previously constructed by AID will be available for the other U.S. technician in Mbabane; the GOS is providing six houses for the research advisors at the Malkerns Research Station); 14 houses for field research teams; and 10 field research storage sheds. An Engineering Analysis is contained in Annex H.

(4) Equipment (\$280,000). Equipment will be provided to support the three major activities under the project. Lab, farm, and office equipment will be provided to support the research effort; various items such as a photocopier, projectors, production equipment, and some office equipment will be provided for the Agricultural Information Section (AIS); and a limited amount of teaching equipment will be provided for the Certificate Training Course. Equipment provided to the AIS will be used to support the in-service training program. The equipment to be provided under this project represents a shortfall in the current equipment pool that must be provided if the project's objectives are to be met. A detailed list of the equipment, including prices, is included in Annex L. Procurement procedures for the equipment to be provided under the project are described in Section VI, Implementation Plan.

(5) Commodities (\$612,000). Commodity support will be provided to ensure timely implementation of project activities. Commodities to be purchased include: (1) fertilizers, seeds, plot markers, fencing, etc. for research trails; (2) office supplies; (3) books, reference materials, and other

research publications; (4) production materials (posters, flip charts, slides, films, etc.) and experimentation materials for use by the small farm mechanization consultant. Annex L provides a listing of commodities, including prices; Annex K lists commodity expenditures by project component and fiscal year; Section VI., Implementation Plan, describes the commodity procurement procedures to be followed.

(6) Vehicles (\$138,000). Vehicles (8) will be bought to support the technical assistance effort's demanding travel schedule. Research officers will closely supervise the on-farm trials and will, therefore, be required to cover the entire country. Likewise, the agricultural information and extension training advisors will be travelling extensively in support of their programs and will require vehicles. Four panel vans will be purchased and fitted with equipment for the Agricultural Information Section in support of the extension service. Finally, 14 motorcycles will be bought for the field teams (all Research Assistants and Peace Corps Volunteers). A list of vehicles is included in Annex L; expenditures by fiscal year can be found in Annex K; and Section VI, Implementation Plan describes the procurement procedures to be followed. Seven of the motorcycles will be purchased in FY 82, and the remaining seven in FY 83.

(7) Other (\$1,309,000). \$17,000 in local costs will be provided for the base-line survey; \$58,000 will pay for the services of a local administrative assistant for the Title XII implementation team; \$48,000 has been budgeted for the external evaluation; and \$1,186,000 has been added as a 10 percent contingency (15 percent on equipment).

b. GOS (\$4,354,000)

(1) Vehicle Maintenance and Operation (\$437,000). The GOS will provide for all fuel and maintenance of project vehicles. Under the current system, petrol is purchased at a government pump; the price includes the cost of the fuel, a maintenance allowance, and a depreciation/replacement allowance. The vehicles bought by AID at the initiation of the project will be replaced by the GOS in 1985 and 1986, or as required.

(2) Salaries (\$1,758,000). This component includes salaries for counterparts plus other professional and support staff that will be engaged in the project through 1987. Of this total, \$413,000 represents an incremental cost to the GOS over the next six years.

(3) Research Facilities and Office Space (\$1,223,000). This contribution represents facilities constructed at the Malkerns

research station. They were funded from the GOS capital budget. These facilities will be used by the cropping system research technical assistance team and their Swazi counterparts.

(4) Housing and Furnishings (\$369,000). The GOS has built six houses which will be used by the U.S. advisors stationed at the Malkerns Research Station. Furnishings will be provided for these houses and the AID-built house in Mbabane for the agricultural information specialist. (Note: The extension training advisor will occupy a house built under a previous project. It will be vacant prior to his/her arrival in Swaziland.) In addition, furnishings will be provided for the 14 houses to be constructed by AID for the field research teams.

(5) Travel Costs for Participants (\$122,000). The GOS will finance the round trip airfare for all participants.

(6) Commodities and Supplies (\$336,000). The GOS will continue to fund research commodities, production materials and supplies. In addition to current levels of commodity support, an additional \$33,000 will be provided for AIS production materials. In FY 86, the GOS will fund 50 percent of the cost of additional production materials and will pick up the total cost in FY 87. By FY 85 the GOS will be providing \$6,500 for teaching materials to be used in the in-service training program (in addition to the current budget). Commodities for research trials will be funded under current Research Division budget allocations.

(7) Contingency (\$109,000). Annex X breaks the GOS contribution term by fiscal year, component, input, and differentiates between expenditures to be covered under present recurrent budget allocations ascribable to the project and incremental budgetary requirements. Of the total, \$1,213,000 (\$933,000) are incremental expenditures which, in addition to present budgetary support, will be required to support the project.

c. U.S. Peace Corps (\$55,000)

The U.S. Peace Corps will provide four volunteers for two years each to assist with the on-farm research program.

## B. Project Approach

This project is designed to overcome three basic constraints to increasing small farmer incomes in Swaziland: (1) lack of relevant research recommendations; (2) the inability of the extension service to effectively motivate farmers to adopt improved farming practices; and (3) the lack of adequate field support for extension workers in the form of extension and teaching aids. Separating the constraints in such a manner is an artificial expedient for the sake of analysis; in fact, they are so interrelated that the insufficiencies of each area are actually part of the problem facing the other two. Therefore, this project, through the provision of the technical assistance, training, equipment, and commodity support described in Section III.B. will address the institutional needs of all three areas in order that the GOS may carry on an effective, on-going research and extension effort.

The research component of the project will focus on an analysis of the systems within which small farmers operate and the development of cropping recommendations relevant to their situation. Research activities during Crop Year (CY) 1982/83 will be planned based on initial observations of cropping constraints in Swaziland and analysis of past research both in Swaziland and at international agricultural research centers. During the first year of the project, the CSR team and Swazi counterparts will conduct and quickly analyze a baseline survey. This survey will be the primary responsibility of the Agricultural Economist and Rural Sociologist. The results will be used to redirect the overall on-station and on-farm research effort during CY 1983/84 and for project evaluations. The program will be carried out by research teams consisting of one Research Assistant (graduate of the two-year Diploma Course in agriculture), two Field Officers from the extension service, and ten farm families (one officer for every five families). Program direction and definition will be provided by the technical assistance research team and their Swazi counterparts (Research Officers), and technical support will be provided by four district-level U.S. Peace Corps Volunteers. During the first year of the project, five Research Assistants and ten Field Officers will receive training in the cropping systems research approach at the research stations and will assist in the gathering of farm data and the selection of participating farmers. During the 1983/84 growing season these teams will work in five RDAs to implement the adaptive research program, while five more Research Assistants are being trained at the research station. During the next crop season (1984/85) the second five field teams will join the adaptive research program. By this time 10 teams consisting of 10 Research Assistants, 20 Field Officers and 100 farmers will be operating to conduct one hundred on-farm adaptive research trials yearly, the level to be maintained for the remainder of the project. Peace Corps Volunteers will continue to provide field level technical support in each administrative district. All field team personnel will be housed in the field at either RDA project centers or other suitable locations.

In addition to continual assessment and modification of the adaptive research program, the technical assistance team will also conduct applied research under controlled conditions at the central and outlying research stations. Some of the research required in this area has been done in Swaziland; however, the technical assistance team will carefully evaluate past research. Based on this analysis, the feedback from the socio-economic

research, and the results of the on-farm trials, it is likely that additional research-station-based applied research (variety screening, timing of irrigation, fertilizer and pesticide rates, etc.) will be necessary.

Based on analysis of present and future manpower requirements, the MOAC's goal of reducing the extension officer:farm ratio to 1:200 will be achieved at the present rate of output without additional assistance. Instead, the project will concentrate on developing the expertise of extension officers in extension methodology and supervision and on improving motivation. Training will encompass cropping systems methodology, including on-farm trials and demonstrations. Special attention will be given to developing approaches and skills for working with farm units with unique features which cause difficulty in carrying out extension work through groups and in developing broad-based research recommendations.

U.S. technical assistance in cooperation with MOAC staff will develop a structured in-service training program. Training needs will be established during the first year of the project and the course content for the first phase of training sessions will be developed. Course content will be based on the needs analysis; courses will range in duration, scope, technical depth, and format depending on those needs.

The technical advisor to the in-service training program will work closely with the Agricultural Information Section (AIS) staff in the planning of training sessions. Audio-visual and other teaching aids developed by the AIS will be used for in-service training to minimize equipment redundancy. Additionally, the U.S. advisor in in-service/extension training will assist the Certificate Training Course faculty by teaching some courses in extension methodologies and the use of extension aids developed under the project. A final element of this component of the project will be academic training for eight Diploma graduates who will staff the Crop Production Section of the MOAC.

To support the efforts in research and extension training, technical assistance, equipment and formal on-the-job training will be provided to establish an effective system for the development of agricultural information and extension aids. This component of the project will test various communications techniques to determine those most appropriate for reaching SNL farmers. A systematic approach will be developed for translating research recommendations into extension manuals and farm publications, and linkages will be created through the participation of AIS staff in some research training activities. Production capacity will be created in the AIS, and mobile extension units will be equipped and operators trained to assist research and extension staff (emphasis will be placed in supporting the Certificate Training Course and extension in-service training programs) with research trials, on-farm demonstrations, field days, and in-service training sessions. While much of the informational work will involve the adaptation of material from other countries early in the project, local production of tapes, slides, and other aids will steadily replace the imported materials as Swazi staff are trained in the production and utilization of various information packages.

### C. Project Phasing

It is unlikely that all of the institutional objectives set for this project (see Section III.C. Logical Frame Narrative and Annex I) will be achieved in their entirety during the six years of project implementation. End of project status should be achieved in the extension training and agricultural information components but, given the complexity and magnitude of the research problem, it is expected that a follow-on effort will be required beginning in FY 1987. Five main factors necessitate planning for a second phase research effort. First, research is a slow process that will, by definition, raise questions and possibilities yet unanticipated. For example, the introduction of new intercropping or irrigated cropping practices may cause changes in plant disease patterns that will require further applied and adaptive research. Second, changing economic and technical conditions under expanded irrigation may change the scale of production necessitating further research. Third, as the amount of SNL under irrigation increases, more emphasis will be required on research under irrigated conditions. Fourth, the information collected during the first five years of the project will add substantially to the body of knowledge concerning the complex livestock situation on SNL. Naturally, the project must include a thorough analysis of the interaction between the livestock and crop subsystems as a basis for making appropriate cropping systems recommendations. However, detailed research in such uses as range management, livestock production, and pasture varieties

will not be carried out during the early phase of the program but may be more appropriate at a later date. Therefore, based on the above, a follow-on phase including a moderate level of technical assistance, with a slightly different mix of skills, may be necessary. Finally, and probably most important for this project, given the shortage of candidates for training (coupled with a nationwide shortage of skilled Swazis in technical fields), it is very likely that the training component will require a second phase to complete the institution building process. Therefore, USAID/Swaziland is tentatively planning a second phase effort; the final decision rests with the findings of a July 1985 external evaluation. Should the need for follow-on activity be confirmed, the design of a follow-on project will be conducted in July-August 1986.

#### IV. Project Analyses

##### A. Technical Analysis

##### 1. Cropping Systems Research

Past agricultural research in Swaziland has been primarily directed toward the needs of the estates and the larger title deed land owners. Past reviews suggest that the research that has been done is of a good quality and that it has made major contributions toward increasing agricultural production in Swaziland. However, most of the research has focused on mono-cropping systems, and has not been directly appropriate for the Swazi Nation Land farmer. (Various sources estimate that between 36-70 percent of the SNL farmers practice mixed cropping.) While some of the past research findings have been utilized by small farmers, the research was not designed to investigate and address the constraints faced on SNL.

Farming on SNL consists of communal livestock grazing (mainly cattle and goats), small scale poultry production, and mixed crop production on cultivated land. The cropped land is set apart from the grazing land during the cropping season, but after the harvest it reverts to communal pasture allowing livestock to graze the crop residue. The average farmer has about 2.75 hectares of land on which to grow crops. The major crops grown on SNL are maize, groundnuts, cotton, juǰo beans, sorghum, beans, pumpkins, sweet potatoes, and tobacco. Occasionally orchard crops, sugarcane, and pineapples are found. Vegetable crops are only grown on a small fraction of SNL and are primarily for home consumption although there are a few areas of commercial vegetable production.

Several projects are currently being implemented which are designed to assist the SNL farmer (see Background Section), including a small intercropping research project sponsored by the International Development and Research Center and the University College of Swaziland under the direction of the Faculty of Agriculture. While some useful technical data is being generated that can be applied under this project, the program does not include a detailed assessment of farmers' constraints, and farmer involvement in the research trials is minimal.

While the programs previously referred to are making important contributions to improving farming conditions, they are not sufficient to attain the GOS goal of increasing commercial farming on SNL. Research recommendations based on a thorough analysis of the complex set of problems faced by small farmers

are necessary for total program success in the agricultural sector.

The design approach in this project, in agreement with the general outline of the PID and consulting reports of the International Agricultural Development Service (IADS) and the Consortium for International Development (CID), is based on a cropping systems research (CSR) framework. This approach depends on a holistic method of studying a system as an entity made up of all its components and their interrelationships, including the environment within which the system exists.

Cropping systems research does not eliminate the need for traditional experiment station-based research, but it is an attempt to improve the efficiency of such research by promoting a closer coordination between the technology development process and the farmers' needs. Thus the systems approach is complementary to traditional agricultural research.

Philosophically, CSR requires a change in the traditional attitudes and approaches of the individuals conducting the research. That is, research teams are composed of individuals from several disciplines working together to design research appropriate to the small farmer rather than a researcher working on a specific, discipline-oriented problem.

Methodologically, much of the CSR is actually carried out on the land of the small farmer using the inputs and techniques the farmer would use in producing a crop. Experiments are planned and carried out by the CSR team in cooperation with the farmer. Whenever possible, the farmer is involved in physically conducting the experiment. The degree of farmer involvement may not be great in the first year, but as the research process continues over a period of years, farmer involvement and control would increase while the role of the research team would diminish. It must be stressed that CSR programs are designed for individual farmers (or a small number of farmers with similar circumstances and constraints), with the level of farmer input in the conduct of the research varying depending on the farmer's interest, capabilities and understanding.

Target groups of farmers with similar production constraints (e.g., rainfall, soil fertility, economic resources) will be chosen through a series of surveys and discussions by all members of the CSR team. Research will be designed within the constraints of the farmer and will not be a series of highly sophisticated experiments with elaborate experimental designs. Instead, they will be simple, straightforward experiments that are understandable by the farmer and would be replicable by him. Experiments will be placed only on the farms of those farmers willing to participate

in the research.

The long-term implementation (technical assistance) team for the research portion of the project will consist of six individuals (see Annex J for detailed job descriptions):

1. General cropping systems specialist (Chief of Party)
2. Cropping systems agronomist
3. Cropping systems horticulturist
4. Irrigation specialist
5. Agricultural economist
6. Rural sociologist

Consultancies in such areas as small farm mechanization, weed control, library science, rural sociology, and livestock management are anticipated. Of these, the services of the small farm mechanization specialist and the librarian will probably be used the most extensively. The library scientist will spend four months establishing the library system as soon as the new research library is completed and will return for three months at a later date to update the system and train Swazi staff in the maintenance of the library. The small farm mechanization specialist will spend three months during the first year of the project determining research and experimentation needs regarding appropriate farm implements. On the basis of the information gathered, the specialist will collect plans and designs that may be applicable to the conditions on SNL and will return during the second year to test prototypes. Afterwards, the small farm mechanization specialist will return for the analysis of crop season research results and to assist in the formulation of recommendations on the use of farm implements. At that time, new or modified designs may also be proposed for the upcoming research cycle. It is expected that the farm mechanization specialist will be required for about three months each year.

In addition, 10 Research Assistants will be hired by the GOS and will be in direct charge of the field experiments under the supervision of the technical assistance team. Peace Corps Volunteers with a B.Sc. or higher degree in some aspect of agriculture will be used for additional technical help.

The first year of the project, the entire CSR team will be involved in the actual field research. Five Research Assistants will be trained at a research station during the first year and assigned to an RDA the second year. At that time, five more Research Assistants will be employed, trained, and assigned to an RDA the third year. Each Research Assistant will work with two Field Officers from the extension service and 10 farmers. The Peace Corps Volunteers will be trained at a research station and then assigned to an RDA - one in each administrative district

or ecological zone. These volunteers will provide the day to day technical assistance and supervision of the field research teams. By the third year of the project, 10 field teams will be working with 100 farmers to conduct on-farm trials, including some farms outside the RDAs.

Maize will continue to be the dominant crop on the majority of SNL farms. However, increasing the level of vegetable production would provide a new source of income for the SNL farmer. Therefore, the activities of the CSR will be mainly oriented toward increased intercropping with maize and to the introduction of commercial vegetable production. Immediately researchable systems components will include such areas as land preparation, intercropping, building soil fertility, crop rotation, introduction of appropriate farm implements, and cropping sequences under irrigation.

The recently completed water resources study by the Corps of Engineers suggests a large potential for improving agricultural production through irrigation, but it cautions that "significant development of this irrigation potential would require a unified and complete commitment of the many and diverse interests involved." The Corps of Engineers' study concluded that even with Republic of South Africa abstractions an additional 57,100 hectares could be irrigated in Swaziland; of this total, 8,600 hectares of land could be irrigated without the construction of additional reservoirs. Therefore, an important potential for irrigation exists in Swaziland. During this project, most of the research in irrigated cropping will focus on the small schemes in RDAs and other pilot irrigation projects that will be implemented during the next 5-6 years.

The concept of a systems research approach demands that the entire farming system must be studied and not just a subsystem such as cropping or livestock. The surveys and research trials conducted during the project, while emphasizing crop production, will certainly focus on the interrelationships between the crop and livestock subsystems. All recommendations emanating from the research program will be sensitive to the effects that specific changes in cropping practices will have on the total farm system. Consultancies in livestock management have been included in the project to assist the technical assistance team better understand the role of livestock within the SNL farming context. Evaluations conducted in FY 83, FY 84 and FY 85 will include an assessment

of this strategy and make recommendations on the inclusion of an expanded livestock research and extension program, either in the latter stages of this project or in a follow-on activity.

## 2. Agricultural Information

The Agricultural Information Section within the MOAC provides for the crucial linkage between research and extension. That is, data and analyses from the researcher are the inputs into AIS activities and timely, interesting and effective information for various members of the agriculture sector is the unit's output.

Currently the AIS is lacking in space, facilities, equipment and working materials. Fortunately the unit has an allotment of 14 established posts, and 11 positions are now filled. However, the present level of staff performance is substantially below what would be required to support the activities of the cropping systems project and the ongoing work of the MOAC.

The objective of this component of the project is to provide support to assist the AIS attain:

- (1) a level of proficiency in providing technical and "popular" agricultural information in various formats so that the results being reported by the cropping systems research team can be effectively and efficiently utilized;
- (2) expertise in developing educational materials for various age and interest groups;
- (3) proficiency in selecting and adapting material from non-Swazi sources (such as international centers, neighboring countries, etc.) for use by farmers and other residents of rural communities in Swaziland;
- (4) an ability to provide, on a timely schedule, information releases for use by the agriculture extension service.

The approach that will be used to accomplish these objectives has five components. First, technical assistance in general agricultural information organization, procedures and scheduling will be provided for five years. The long-term technician will be supported by consultants at times when specific expertise is needed. Second, a counterpart will be sent for U.S. training to the M.Ed. level and return to serve as Section Chief. Third, short-term training will be provided in certain skill areas for members of staff charged with responsibility for maintaining and repairing the unit's equipment. A fourth component is the construction of a two story building to house the AIS. Con-

solidating the work of the unit in adequate facilities in close proximity to the extension training section in the MOAC will increase coordination between these two highly interrelated units.

The final component of the design is the provision of a selection of basic equipment and substantial stock of working documents and production materials.

During the early stages of the project, in addition to designing and implementing an efficient production and distribution system, the U.S. advisor will work with AIS staff to determine the communications media and informational formats that are most appropriate for reaching SNL farmers. On the basis of this research, four mobile vans will be equipped and AIS staff trained to support extension staff in the field.

### 3. Extension In-Service Training

The cropping systems research unit provides the information for the farmer, and the AIS translates these inputs into a format which the farmer can use. The final link in this process is the delivery of the information to the farmer. Thus the third integral component of this project is a program of in-service training to support the extension worker.

Agricultural extension accounts for the largest number of personnel in the MOAC, although the exact number of people in extension depends on what is classed as an extension activity. In spite of the focus on extension (including technical assistance personnel under a variety of foreign donor projects), the evidence suggests that the extension service is not reaching its goal of assisting all Swazi farmers. Even allowing for significant sampling errors, a recent survey (De Vletter: 1981) found that only 14 percent of Swazi farm households received extension advice and of that only 18 percent felt they benefitted from the information received.

Two constraints to achieving a higher level of performance by the extension personnel are:

- (1) an inadequacy of resources and facilities to provide the extension officer with useful information to extend; and
- (2) the lack of a structured, continuous program for in-service training of extension staff.

AIS will focus on problems arising from the first constraint, while development of a system in support of in-service extension training is the emphasis in this component of the project.

Training for extension officers presently consists of a

one-year certificate training program conducted by the MOAC in facilities leased from the University College of Swaziland. Graduates of this program (designed as 40 percent technical and 60 percent field practice) become the entry level Field Officers of the extension service. There is some discussion of the need to extend the program to two years, but there is general agreement that the one year program is more appropriate at the present time. Also it is agreed that the current level of output, 40 per year, is about the number of graduates that can be absorbed into the extension system. This project will assist the certificate training program through:

- (1) the provision of basic teaching aids (film strips, projectors and slides, flip charts, etc.) to enhance the learning process and also the subsequent use of these materials in extension activities; and
- (2) coordination of the certificate program with in-service training.

The bulk of this project's activities in extension will be for in-service training through the provision of refresher courses for the extension officer currently on the job.

In-service extension training is currently almost nonexistent. Although there is an established post for a training coordinator, the position has gone unfilled for the past two years, and there is little support for materials and programs. Furthermore, the position is established within the Agricultural Information Section since there is no separate in-service training section. Such a section will be established within the Agricultural Division, MOAC.

The project will provide technical assistance for five years to develop and implement an in-service training program. The emphasis will be on competence based training, starting with field level officers but reaching all extension staff over the five year period. Training for extension staff will be directed toward helping them become knowledgeable about cropping systems and about new results which flow from cropping system research. They will also be involved in field demonstrations and be updated on most effective methods of interacting with farmers and leaders while in the process of transmitting knowledge and collecting information.

Courses will be based on an analysis of training needs and will be conducted at Farmer Training Centers, the Malkerns Research Station and sub-stations, and at the University during

term breaks. In addition to senior MOAC extension staff, research team members and Faculty of Agriculture staff will assist in conducting in-service training courses.

Additionally, the cadre of Swazi subject area specialists created through the training included in this project for the Crop Production Section of the MOAC will provide a pool of in-service instructors. The current staff of B.Sc. holders in the Crop Production Section are being transferred to the Research Division and will be trained as Research Officers under the project. Eight diploma graduates will be trained to the B.Sc. level in specialized agricultural fields to re-staff the Crop Production Section by 1987. These specialists' principal role is to provide technical back-up to the extension service, and they will work closely with the cropping systems research program. The Crop Production Section staff will attend sessions at the Research Station to review the results of the previous crop season research and will then, in turn, assist with the in-service training of extension staff.

Finally, a small but important element of the project's in-service training component will be sessions during the first two years for MOAC staff to raise the level of awareness concerning the cropping systems research effort; such courses will include staff at various levels and functions within the MOAC.

## B. Social Soundness Analysis

### 1. The Setting

Background. Sixty-six percent of Swaziland's 565,000 residents live on Swazi Nation Land. This land, held in trust by the King for the Swazi people, accounts for 60 percent of the country's land area; the remaining 40 percent is individually owned. By birth, every Swazi has a right to residency on the community-held land which is administered, for the most part, under a chiefdom. Approximately 200 chiefs allocate land to families through male progeny.

Each Swazi male gains individual entitlement to a parcel of land at the time of marriage. Although the land cannot be sold or traded, it usually remains his to pass on to offspring. The system therefore provides a considerable amount of land security despite empowerment of chiefs to reallocate land. Reallocation normally occurs only when a serious offense has been committed or land has been neglected.

The land and buildings belonging to a given family comprise a homestead, the basic unit of social organization on Swazi Nation Land. The homestead, in turn, may consist of one or more individual families (households) depending upon the structural complexities of marriage (about 20 percent are polygamous) and the organization of various internal kinship groupings. Typically, each homestead has a male head responsible for overall functioning of the unit, and adult resident males have authority over resident females. Males gain ascendancy to homestead/household authority through a seniority system.

SNL homesteads, about 42,000 in number, tend to be widely dispersed such that the organizational entity known as a village does not exist. The landholding of the average homestead is 2.75 hectares; few exceed 12 hectares. Parcels of land are usually fragmented rather than contiguous.

Traditional Farming Practices. About 13 percent of SNL is utilized for cropping and settlement. The remainder is devoted to communal grazing or is mountainous or wasteland. In the past, employment opportunities in the modern sector have led to a situation where a large portion of the adult labor force works off-farm.

Nearly 70 percent of SNL homesteads have absentee workers; 58 percent of the adult male work force and 28 percent of the adult female work force are employed off-farm. Half of the homesteads receive regular migrant cash contributions. Nevertheless, the income of 73 percent of SNL families is less than \$200 per resident member, the poverty line adopted for Swaziland's rural population. Only 41 percent of the homesteads receive a portion of their income from crops. Such crops (primarily maize, groundnuts and beans) average a gross annual homestead income of about \$227 (approximately \$25 per capita).

Ninety-six percent of SNL farmers grow maize, the Swazi staple food. Although this accounts for over three-fourths of the total land under cultivation, it does not meet consumption needs of the growers; 46 percent purchase additional maize during a typical harvest year. Also frequently grown, primarily for consumption, are groundnuts and beans. Few homesteads currently grow high income potential crops such as tobacco and cotton; and those that do tend to be homesteads with five or more hectares of land. Reasons given by SNL farmers for not growing these crops include: lack of knowledge of how to grow the crops; inadequate land; lack of labor; and lack of money, capital or equipment.

Role of Women. Women are the mainstay of SNL homesteads. In addition to their responsibility for most domestic tasks, women often have responsibility for supervising the household when men are away (due to the seasonal nature of some modern sector jobs). In addition, women perform many of the agricultural tasks, even when male members of the homestead are present.

Traditionally, the husband is the head of the family and, consequently, makes all major decisions concerning the farm. If, for example, a production input loan is needed, the husband's consent is required. However, the extended family system provides for a senior relative who can make decisions in the absence of the husband (e.g. act as guarantor on farm loans).

To date, the MOAC has more male than female extension workers (only 12 percent are female) despite the fact that the majority of farmers involved in agricultural production are women. This situation is gradually changing, however, as more women are admitted to the diploma and certificate programs in agriculture. While more men than women currently apply for admission to these courses, students are accepted strictly on an academic basis.

All components of the project will be sensitive

to the role women play in the SNL homestead. By definition, cropping systems research is an approach that identifies problems prior to conducting experiments or proposing solutions. In some cases, the absence of male household members may be identified as a critical constraint, while in other cases it may not. The research program will, therefore, be specifically designed to meet the actual problems facing farmers. Experimentation in support of on-going appropriate technology efforts will be carried out by the small farm mechanization consultant. Also, methods will be devised by the extension service and AIS to more effectively reach women with research recommendations, and women will be instructed in the use and maintenance of the technological innovations introduced by the project. Furthermore, it is a goal of this project that 20 percent of all participants sent for training be women, and women will serve on the field research teams. Finally, the rural sociologist on the research staff will have an input into the design of the research program as well as cropping recommendations resulting from the field trials. Under no circumstances will recommendations be promoted that are considered detrimental to the status of SNL women.

## 2. Spread Effects

The project will involve considerable farmer participation in planning and implementation of cropping systems research. This on-site research will ensure that agricultural inputs and innovations are adapted to the needs of SNL farmers who ultimately will bear responsibility for their adoption and further spread.

Cropping patterns currently in existence indicate that Swazi farmers are receptive to the advice of extension field workers concerning the planting of hybrid maize varieties, application of fertilizer and other improved inputs. The adoption of new technology has, of course, depended on the economic viability of such adoption. Swazi farmers are keenly aware of the opportunity costs involved. This project, by approaching the farmers' environment from a cropping systems standpoint, will ensure that recommendations are based on the cultural and economic factors that affect the acceptance level of improved technologies.

Additionally, the project is expected to improve and expand the capacity of MOAC research and extension programs to develop information relevant to needs of various categories of SNL farmers. Incentives for and motivation of extension agents who work in the MOAC extension service will be a concern of the project.

Special assistance will be provided the MOAC Agricultural Information Section in development and dissemination of visual aids, printed material, and motivational techniques appropriate for farmers' needs. Ongoing studies will focus upon positive and negative reactions of recipients to different forms of information. Agricultural information is also expected to spread through informal interpersonal contacts, improved radio farm broadcasts and other agricultural mass media.

### 3. Social Consequences and Beneficiaries

The project's goal is to make SNL farming more economically viable; ultimate beneficiaries will be the 42,000 SNL families with farm areas averaging 2.75 hectares. It is estimated that by 1992 the percentage of SNL farmers producing primarily for commercial markets will increase to 20 percent, and by 1997, to 30 percent. The percentage of farmers producing marketable surplus above subsistence needs is expected to increase to 60 percent by 1992, and 80 percent by 1997.

Several assumptions have been made which are crucial to the success of the project. It is assumed that the GOS will continue its emphasis on the RDA program, the cooperative movement, and other programs aimed at improving the ability of SNL farmers to make the transition from subsistence to commercial agriculture. It is also assumed that production inputs will be available and that a marketing system will be in place that can accommodate increased agricultural production.

Direct beneficiaries of the project will include 28 Swazi trainees/counterparts who will receive academic training outside Swaziland, and approximately 427 extension service personnel who will receive in-service training (includes current professional staff of 260 plus additional staff over the next five years). The latter, additionally, will benefit from access to improved audio-visual and reference materials made available by the project to the Agricultural Information Section. The 350 farmers reached by on-farm research trials also will receive direct benefits from the project.

Approximately 75 percent of all SNL farmers are expected to benefit yearly from access to recommendations based on cropping systems research. These will have been translated into terms usable by extension field officers and understandable by farmers. Other benefits will include radio broadcasts that relate new, improved farming techniques; and access to increased contact with better trained and better supervised extension field workers.

4. Social Research. Sociological research will play a vital role in providing information on the social soundness of the project. Currently, an FAO rural sociologist is working with the Swazi Research Division sociologist to gather data on farm practices, labor roles, etc. to feed back into the design of future research programs. This information, in addition to research being conducted by another MOAC rural sociologist, will be invaluable to the technical assistance team. The FAO sociologist will be in Swaziland for six months after the arrival of the AID team, thereby providing an opportunity for the team sociologist to become familiar with some of the basic research problems in a short period of time. Future studies will be carried out in different geographic areas to further assess socio-cultural and economic aspects of current cropping practices in order to guide the design of on-farm research trials. Throughout these trials (as well as in demonstrations conducted by extension staff) the Research Division sociologist will monitor the impact of various cropping approaches upon the family, especially women, social customs, beliefs, and overall adoption of farming techniques. This information will be fed back to the technical assistance team to be used in improving its ability to relate to the unique social circumstances of farmers.

In addition to a broad base-line survey which will include a cross section of SNL farmers, follow-up surveys will take place every five years to measure project impact, both upon farmers directly exposed to on-farm trials and upon those exposed through access to cropping systems research recommendations. Results of these studies will be used for project evaluations and for planning purposes of the MOAC. Finally, information obtained will serve to augment the existing body of scientific literature concerning agricultural development.

In summary, the project's approach will be one that focuses on the alleviation of constraints actually faced by SNL farmers. Socio-economic data gathered during the project will provide a key to many of these constraints. The research trials will be planned and conducted with a high degree of farmer participation. Eventual recommendations, including the method of disseminating research findings, will, therefore, be responsive to the actual conditions faced by farmers.

Therefore, given that the project by its very nature will emphasize socio-cultural factors in a research effort that has been primarily technical in the past, this project is considered socially sound.

### C. Administrative Analysis

The cropping systems framework, as applied in this project, will require an integrated approach for reaching SNL farmers with economically viable research recommendations. Two Divisions of the MOAC, one under the Director of Agriculture and one under the Director of Research and Planning, will be the major implementing units of the project. Direct administrative leadership will be provided by the Senior Agriculture Officer at MOAC headquarters, who is in charge of extension activities, and the Chief Research Officer at the Malkerns research station. In addition, the Certificate Training Course is administratively the responsibility of the Dean of Agriculture at the University College of Swaziland. Finally, all policy level direction for the research, extension, and information programs is the responsibility of the Permanent Secretary or Undersecretary, MOAC.

The front line administrators (the Senior Agriculture Officer, the Chief Research Officer and the Dean of Agriculture) are articulate, dedicated professionals who work well together. The patterns of cooperation developed by this trio of relatively young professionals should provide the benchmarks for organizational interaction over the next decade.

An area of concern is the need for more junior level administrators. The lack of personnel in this category is indicated by an expressed need from the MOAC for more supervisory level men and women in extension and the inability to recruit trained Research Officers. For this project, the Research Officers who will work as counterparts to the technical assistance team will be transferred from the MOAC's Crop Production Section. The positions vacated by these transfers will subsequently be filled by people trained to the B.Sc. level through this project.

In addition to the training provided within the scope of this project, AID is supporting additional degree training in agriculture through its Southern Africa Manpower Development Project. The people trained through both of these programs will provide the cadre of young professionals from which the future administrators of Swaziland's agricultural programs can be selected.

The GOS is currently designing and implementing programs to help attract and to train more people in agriculture. The Government has, for example, approved and will soon implement a plan to upgrade some of the Research Officers to a more senior category. The concept of a "career ladder" is also being used in other divisions of MOAC.

Another positive step is the opportunity for young Swazi students to advance through the educational system by exhibiting superior performance. For example, the best of the certificate level graduates are now provided the opportunity to enter the diploma course, and the best of these can qualify for the degree program. Thus an incentive system has been put in place to encourage high levels of performance in the agricultural courses at the university.

On the basis of the PP team's analysis of the administrative units involved, it is concluded that the organizational structure and personnel are adequate to support the project.

#### D. Environmental Considerations

An Initial Environmental Examination was submitted with the PID and a negative determination was approved by the AA/AFR on May 8, 1980. At this time, there are no project activities anticipated that deviate from those described in the IEE with regard to the use of pesticides or herbicides. In the event that a decision is made to consider promoting the use of certain pesticides or herbicides by farmers, AID/W assistance will be requested as offered by AID/W in the PID approval cable.

#### E. Economic Analysis

##### 1. Introduction

The long-run objective of this project is to increase the economic viability of farming on SNL. This analysis will cover the potential for increasing SNL farm incomes from two perspectives: (1) the project level using data and rates of return for irrigation estimated in a recent U.S. Army Corps of Engineers study and (2) the farm level by hypothesizing the adoption of certain recommendations.

Recommendations from research and extension are never adopted by all farmers at once, but are usually adopted through a spread effect over a long period of time. Furthermore, it is an extremely difficult task to assign the benefits of agricultural development to the various components (such as extension services) that contribute to increasing farm incomes. Available evidence shows that significant returns to agricultural research have occurred in various countries (see Annex E Table E-1). For example, estimates of the average internal rate of return to public research in agriculture in the U.S. over the past several decades has averaged nearly 40 percent. The record in less developed countries is even more impressive, with average annual returns of 90 percent for wheat in Mexico and 77 percent for

cotton in Brazil. Even the less successful projects have estimated rates of 11 percent for wheat in Colombia and 35 percent for maize in Mexico.

The focus of the project at the purpose level is to assist the MOAC to more effectively direct its research and extension programs toward the small farmer -- under both irrigated and rainfed conditions.

## 2. Benefits

### a. Potential Under Irrigated Conditions

The GOS has recognized the potential for irrigation in Swaziland and has set goals for development of its water resources as follows:

- (1) Maximize employment opportunities;
- (2) Increase government revenue;
- (3) Increase value added;
- (4) Increase foreign exchange earnings;
- (5) Increase import substitution; and
- (6) Protect and enhance the environment for the long-term benefits of the country.

The U.S. Corps of Engineers recently completed a study on the potential for increased irrigation in Swaziland. Data from this study indicate that about 42,000 hectares are now being irrigated, and the nation has a potential for 57,100 hectares more with the surface water now available (see Annex E Table E-2). The Corps of Engineers study did not attempt to estimate ground water potential, but such a study is now planned. The Corps study did, however, identify the amount of land potentially suitable for irrigation, in addition to that potentially irrigable by surface water, and found that an additional 96,517 hectares could be irrigated if water was available from other sources.

The Corps of Engineers study also estimated benefits, costs, internal rates of return, number of on-farm and off-farm jobs created, number of homesteads resettled from project lands, and number of project homesteads created in line with the GOS goals for development (see Annex E Table E-3).

The Lomati River basin (without storage) had the highest internal rate of return (33 percent) from increased irrigation. Two dam sites within the Usutu basin had the lowest internal rate of return (7 percent). The internal rate of return does not tell the whole story, however. The creation of additional farming jobs is also an important factor. An estimated 19,500 on-farm and 39,000 off-farm jobs would be created if irrigation were developed to its potential on land presently suitable for

surface water irrigation. With the development of ground water resources the number of jobs attributable to irrigation would be even higher.

Potential      b. Rainfed and Irrigated SNL - Farm Gross Margin

The CDSS focuses on the importance of irrigated agriculture as a long-term strategy for development of the agricultural sector. Thus, a significant portion of the research effort (the specific percentage will be determined by the implementation team, but will be approximately 50 percent) will be allocated to developing cropping systems under irrigated conditions. However, a major emphasis on rainfed cropping research is included in the project in support of the SNL farmers in the short and intermediate time horizon.

It is not possible to estimate an overall benefit-cost ratio or internal rate of return for projects that are institution-building. However, some evidence of the relative profitability of enterprises using present practices, and the potential for improvement in income with improved practices, is available from studies conducted in the RDAs. Table IV.E.1 shows the "profitability" of maize, beans, cotton, and tobacco under alternative conditions. The concept used to indicate "profitability" is gross margin which is defined as the residual claimant to income after all variable costs have been subtracted from gross income (including imputed value of production used for home consumption). In these examples, the residual claimants are land, unpaid family labor, capital, and management.

TABLE IV E.1

Crop Profitability per Hectare - KDA's

	Maize			Beans	Cotton	Tobacco
	Traditional Local Variety	Traditional Hybrid	Semi- Mechanized	Traditional Techniques	Semi- Mechanized	Semi- Mechanized
Output (kg)	1,000.00	2,700.00	3,500.00	800.00	1,600.00	800.00
Price (E/Kg)	0.12	0.12	0.12	0.59	0.45	1.15
Value of Output (E)	120.00	324.00	420.00	472.00	720.00	880.00
Variable Cost (E)	45.80	125.47	166.26	111.88	271.65	246.28
Gross Margin (E)	74.20	198.53	253.74	360.12	448.35	633.72
Labor Requirements (Days)	22.00	21.00	21.00	122.00	76.00	207.00
Gross Margin/Labor Day	3.37	9.45	12.08	2.95	5.90	3.06

Source: Ministry of Agriculture, Crop Profitability Guide Book, May 1980.

E1=\$1.30

A limitation of the gross margin concept is that it does not show profitability per unit of labor, which may be more important to the Swazi farmer than profitability per hectare. For example, semi-mechanized tobacco has the highest gross margin per hectare (E634), but earns only E3.06 per labor day because it is highly labor intensive. In comparison semi-mechanized maize has a gross margin of E254 but earnings per labor day of E12.08 (E1=US \$1.30).

Using data from the Cropping Profitability Guide Book No. 6, January 1980, MOAC, a series of typical case studies were developed to show the possible increase in incomes which could be achieved by SNL farmers.

Under present cropping practices, a three hectare (ha) farm would probably include 2.0 hectares of maize, 0.5 hectares of beans, and 0.5 hectares of groundnuts. The following table, Present Situation, provides an illustration of current gross margins under certain assumptions regarding fertilizer and insecticide usage (columns 3 and 4 show the amount of recommended levels of fertilizer and insecticide application that are actually used by the farmer). The total gross margin to the farm is estimated at E225.80 in the Present Situation table. The examples that follow are based on this table; certain variables and the types of crops grown are changed to depict gross margins under different cropping practices.

#### Present Situation

Crop	Ha	% Fert. Recom.	% Insect. Recom.	Yield/ Ha	GM/HA	GM/LD*	TOTAL GM
Maize	2	50%	50%	1000 Kg	E67.15	F3.12	E134.30
Beans	1/2	0%	0%	300 Kg	138.00	2.77	69.00
Groundnuts	1/2	0%	0%	550 Kg	45.00	.10	22.50
TOTAL GM							E225.80

\* GM - Gross Margin      LD - Labor Day

In Example 1, it is assumed that the farmer decreases the area of maize to 1.5 ha (enough to satisfy home consumption requirements of 1500 to 1750 kg), discontinues the growing of groundnuts and increases the amount of beans to 1.5 ha. With cultural practices assumed to remain the same, the gross margin on the farm would increase to E308 or 36 percent over base conditions.

#### Example 1

Crops	Ha	% Fert. Recom.	% Insect. Recom.	Yield/ Ha	GM/HA	GM/LD	TOTAL GM
Maize	1 1/2	50%	50%	1000 Kg	E67.15	E3.12	E100.72
Beans	1 1/2	0%	0%	300 Kg	138.00	2.77	207.00
Groundnuts	0	-	-	-	-	-	-
TOTAL GM							E307.72

In Example 2, the farmer grows the same crops on the same land area, but applies fertilizer to maize at the recommended level. The gross margin is less than estimated for Example 1, but still shows a 10 percent increase over the present conditions.

#### Example 2

Crop	Ha	% Fert. Recom.	% Insect. Recom.	Yield/ Ha	GM/Ha	GM/LD	TOTAL GM
Maize	2	100%	50%	1500 Kg	E80.00	E3.72	F160.00
Beans	1/2	0%	0%	300 Kg	138.00	2.77	69.00
Groundnuts	1/2	0%	0%	550%	45.00	.70	22.50
TOTAL GM							E251.50

In Example 3, it is assumed that the farmer retains the 1.5 ha of maize for home consumption, plants 1.25 ha in beans, and allocates the remaining 0.25 ha to tobacco. This action more than doubles gross margin for the farm. It must be noted, however, that tobacco is a labor intensive crop and that a significant amount of unpaid family labor is included in the gross margin calculations.

#### Example 3

Crop	Ha	% Fert. Recom.	% Insect. Recom.	Yield/ Ha	GM/Ha	GM/LD	TOTAL GM
Maize	1 1/2	50%	50%	1000 Kg	E67.15	E3.12	E100.72
Beans	1 1/4	0%	0%	300 Kg	138.00	2.77	172.50
Tobacco	1/4	100%	100%	800 Kg	766.81	3.09	191.70
TOTAL GM							E464.92

In Example 4, it is assumed that the farmer is willing to allocate 1.0 ha to improved pasture in order to meet the requirements for receiving 2 dairy cows. In this case, the farm gross margin would increase by E258 and cash income would be available throughout most of the year.

#### Example 4

Crop	Ha	% Fert. Recom.	% Insect. Recom.	Yield/ Ha	GM/Ha	GM/LD	TOTAL GM
Maize	1 1/2	50%	50%	1000 Kg	E67.15	E3.12	E100.72
Beans	1/2	0%	0%	300 Kg	138.00	2.77	69.00
Improved Pasture	1	50%	-	400 lt	314.05	5.65	314.05
TOTAL GM							E483.77

In the final example, it is assumed that the farmer is given the opportunity to be allocated 0.4 ha of irrigated land. The farmer produces the following crops:

Summer

Green Mealies	0.20 ha	E243.00
Tomatoes	0.16 ha	240.00
Carrots	0.04	<u>180.00</u>
		E663.00

Winter

Cabbages	0.20 ha	E334.00
Tomatoes	0.08 ha	120.00
Onions	0.08 ha	480.00
Carrots	0.04 ha	<u>180.00</u>
		E1,114.00

Gross Receipts	E1,777.00
Total Variable Costs	<u>E 368.65</u>
TOTAL GROSS MARGIN	<u><u>E1,408.35</u></u>

The gross margin is more than 5 times that of the farmer's present return from rainfed farming. However, it also assumes the farmer has: (1) the technical knowledge for production of these vegetables; (2) sufficient labor for production of these crops; and (3) a market for the vegetables produced. Thus, the example is indication of future potential rather than a realistic alternative under present conditions.

c. Income Targets for SNL Farms

One method to determine whether small holder farming is economically attractive is to compare farm income and other benefits with those obtained by unskilled laborers. It is estimated that the pineapple industry pays E1.47 per labor day for unskilled labor; the sugar industry pays E1.72. The rate for unskilled labor employed by the Government is around E2.50 per labor day. Assessment of the opportunity cost of remaining in agriculture does, however, require much more than a direct comparison of wage rates. The costs of housing, food, and fuel would be quite different for a family living on wage employment as compared to the family on a small holding.

It was suggested in the PID that a total gross margin of \$1,500 (E1,150) may be a reasonable income target which would begin to stem the flow of labor from the farm. The typical SNL homestead is not now making this target income from crop and live-stock sales.

This project, or indeed this project in conjunction with all currently active agricultural projects in Swaziland, will probably not result in a majority of the farmers reaching the income target of \$1,500 in the near future. Thus, farm-to-town migration is expected to continue. However, this project will help to slow this trend and contribute to the USAID's estimate that 20 to 30 percent of the farmers could reach this target by 1997. Other farmers will be able to achieve smaller increases in income. Perhaps, of more importance, is that even if an estimated 80 percent of farmers do not reach the income target goal, farming will at least become relatively more attractive when compared with off-farm alternatives.

#### d. Other Benefits

The cropping systems research approach is one which first considers the small SNL farmers' resource situations, then adapts present research and designs new research to meet their special needs. Benefits from this approach should result in increased real income for SNL farmers, improved nutrition, and improved living conditions in general. It should benefit the whole economy through improved food self-sufficiency and reduced food imports with less loss of foreign exchange; increased foreign exchange earnings as surpluses are produced for export; and, a multiplier effect on the whole economy by increasing the cash flow from SNL.

These benefits should be achieved with little or no loss to the large farm or estate agriculture; this sector is already advanced and finances its own research. The shifting of scarce research and extension efforts to the SNL should result in marginal returns being greater per unit spent, as this is where land, labor, and other resources are the most underutilized.

### 3. Constraints Analysis and Alternatives

The selection of the cropping system approach as a method of increasing economic viability of SNL farmers was based on an analysis of potential constraints and alternative design approaches. The major alternative project approaches included: (1) an emphasis on the livestock rather than the crop subsector; (2) the broadening of the project to include both the crop and livestock subsectors; and (3) a marketing- rather than a production-oriented approach.

The fact that only 13 percent of SNL is used for crop production and homesteads suggests that a livestock rather than a crop emphasis may be preferable. However, an evaluation of the alternatives indicated that the high percentage of grazing land was due to limited crop production potential under dryland conditions. The returns to the limited water resource would be higher for cropping land than for pasture land. Thus, a cropping systems approach is the better alternative.

A second alternative was to examine a farming systems approach which included both crop and livestock production activities. The basic decision is to not implement this design as it does not provide the critical mass of people needed to effectively implement the program. It would result in spreading people too widely, thus running the risk of a complete collapse of the project. Conversely, the PP design team recognized the interrelationship between the crop and livestock subsectors and the constraints which this imposed on the cropping systems approach. Constraints have been attacked three ways: (1) the decisions made within the cropping systems approach will provide for a direct and specific evaluation of the potential impact on livestock; (2) a relatively large input of short-term consultants will permit the flexibility of bringing livestock specialists to Swaziland for specific problems; and (3) the livestock question will be periodically assessed by the evaluation teams with a potential of shifting to more emphasis on livestock in the later phases of the project.

The third major alternative approach which was considered was implementing a marketing rather than a production-oriented project. The decision to focus on production is based on the belief that marketing follows production in a natural sequence - especially when the project faces the lead-time required for research findings to impact on the cropping practices of the typical SNL farmer. This does not deny the importance of the marketing function, and indeed it must be available in some form for the project to be a success. The constraint is not insurmountable, however, because: (1) there is a rudimentary agricultural marketing system currently available in Swaziland; (2) several other donors are currently active in evaluating potential marketing projects; and (3) the flexibility in this project design will permit the use of marketing consultants to tackle specific marketing problems as they arise.

In addition to meeting the objective of a "critical mass" of personnel working on a realistically defined problem area, the cropping systems approach also was judged to be the most cost-effective of the alternatives considered.

#### Cost-Effectiveness

The decision criteria used in determining a cost-effective approach is the economic maximization of the returns to the scarce inputs in the attainment of a given objective. In the project, the crucial inputs are those needed to increase the economic viability of the farm sector, and, in turn, the income of the farm homesteads. The PP design team considered

that two inputs--labor and water for irrigation--are the crucial inputs, and on the basis of the analysis, it was concluded that the returns to labor allocated to crop production would be higher than if it was assigned to increasing livestock production on the communal grazing land. (The returns to labor in the dairy industry might be higher but there is currently a major dairy project in Swaziland sponsored by the Canadian Government.) The other critical input, water for irrigation, would also be expected to return a higher yield in the production of crops than in livestock. The probable return to irrigated pasture land would tend to be both meager and costly considering the terrain of typical Swazi pasture land.

It is difficult to make direct cost-effective comparisons between production-oriented and marketing-oriented projects. A more realistic comparison is between the proper sequencing of activities, i.e., that the production-related activities must precede the development of an expanded marketing system. In this project, it was the judgement of the PP design team that crop production activities were more cost-effective than marketing-oriented activities.

#### 4. The Internal Rate of Return (IRR)

In order to relate the effect which this project aims to have on SNL farmer/homestead income and the resources used, internal rates of return (IRR) were computed. In all cases, checks were made to test whether or not the non-continuous benefit and cost streams could lead to more than one IRR.

The cost stream is composed of two parts, (a) the AID contribution, which is time-dimensioned on page 54, and (b) GOS/MOAC's recurrent budget contribution which is time-dimensioned on pages 56 and 57. (In Tables V.5 and V.6, only line three is used for the Swazi contribution, i.e., "incremental cost of this project to MOAC" and "cost of expanded research, information and inservice training programs".) It is assumed that the costs to the GOS will rise by 15% each year after 1989/90. All costs given in local currency are converted to U.S. dollars using E1=US\$1.30.

The benefit stream also has two components: (a) the number of homesteads effected by the project and (b) the average level of changed income. In the logical framework (Annex I-2) one objectively verifiable indicator (2.c) is "reaching 75% of the SNL farmers yearly with research recommendations". Since there are 42,000 homesteads, the target is to reach 31,500. In order to be as conservative as warranted, this analysis assumes that only 21,000 homesteads will be reached (67% of the target and 50% of all SNL homesteads). The income targets are discussed on pages 50-51. The analysis assumes that 20-30% of the SNL farmers will have their incomes increased by \$1,500 per year. If we assume that an equal portion of farmers will have no change in their incomes, and an equal distribution between these extremes, then the target for income change per SNL homestead is \$750. Again, in order to be conservative, this IRR analysis assumes that the income change will only be \$400 (53% of the target).

Neither of the above changes are criticisms of the targets, but rather an effort is made to judge the project by a harsh standard.

For both the number of homesteads reached and income changed, a path from project initiation to project goal achievement must be assumed. The standard "S"-shaped learning curve meets the requirements of both in that it indicates very few benefits/beneficiaries in the early years, followed by major changes when the institution is in place and functioning. The "S" is completed by the "maturity" phase when the changes are more again moderate.

The last necessary assumption is the time horizon for project benefits and costs. The basic model uses a ten-year horizon. There is nothing special about this timeframe, and sensitivity analysis, discussed below, also tests alternative horizons.

Using this model, the IRR for this project is 17.25%. There are three conditions, or cases, under which traditional benefit-cost analysis often misestimates the IRR:

1. large-scale unemployment in situations where there is a minimum wage indicates that the social cost of unskilled and semi-skilled labor is lower than actually paid;
2. many LDC foreign exchange rates are overvalued as evidenced by an active illegal trade in currency; and
3. shortages of host government recurrent revenue indicates that the true cost of using limited funds is in excess of actual costs.

In all three cases, this analysis seeks to use the opportunity cost of the item being analyzed.

For case one, this analysis used the figures in the financial tables (Annex K) to derive estimates of Swazi labor costs. Since all assumptions, when there is unemployment in urban areas, tend to lower the social cost of expenditures, they also raise the IRR. For this reason, the analysis chose to only discount the GOS salaries by 30%. This raised the IRR to 19%. If the salaries are discounted by 50%, the IRR rises to nearly 22%.

Case two is not analyzed since the Swazi emalangeni is tied to the South African rand and is not considered over- or undervalued to any significant degree. Some observers feel the rand is slightly undervalued now. Any adjustments would tend to raise the IRR, but by relatively insignificant amounts.

For case three, the analysis needs to be cognizant of the heightened pressure to allocate a scarce resource--GOS recurrent revenue. As this stagnates, the pressure will increase. A very extreme assumption would be that the opportunity cost of GOS recurrent expenditures is twice

actual costs. This change lowers the IRR to 13½%.

Summary: For the three modifications, two tend to increase the IRR and one will reduce it. On balance, it is felt that the over-estimate of wages has a stronger impact than the dampening effect of underestimated recurrent costs. (Foreign exchange costs are not considered significant.) These modifications, as a group, tend to improve the basic model's IRR.

#### Sensitivity Analysis

Three sensitivity tests were done on the data:

1. testing the effect of changes in the number of homesteads affected;
2. testing the effect of changes in the average income per homestead; and
3. testing the effect of change in the time horizon.

If the project affects the 31,500 homesteads, which is its goal, then the IRR rises to 27%. If only 18,000 homesteads are reached, then the IRR falls to 14%. If only 15,000 homesteads (36% of SNL homesteads) are reached, then the IRR is 10%. This sensitivity test illustrates that, even if the project fails to meet its goals, it still makes economic sense.

Only if it cannot even reach half of its own goals does the IRR fall to a critically low 10%.

With income, the project target is an increase of \$750 by 1991. If this is reached, then the IRR would approach 40%. If it can only reach \$350, the IRR is 14%; and reaching a \$300 income change per homestead reduces the IRR to 10%. (This is changing income by only \$33 per person within the homestead.)

In both cases the sensitivity tests show that, even if these analyses' already-conservative adjustments to targets are not met, the project still possesses high IRRs. In fact the project's targets yield IRRs that are just slightly below those of other agricultural research projects elsewhere in the world (see Annex E-1).

The IRR is exceptionally sensitive to the time horizon. For the first seven years, the basic model has a negative IRR, i.e., at all positive discounts rates, costs will exceed benefits. In the eighth year, the project's IRR rises to 1.88%. A eighty-year time horizon boosts the IRR to 11.53%, and a ten-year horizon has the IRR at 17.25%. With a fifteen-year horizon, the IRR jumps to 27.88%, and a twenty-year horizon has the IRR over 30%.

When the project is completed, in 1987, the IRR is still negative. The external evaluation must look beyond already attributable benefits to whether or not the institutional development has taken place to a sufficient degree to allow for increased benefits and beneficiaries after that date.

Summary: Under all reasonably conservative assumptions, the project's IRRs are uniformly high. It is highly unlikely that failure of any one assumption will destroy the economic viability of the project. Of course, if a number of unrelated factors all occur, then the IRR can become not worthwhile: i.e., an exceptional stagnation of recurrent revenues combined with huge increases in urban unemployment, combined with a failure to get information to the households, combined with a failure to get useful information to those households which are affected. If all of these combine, then the IRR will be exceptionally low. Even if the probability of each separately occurring is a very high 70%, the likelihood of all occurring together is only 20%. While possible, this is highly unlikely.

As long as a ten-year time horizon is used for analysis, the project makes economic sense.

## V. Financial Plan and Recurrent Budget Analysis

### A. Project Funding Summary

As currently designed, the total cost of this project is estimated at \$17,309,000. Of this total, AID will finance \$12,900,000; the GOS will provide \$4,354,000; and the US Peace Corps will contribute \$55,000 in volunteer support. A summary of these contributions, identified by major project component, is provided in Tables V.1 and V.2, while Table V.3 provides AID expenditures for each component by fiscal year as well as projected yearly obligations. More detailed cost estimates for both AID and the GOS are contained in Annex K, Financial Tables. Annex L, Equipment List, provides a detailed breakdown of equipment and commodities to be funded by AID.

Table V.1

#### Source and Use of Funds (\$ 000)

<u>Sources</u>	<u>A.I.D.</u>		<u>GOS</u>		<u>U.S. Peace Corps</u>		<u>TOTAL</u>
	<u>FX</u>	<u>LC</u>	<u>FX</u>	<u>LC</u>	<u>FX</u>	<u>LC</u>	
<u>Use</u>							
Cropping Systems							
Research	7387	340	-	3440	26	24	11,217
Agricultural Infor- mation	1681	126	-	585	-	-	2,392
Extension Training	2132	-	-	220	-	-	2,352
Evaluation	48	-	-	-	-	-	48
Subtotal FX & LC	11,248	466	-	4245	26	24	16,009
Subtotal FX - LC	11,714		4245		50		16,009
Contingency	1,166		109		5		1,301
<b>TOTAL PROJECT</b>	<b>12,900</b>		<b>4354</b>		<b>55</b>		<b><u>17,309</u></b>
(% of Total)	(74.5%)		(25.2%)		(.3%)		

Table V.2

A.I.D. Funding by Input and Project Component (\$ 000)

Input	Research	Extension Training	Agricultural Information	TOTAL
Technical Assistance	6138	1001	1001	8,140
Training	613	1057	111	1,781
Construction	388	-	252	640
Equipment/Commodities	437	65	390	892
Vehicles	76	9	53	138
Other (Local)	75	-	-	75
Subtotal (%)	7727 (66)	2132 (18)	1807 (16)	11,666 (100)
Contingency (15% on equipment, 10% on all other items)				1,181
Add: External Evaluation (Includes 10% contingency)				53
<b>TOTAL</b>				<b>12,900</b>

- Inflation factors for both tables are included in line items.
- See Annex D for details including base cost estimates, inflation factors, and yearly expenditures for both A.I.D. and GOS.

TABLE V.3

Expenditures and Obligations by Fiscal Year (\$ 000)

<u>Expenditures</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>	<u>FY 86</u>	<u>FY 87</u>	<u>TOTAL</u>
Technical Assistance	-	900	1354	1516	1590	1776	1004	8140
Training	-	79	288	484	502	324	104	1781
Construction	-	346	136	158	-	-	-	640
Equipment/Commodities	-	399	90	83	93	105	122	892
Vehicles	-	108	14	16	-	-	-	138
Other Local Costs	-	16	19	10	11	12	7	75
Evaluation	-	-	-	-	48	-	-	48
Contingency	-	200	190	227	225	221	123	1186
<b>TOTAL EXPENDITURES</b>	<b>0</b>	<b>2048</b>	<b>2091</b>	<b>2494</b>	<b>2469</b>	<b>2438</b>	<b>1360</b>	<b>12,900</b>
<u>Obligations</u>	3406	-0-	1410	3000	3000	2084	-0-	12,900
Pipeline	3406	1358	677	1183	1714	1360	-0-	-0-

### B. The MOAC Recurrent Budget

The total GOS recurrent budget has increased in recent years from E45.0 million in FY 77/78 (April 1, 1977 through March 31, 1978) to E98.2 million in FY 81/82 (E1=US \$1.30), an increase of 117 percent over the period ( a compound annual rate of 21.5 percent). At the same time, the MOAC budget has increased by 117 percent as well, from E4.1 million to E8.9 million. Therefore, the MOAC's share of the total GOS recurrent budget has remained constant at approximately 9 percent.

A breakdown of the FY 77/78 and FY 81/82 MOAC recurrent budget by major activity center is as follows:

Table V.4

#### MOAC Budget by Activity Center

	1977/78		1981/82	
	E (000)	% of Total	E (000)	% of Total
Minister	43	1.0	81	.9
Ministry Administration	383	9.4	1354	15.2
Livestock	1978	48.6	- 3204	36.0
Crops	801	19.7	1468	16.5
Fisheries	61	1.5	94	1.1
Forestry	38	.9	136	1.5
RDA	276	6.8	662	7.4
Land	270	6.6	512	5.7
Research <u>1/</u>	-	-	722	8.1
Home Economics	121	3.0	231	2.6
Economic Planning	103	2.5	102	1.1
Cooperatives <u>2/</u>	-	-	347	3.9
<b>TOTAL</b>	<b>4074</b>	<b>100.0</b>	<b>8913</b>	<b>100.0</b>

1/ Research was transferred from the University College of Swaziland in 1979/80 to the MOAC; E442,000 was budgeted by the MOAC for research in that year.

2/ Until FY 1979/80, Cooperatives were part of the Ministry of Commerce and Cooperatives before being transferred to the MOAC in that year.

The three activity centers that will be involved in this project are Ministry Administration (which includes the Agricultural Information Section), Crops (which includes the extension in-service training function), and Research. Since 1977/78, the relative budgetary position of Ministry Administration has increased from 9.4 to 15.2 percent of the total MOAC budget while that of Crops has declined slightly from 19.7 to 16.5 percent. The recurrent budget for the Research Division is currently 8.1 percent.

Assuming that the total GOS recurrent budget will continue to grow at 21.5 percent per year and that the MOAC's share will remain, at minimum, constant at 9.1 percent, the following table depicts probable MOAC total recurrent budget levels and the recurrent costs associated with this project:

Table V.5

MOAC Recurrent Budget Estimates (E 000)

	<u>FY 1981/82</u>	<u>82/83</u>	<u>83/84</u>	<u>84/85</u>	<u>85/86</u>	<u>86/87</u>
1. MOAC Recurrent Budget	8913	10,857	13,192	16,028	19,474	23,660
2. Increase from Previous FY	-	1,944	2,335	2,836	3,446	4,186
3. Incremental Costs of this Project to MOAC		99	156	164	156	170
4. Project incremental cost as percentage of total MOAC recurrent budget increase		5.1	6.7	5.8	4.5	4.1

(Figures do not include contingency or partial year funding in 1987/88.)

The recurrent budget increase resulting from project activities is well within the anticipated MOAC allocations. Even assuming a decline in the total GOS recurrent budget growth rate to 15 percent (with the MOAC share of the that budget remaining at 9.1 percent), the costs associated with this project do not exceed 10.1 percent of the MOAC's incremental budget in any given year. On the other hand, assuming the GOS total recurrent budget continues to grow at 21.5 percent but the MOAC's share of the total recurrent budget declines to, for instance, 8.0 percent, project costs account for only 7.6 percent (at the maximum) of the MOAC's total incremental budget.

Some of the costs in the above analysis are associated with activities that will not be continued after AID assistance is terminated (e.g. participants' air fare, house furnishings), and some commodity costs funded by AID during the project must be included in future MOAC budgets. The following table depicts the recurrent budget implications of the expanded research, information, and extension in-service training programs after FY 1986/87.

Table V.6  
MOAC Recurrent Budget After Project Termination (E000)

	<u>FY 1987/88</u>	<u>88/89</u>	<u>89/90</u>
1. MOAC Recurrent Budget	28,747	34,928	42,437
2. Increase from Previous Year	5,087	6,181	7,509
3. Cost of Expanded Research, Information, and In-Service Training Programs	216	248	285
4. 3 as a percentage of 2	4.2	4.0	3.8

As can be seen from Table V.6, maintenance of the research, agricultural information, and extension in-service programs at the level institutionalized by this project (including a 15 percent/year inflation rate), requires a constantly diminishing share of the MOAC's recurrent budget increments (figures do not reflect levels of activity beyond those created during the project nor the possibility of follow-on AID project funding). Care was taken during the project design to utilize existing MOAC resources and staff positions to the extent possible. Few new positions will be required under the project; for the most part, Swazis will be trained to fill existing posts for which budget allocations are available. Furthermore, the efficiencies that will result from a better trained and supported extension service should result in cost savings that will offset some of the incremental costs associated with the project.

The MOAC, Ministry of Finance, and the Department of Economic Planning and Statistics have reviewed the recurrent budget implications of the project and agree with the PP design team that the future recurrent costs are well within the GOS' financial capacity.

## VI. Implementation Plan

### A. Implementation Schedule

The following schedule presents the major implementation actions to take place during the project along with the responsible agent.

<u>Date</u>	<u>Action</u>	<u>Responsibility</u>
Aug 81	Grant Agreement signed	USAID/GOS
Sept 81	Preliminary planning for all facilities to be constructed, including designs for Ag. Info. Bldg. and Malkerns facilities	GOS
Sept 81	Tender document issued for construction of TA House	GOS/USAID
Oct 81	Contract negotiated with contracting university	AID/W/Contractor
Oct 81	Two station wagons and two pickup trucks ordered for technical assistance team	GOS/USAID
Oct 81	Tenders for Ag. Info. Bldg. and Malkerns facilities	GOS/USAID
Dec 81	Ag. Info. Bldg., Malkerns Soils Lab, Library, and TA House contracts awards	GOS/USAID
Dec 81	Three pickup trucks ordered for technical assistance team	GOS/USAID
Jan 82	Chief of Party, Rural Sociologist, Extension Training Specialist and Economist arrive in Swaziland	Contractor
Feb 82	3 candidates selected for US training; applications submitted to universities	GOS/USAID/ Contractor
Feb 82	One pickup truck ordered for technical assistance team	GOS/USAID
Mar 82	First contingent of equipment and supplies ordered	Contractor
Mar/Apr 82	Swazi counterparts identified (and posts established, if necessary) for each U.S. technician on project and transferred to specific positions	GOS

Date	Action	Responsibility
Mar 82	3 candidates selected to enroll in refresher course in University College of Swaziland (UCS)	GOS/USAID/ Contractor
Apr 82	All remaining members of technical assistance team arrive Swaziland (except Agricultural Information Specialist)	Contractor
Apr 82	Rural Sociologist and Agricultural Economist provide leadership in designing and conducting base-line survey	Contractor/ GOS
Apr/June 82	Research staff observe harvest and begin detailed planning for 1982/83 cropping season	Contractor/GOS
May 82	3 Swazis leave for M.Sc. program in US	GOS/Contractor
May 82	4 Swazis leave for B.Sc. program	GOS/Contractor
Jun 82	TA house and Malkerns facilities completed	GOS/USAID
Jun 82	Agricultural Information Specialist arrives in Swaziland	Contractor
Jun 82	Tender for first seven field research houses and five storage sheds	GOS/USAID
Jun 82	Ag Information technician selected; departs for 6 months training	GOS/Contractor
Aug 82	Contracts awarded for seven field houses and five storage sheds	GOS/USAID
Aug 82	Second contingent of equipment ordered	Contractor
Aug 82	Four vans for AIS ordered	GOS/USAID
Sept 82	Start of program for first crop season under project	Contractor
Aug 82	First group of five Research Assistants begin training at research station	GOS/Contractor
Nov 82	Ag. Info. Bldg. completed	GOS/USAID
Dec 82	Ag. Information technician returns from training	Contractor
Feb 83	4 candidates selected for training in US; applications submitted to universities	GOS/Contractor

Date	Action	Responsibility
Mar 83	4 candidates for training enrolled in UCS for refresher courses	GOS/Contractor
May/Jun 83	Data from base-line survey collected and preliminary analysis completed	Contractor
Apr 83	Equipment and motorcycles for first field team ordered	Contractor
Apr/Jul 83	Research team analyzes results from first crop season	Contractor
May 83	4 Swazis leave for training in U.S. (2 M.Sc., 2 M.Ed.)	GOS/Contractor
May 83	Start of program for first irrigated crop season	Contractor
May 83	4 Swazis leave for B.Sc. training	GOS/Contractor
Jun 83	Completion of first seven field houses and five storage sheds	GOS/USAID
Jun 83	Tender for remaining seven field houses and five storage sheds	GOS/USAID
Jun 83	First five field research teams transferred to field sites	GOS/Contractor
Jul 83	Internal Evaluation (PES)	USAID
Aug 83	Second group of five Research Assistants begin training at research station	GOS/Contractor
Aug 83	Contract awards for remaining seven field houses and five storage sheds	GOS/USAID
Aug/Sept 83	Analysis of irrigated crop season results	Contractor
Sept 83	Results of research findings published in annual report	Contractor/GOS
Sept 83	Start of new crop season program	Contractor
Feb 84	4 candidates selected for training in US; applications sent to universities	GOS/Contractor
Mar 84	4 candidates for advanced training enroll in refresher courses at UCS	GOS/USAID
Apr 84	Equipment and motorcycles for second field team ordered	Contractor
May 84	3 students complete M.Sc. training, return to Swaziland and start work with TA counterparts	GOS/Contractor

Date	Action	Responsibility
May 84	4 M.Sc. trainees depart for US	GOS/Contractor
Apr/Jul 84	Data and preliminary analysis of first annual update of socio-economic information completed	Contractor/GOS
Apr/Jul 84	Team analyzes results of previous crop season	Contractor/GOS
May 84	Start of irrigated crop season program	Contractor
Jun 84	Remaining seven field houses and five storage sheds completed	GOS/USAID
Jun 84	Second five field research teams transferred to field sites	GOS/Contractor
Jul 84	Internal Evaluation (PES)	USAID
Aug/Sept 84	Analysis of irrigated crop season results	Contractor
Sept 84	3 Swazis assume responsibility of position with TA as advisors	GOS/Contractor
Sept 84	Research findings published in annual report	GOS/Contractor
Sept 84	Start of new crop season program	Contractor
May 85	4 students complete M.Sc. training; return to Swaziland and start work with TA counterparts	GOS/Contractor
Apr/Jul 85	Team analyzes results of previous crop season	Contractor
Apr/Jul 85	Data for 2nd annual update of socio-economic information; in conjunction with previous information the research program's overall direction is re-examine.	Contractor/GOS
May 85	Start of irrigated crop season program	Contractor
May/Aug 85	On-farm demonstration program of research findings under irrigated conditions	GOS/Contractor
Jul 85	External Evaluation	REDSO/EA/Consultants
Aug/Sept 85	Analysis of irrigated crop season results	Contractor
Sept 85	4 Swazis assume responsibility of positions with TA as advisors	Contractor
Sept 85	Research findings published in annual report	GOS/Contractor

Date	Action	Responsibility
Sept 85	Start of new crop season program	Contractor
Sept 85 - Apr 86	On-farm demonstrations of research findings	GOS/Contractor
Jan 86	Start decision process for determining whether a phase II will be implemented	USAID/GOS/ Contractor
May 86	4 students complete M.Sc. training in US and return to start work with counterparts	GOS/Contractor
May 86	4 B.Sc. graduates return to work in Crop Production Section	GOS/Contractor
Apr/Jul 86	Team analyzes results of previous crop season	Contractor/GOS
Apr/Jul 86	Socio-economic team gathers new data, analyzes 4 years of data, and makes comparisons	Contractor/GOS
May 86	Start of final irrigated crop season program	Contractor/GOS
May/Aug 86	On-farm demonstrations of irrigated research findings	GOS/Contractor
Jul/Aug 86	Follow-on PP Design, if required	USAID/Contractor: GOS
Aug/Sept 86	Analyses of final irrigation crop season results	Contractor/GOS
Sept 86	4 Swazis assume responsibility of position with TA as advisors	GOS/Contractor
Sept 86	Research findings published in annual report	GOS/Contractor
Sept 86	Start of final crop season program	Contractor/GOS
Sept 86 - Apr 87	On-farm demonstrations of research findings	GOS/Contractor
Oct 86	Phase II PP Approval	AID/W
Jan 87	Contract signed for implementation of Phase II	AID/W/Contractor
Apr 87	Summary report of research findings during first five years	Contractor/GOS
Apr/Jul 87	Research staff analyze results of previous crop season	GOS/Contractor

<u>Date</u>	<u>Action</u>	<u>Responsibility</u>
Apr 87	Phase II implementation begins	USAID/ GOS/ Contractor
May 87	4 B.Sc. graduates return to work in Crop Production Section	GOS/Contractor

## B. Implementation Responsibilities

### 1. GOS

a. Agricultural Research Division. The GOS will transfer five Crop Production Specialists from the Crop Production Section of the MOAC to the Research Division to serve as counterparts to AID-funded technical assistance team. In addition, the GOS will establish five positions in 1982 and five in 1983 for Research Assistants. The first five positions will be filled by April 1982 either by recruiting new diploma graduates or transferring experienced Research Recorders who are diploma holders into those positions. The remaining five Research Assistant positions will be filled by April 1983.

b. Extension In-Service Training Section. The GOS will formally establish an Extension In-Service Training Section in the Agriculture Division of the Ministry of Agriculture and Cooperatives. The existing post for the Extension In-Service Training Coordinator will be transferred from the Agricultural Information Section to the new section and an additional position will be created for an Assistant Coordinator. A position will also be established for one secretary/typist and all three positions will be filled in FY 82/83.

c. Agricultural Information Section. The GOS will fill one existing Farm Radio Broadcaster position, and two of the existing three projectionist positions (one is already filled). A fourth projectionist position will be established and filled in 1983.

d. Other. The GOS will be responsible for the timely selection of participants with adequate academic qualifications for training in disciplines as illustrated in Table III.2 of this PP and in accordance with the time frames illustrated in this table.

In conjunction with commodity support from AID, the GOS will be responsible for providing adequate recurrent budget support to implement and carry out the programs in Agricultural Research, agricultural information, and extension in-service training. The GOS will also be responsible for providing facilities for research and extension in-service training.

The Public Works Department of the Ministry of Works, Power and Communications will be responsible for coordinating all project construction activities. The Public Works Department will prepare final plans and specifications, tender documents, and will select and supervise contractors. Plans, contracts and construction will be inspected and approved by AID engineers; these approvals will be formalized in Project Implementation Letters submitted to the GOS.

## 2. AID

USAID/Swaziland will be responsible for project monitoring, and the USAID/S project manager will serve as the primary contact point for the contract team's Chief of Party and will be responsible for obtaining decisions on contract and project matters. USAID/S will prepare necessary PIO/Ts and Project Implementation Letters and will be responsible for the preparation of one Project Evaluation Summary in addition to the supervision of the one external evaluation. USAID/S will issue Source and Origin Waivers to permit Code 935 procurement under Mission Director Authority, or request such waivers from AID/W if required.

USAID/S will disburse funds for local costs on a reimbursable basis following procedures to be defined in the Grant Agreement and Project Implementation Letters. Funds for construction will be disbursed on a Fixed Amount Reimbursement (FAR) basis with disbursement levels and procedures for advances to be established with assistance from USAID engineers and set forth in Project Implementation Letters.

## 3. Contractor

The design of this project was carried out through the collaborative mode with assistance provided by a Title XII Institution; it is planned that the project will be implemented by the same institution, Pennsylvania State University (Penn State). AID/W, in coordination with USAID/S, will contract with Penn State to provide the technical assistance proposed for the project. Penn State (referred to in most of this PP as the contractor) will be responsible for the timely provision of the required technical assistance personnel as well as all administrative arrangements related to recruitment, transportation, shipment of household effects, etc.

The technical assistance team, under the leadership of the Chief of Party, will be responsible for implementing project activities as described in the Project Paper (detailed job descriptions are included as Annex J). In addition to in-country and on-the-job training responsibilities, the technical assistance team will also assist the GOS in the selection and evaluation of participant trainees, and will be primarily responsible for securing placement of participants sent for U.S. and third country training. Since participant training is grant funded under the contract, the technical assistance team will prepare all PIO/Ps, with USAID/S guidance and assistance as needed, and will furnish copies of PIO/Ps to USAID/S.

Project commodities will be procured under the contract; therefore, Penn State's procurement office, and the technical assistance team will be responsible for all commodity procurement, following AID procurement regulations. However, before equipment and/or commodities are procured, the technical assistance team must obtain USAID/S approval of types and prices of non-expendable items.

The technical assistance team will be required to submit annual work plans to be approved by MOAC and USAID. Requisite reports consist of quarterly progress/status reports and a final, end of project report.

### C. Procurement Plan

#### 1. Authorized Source of Procurement

The authorized source of procurement under the project will be the Geographic Code 000 (U.S. only) and Swaziland, except for those items covered by the source waivers, included as Annex M, and the light duty vehicles, which will be procured from Code 935 sources under the existing blanket vehicle waiver for southern Africa.

#### 2. Responsibility

It is planned that all procurement under the project will be carried out by Penn State, with all A.I.D. rules and regulations concerning procurement being applicable. Exceptions to the foregoing are: (1) the light duty vehicles will be purchased by the GOS Central Transport Authority, in order for transportation to be available to the implementation team upon its arrival in Swaziland and (2) since all construction will be under the FAR method of financing, the contractor hired by the GOS will procure all construction materials. The contract with Penn State will clearly specify its procurement responsibilities, including a requirement that all transactions for non-expendable items must be reviewed and approved by USAID/S prior to placement of orders.

#### 3. Imported Shelf Items

Within the limits authorized, some items of other than Geographic Code 941 origin will be purchased off-shelf in Swaziland. Included among these items will be relatively small quantities of fertilizers and pesticides required at intermittent periods during the life of the project; equipment, such as photocopiers, for which local service is essential; and production materials and supplies, including flip charts, film and printing materials. Penn State will also be responsible for the procurement of these items, taking into consideration all AID rules and regulations concerning commodity eligibility.

#### 4. Mini-Computer

A computer equal to the Wang Model 2200T-6 and related accessories is required for the efficient implementation of the project. The detailed specifications for the computer will be prepared by specialists at Penn State, based on the following requirements:

(1) the social science members of the team will need computer facilities with adequate storage and software to store and analyze data from the base-line survey, annual updates and the end of project survey;

(2) the agricultural scientists need the computer facilities for recording and analyzing the results of field trials and farm demonstrations; and

(3) the functional efficiency of the soil testing and plant tissue laboratories (and other related activities) will be greatly increased if some of the routine analyses are performed by computer.

A consultant will be provided under the project to assist in the start-up of computer operations; the long-term technical advisors in research will be familiar with computer analysis techniques and computer operation. (The only computer in Swaziland with significant storage and operational functions is located in the Ministry of Finance and already has a very high level of use.)

## VII. Evaluation Plan

### A. Internal Evaluations

Two AID Project Evaluation Summaries (PES) will be undertaken during the life of the project. The first one, scheduled in July 1983 (FY 1983) to allow for completion of the preceeding crop season and subsequent data collection and analysis, will examine progress toward achieving project objectives and the performance of the contractor, USAID and the GOS in meeting project commitments.

The second internal evaluation is scheduled for July 1984 (FY 1984). Composition of the evaluation team will be determined in March 1984 on the basis of the July 1983 evaluation and consultation between the GOS and USAID. This evaluation will focus on: (a) institutional relationships and support for the project within the GOS, particularly in the MOAC; (b) adequacy and utility of the baseline survey; and (c) timeliness and effectiveness of participant training.

Both evaluations will (a) assess MOAC capacity to provide livestock research and extension; (b) assess the links to the cropping systems research; and (c) make recommendations, if appropriate, on whether or not an expanded livestock research and extension program should be included either in the latter stages of this project or in a follow-on effort. This will insure that if the livestock aspect of the farming system appears to be a major constraint to expanded crop production, this project and the existing agricultural research structure will have the capacity to address the problem.

The evaluations will be conducted jointly by the GOS and USAID in accordance with standard AID procedures.

### B. External Evaluation

A major, external evaluation is scheduled for July 1985. The evaluation will be conducted by a RFDSO/EA evaluation officer and three outside consultants over a four week period. The appropriateness and timeliness of the provision of project inputs will be evaluated at this stage along with an assessment of output achievement. The evaluation team will compare actual achievements to the targets projected in the Project Paper and evaluate progress toward reaching the end of project status. If necessary, the evaluation team will recommend modifications regarding project inputs that may be required to accomplish the project purpose. Additionally, using the project base-line survey and subsequently gathered data, the evaluation team will assess any progress toward achieving the 1992 goal level indicators, if possible.

The external evaluation will also serve as the basis for deciding the need for a follow-on effort. An explicit recommendation on this question will be required of the evaluation team as well as preliminary recommendations on the direction that a second phase project should take.

### VIII. Conditions and Covenants

The Project Grant Agreement will contain, in substance, the following conditions and covenants:

Condition Precedent. Prior to the disbursement of funds, or to the issuance of documentation pursuant to which disbursement will be made, for each construction activity the Cooperating Country will furnish to AID in form and substance acceptable to AID: (1) evidence that adequate sites have been identified and provided for each construction activity; and (2) final plans and specifications for each construction activity.

#### Covenants

A. Establishment of Positions. The Cooperating Country covenants to establish and fill the new positions and the positions currently unfilled as set forth in Annex A to the Grant Agreement.

B. Participants. The Cooperating Country covenants that candidates for participant training will be selected on a timely basis as set forth in the implementation plan in Annex A to the Grant Agreement.

C. Counterparts. The Cooperating Country covenants to assign counterparts to each of the technical assistance personnel.

D. Recurrent Budget. The Cooperating Country covenants to assume the recurrent budget costs for the project as set forth in Annex A to the Grant Agreement.

E. Vehicles. The Cooperating Country covenants that all project vehicles will be used solely for this project unless AID otherwise agrees in writing. The Cooperating Country further covenants that it will replace all project vehicles as required.

F. Housing. Except as otherwise agreed to by AID in writing, title to houses financed by AID under this Agreement will be vested in the Cooperating Country. Notwithstanding that title is so vested, the Cooperating Country covenants that: (1) the house for the Agricultural Information Specialist will be reserved for the exclusive use of AID-financed technical assistance personnel working on this project or other AID-financed projects in Swaziland, until such time as the Parties agree that this house is no longer required for the support of this or any other AID-financed projects in Swaziland; and (2) that the 14 houses for the field research assistants and Peace Corps Volunteers will be reserved for the exclusive use of this or a follow-on project until such time as the Parties agree that these houses are no longer required.

The Cooperating Country further covenants that it will provide permanent housing at Malkerns for all other AID-financed technical assistance personnel under this project.

In the event that AID-financed housing or other permanent housing is not available for use by AID-financed technicians upon their arrival in Swaziland, the Cooperating Country covenants to provide suitable temporary housing for such technicians and their families until such time as permanent housing is available.

G. Pesticides. The Cooperating Country covenants that the procurement or use of pesticides in connection with this project will be for research or limited field evaluation purposes only and that such procurement or use will be undertaken in accordance with Section 216.3(b)(2)(iii) of the AID Environmental Procedures.

## ANNEXES

- A. GOS Application for Assistance
- B. PID Approval Cable
- C. Draft Project Authorization
- D. Social Soundness Analysis
- E. Economic Analysis Tables
- F. Local Cost Financing Determination
- G. Summary of Certificate Training Course Curriculum
- H. Engineering Analysis
- I. Log Frame
- J. Job Descriptions
- K. Financial Tables
- L. Equipment List
- M. Waiver Justifications
- N. Statutory Checklist
- O. Participant Training Time Flow Chart
- P. Initial Environmental Examination

SWAZILAND



GOVERNMENT

Prime Minister's Office,  
 Department of Economic Planning  
 and Statistics,  
 P. O. Box 602,  
 Mbabane,  
 SWAZILAND.

Ref: ECO/08/2

29th June, 1981

The Director,  
 U.S.A.I.D.,  
 P. O. Box 750,  
 MBABANE.

Dear Sir,

CROPPING SYSTEMS RESEARCH AND EXTENSION TRAINING PROJECT

On behalf of the Ministry of Agriculture and Cooperatives this Department submits the attached project document proposal entitled "Cropping Systems Research and Extension Training Project" for U.S.A.I.D. funding as indicated in the document.

As the proposed project complements the work of other donors and other U.S.A.I.D. assistance with respect to assisting subsistence farmers in moving from subsistence to semi-commercial and commercial agriculture, this Department fully supports this request because of the vital assistance the proposal offers to agricultural and rural development.

We are conscious of the work and joint co-operation between officials of your Agency and the Ministry of Agriculture and Cooperatives in the formulation of this Research Proposal which is in keeping with the development needs of our fast expanding agricultural sector.

In supporting this project we are prepared to commit the local resources necessary to implement the project estimated at approximately E 900 000 over the life of the project within our budgetary constraints. The counterpart staffing component will be taken care-of by the Swaziland Government.

Our understanding is that Government will control the use of vehicles which will be purchased with U.S.A.I.D. assistance for use by Research Officers and maintained by Government as well as providing fuel for their operation.

We appreciate very much the consistent support provided by your staff and other members of the United States Agency for International Development for the time spent with us in formulating this complex but critically important project proposal.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'E. Bnembe', written in a cursive style.

E. BNEMBE

for : PERMANENT SECRETARY



(B) USAID/S NEEDS TO EXAMINE FURTHER THE VALIDITY OF THE ASSUMPTION THAT A POTENTIAL INCOME LEVEL OF 1,500 DOLS PER YEAR FOR THE AVERAGE TWO TO THREE HECTARE SWAZI NATION LAND (SNL) FARM WILL ENTICE MALE LABOR TO REMAIN WITH AGRICULTURE IN PREFERENCE TO JOINING THE URBAN OR MIGRANT LABOR FORCE. HOW DOES THIS LEVEL RELATE TO THE 3,500 DOLS PER YEAR INCOME NOTED IN THE CDSS AS BEING APPARENTLY SUFFICIENT TO MINIMIZE MIGRATION OF SMALL FARMERS GROWING IRRIGATED SUGAR CANE (FY 82 CDSS, PAGE 43)? IF MALE LABOR IS TO BE INDUCED TO RETURN TO AGRICULTURE, THERE MAY BE SOCIOLOGICAL AS WELL AS ECONOMIC STIMULI REQUIRED.

(C) USAID/S SHOULD EXPLICITLY ADDRESS THE IMPACT OF THE PROPOSED PROJECT ON THE ALREADY VULNERABLE ROLE OF WOMEN IN SWAZI SOCIETY. A PROJECT SUCH AS THIS ONE, WHICH WILL CHANGE TRADITIONAL FARMING PRACTICES, HAS THE POTENTIAL FOR ADVERSELY INFLUENCING THE BENEFITS WHICH TRADITIONALLY ACCRUE TO WOMEN FROM THEIR ROLE IN AGRICULTURE. THE SPECIFIC SAFEGUARDS TO ENSURE THAT THIS PROJECT AFFECTS WOMEN ONLY IN A POSITIVE MANNER SHOULD BE PROVIDED IN DETAIL IN THE PP. IF, AS INDICATED IN ANNEX A OF THE PID, THERE ARE TO BE MORE WOMEN TRAINED AS AGRICULTURAL EXTENSION FIELD OFFICERS, IS THIS DECISION BASED UPON PRACTICAL CONSIDERATIONS? ARE THERE WOMEN READILY QUALIFIED TO UNDERTAKE THE TRAINING PROGRAM AT THE AGRICULTURAL COLLEGE? ARE THERE SUFFICIENT DORMITORY SPACES FOR WOMEN TRAINEES AT THE AGRICULTURAL COLLEGE? THE SWAZICAND 1982 CDSS STATES, QUOTE: WHILE WOMEN ARE NOT FORMALLY DENIED OPPORTUNITIES IN AGRICULTURE, THERE IS A FAILURE TO PROMOTE THE UTILIZATION OF FEMALE RESOURCES IN AGRICULTURE, TO TRAIN WOMEN IN AGRICULTURAL SKILLS, AND TO ENCOURAGE FULL FEMALE PARTICIPATION IN AVAILABLE AGRICULTURAL PROGRAMS (E.G., EXTENSION, CREDIT). UNQUOTE. AID/M WISHES TO EMPHASIZE THE NEED TO ACTIVELY PROMOTE THE UTILIZATION OF FEMALE RESOURCES IN THIS PROJECT AND TO REACH RURAL WOMEN THROUGH MASS MEDIA IN ORDER TO ADDRESS THE PROBLEM AS PRESENTED IN THE CDSS.

(D) THE PID PROPOSES A FIVE YEAR EFFORT OF CROPPING SYSTEMS RESEARCH AND EXTENSION TRAINING. THE PROJECT PAPER SHOULD EXAMINE THE RELATIONSHIP OF THIS PROJECT TO THE EXISTING MARKETING STRUCTURE AND ITS ADEQUACY, AND TO POSSIBLE COMPLEMENTARY ACTIVITIES SUCH AS THE PROVISION OF VEGETABLE MARKETING INFRASTRUCTURE (INCLUDING COLD STORAGE) AND THE PROVISION OF IRRIGATION INFRASTRUCTURE. ALTHOUGH THESE AND OTHER RELATED ACTIVITIES MAY BE FINANCED LARGELY BY DONORS OTHER THAN A.I.D., THEIR INTERDEPENDENCE AND THE RELATIONSHIP OF ALL OF THE PROPOSED ACTIVITIES TO SWAZI-LAND'S RURAL DEVELOPMENT AREAS PROGRAM REQUIRE DETAILED ANALYSIS. THIS SHOULD INCLUDE A COMPLETE DISCUSSION OF THE PHASING OF THE VARIOUS ACTIVITIES, WITH THE PROVISION

FOR A REVIEW OF THE ENTIRE SCHEME IF THE RESULTS OF A NATIONAL WATER RESOURCES SURVEY DO NOT INDICATE THAT SIGNIFICANT EXPANSION OF IRRIGATION IS PRACTICAL.

(E) THE COMMITTEE EXPRESSED CONCERN THAT THE PARTICIPANT TRAINING BEING PROPOSED IS UNLIKELY TO PROVIDE A SUFFICIENT BASIS FOR A STRONG CROPPING SYSTEMS RESEARCH INSTITUTION, AND THAT THE IN-SERVICE TRAINING BEING PROPOSED APPEARS INADEQUATE TO THE TASK OF UPGRADING THE CAPABILITY OF THE CURRENTLY UNDERQUALIFIED 177-MEMBER EXTENSION STAFF. IT WAS AGREED DURING THE MEETING THAT THE PROPOSED TRAINING INPUT SHOULD BE REVIEWED, BALANCING THE AID/M SUGGESTION TO DOUBLE OR TRIPLE THE AMOUNT OF TRAINING AGAINST THE REALITY OF A LIMITED POOL OF POTENTIAL TRAINEES IN EACH SPECIFIC PROFESSIONAL DISCIPLINE IN SWAZILAND. AID/M ALSO SUGGESTS THAT USAID/S CONCENTRATE ON UPGRADING THE QUALIFICATIONS OF THE EXISTING EXTENSION STAFF BEFORE DEVOTING RESOURCES TO DOUBLING THE SIZE OF THE STAFF.

(F) THE PID'S DISCUSSION OF IMPACTS, SECTION II, APPENDIX A, IS QUITE THOROUGH IN REGARD TO PESTICIDES. AID/M NOTES THAT PESTICIDES MAY BE USED FOR RESEARCH PURPOSES UNDER STRICT SUPERVISION OF PROJECT PERSONNEL FOR CONTROL PURPOSES ON ACTUAL SWI FARMS AS WELL AS ON RESEARCH STATION PLOTS. AID/M WILL ASSIST IN PROVIDING AN INSECTICIDE EXPERT IF AND WHEN THE DECISION IS MADE TO CONSIDER PROVIDING INSECTICIDES TO FARMERS OR PROMOTING THEIR USE BY FARMERS.

THE GOS A MIXTURE OF LOAN AND GRANT FUNDING FOR THIS PROJECT. FOR EXAMPLE, COMMODITIES, VEHICLES AND CONSTRUCTION, WITH INFLATION AND CONTINGENCY FACTORS ADDED, TOTAL APPROXIMATELY 1.3 MILLION DOLS AND MAY BE APPROPRIATE FOR LOAN FUNDING.

(H) THIS PROJECT FITS THE CRITERIA FOR THE COLLABORATIVE ASSISTANCE APPROACH TO DESIGN AND IMPLEMENTATION AS OUTLINED IN PARA 3, A.I.D. HANDBOOK 14. THE INVOLVEMENT OF U.S. EDUCATIONAL INSTITUTIONS AND INTERNATIONAL RESEARCH INSTITUTIONS IS APPROPRIATE IN ACCORDANCE WITH THE PROVISIONS OF TITLE XII, F.A.A. AID/M WILL EXPAND UPON THE SHORT LIST OF TITLE XII INSTITUTIONS ALREADY PROVIDED BY BIFAD UPON RECEIPT FROM USAID/SWAZILAND OF THE PIOT FOR PROJECT DESIGN, INCLUDING THE SCOPE OF WORK AND SUGGESTED CRITERIA FOR USE IN THE SELECTION OF AN APPROPRIATE INSTITUTION TO UNDERTAKE THE COLLABORATIVE DESIGN OF THE PROJECT. ONLY IF NO INTERESTED AND APPROPRIATELY QUALIFIED TITLE XII INSTITUTION IS FOUND MAY CONSIDERATION BE GIVEN TO ALTERNATIVE METHODS FOR DESIGN AND IMPLEMENTATION. HOWEVER, MISSION MAY CONTRACT SEPARATE TECHNICAL SERVICES TO ASSIST MISSION IN MONITORING AND EVALUATING PROJECT AT APPROPRIATE INTERVALS. SIMILARLY, SINCE CONTRACTING PROCESS MAY REQUIRE SOME FOUR OR FIVE MONTHS, MISSION, IF NECESSARY TO CONTINUE PROJECT DEVELOPMENT PROGRESS, MAY CONTRACT FOR TECHNICAL SERVICES TO ADDRESS PRIMARILY PRE-DESIGN ISSUES.

4. FY11 THERE IS ALREADY EVIDENCE OF CONSIDERABLE INTEREST IN SWAZI PROJECT WITHIN TITLE XII COMMUNITY. CHRISTOPHER

PROJECT AUTHORIZATION

Name of Country: Swaziland

Name of Project: Cropping Systems  
Research and Extension  
Training

Number of Project: 645-0212

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended (the "Act"), I hereby authorize the Cropping Systems Research and Extension Training Project for Swaziland ("Cooperating Country") involving planned obligations of not to exceed \$12,900,000 in grant funds over a six year period from date of authorization, subject to availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the project. In addition, I hereby authorize a six year life of project.

2. The project consists of redirecting the focus of agricultural research in Swaziland toward the small farmer, improving the training of extension workers and improving the agricultural information service through the provision of technical assistance, training, equipment, vehicles and commodities.

3. The Project Agreement which may be negotiated and executed by the officer to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

a. Source and Origin of Goods and Services

Goods and services, except for ocean shipping and except as provided in paragraph d. below, financed by A.I.D. under the project shall have their source and origin in the Cooperating Country or in the United States except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States.

b. Conditions Precedent

The Grant Agreement shall contain a condition precedent in substance as follows:

Prior to the disbursement of funds, or to the issuance of documentation pursuant to which disbursement will be made, for each construction activity the Cooperating Country will furnish to A.I.D. in form and substance acceptable to A.I.D.:

(1) evidence that adequate sites have been identified

and provided for each construction activity; and  
(2) final plans and specifications for each construction activity.

c. Covenants

The Cooperating Country shall covenant in substance as follows:

1) Establishment of Positions

The Cooperating Country covenants to establish and fill the new positions and the positions currently unfilled as set forth in Annex A to the Grant Agreement.

2) Participants

The Cooperating Country covenants that candidates for participant training will be selected in a timely basis as set forth in the implementation plan in Annex A to the Grant Agreement.

3) Counterparts

The Cooperating Country covenants to assign counterparts to each of the technical assistants.

4) Recurrent Budget

The Cooperating Country covenants to assume the recurrent budget costs for the project as set forth in Annex A to the Grant Agreement.

5) Vehicles

The Cooperating Country covenants that all project vehicles will be used solely for this project unless A.I.D. otherwise agrees in writing. The Cooperating Country further covenants that it will replace all project vehicles as required.

6) Housing

Except as otherwise agreed to by A.I.D. in writing, title to houses financed by A.I.D. under this Agreement will be vested in the Cooperating Country. Notwithstanding that title is so vested, the Cooperating Country covenants that : 1) the house for the Agricultural Information Specialist will be reserved for the exclusive use of A.I.D.-financed technical assistance personnel

working on this Project or other A.I.D.-financed projects in Swaziland, until such time as the Parties agree that this house is no longer required for the support of this or any other A.I.D.-financed projects in Swaziland; and ii) that the 14 houses for the field research assistants and Peace Corps Volunteers will be reserved for the exclusive use of this or a follow-on Project until such time as the Parties agree that these houses are no longer required.

The Cooperating Country further covenants that it will provide permanent housing at Malkerns for all other A.I.D.-financed technical assistance personnel under this project.

In the event that A.I.D.-financed housing or other permanent housing is not available for use by AID-financed technicians upon their arrival in Swaziland, the Cooperating Country covenants to provide suitable temporary housing for such technicians and their families until such time as permanent housing is available.

7) Pesticides

The Cooperating Country covenants that the procurement or use of pesticides in connection with this project will be for research or limited field evaluation purposes only and that such procurement or use will be undertaken in accordance with Section 216.3(b)(2)(iii) of the AID Environmental Procedures.

d. Waivers

Based upon the justification contained in Annex M of the Project Paper, I hereby:

(1) Approve source/origin procurement waivers from AID Geographic Code 000 (U.S.) to Code 935 (Special Free World) to permit procurement of (a) project equipment at an approximate cost of \$36,450, (b) 14 motorcycles at an approximate cost of \$33,000, (c) construction materials at an approximate cost of \$352,000, and (d) imported shelf items at an approximate cost of \$300,000;

(2) Certify that exclusion of procurement from Free World Countries other than the Cooperating Country and countries included in Code 935 would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program; and

(3) Certify that special circumstances exist to waive, and do hereby waive, the requirements of Section 636(i) of the Act.

Date: \_\_\_\_\_

\_\_\_\_\_  
Administrator

Clearances:

AAA/AFR/DR: JWKoehring	_____	Date:	_____
GC: JBolton	_____	Date:	_____
AFK/SA: TMorse	_____	Date:	_____
A-AA/PPC: LSmucker	_____	Date:	_____
AFR/DR/SA: WWolff	_____	Date:	_____
AFR/DR/SA: DBlane	_____	Date:	_____
AAA/AFR/DP: ICoker	_____	Date:	_____

Drafter: RLA/S: AWilliams

SOCIOCULTURAL FACTORS RELEVANT TO THE  
TRANSITION FROM SUBSISTENCE TO  
COMMERCIAL CROPPING ON SWAZI NATION LAND

A priority of the Government of Swaziland (GOS) Third National Development Plan (1978/79 - 1982/83), is to increase agricultural production by 6 percent annually. One proposed means of accomplishing the goal is to produce a higher proportion of cash cropping. To assist in the effort, the United States Agency for International Development, Swaziland (USAID/S) is committed to a first phase, five-year, Cropping Systems Research and Extension Training Project designed to increase the agricultural productivity of the small farm holder on Swazi Nation Land (SNL) and to make SNL farming more economically viable.

At present the majority of SNL farmers engage in subsistence cropping. The transition to commercial cropping will require sociocultural adjustments as well as scientific and technical adjustments. This paper discusses several sociocultural factors that will have bearing on the transition process, including: social organization on SNL; traditional farming and cropping patterns on SNL; and general development issues pertaining to movement from subsistence to commercial cropping.

### Social Organization

Sixty-six percent of Swaziland's 565,000 residents live on Swazi Nation Land (SNL). This land, held in trust by the King for the Swazi people, accounts for 60 percent of the country's total land resources. The remaining 40 percent is Individual Tenure Farm (ITF) land, primarily controlled by non-Swazi. By birth, every Swazi has a right to residency on the communally held land which is for the most part rural. SNL is largely governed under the country's traditional hierarchical form of government (versus the dual modern system) and is administered at the level of chiefdom. The 200 chiefs allocate land to families through male progeny.

Each Swazi male gains individual entitlement to a parcel of land at the time of marriage. Although the land cannot be sold or traded, it usually remains his to pass on to male offspring. The system therefore provides a considerable amount of land security despite entitlement of chiefs to reallocate land. Normally this occurs only when a serious offense has been committed or land has been neglected.

## Homestead Organization

The land and buildings, together with the patrilineal family of their attachment, comprise a homestead (umuti), the basic unit of social organization on SNL. The homestead may consist of one or more individual families (households) depending upon the structural complexities of marriage (about 20 percent are polygynous) and the organization of various internal kinship groupings. Each household has its own residential buildings, a separate kitchen, and relative autonomy of internal economic functioning. The totality of households usually are in close proximity to one another and form a courtyard.

Typically each homestead has a male head responsible for overall functioning of the unit, as well as a male head of each individual household within the unit. Adult resident males of each household have authority over household females. Males gain ascendancy to homestead/household authority through a seniority system.

It is from the homestead that the Swazi receives identity and thus obtains access to land, membership in a chiefdom, and a lifelong system of privileges and obligations appropriate to his/her sex, age, and marital status.

Sex roles within the homestead are clearly defined. Generally male roles are separate from female roles. By tradition, males are responsible for the external affairs of the homestead/household, including cattle care, politics of the chiefdom and nation, and other matters pertaining to receipt of benefits from the outside world (such as money) or protecting the umuti from the world's dangers.<sup>1</sup> Women have responsibility for internal, domestic affairs and general welfare of the umuti, including rearing of children, care of the sick, provision of food and cultivation of fields.<sup>2</sup>

Most SNL children of school age attend school regularly when it is in session, although school entrance of males sometimes is delayed due to cattle herding. Children play a major role in helping women with the care of the fields.

SNL homesteads, about 42,000 in number, tend to be widely dispersed such that the organizational entity known as a village does not exist. The landholding of the average homestead is 2.75 hectares; practically none exceed 12 hectares. Parcels of land are usually fragmented rather than contiguous.

## Traditional Farming and Cropping Patterns

About 11 percent of SNL is utilized for cropping and settlement. The remainder constitutes communal grazing land or is mountainous or wasteland. From early beginnings as a semi-

nomadic pastoral people, cattle have played an important role in the Swazi culture. Historically they have been the exclusive domain of males and symbolize the wealth and achievements of a homestead. Cattle inherited from one's father are regarded as a sacred trust held for the ancestors.<sup>3</sup> The passing of cattle through male offspring thus imparts values of familial solidarity and trust as well as those of social esteem.

Cattle also serve important ritualistic and social functions. The marriage of practically every SNL male occasions the giving of cattle (although not necessarily a direct physical transaction) as lobola, bride price. The sacrificing of cattle forms part of the traditional wedding ceremony. Cattle also are important in the socialization of Swazi males in that herding is considered a first step toward manhood.

The cattle tradition remains strong today. About 80 percent of SNL (787,000 hectares) constitutes grazing land which sustains 546,000 cattle and 281,000 sheep and goats.<sup>4</sup> Cattle are considered a good inflationary hedge since they multiply, are a food source, can be easily converted to cash, are tax-free, and are easy to maintain in terms of labor and food requirements (feed on communal land.)<sup>5</sup> Farmers therefore are reluctant to destock cattle despite overgrazing and severe soil erosion.

The prevailing strength of the cattle tradition on SNL is evidenced by a recent study which found 42 percent of those sampled would have more respect for a person with a lot of cattle than one with a lot of money.<sup>6</sup>

Unlike livestock, cropping as a viable agricultural activity is less a tradition on SNL. Historically, it has been the domain of women; although prior to the devastating drought and famine visited upon the country in 1896-97, men were involved sufficiently that crops provided a livelihood. Since that time, the country has been largely dependent upon food imports from South Africa.<sup>7</sup> An increasing number of men have migrated to work in South Africa, especially in mines. In more recent history, they have migrated to employment opportunities available in Swaziland by private, individually tenured farms; agro-industrial projects established by foreign countries; and urban services employment.

The process has resulted in a steady drain of adult males from SNL cultivation, leaving the bulk of farming to women and children. The migrants, however, maintain a strong, continuous attachment to homesteads as the latter provide a permanent social security to which workers may return in the event of sickness, unemployment, and other eventualities. Cash and material contributions as well as frequent visits are means of assuring this security.<sup>8</sup>

At present, nearly 70 percent of SNL homesteads have absentee workers, accounting for 57.6 percent of the adult male work force; and 27.7 percent of the adult female work force.<sup>9</sup> Although half of the homesteads receive regular migrant cash contributions, the income of 73 percent of SNL families is less than \$200 per resident member, the poverty line adopted for Swaziland's rural population.<sup>10</sup> Only 41 percent of the homesteads receive cash income from crops.

Ninety-six percent of SNL farmers grow maize, the Swazi staple food. Even though this usage accounts for three-fourths of the total land under cultivation, it does not meet consumption needs of the growers; 46 percent purchase additional maize during a typical harvest year.<sup>11</sup> Also frequently grown, primarily for consumption, are groundnuts and beans. Few homesteads currently grow high income potential crops such as tobacco (4 percent) and cotton (8 percent). Those that do, tend to be homesteads with five or more hectares of land.

Reasons given by SNL residents for not growing tobacco and cotton include: inadequate land (23 percent); lack of labor (19 percent); lack of money, capital, or equipment (12.5 percent); and lack of knowledge of how to grow the crops (10 percent).<sup>12</sup> The land tenure system places additional constraints upon commercial cropping to the extent that farmers are unable to exercise control over their land resources. Whereas in reality the majority of SNL farmers have security of land tenure, most feel they can be evicted from the land.<sup>13</sup>

The communal grazing system on SNL places limits on use of cropping land since by custom all fields are opened to everyone's cattle prior to the planting of crops and after harvest.<sup>14</sup> This means that cropland preparation, planting, and harvesting must be carried out at about the same time by all homesteads; further they are to a large extent restricted to crops which conform to a common cycle of growth and maturation. Such practices likewise prevent cutting and storing of maize stalks for silage as anyone who does so could be viewed as depriving their neighbor's cattle of food.<sup>15</sup>

Farmers who grow cash crops despite these obstacles are hampered still by absence of an adequate marketing infrastructure, low prices from crop sales, high costs of inputs, difficulties with credit arrangements and lack of insurance against hazards of production.<sup>16</sup>

Given these obstacles, it is not surprising that many SNL farmers currently grow only enough crops for subsistence and maintenance of entitlement to land.

Transition From Subsistence To Commercial Cropping:  
Development Issues

A. Approach

Movement from subsistence to commercial cropping on SNL will seemingly be a formidable undertaking. Probability of success will depend heavily upon proper approaches and adequacy of institutional supports. The USAID Cropping Systems Research Extension and Training Project, is a logical first step in the process. This research, as a result of being carried out on SNL farmers' fields, provides opportunity for assessment of the exact nature of current cropping constraints and potential for remedy, both from the perspective of the farmer and an interdisciplinary team of technical assistants.

Once this is complete, demonstration trials can be carried out in a variety of farm situations to determine which crops, or combination of crops, will produce the highest yield and greatest income potential within a given sociocultural, economic and agricultural context. The agricultural extension and training component of the project will complement this process by strengthening the capacity of Swaziland extension agents and other Ministry of Agriculture and Cooperatives staff to make improved cropping recommendations available to farmers through additional and better trained extension workers; and through improved methods of disseminating agricultural information.

Two factors will bear considerably on eventual impact of the project. First, SNL farmers must have meaningful involvement in all phases of planning and implementation of demonstrations. The resulting cropping systems recommendations must be understandable as well as acceptable to them. Farmers, themselves, ultimately will bear responsibility for adoption of research recommendations and further spread of new techniques.

Equally as crucial is that farmers must be given some incentive for change and some assurance that their time/cost investments will bear fruit. A strong commitment to the rural development effort on the part of the Government of Swaziland (GOS) is therefore vital. An assumption of the project is that the GOS will continue its emphasis on the Rural Development Area (RDA) program, the cooperative movement, agricultural extension and information services, and other related activities relative to improving the ability of SNL farmers to make the transition from subsistence to commercial agriculture. It is also assumed that production inputs will be available and that eventually a marketing system will be in place which can accommodate increased agricultural production.

An indirect project assumption is that if on-farm crop income becomes competitive with off-farm wage income, male migrants will be attracted back to the farm. This is certainly likely in the case of unemployed workers, the number of which is steadily growing. It might not be as likely for workers holding steady jobs and those who have established occupational careers, such as miners. Also one has to consider the attraction of urban areas and non-farm residence from the perspective of alternative life styles and individual freedoms. However, the strong attachment that migrants maintain to the homestead is likely to weigh more heavily than the latter.

#### B. Sociocultural and Economic Sensitivities

Outlined below are sociocultural and economic contextual issues and concerns that have come to attention during the design phase of the Cropping Systems Research and Extension Training Project. Knowledge of these should prove useful to the Project Implementation Team and others who will be concerned with the project.

Commercial Cropping Potential - SNL farmers are not a homogenous grouping. They vary widely in extent of involvement in cropping and commitment to it as a source of livelihood.<sup>17</sup> They also vary in potential to increase cropping productivity based on their available capital, farm production inputs, land and labor. Farmers living in the four older and more highly developed RDAs\* are advantaged by improved access to credit, cooperatives, agricultural inputs, irrigation, roads, extension, and agricultural information. These RDAs, additionally, have made significant progress in removing land tenure constraints to productive cropping as a result of land-use reallocation schemes, consolidation of landholdings, resettlement, and fencing of cattle grazing areas.

Available evidence suggests that SNL farmers are receptive to many of the recommendations of the RDA program, including planting of hybrid maize varieties, application of fertilizer and other improved inputs, and to a limited extent, cattle destocking.<sup>18</sup> At the same time, many traditional attitudes and beliefs prevail that can impede agricultural progress, such as that "good luck" is a major requisite for economic success; crops can be bewitched; and that a lot of cattle commands more respect than a lot of money.<sup>19</sup>

A final characteristic of SNL farmers is that members of a homestead frequently do not farm as a collective unit.<sup>20</sup>

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\* About 60 percent of SNL is now proposed for incorporation into the RDA program.

Consequently, it would be in error to estimate the production capabilities of an "extended family" group at the level of homestead. As indicated earlier, whenever separate households exist within a homestead, they each have considerable autonomy of functioning. Only the common fields, usually referred to as "mother's fields", belong to and are cultivated by the homestead as a whole. Beyond this, each household has separate fields which usually are allocated to the wives of male heads. <sup>21</sup> Only produce from the common fields are under control of the homestead head, who may sell it, use it to feed dependents of his who do not belong to households with their own fields, or to make-up a shortfall in grain supplies of other households in his homestead.

A recent visit by the PP team Rural Sociologist to a multiple-household homestead in an RDA provides an example. The maize belonging to the common fields of the homestead (mother's fields) had been harvested by labor contributed by women from each of the households. It had been placed in an independent storage crib to dry. Next to it, in another crib was maize from the fields of the wife of the homestead head. It had been harvested by his wife, alone (except for limited help from him) and was to be used by his household only. A few paces away, in a storage hut, was maize from the fields of the wife of the brother of the homestead head. Her maize had been harvested by herself alone (as her husband is employed away from the homestead) and was spread to dry on a cow dung floor. This maize eventually would feed only her household. This example clearly shows the complications that can arise in trying to determine the production-income potential of a homestead. The quantity and quality of maize from different homestead sub-divisions would vary due to differences in production inputs, labor, storage, etc. Households would also vary in methods of disposing of produce, by consumption or sale.

In such cases, it would make sense to assess cropping activities of each household, as a separate entity, although permission of the homestead head would be required. The same logic would apply to making generalizations about investment potential of cattle and other homestead livestock.

Role of Women - Women are the mainstay of SML homesteads. In addition to their responsibility for most domestic tasks, women often have responsibility for supervising the household when men are away (due to the seasonal nature of some modern sector jobs). Sixty percent are engaged in one or more non-agricultural income earning activity such as handicrafts or beer brewing. In the absence of adult males, about 22 percent of the homesteads are headed by women. <sup>22</sup>

With the help of children, women perform approximately 70 percent of the agricultural activity.<sup>23</sup> Traditionally, the husband is the head of the family and, consequently, makes all major decisions concerning the farm. If, for example, a production input loan is needed, the husband's consent is required. However, the extended family system provides for a senior relative who can make decisions in the absence of the husband (e.g. act as guarantor on farm loans).

Female farmers are visited less by extension agents than male farmers and those visited have fewer total contacts with agents than is the case of males. One reason for this is that Swazi custom considers it inappropriate for male strangers to visit females in absence of an adult male household member.<sup>24</sup>

The Cropping Systems Research and Extension Training Project will be carried out with a high degree of sensitivity to the agricultural contributions and unique circumstances of SWL women. As is already known, agricultural development in Africa, Asia, Latin America and other areas frequently leads to overwork and poor health of women due to increased crop production responsibilities without increased labor support.<sup>25</sup> They also have suffered loss of social status and reduced self-esteem as a result of denial of access to machine technology and improved agricultural inputs and techniques that are otherwise made available to men. A status gap is thus created in the agricultural roles of the sexes. The process results from the fact that western technology tends to be introduced in developing societies based on sex biases and stereotypes which exist in the west, especially the assumption that scientific agriculture is a man's field.<sup>26</sup>

Presently SWL women perform many cropping roles including ploughing, planting and harvesting. Rural Women also use the oxen-drawn plough; few currently operate tractors although no social taboos appear to be responsible.<sup>27</sup> Women will be instructed in the use, operation, and maintenance of all technological innovations introduced by this project, provided they do not conflict with existing Swazi custom.

The project will seek to improve the access of Swazi women farmers to agricultural extension services. Presently few women are trained as agricultural extension agents, and less than 12 are now employed in that capacity. A goal of this project is that at least 20 percent of the participants sent for training will be female. It is also expected that methods will be devised (through work with the MOAC Agricultural Information Section) to more effectively reach women regarding agricultural materials, visual-aids, and mass media.

The Poor and Socially Disadvantaged - Development projects create increased status gaps between different social groupings within a population. Persons having greater amounts of capital and other resources are in position to exploit more fully the benefits of increased economic opportunities than persons with fewer resources. The former also tend to be better educated, more highly motivated and easier to work with. Consequently they reap the majority of initial benefits which can be progressively built upon to create an elitist class. The poor are therefore worse off, relatively, than before development efforts began.

At present, the typical SNL homestead is poor, possessing few capital resources. It is expected that the Cropping Systems Research and Extension Training Project will focus most of its energies on "representative" homesteads. While it is unlikely that all homesteads will have commercial cropping potential in the near future, they can be helped to improve their present condition if given assistance in obtaining improved crop yields from resources available.

Social Research - Sociological research will play a vital role in providing continual information on social soundness of the project. Studies will be carried out to assess socio-cultural and economic aspects of current cropping practices of SNL farmers. Throughout the on-farm demonstrations, the sociologist will monitor the impact of various cropping approaches upon the farm families. This information will be used by the technical assistance team to improve their ability to relate to the unique social and economic circumstances of each individual farmer.

In addition to a broad base-line survey which will include a cross section of SNL farmers, follow-up surveys will take place to measure general project impact. Results of these studies will be used for project evaluation and for planning purposes by Swaziland's Ministry of Agriculture and Cooperatives. Finally, information obtained will serve to augment the existing body of scientific literature concerning agricultural development.

FOOTNOTES

1. Harriet Sibisi, "Traditional Securities and the Response to 'Modern' Economic Opportunities," Kingdom of Swaziland, Ministry of Agriculture and Cooperatives, March 1980, p.10.
2. Ibid.
3. Carolyn Barnes, "Background Paper on Social Factors and Government Systems: For USAID's Swaziland Country Development Strategy Statement," November 1979, p.32.
4. United States Agency for International Development (USAID), "Country Development Strategy Statement for Swaziland," December 1979, p.7
5. Barnes, op. cit., p.16.
6. Glenn T. Magagula, A Socio-Economic Analysis of Rural Development Areas in Swaziland, Dissertation, University of Maryland, 1978, p. 304.
6. Barnes, op. cit., p. 16.
7. Ibid., p. 2.
8. Sibisi, Op. Cit., pp. 5-7.
9. Fion DeVletter, "The Swazi Rural Homestead: Preliminary Findings of A Socio-Economic Survey Undertaken Jointly by the United States Agency for International Development (USAID) and the University College of Swaziland," February 1981.
10. USAID, op. cit., p. 15.
11. Ibid.
12. Ibid.
13. Magagula, op. cit., p. 128.
14. Sibisi, op. cit., p. 9.
15. Ibid.
16. Harriet Sibisi, "Who are the Swazi Food Farmers? An Interim Discussion Paper," Ministry of Agriculture and Cooperatives, January 1981, p.6.

17. Ibid., pp. 1-7.
18. Magagula, op. cit.
19. Ibid., p. 304
20. Sibisi, "Who are the Swazi Food Farmers?," op. cit., pp 4-5
21. Ibid.
22. Barnes, op. cit., p. 40.
23. Ibid., p. 45.
24. Ibid., pp 44-45.
25. See Irene Tinker and Michele Bo Bransen, eds., Women and World Development, Overseas Development Council, 1976.
26. Irene Tinker, "The Adverse Impact of Development on Women," pp. 22-34, Women and Development, op. cit.
27. Magagula, op. cit., p. 211. See also Kathi B. Nxumalo, "Draft Report on the Survey of Roles, Tasks, Needs and Skills of Rural Women in Swaziland 1977/78," Government of Swaziland, Ministry of Agriculture; and UNICFF, pp 23-27.

TABLE E-1Internal Rates of Return to Agricultural Research in Different Countries

Author	Country	Research	Time Period	Average Internal Rate of Return %
Peterson & Fitzharris	U.S.	All Public Agriculture	1937-42	50
Peterson & Fitzharris	U.S.	All Public Agriculture	1947-52	51
Peterson & Fitzharris	U.S.	All Public Agriculture	1957-62	49
Peterson & Fitzharris	U.S.	All Public Agriculture	1967-72	34
Kahlon, et. al.	India	All Public Agriculture	1960-73	63
Hayami & Akino	Japan	Rice Breeding	1927-61	74
Heltford et. al.	Colombia	Rice	1957-72	71
Heltford et. al.	Colombia	Wheat	1927-76	11
Heltford et. al.	Colombia	Soybeans	1960-71	88
Ardito-Barlita Nicolas	Mexico	Maize	1943-63	35
Ardito-Barlita Nicolas	Mexico	Wheat	1943-63	90
Ayer	Brazil	Cotton	1924-67	77

Source: From several articles in "Resource Allocation and Productivity in National Agricultural Research" Ed. by T.M. Arndt, D.G. Dalrymple and V.N. Ruttan. University of Minnesota.

TABLE E-2

Estimates of Current and Remaining Irrigation  
Development Potential, Swaziland, as of 1980 <sup>1/</sup>

River Basin	Irrigation Potential Surface Water			Other Irri- gable Land <sup>2/</sup>	Total Irrigation Potential
	Presently Irrigated	Additional Potential	Total		
	(Ha)	(Ha)	(Ha)	(Ha)	(Ha)
Lomati	732	486	1,218	14,930	16,148
Komati	12,657	4,050	16,707	29,831	46,538
Mbuluzi	10,914	13,365	24,279	6,721	31,000
Little Usutu	150	6,900	7,050	7,499	14,549
Upper Crest Usutu	3,261	2,415	5,676	122	5,798
Ngwempisi	591	2,835	3,426	5,864	9,290
Mkondo	251	405	656	5,606	6,262
Lower Crest Usutu	10,840	18,225	29,065	8,635	37,700
Ngwavuma	2,609	2,530	5,139	23,198	28,337
<b>TOTAL</b>	<b>42,005</b>	<b>51,211</b> <sup>3/</sup>	<b>93,216</b>	<b>102,406</b>	<b>195,622</b>

<sup>1/</sup> U.S. Army Corps of Engineers, Swaziland Water and Related Land Resources Frame Work Plan, 1981; and

UNDP, General Plan for Development and Utilization of Water Resources, 1970; and

Ngwavuma River Basin Study, February 1977

<sup>2/</sup> Land considered irrigable, but beyond the amount which can be irrigated with present surface water. It may be that ground water sources could be developed for this land in some cases.

<sup>3/</sup> This figure is based on the 1970 UNDP Study. The Corps of Engineers identified an additional 4,989 hectares that could be irrigated with surface water for a total of 57,100 hectares.

TABLE E-3

Estimates of Internal Rates of Return and Jobs Created for  
Proposed Irrigation Projects in Swaziland, 1980 <sup>1/</sup>

Item	Lomati				Usutu		Total
	No Storage	With Storage	Mbuluzi (Mnjoli)	Ngwavuma	DS 1.3	DS 2.2 & 3.2	
Irrigated Land (Ha)	3,600	14,200	5,000	2,400	6,600	10,900	39,100
Total Construction Cost (E000)	10,121	61,949	25,149	16,443	65,103	157,070	325,714
Interest During Construction (E000)	1,619	9,912	4,023	2,631	10,416	25,131	52,113
Annual Oper. and Maint. (E000)	818	3,307	1,181	591	1,852	3,757	10,688
Net Irrigation Benefits (E000)	4,796	18,831	3,762	10,273	16,470	56,981	
Internal Rate of Return - 50 yr- %	33	21	23	17	11	7	12
Number of Jobs Created On-Farm	1,800	7,000	2,500	1,200	3,300	5,500	19,500
Off-Farm	3,600	14,000	5,000	2,400	6,600	11,000	39,000
No. of Homesteads Resettled from Project Lands	300	1,400	500	130	130	120	2,280
No. of Project Homesteads created	1,400	5,700	2,000	1,000	2,600	4,400	15,700

<sup>1/</sup> U.S. Army Corps of Engineers, Swaziland Water and Related Land Resources Framework Plan, 1981. The economic analyses performed by the Corps do not include the 18,000 hectares of irrigable land in the Usutu basin that are already being studied for feasibility by the GOS and other donors.

Terms: DS - Dam Site

ANNEX F

Local Cost Financing

Determination of Reasonableness of Prices for Indigenous and  
Imported Shelf-Item Goods

On the basis of experience under other projects in Swaziland and an analysis of the supply and prices of shelf item goods and services expected to be required under the project, it is hereby determined that such prices are reasonable, taking into account the cost of delivery and prices for such items from eligible sources and the implementation schedule of the project. In any particular instance when a price is considered unreasonable, the item will be imported from eligible sources, or, if necessary, other sources.

Julius E. Coles  
Julius E. Coles 6/24/81  
Director

## ANNEX G

SUMMARY OF CERTIFICATE TRAINING COURSE (CTC) CURRICULUM

TERM	DURATION IN WEEKS	DEPARTMENT	COURSE	LECTURE PERIODS (Each of 40 Mins) Per Week	PRACTICAL PERIODS (Each of 40 Mins) Per Week		
1	12	Crops	Princ. of Crop Prod.	2	-		
			Vegetable Prod.	-	3		
		Animals	Princ. of Animal Production	1	-		
			Animal Practice	-	6		
		Land Use & Mech.	Tractor Driving	-	3		
			Carpentry	-	3		
			Building	-	3		
		Econom. & Exten.	Ag. of Swaziland	1	-		
		Basic Courses	Communications (English)	5	-		
			Biological Sc.	3	3		
			Ag Maths	3	3		
		2	8	Crops	Veget. Production	2	3
					Crop Production	-	3
Animals	Animal Breeding			2	-		
	Dairy Practical			-	3		
	Fish Production			1	-		
Land Use & Mech	Surveying			3	3		
	Mechanization			1	-		
	Tractor Mainte.			-	3		
	Conservation			-	3		
Economic & Exten.	Economic			1	-		
	Extension			2	-		
Basic Courses	Communications			2	-		
	Biological Sc.			3	3		
	Ag Maths	3	3				

TERM	DURATION IN WEEKS	DEPARTMENT	COURSE	LECTURE PERIODS (Each of 40 Mins) Per Week	PRACTICAL PERIODS (Each of 40 Mins) Per Week		
3	8	Crops	Crop Production	2	3		
			Fruit Production	1	3		
			Crop Protection	1	-		
			Grain Storage	1	-		
		Animals	Animal Feeding	3	-		
			Beef Production	2	-		
			Animal Practical	-	9		
		Land Use & Mech.	Surveying	1	3		
			Mechanization	3	3		
		Econ. & Extension	Economics	2	-		
			Extension	2	-		
		Basic Courses	Communications	2	-		
		4	8	Crops	Crop Production	1	6
					Crop Protection	1	-
Soil Science	1				3		
Forestry	1				-		
Animals	Dairy Production			2	-		
	Disease Control			2	-		
	Poultry Practical			-	6		
	Pig Production			1	-		
Land Use & Mech.	Mechanization			3	6		
	Metalwork			-	3		
Econ. & Extension	Economics			2	-		
	Extension			1	6		
	Visits			-	6		
Basic Courses	Communications			2	-		

TERM	DURATION IN WEEKS	DEPARTMENT	COURSE	LECTURE PERIODS (Each of 40 Mins) Per Week	PRACTICAL PERIODS (Each of 40 Mins) Per Week
5	8	Crops	Crop Production	3	3
		Animals	Poultry	2	-
			Sheep, Goats & other animals	2	-
			Veld & Pastures: Practical	-	6
		Land Use & Mech.	Mechanization	3	3
			Irrigation	-	3
			Land Use Planning	1	-
		Econ. & Extension	Economics	2	-
			Extension	1	6
			Visits	-	6
		Basic Courses	Communications	2	-
			Human Nutrition	2	-

## ANNEX H

### ENGINEERING ANALYSIS

Construction of (1) a house for the Agricultural Information Specialist working in Mbabane, (2) an Agricultural Information Section (AIS) building in Mbabane, (3) a research library/conference room at the Malkerns Research Station, (4) a soils laboratory extension to expand the cramped existing facilities at the Malkerns Research Station, and (5) fourteen houses for 10 Field Research Officers (one in each of ten selected RDA's) and 4 Peace Corps Volunteers (PCV) (one in each administrative district) and (6) ten prefabricated-type storage sheds, all located in ten RDAs or other research sites throughout the country, are planned under the project. The remaining technical assistance team will be housed in existing facilities of the Malkerns Research Station and the Ministry of Agriculture facilities are adequate for project activities.

#### Mbabane Construction

The TA house will be constructed on a site called St. Michael's Road Sub Division, allocated to USAID's Southern African Manpower Development Project (SAMDP). The site has been inspected and approved by a USAID engineer. The site is sufficient for eight to ten houses, but only seven are to be constructed under SAMDP. The Public Works Department (PWD) of the Ministry of Works, Power and Communication will be asked to prepare a site plan for eight type B3A houses. The B3A house provides 113m<sup>2</sup> of living space in the main house and features a detached garage/servants quarters of an additional 36m<sup>2</sup>. PWD has modified the plan to better suit American life styles and USAID/Swaziland has decided to use the plan for all future TA housing. PWD will have the site plan and tender documents for the houses prepared in July or August 1981. The tenders for the seven SAMDP houses will be issued at that time, followed by the tender for this project in September 1981.

The Agriculture Information Section Building will be constructed to the east of and adjacent to the MOAC headquarters building. A two level building is proposed to accommodate the steep slope of the site. The PP design team has developed a sketch of the building, showing space requirements for storage, offices, a conference room and a library. The lower storage level will have a loading ramp with access to the parking area below the headquarters building. The upper office level will have approximately 240m<sup>2</sup> of area on each level (see attached sheet). Final building plans will be prepared by a PWD architect, and the building will be tendered to a contractor for construction.

### Malkerns Construction

A library/conference room building will be constructed behind the administrative block of the research station. The site is flat and all services are readily available. The PP design team and director of the research station have determined that a library of approximately 150m<sup>2</sup> and a conference room of approximately 50m<sup>2</sup> in area are required. (See attached sketch). Final plans for the building will be prepared by a PWD architect and the building will be tendered to a contractor for construction.

The soil laboratory extension will be constructed to the south of the existing lab on a portion of the loading area. The PP design team and director of the soils lab have determined that a 2 x 3 m dark room store for chemicals, a 2 x 3 m room for delicate electronic balances and a 3 x 6 m office for two laboratory technicians are required (see attached sketch). Final plans will be prepared by a PWD architect, and the building will be tendered along with the library/conference room to a contractor for construction.

### RDA Construction

Field Research Assistant and Peace Corps Volunteer housing will be constructed at ten different RDA project center locations. Each center already consists of offices, stores and housing, with established services and areas for additional facilities. The standard GOS B1 type house plan, used for existing junior officer housing in the RDA's, will be copied for this project. The B1 house has a living room, one bedroom, kitchen and bathroom in 42m<sup>2</sup> of total building area. Seven houses (five for Field Research Assistants and two for PCV's), in the Northern, Central, Southern Mahlangatya and Tikhub/Maphimgwane RDA's, are required by June 1983. The remaining seven will be constructed in other RDA's selected in 1983, and will be required by June 1984. The houses will be tendered to contractors where interested or turned over to PWD labor forces for construction.

Storage sheds for fertilizer, seeds and farm equipment and implements used by the Field Research teams will be needed at the same ten RDA project centers. Simple prefabricated structures, providing approximately 35m<sup>2</sup> in area, will be erected on concrete slabs. The sheds will have double doors to facilitate storage of farm implements and will be fitted with shelves, cabinets and pallets for fertilizer, seeds and tools. The contractor constructing housing in the RDA's will also prepare the floor slab and erect the sheds. The sheds will be phased in on the same schedule as Field Research Assistant and PCV housing.

IMPLEMENTATION SCHEDULE

The time estimates for construction implementation activities are based on PWD estimates and recent USAID experience in Swaziland.

<u>Action</u>	<u>Date</u>
1. PP Approved	July 1981
2. Grant Agreement Signed	August 1981
3. TA House Tender	September 1981
4. PWD Architect Begins Designs for Ag. Info. Building, Research Library/Office, Soils Lab	September 1981
5. Tenders for Ag. Info. Building, Malkerns Facilities	October 1981
6. TA House Contract Award	December 1981
7. Ag. Info. Building on Malkerns Contract Award	December 1981
8. TA House and Malkerns Facility Completed	June 1982
9. Tender for seven Field Houses and Five Storage Sheds (First Group)	June 1982
10. RDA Field Houses and Sheds Contract Award	August 1982
11. Ag. Info. Building Completed	November 1982
12. Tender for Remaining Seven Field Houses and Five Storage Sheds	June 1983
13. First Group of Seven Field Houses and Five Storage Sheds Completed	June 1983
14. Remaining Seven Field Houses and Five Storage Sheds Contract Award	August 1983
15. Remaining Seven Field Houses and Five Storage Sheds Completed	June 1984

AID Approvals, Monitoring and Reimbursement

USAID engineers have inspected and approved sites for the TA house and AIU in Mbabane and the library/conference building and soils laboratory extension at Malkerns. Sites for RDA facilities have not been inspected, but inspections will be required when the sites are identified.

COST ESTIMATES

The following cost estimates are based on recent PWD contracting experience. Except for prefabricated buildings and standard GOS designs, an estimate of E280/m<sup>2</sup> is used. Inflation of construction costs is estimated by PWD to be between 18 and 24 percent per year. A figure of 20 percent is used here.

<u>ITEM</u>	<u>JUNE 81 Cost (\$)</u>	<u>INFLATION (\$)</u>	<u>TOTAL (\$)</u>
B3A House	57,200	2,800	60,000
Information Unit	174,700	17,500	192,000
Library/Conference	72,800	7,300	80,000
Lab Extension	13,000	1,300	14,000
B1 House - First Seven	100,000	20,000	120,000
Second Seven	100,000	20,000	140,000
Storage Sheds-First Five	13,000	2,600	16,000
Second Five	13,000	5,200	18,000
<b>TOTAL</b>			<b>\$ 640,000</b>

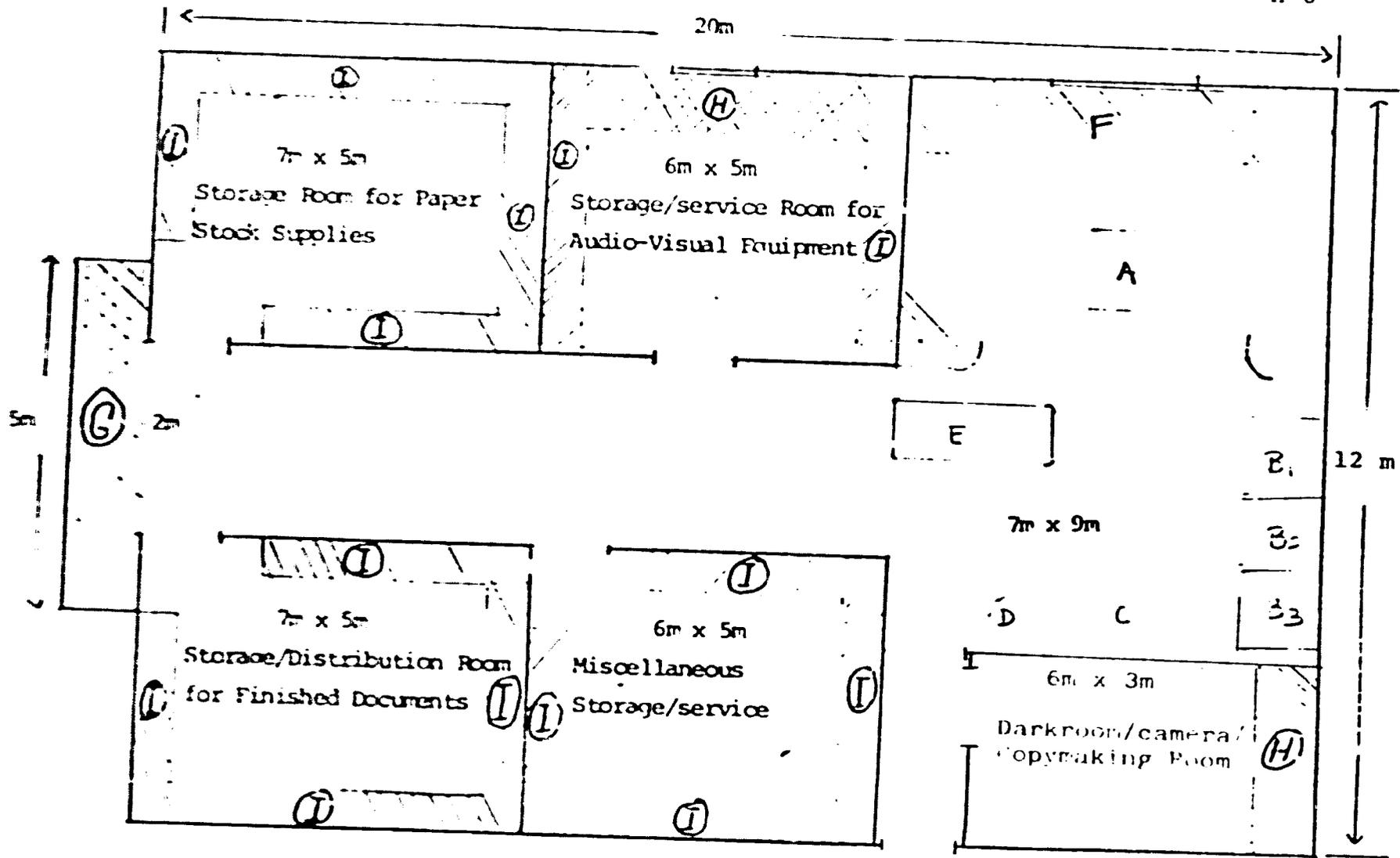
The B1 and modified B3A house plans have been received and approved by AID engineers. Review and approval of final designs for the AIS and Malkerns facilities will be required when designs are completed. Review and approval of the pre-fabricated system selected for storage sheds and tender documents for all facilities and review and concurrence of all contracts is also required.

USAID/S Fixed Amount Reimbursement (FAR) procedures will be utilized for all construction. FAR costs will be negotiated with the government following engineering review of final plans and tender documents. USAID engineers will make periodic inspections of construction and a final inspection and approval before reimbursement requests will be accepted.

#### 611A Determination

The construction industry in Swaziland has become increasingly unpredictable over the past couple of years. Labor and material costs can unexpectedly rise overnight, and contractors are tempted to pad their bids to reduce risks. New local contractors are getting involved, often significantly under bidding more experienced contractors. The amount of other work at any given time and the small size or remote location of work often reduce contractor interest or raise costs and force use of PWD labor on construction. These factors often result in longer times for satisfactory completion of construction.

The construction planned under this project is as simple as can be acceptable to USAID/S. The cost estimates and implementation schedules reflect the latest trends in Swaziland. The planned USAID/S approvals, monitoring and FAR procedures are intended to reduce AID's risk as much as possible. Therefore, the requirements of FAA Section 611(a) as amended for sufficient planning and reasonably firm cost estimates are considered to be met by this analysis.

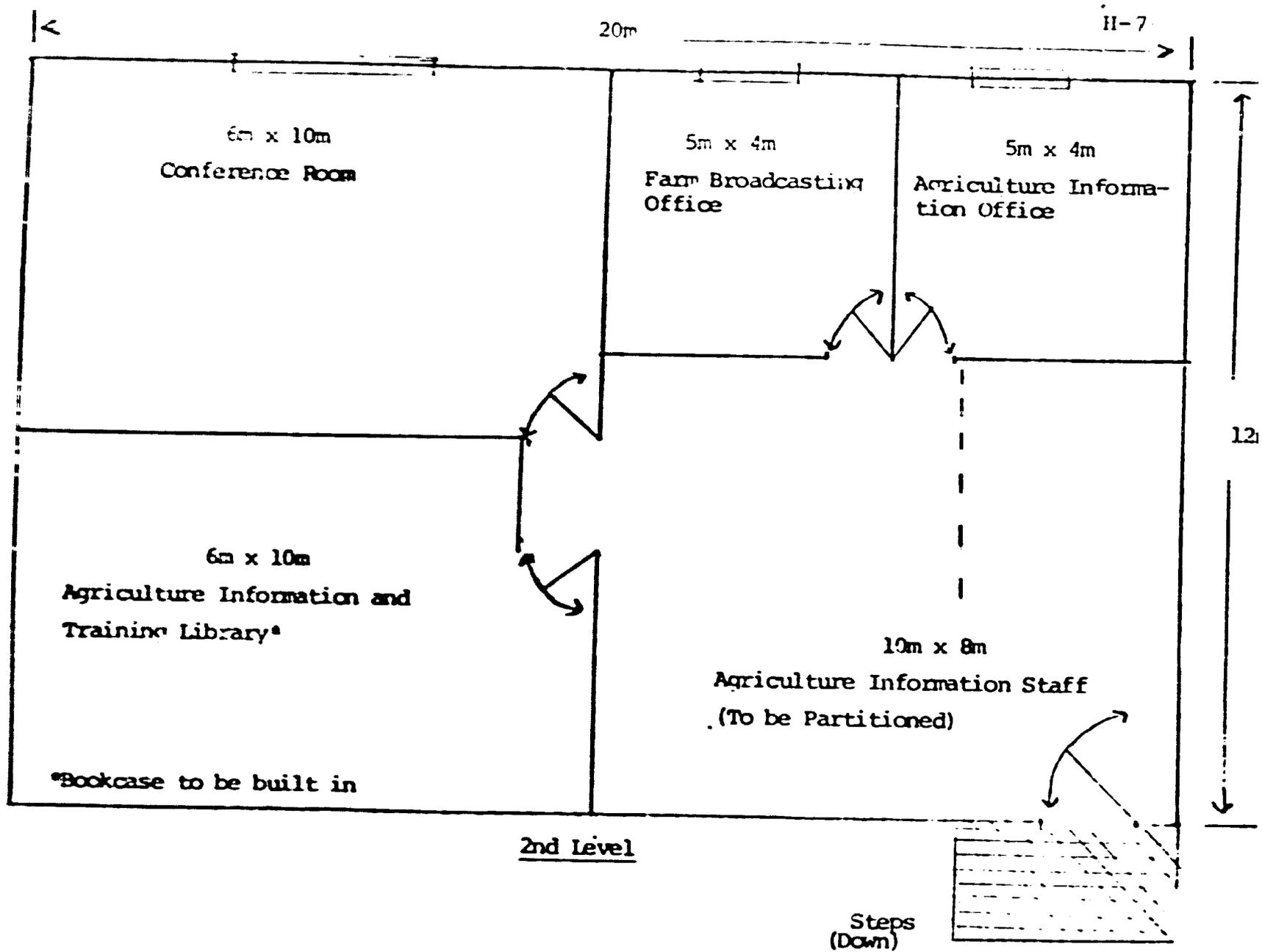


First Level (Ground Floor)

- A = Offset Printing Machine
- B1 = Binder - spiral
- B2 = Binder - stitch
- B3 = Binder - Glue/tape
- C = Photocopying Area
- D = Laminating Area
- E = Service Desk
- F = Desklevel sorting surfaces
- G = Loading Dock
- H = Work Bench
- I = Shelving - Floor to Ceiling

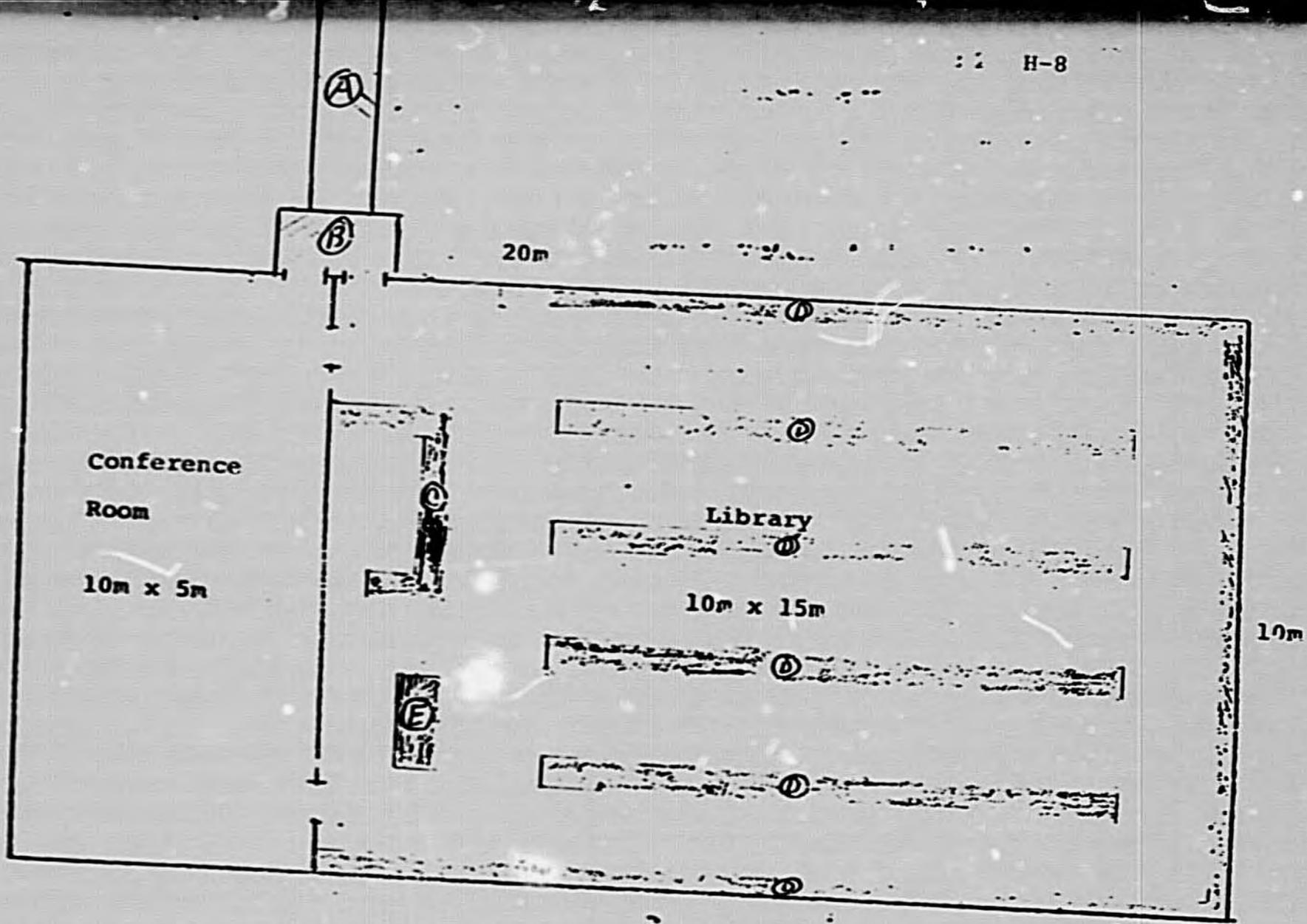
Proposed Facility for Housing the MOAC's  
Cultural Information Unit

Total Area = 240m<sup>2</sup>



total Area = 240m<sup>2</sup>

Proposed Facility for Housing the MOAC's  
Agricultural Information Unit



RESEARCH LIBRARY/CONFERENCE ROOM

- A = Covered Walk to Existing Administration Building
- B = Entry Porch
- C = Librarian's Work Counter
- D = Book Shelves
- E = Library Work Table



PROJECT DESIGN SUMMARYLOGICAL FRAMEWORK

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<u>Goal:</u> To increase the economic viability of farming on SNL	<u>Indicators:</u> 1. Percentage of SNL farms producing primarily for commercial market increases to 20% by 1992 and 30% by 1997.  2. Percentage of SNL farms producing marketable surplus above subsistence needs increases to 60% by 1992 and 80% by 1997.	1. Project on-farm survey 2. Impact Evaluation 3. Swaziland census of agriculture 4. Annual survey of SNL 5. R.D.A. Monitoring and Evaluation Unit reports	<u>Purpose to Goal Assumptions:</u> 1. GOS policies will continue to encourage cash cropping.  2. Production inputs continue to be available on a timely basis.  3. Marketing systems can accommodate increase in commercial farm activities  4. SNL area under irrigation continues to increase

PROJECT DESIGN SUMMARY

I-2

LOGICAL FRAMEWORK

NARRATIVE SUMMARY

OBJECTIVELY VERIFIABLE INDICATORS

MEANS OF VERIFICATION

IMPORTANT ASSUMPTIONS

Purpose:

To improve and expand the capacity of the MOAC research and extension program to develop and effectively extend cropping systems recommendations relevant to the economic needs of the SNL farmer.

EOPS: 1. Agricultural Research Capable of:

- a) Conducting economic, social & technical research on a continuing basis.
- b) Conducting 100 on-farm research trials yearly.
- c) Producing annual research recommendations designed to provide useful results to extension agents and farmers.

2. Extension Program capable of:

- a) Conducting 100 on-farm research trials and 160 on-farm demonstrations of research recommendations yearly.
- b) Conducting annual field days and farmer training sessions.
- c) Reaching 75% of the SNL farmers yearly with research recommendations.
- d) Conducting in-service training sessions reaching 50% of the total number of extension workers annually.

- 1. Project records and evaluations
- 2. Ag census of SNL
- 3. Project contractor reports
- 4. Project on-farm survey
- 5. RDA Monitoring and Evaluation Unit reports

Output to Purpose Assumptions:

- 1. Adequate financial resources will be made available to meet MOAC recurrent expenditures.
- 2. Participants will return and remain in staff positions for which they were trained

PROJECT DESIGN SUMMARY - LOGICAL FRAMEWORK

## NARRATIVE SUMMARY

OBJECTIVELY VERIFIABLE  
INDICATORS

## MEANS OF VERIFICATION

## IMPORTANT ASSUMPTIONS

e) Putting research recommendations into a form usable by extension workers and applicable to SNL farmers with various resource constraints.

f) Conducting an effective information program to supplement direct extension agent efforts.

PROJECT DESIGN SUMMARYLOGICAL FRAMEWORK

NARRATIVE	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<u>Outputs:</u> 1. On-farm survey conducted on SNL covering: -socio-economic aspects of current cropping systems -technical practices currently used -productivity in selected crops -SNL resource base	<u>Levels:</u> 1. 1 base line survey and annual updates	<u>Means:</u> 1. PES 2. Annual Contractor reports 3. MOAC records and reports 4. Observations	<u>Input to Output Assumptions:</u> 1. The GOS will establish required posts. 2. Qualified Swazis will be available for training. 3. Posts essential to the project will be filled by qualified Swazis.
2. Scientifically designed experiments conducted at central research stations.	2. X		
3. Scientifically designed experiments conducted at outlying stations.	3. X		
4. On-farm trials	4. 350 trials		
5. Annual Research reports.	5. 5 annual reports		
6. Cropping systems recommendations.	6. X		
7. In-service training program designed and courses conducted for extension workers and other staff.	7. Program designed and implemented, courses conducted.		

## PROJECT DESIGN SUMMARY - LOGICAL FRAMEWORK

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<u>Outputs:</u>	<u>Levels:</u>	<u>Means:</u>	
8. Ag. Information Section converts technical recommendations into form useable by extension agents.	8. X		
9. Ag. Information Section develops and implements communications support program to assist extension service.	9. X		
10. Materials to support extension fields staff produced by Ag Information Section.		10. Field staff using flip charts, posters, bulletins, slide shows and/or other materials in making presentations.	
11. Strengthened linkages between Research, Ag. Info, Extension and Faculty of Agriculture.	11. X		
12. Relationships established with international research organizations.	12. X		
13. Farm demonstration and field days.		13. 320 on-farm demonstrations and 16 farmer field days.	
14. Personnel trained and in place.		14. Research Division, Ag. Info. Section, In-service training section staffed (see inputs) and operating effectively.	
15. Facilities in place.		15. Additional facilities in use (see inputs)	

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTION
<u>Inputs: AID</u>			
1. Technical Assistance	1. 40.75 person years of long-term and 90 person months of consultancies (\$8,140,000).	1. Contractor Reports 2. Project Evaluations	
2. Training	2. 54 study years of academic training and 4.75 years of short-term and work/study training (\$1,781,000).	3. Observation	
3. Construction	3. - Research library/conference room - Soils lab extension - Agricultural Information Section building - 1 TA staff house - 14 houses for field research teams - 10 field research storage sheds (\$640,000)		
4. Equipment	4. Research equipment, lab equipment, agricultural information production equipment, teaching equipment (\$280,000). See Annex L for details.		
5. Commodities	5. Research trial commodities, office supplies, teaching materials, information production materials (\$612,000). See Annex L for details.		
6. Vehicles	6. - 4 Vans - 6 Pickup Trucks - 2 Station Wagons - 14 Motorcycles (\$138,000)		

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
7. Research base-line Survey	7. - Recorder and enumerator expenses - Supplies (\$17,000)		
8. Administrative Assistance	8. 1 person for 5 years (\$58,000)		
9. Evaluation	9. 1 external evaluation in FY 85 (\$48,000)		
10. Contingency	10. (\$1,186,000)		

GOS

1. Salaries	\$1,758,000
2. Vehicle Maintenance, Operation and replacement	\$ 437,000
3. Research Facilities and Office Space	\$1,223,000
4. Housing and Furnishings	\$ 369,000
5. Travel Costs for Participants	\$ 122,000
6. Commodities and Supplies	\$ 336,000
7. Contingency	\$ 109,000

U.S. Peace Corps

## Volunteer Support

Support costs for 4  
volunteers for 2 years each -  
\$55,000

NOTE: It is expected that at least three long-term team members will have international experience in developing countries.

JOB DESCRIPTION

CROPPING SYSTEMS AGRICULTURIST

TIME FRAME            5 years

QUALIFICATIONS: A Phd degree in a recognized agricultural discipline, preferably in either Horticulture or Agronomy, and at least 10 years of research/extension experience. Position requires administrative experience at the level of department head or equivalent, and emphasis will be placed on this required qualification. Previous experience in African agriculture is desirable but not required; however, international experience is virtually essential. Must be knowledgeable about and accept the cropping system concept as the framework for the project.

DUTIES:

- Serve as Chief of Party for the AID Project Team
- Coordinate the professional and support activities of a multi-disciplinary 8 person technical assistance team and a number of short-term consultants.
- Assist the Chief Research Officer (MOAC) and the Director of Agriculture (MOAC) in coordinating the activities of the Swazi colleagues assigned to the project.-
- Establish and maintain, and encourage other working members of the TA team to establish and maintain "collaborative" relationships with other units in the GOS and the University College of Swaziland which relate to project objectives.
- Assist in identifying and selecting students for advance study in the United States and assist in logistics of placement of the students.
- Conduct applied research and extension activities in his/her area of specialization.
- In cooperation with the AIS, extension staff, and other team members assist in translation of information and data resulting from research activities into a form more readily understandable and usable by field officers and farmers.
- Provide periodic, special instruction in the Certificate Training Course and at the Faculty of Agriculture in field of speciality on a special invitation/needs basis.

CROPPING SYSTEMS AGRICULTURIST

- Other activities and responsibilities as may be required to successfully implement the project.

DUTY STATION: Malkerns Research Station

JOB DESCRIPTIONAGRONOMIST

TIME FRAME: 5 years

QUALIFICATIONS: A PhD degree or equivalent in Agronomy with a primary speciality in maize and a secondary emphasis in vegetable production. Five years of experience in applied research and a knowledge and understanding of, and a willingness to work within a cropping systems approach. Previous work in African agriculture is desirable but not required.

## DUTIES:

- Work in collaboration with other members of the team to design, develop and implement cropping system packages in field crops, with a focus on maize and how it inter-relates from an agronomic standpoint with other crops grown with it in a mixed intercropping system for both rainfed and irrigated agriculture.
- Conduct research in field crop production with emphasis on the constraints associated with soil fertility and general plant growth and production.
- Participate in field days and other farmer demonstration activities.
- Work closely with Swazi colleagues and maintain research activity while Swazi colleague is away for advanced training.
- In cooperation with AIS, extension staff, and other members of the research staff assist in translation of information and data resulting from research activities into a form more readily understandable and usable by extension field officers and farmers.
- Provide on-the-job training for the research assistants, extension field officers, recorders and other members of the extended cropping system research team.
- Work with other members of the team to develop a plan for the rational allocation of resources in field crops research, and to plan cropping system research activities for both rainfed and irrigated agriculture.
- Establish collaborative working relationship with colleagues in MOAC and Faculty of Agriculture.
- Provide periodic, special instruction in the Certificate Training Course and at the Faculty of Agriculture in field of speciality on special invitation/needs basis.

AGRONOMIST

- Other activities and responsibilities as may be required to successfully implement the project.

DUTY STATION: Malkerns Research Station.

JOB DESCRIPTIONHORTICULTURIST

TIME FRAME: 5 years

QUALIFICATIONS: PhD degree with a minimum of 5 years of applied research in vegetable crops such as beans, cabbage, pumpkins, tomatoes and other vegetable crops. With team and occasional consultant support should be able to address problems involved in all phases of the production of vegetable crops. The person selected must be willing to devote a major portion of his/her activities to on-farm research and trials.

DUTIES:

- Work in collaboration with other members of the team to design, develop and implement research activities which will result in the development and extension of cropping system packages for the production of vegetables under both rainfed and irrigated conditions.
- Assist in the selection and training of a Swazi colleague and to carry on the research activity while the Swazi colleague is enrolled in advanced training.
- Develop research and design and determine potential feasibility of various systems of inter-cropping and multiple cropping combinations in collaboration with other members of the team and Swazi colleagues.
- Participate in field days and other farmer demonstration activities.
- Work with other members of the team in developing an integrated system for the long run allocation of research activities.
- In cooperation with the AID, extension staff, and other members of the research staff assist in translation of data and information resulting from research activities into a form more readily understandable and useable by field officers and farmers.
- Establish collaborative working relationship with colleagues in MOAC and Faculty of Agriculture.
- Provide periodic, special instruction in the Certificate Training Course and at the Faculty of Agriculture in field of speciality on special invitation/needs basis.

HORTICULTURIST

- Other activities and responsibilities as may be required to successfully implement the project.

DUTY STATION:

Malkerns Research Station.

JOB DESCRIPTIONIRRIGATION SPECIALIST

TIME FRAME: 5 years

QUALIFICATIONS: MS degree in agricultural engineering, agricultural mechanization, irrigation engineering or equivalent. At least 5 years experience in applied research or extension and a willingness to work directly with farmers within a cropping systems approach. Experience in African agriculture is desirable but not required.

**DUTIES:**

- Work as an irrigation generalist on a wide range of problems facing the farmer on SML.
- Design, develop and implement research/extension activities on issues ranging from timing of water deliveries and its efficient allocation to disease and pest control under irrigated conditions.
- Work in close cooperation with other members of team in addressing issue of potential technical and economic feasibility of irrigation under alternative development schemes.
- Assist in selection and training of a Swazi colleague and maintain activities while Swazi is away for training.
- In cooperation with the AIS, extension staff, and other members of the research staff assist in translation of information and data resulting from research activities into a form more readily understandable and usable by extension field officers and farmers.
- Assist in development and implementation of farm trials and field demonstrations.
- Establish collaborative working relationship with colleagues in the MOAC and Faculty of Agriculture.
- Provide instruction in area of expertise at Certificate Training Course and Faculty of Agriculture on a special invitation/needs basis.
- Work with other members of team in developing a rational method for the long run allocation of resources in support of irrigation research and extension.

IRRIGATION SPECIALIST

- Other activities and responsibilities as may be necessary to successfully implement the project.

DUTY STATION:

Malkerns Research Station

JOB DESCRIPTIONAGRICULTURAL ECONOMIST

TIME FRAME: 5 years

QUALIFICATIONS: PhD degree in agricultural economics or equivalent is required. At least 5 years of directly applicable experience is required with preference given to a person with experience in a less developed country.

- DUTIES:
- Work with other members of the team in screening proposed new activities for probable economic feasibility.
  - Advise other members of the team on the types of data required for economic analysis.
  - Provide an economic analysis of the results of various changes in farming activities.
  - Work closely with the rural sociologist in developing a base line survey and annual update.
  - Address some of the major issues facing Swazi farmers as they directly relate to the outcome of the cropping system project. (This activity would be in association with short-term consultants with areas of specialization directly applicable to the issue being addressed, e.g. marketing of vegetables and rural labor force availability).
  - In cooperation with the AIS, extension staff, and other research staff assist in translation of information and data resulting from research activity into a form more readily understandable and usable by field officers and farmers.
  - Establish collaborative working relationships with colleagues in MOAC and the Faculty of Agriculture.
  - Provide periodic instruction in area of expertise on special invitation/needs basis at the Certificate Training Course and Faculty of Agriculture.
  - Assist in selection and training of Swazi colleague and maintain agricultural economics effort while Swazi is undergoing advanced training.
  - Develop long-term plan for agricultural economics research within probable budgeting constraints.

AGRICULTURAL ECONOMIST

- Other activities and responsibilities necessary to successfully implement the project.

DUTY STATION:

Malkerns Research Station

JOB DESCRIPTIONRURAL SOCIOLOGIST

TIME FRAME: 5 years

QUALIFICATIONS: PhD degree in rural sociology or closely related field with at least 5 years experience in applied research or extension. Experience with socio-economic survey design and data collection required - preferably in an LDC.

- DUTIES:
- Organize, design, conduct, analyze and write findings of socioeconomic studies in support of team activities
  - Work in collaboration with the agricultural economist and other members of the team in the design and implementation of base line, annual up-date and end-of-project surveys.
  - Monitor a sample of farm trials and demonstrations on a continuing basis to help sort out socio-cultural implications.
  - Work closely with the agricultural economist in addressing issues directly related to the project, e.g., the impact of cropping systems recommendations on the quality of life of rural women and the impact of land tenure on farm labor availability.
  - Assist in selection and training of a Swazi colleague and provide continuity of effort while Swazi is enrolled in advanced training.
  - Investigate values of Swazi people to help determine factors associated with the image of agriculture and its implication for long-term viability of the agricultural sector.
  - In cooperation with the AIS, extension staff, and other research staff assist in translation of information and data resulting from research activities into a form more readily understandable and usable by field officers and farmers.
  - Establish collaborative working relationship with colleagues in MOAC and the Faculty of Agriculture.
  - Provide instruction on a needs/invitation basis at the Certificate Training Course and Faculty of Agriculture.

RURAL SOCIOLOGIST

- Other activities and responsibilities as may be necessary to successfully implement the project.

DUTY STATION: Malkerns Research Station

**JOB DESCRIPTION****AGRICULTURAL INFORMATION SPECIALIST**

**TIME FRAME:** 5 years

**QUALIFICATION:** MS degree in agricultural information and communications or closely related area with a minimum of 5 years of experience. A willingness to work within a concept which focuses on constraints facing farmers on SNL.

- DUTIES:**
- Design and implement a structured program for providing usable agricultural information to farmers on SNL under different styles and formats.
  - Inventory information now available from Swaziland and other nations and design and implement programs to make this material more applicable to the Swazi farmer.
  - Work to complement the extension training specialist activities by providing appropriate material for training and subsequent distribution.
  - Assist in the selection and training of a Swazi colleague and maintaining a viable program while he/she is away for advanced training.
  - In cooperation with research and extension staff assist in translating of information and data resulting from research activities into a form more readily understandable and usable by extension officers and farmers.
  - Assist in the selection and training of agricultural information officers and the skilled technicians required to operate and maintain the equipment.
  - Provide on-the-job training for Swazi counterparts in appropriate methods of storage, maintenance and repair of agricultural information related equipment.
  - Establish collaborative working relationships with colleagues in MOAC and the Faculty of Agriculture
  - Provide periodic, special instruction in the Certificate Training Course and at the Faculty of Agriculture.
  - Other activities and responsibilities as may be necessary to successfully implement the project.

**DUTY STATION:** Ministry of Agriculture, Mbabane.

JOB DESCRIPTIONEXTENSION TRAINING SPECIALIST

TIME FRAME: 5 years

QUALIFICATIONS: PhD degree in agricultural or extension education or closely related area. A minimum of 10 years of directly applicable experience with preference given to experience in an LDC. Must be willing to travel extensively within Swaziland in support of project objectives.

## DUTIES:

- Assist in the development of a program for in-service training for extension officers of various levels.
- Develop in cooperation with Swazi colleague appropriate curriculum material and supplies for conducting workshops for farmers.
- Advise extension service administrative personnel on needs for facilities and equipment to conduct in-service training.
- Allocate 10 to 20 percent of time to working with the certificate program to help determine the training needs of Swazi extension officers.
- Work with personnel at the Faculty of Agriculture in designing and implementing on-campus training for updating skills of extension personnel currently working with farmers.
- Assist in selection and training of Swazi colleague and conduct extension training activities while he/she is engaged in advanced training.
- Work closely with agricultural information specialist to ensure continuity of effort.
- Provide for periodic instruction in the Certificate Training Course and at the Faculty of Agriculture in area of expertise on a needs/invitation basis.
- In cooperation with the AIS, other members of the extension staff, and research staff assist in translation of information and data resulting from research into a form more readily understandable and useable by extension field officers and farmers.
- Other activities and responsibilities may be necessary to successfully implement the project.

DUTY STATION: Ministry of Agriculture, Mbabane.

## JOB DESCRIPTION

### CONSULTANTS

TIME FRAME: 90 Person Months

The following are examples of consultancy requirements anticipated during the project:

A. Livestock Management/Grassland Agriculture Specialist

Graduate degree in grazing land management/tropical forage systems with experience in developing countries with both large and small ruminants. Knowledge about African livestock/grassland situation essential. Specific duties would include assessing the impact of large and small ruminants on current and future cropping patterns on the SNL; recommending improvements in the research program where both crops and livestock are involved; evaluating the livestock research and extension capability of the MOAC relative to livestock cropping systems; and providing recommendations to the research/extension program concerning the viability of proposed cropping interventions on SNL farms.

B. Marketing Specialist

MS/MA degree in agricultural economics and/or agricultural marketing. This consultant will do a study related to the marketing of vegetables. This study will include determination and identification of domestic market demands, both quantitatively, qualitatively, and seasonally. In cooperation with the TA team, the specialist will determine the most dependable sources of production and potential sources of production to meet domestic demand. The consultant will make recommendations on the most appropriate type of market structure to meet expanding needs.

C. Agricultural Mechanization Specialist

MS degree in agricultural engineering or mechanization and experience in working with appropriate technology concepts. Specific duties would be to observe, recommend and evaluate alternative farming practices with emphasis on labor saving devices which are technically and economically feasible.

D. Agricultural Pest Control Specialist

PhD degree with speciality in area of pest control on rainfed and irrigated agriculture. Broad range of experience and knowledge in applied research or extension. This specialist would work closely with the three technical agricultural members of the team - agronomist, horticulturist, and irrigation specialist - in the control of a broad range of agricultural pests.

CONSULTANTSE. Weed Control Specialist

PhD degree with broad range of experience in weed control programs. This consultant will be expected to provide expertise in solution of problems identified by the technical agriculturist on the project team.

F. Librarian

BS degree in library science or equivalent, with a generalist knowledge of all functions of a working agricultural library. Responsibilities will range from providing assistance in designing a new library/conference building to selection, cataloging and maintenance of a research/extension library.

G. Computer Technician

An individual skilled in the start up of the small computer to be procured for the Malkerns Research Station. He/She would be responsible for the development of basic programs and procedures to help ensure the continued use of this equipment.

H. Agricultural Policy Economist

PhD degree with training and experience in a broad range of agricultural policies to assist the agricultural economist and rural sociologist team members in designing and implementing specific studies of direct relevance to the cropping systems project.

I. Rural Sociologist

PhD degree with speciality in survey design and implementation. Major responsibility would be to assist and advise in the development of base-line and end of project survey.

J. Others

Plant nutrition, audio-visual techniques, extension materials production, agricultural information equipment-maintenance and repair, and livestock management.

DUTY STATION: Malkerns Research Station and Ministry of Agriculture, Mbabane.

## ANNEX K

EXPENDITURES BY FISCAL YEAR-A.I.D. (\$000)

Component: Research	FY 81 COST	INFLATION RATE	FY 81	FY 82	FY 83	FY 84	FY 85	FY 86	FY 87	TOTAL
<b>1. Technical Assistance</b>										
a. Cropping Systems (COP)	112/yr	12%		95	141	158	177	198	112	881
b. Rural Sociologist	112/yr	12%		95	141	158	177	198	112	881
c. Agr. Economist	112/yr	12%		95	141	158	177	198	112	881
d. Agronomist	112/yr	12%		63	141	158	177	198	112	849
e. Horticulturist	112/yr	12%		63	141	158	177	198	112	849
f. Irrigation Specialist	112/yr	12%		63	141	158	177	198	112	849
g. Consultants	8.25/mo	12%		180	138	156	174	192	108	948
									Subtotal	6138
<b>2. Training</b>										
a. M.Sc Rural Sociologist (2yrs)	20/yr	12%		8	25	19				52
b. M.Sc Agr. Economics (2 yrs)	20/yr	12%		8	25	19				52
c. M.Sc Agronomy (2 yrs)	20/yr	12%		8	25	19				52
d. M.Sc Horticulture (2 yrs)	20/yr	12%			8	28	21			57
e. M.Sc Irrigation Tech. (2 yrs)	20/yr	12%			8	28	21			57
f. M.Sc Farm Mechanization (2 yrs)	20/yr	12%				9	31	23		63
g. M.Sc Agronomy (2 yrs)	20/yr	12%				9	31	23		63
h. M.Sc Soil Fertility/Crop (2 yrs)	20/yr	12%				9	31	23		63
i. M.Sc Dairy Science (2 yrs)	20/yr	12%				9	31	23		63
j. S.T. Ag. Statistics (1 yr)	20/yr	12%		8	17					25
k. S.T. Research Training (15 mos.) (Third Country)	3.0/mo	15%			24	27	15			66
									Subtotal	613

EXPENDITURES BY FISCAL YEAR-A.I.D. (\$000)

Component: Research (Con't.)	<u>FY 81</u> <u>COST</u>	<u>INFLATION</u> <u>RATE</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>	<u>FY 86</u>	<u>FY 87</u>	<u>TOTAL</u>
<b>3. Vehicles</b>										
a. Station Wagon - 1	8	15%		9						9
b. Pickup Truck 2WD-4	6	15%		28						28
c. Pickup Truck 4WD-1	8	15%		9						9
d. Motorcycle - 14	1.5	15%			14(7)	16(7)				30
										<u>76</u>
										Subtotal
<b>4. Construction</b>										
a. Library/Conference room	72.6	20%		80						80
b. Soil Lab Extension	13	20%		14						14
c. Field Team Houses	14.1/ea	20%			120(7)	140(7)				260
d. Field Storage Sheds	2.6/ea	20%			16(5)	18(5)				34
										<u>388</u>
										Subtotal
<b>5. Equipment (See Annex L)</b>		12%		142	16					158
<b>6. Commodities (See Annex L)</b>										
a. Research Trial	5/yr	15%		6	7	8	9	10	12	52
b. Lab Supplies	5/yr	15%		6	7	8	9	10	12	52
c. Admin. & Office supplies	6/yr	15%		7	8	9	10	12	14	60
d. Consumables	4/yr	15%		4	5	5	6	7	8	35
										<u>199</u>
										Subtotal
<b>7. Research Books and Publications</b>				30	10	10	10	10	10	80
<b>8. Base-line Survey (Materials, enumerator expense, etc.)</b>				7	10					17
<b>9. Administrative Assistant (Salary)</b>	8/yr	8%		9	9	10	11	12	7	58
<b>SUBTOTAL</b>				1037	1338	1504	1472	1533	843	7727
<b>Contingency (15% on item 5, 10% on all others)</b>				112	134	150	147	153	84	780
<b>TOTAL</b>				1149	1472	1654	1619	1686	927	8507

EXPENDITURES BY FISCAL YEAR-A.I.D. (\$000)

Component: Agricultural Information	FY 81 COST	INFLATION RATE	FY 81	FY 82	FY 83	FY 84	FY 85	FY 86	FY 87	TOTAL
<b>1. Technical Assistance</b>										
a. Agr. Information Specialist 112/yr		12%		63	141	158	177	198	112	849
b. Consultants	8.25/mo	12%		60(6)	44(3)	48(3)				152
										<u>1001</u>
<b>2. Training</b>										
a. M.Sc. Agr. Information (2 yrs)	20/yr	12%			8	28	21			57
b. S.T. Agr. Information (1 yr)	20/yr	12%					31			31
c. S.T. Audio-Visual Tech (6 mos.)	3.3/mo	12%		15	8					23
										<u>111</u>
<b>3. Vehicles</b>										
a. Pickup Truck - 1	6	15%		7						7
b. Van - 4	10.0	15%		46						46
										<u>53</u>
<b>4. Construction</b>										
a. Agr. Information Building	174.7	20%		192						192
b. 1 House for TA	57.2	20%		60						60
										<u>252</u>
<b>5. Equipment (See Annex L)</b>		12%		120						120
<b>6. Production Commodities (See Annex L)</b>	75/1st yr 25/yr for FY 83-87	15%		75	29	33	38	44	51	270
<b>SUBTOTAL</b>				638	230	267	267	242	163	1807
<b>Contingency (15% on item 5, 10% on all others)</b>				70	23	27	27	24	16	187
<b>TOTAL</b>				708	253	294	294	266	179	<u>1994</u>

EXPENDITURES BY FISCAL YEAR - A.I.D. (\$000)

Component : Extension Training	FY 81 COST	INFLATION RATE	FY 81	FY 82	FY 83	FY 84	FY 85	FY 86	FY 87	TOTAL
<b>1. Technical Assistance</b>										
a. Extension Training Specialist	112/yr	12%		53	141	158	177	198	112	849
b. Consultants (12pm)	8.25/mo	12%		60	44	48				152
										<u>1001</u>
<b>2. Training</b>										
a. M.Sc Extension Training (2 yr)	20/yr	12%			8	28	21			57
b. Work/Study - Ext. Training (1 yr)	20/yr	12%				28				28
c. B.Sc Agronomy (4 yrs)	20/yr	12%		8	25	28	31	23		115
d. B.Sc Horticulture (4 yrs)	20/yr	12%		8	25	28	31	23		115
e. B.Sc Ag Economics (4 yrs)	20/yr	12%		8	25	28	31	23		115
f. B.Sc Agronomy/Soils (4 yrs)	20/yr	12%		8	25	28	31	23		115
g. B.Sc Irrigation Tech. (4 yrs)	20/yr	12%			8	28	31	35	26	128
h. B.Sc Entomology (4 yrs)	20/yr	12%			8	28	31	35	26	128
i. B.Sc Farm Mechanization (4 yrs)	20/yr	12%			8	28	31	35	26	128
j. B.Sc Plant Pathology (4 yrs)	20/yr	12%			8	28	31	35	26	128
										<u>1057</u>
<b>3. Vehicles</b>										
Station Wagon	8	15%		9						9
<b>4. Equipment (See Annex L)</b>										2
<b>5. Commodities (See Annex L)</b>										
a. Reference Materials	5/yr	15%		6	7	8	9	10	12	52
b. Training Supplies	1/yr	15%		1	1	2	2	2	3	11
										<u>63</u>
<b>SUBTOTAL</b>				173	333	496	457	442	231	2132
<b>Contingency (10% on all items)</b>				18	33	50	46	44	23	214
<b>TOTAL</b>				191	366	546	503	486	254	<u>2346</u>

EXPENDITURE BY FISCAL YEAR - A.I.D. (\$000)

Component: External Evaluation

FY 85	3 p.m. at 16/mo	48
	Contingency 10%	<u>5</u>
	TOTAL	53

## EXPENDITURES BY FISCAL YEAR - GOS (E000, E1=US \$1.30)

Component: Research

	<u>FY 81</u>	<u>INFLATION</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>	<u>FY 86</u>	<u>FY 87</u>	<u>TOTAL</u>
	<u>COST</u>	<u>RATE</u>								
<b>A. Current</b>										
<b>1. Salaries</b>										
Chief Research Officer(1)G-24	10.6	5%		11	12	12	13	14	7	69
Sr Research Officer(3)G-22	8.1	5%		26	27	28	30	31	17	159
Research Officer (9) G-20	6.7	5%		63	66	70	73	77	41	390
Sr Recorder (3) G-14	3.4	5%		11	12	12	13	14	7	69
Lab Technician(1)G-14	3.4	5%		4	4	4	4	4	3	23
Recorder (2) G-12	2.7	5%		6	6	6	7	7	4	36
Typist (2) G-7	1.6	5%		3	4	4	4	4	2	21
										<hr/>
								Subtotal		767
<b>2. Facilities</b>										
Existing (labs, offices, etc.)	906		906							906
New Office	35		35							35
Staff Houses (6)	350/mo	10%		19	28	30	34	37	20	168
										<hr/>
								Subtotal		1109
3. Research Commodities & supplies	20/yr	10%		22	24	27	29	32	35	169
4. House Furnishings (6)	8	10%		53						53
										<hr/>
Subtotal - Current			941	218	183	193	207	220	136	2098
<b>B. Incremental</b>										
<b>1. Salaries</b>										
SR Research Recorder(5)G-14	3.4	5%		18	19	20	21	22	12	112
SR Research Recorder(5)G-14	3.4	5%			19	20	21	22	12	94
Secretary (3) G-14	3.4	5%		11	11	12	12	13	7	66
										<hr/>
2. Vehicle Fuel & Maintenance								Subtotal		272
TA Vehicles (6)	3.6/yr	10%		18	26	29	32	35	17	157
Motorcycles (7)	1/yr	10%		1	1	1	2	2	1	8
Motorcycles (7)	1/yr	10%			1	1	2	2	1	7
										<hr/>
								Subtotal		172



EXPENDITURES BY FISCAL YEAR - GOS (E000, E1=US \$1.30)

Component: <u>Agricultural Information</u>	<u>FY 81</u>	<u>INFLATION</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>	<u>FY 86</u>	<u>FY 87</u>	<u>TOTAL</u>
	<u>COST</u>	<u>RATES</u>								
<b>A. Current</b>										
<b>1. Salaries</b>										
Agr Officer(1) G-20	6.7	5%		7	7	8	8	9	5	44
Publications Officer(1)G-14	3.4	5%		4	4	4	4	4	3	23
Carpenter (1) G-13	3.0	5%		3	3	3	3	4	2	18
Farm Broadcaster (1) G-12	2.7	5%		3	3	3	3	3	2	17
Field Officer (1) G-10	2.2	5%		2	2	2	2	3	2	13
Visual Aids Officer (1) G-9	1.9	5%		2	2	2	2	3	2	13
Photographer (1) G-9	1.9	5%		2	2	2	2	3	2	13
Projectionist (3) G-9	1.9	5%		6	6	7	7	7	4	37
Technical Assistant (3) G-8	1.7	5%		5	6	6	6	7	4	34
Typist (1) G-7	1.6	5%		2	2	2	2	2	1	11
										<u>223</u>
<b>2. Production Materials</b>	<b>5/yr</b>	<b>10%</b>		<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>		<u>46</u>
Subtotal - Current				42	44	47	48	55	33	269
<b>B. Incremental</b>										
<b>1. Vehicle Fuel &amp; Maintenance (5)</b>	<b>3.6/yr</b>	<b>10%</b>		20	22	24	26	29	16	137
<b>2. Furnishings for 1 TA House</b>	<b>8</b>	<b>15%</b>		9						9
<b>3. Participants' Air Fare</b>	<b>1.1</b>	<b>12%</b>		1	3	2	4			10
<b>4. Production Materials</b>	<b>15.0/yr</b>	<b>10%</b>								25
Subtotal - Incremental				30	25	26	30	41	29	181
Subtotal A & B				72	69	73	78	96	62	450
Contingency at 10% (B only)										18
<b>TOTAL</b>										<u>468</u>
										<u>E 468</u>
										<u>(\$ 608)</u>

(1) Represents 50% of requirements.

(2) GOS will assume 100% of budget by FY 87. The 13,000 is half of this total since project ends six months into FY 87.



Equipment and Commodity List (\$ 000)

<u>I. Vehicles</u>	<u>Quantity</u>	<u>FY 81 Unit Price</u>	<u>TOTAL</u>
<u>A. Research</u>			
1. Station Wagon	1	8	8
2. Pickup Truck 2WD	4	6	24
3. Pickup Truck 4WD	1	8	8
4. Motorcycle 125/150cc	14	1.5	21
<u>B. Agricultural Information</u>			
1. Pickup Truck	1	6	6
2. Panel Van	4	10	40
<u>C. Extension Training</u>			
Station Wagon	1	8	<u>8</u>
		<b>Subtotal Vehicles</b>	<b>115</b>
		<b>Inflation</b>	<b>23</b>
		<b>Contingency 10%</b>	<b><u>14</u></b>
		<b>TOTAL Vehicles</b>	<b><u>152</u></b>
<u>II. Equipment</u>			
<u>A. Research</u>			
1. Atomic Absorption Spectrophotometer	1	17.0	17.0
2. Calorimeter	1	7.8	7.8
3. Flame Analyzer	1	13.0	13.0
4. Two-wheel tractor (8 hp) with plough, disc, rotary tiller	10	1.5	15.0
5. Mini Computer with augmented storage and software	1	35.0	35.0
6. Typewriter (IBM selectric or equivalent)	2	1.35	2.7
7. Manual typewriter (wide carriage)	1	.5	.5
8. Photocopy machine	1	3.0	3.0
9. Handheld calculator (157 or equivalent)	15	.1	1.5
10. Handpump, knapsack type sprayer	10	.14	1.4
11. Fertilizer spreader (hand operated)	10	.08	.8
12. Hand seeder	10	.08	.8

Equipment and Commodity List (\$ 000)

	<u>Quantity</u>	<u>FY 81 Unit Price</u>	<u>TOTAL</u>
13. Hand tools (hoes, spades, spade forks, rakes, maddocks)	10 sets	.2	2.0
14. Hand operated maize planter	10	.03	.3
		Subtotal	100.8
		Insurance and Freight at 40%	40.2
		Subtotal CIF	141.0
		Inflation at 12%	17.0
		Contingency at 15%	24.0
		<b>TOTAL Research</b>	<b>182.0</b>
<b>B. <u>Agricultural Information</u></b>			
1. Overhead projector 250x250mm	2	.45	.9
2. Portable projection Stand	2	.15	.3
3. Projector, 16mm sound-film	3	1.5	4.5
4. Projector, 35mm slide	8	.4	3.2
5. Slide sorter	2	.05	.1
6. Camera, 35mm SLR w/ flash, wide angle lens, macro and telephoto lens	2	1.5	3.0
7. Portable cassette tape recorder with speakers (AC/DC)	7	.35	2.4
8. Public address system set, mobil, 6-12V with parts	4	2.0	8.0
9. Projection screens, portable	4	.2	.8
10. Generator, portable, gasoline powered, 7KW, 220V, 50 Hz	4	1.2	4.8
11. Mimeograph machine, heavy duty	1	2.5	2.5
12. Laminating machine	2	1.5	3.0
13. Spiral binding machine	1	.7	.7
14. Staple binder machine	1	.6	.6
15. Multi-hold drill punch, heavy duty	1	.8	.8
16. Guillotine paper cutter, heavy duty	2	.6	1.2
17. Filing cabinet, five drawer	6	.25	1.5

Equipment and Commodity List (\$ 000)

	<u>Quantity</u>	<u>FY 81 Unit Price</u>	<u>TOTAL</u>
18. Silk screening equipment (frame, silk drying rack)	1	2.5	2.5
19. Utility table w/ wheels, heavy duty	1	.4	.4
20. Folding work tables	3	.15	4.5
21. Draughtman's table	4	.35	1.4
22. Aluminum dolly	2	.1	.2
23. Stepladder, 4 ft.	3	.04	.12
24. Typewriter (IBM selectric or equivalent)	1	1.35	1.35
25. Photocopy machine	1	3.0	3.0
26. Video cassette System (TV Monitor, camera, playback unit)	4 (2 cameras only)	6.2	24.8
		<b>Subtotal</b>	<b>76.57</b>
		<b>Insurance and Freight at 40%</b>	<b>30.43</b>
		<b>Subtotal CIF</b>	<b>107.0</b>
		<b>Inflation at 12%</b>	<b>13.0</b>
		<b>Contingency at 15%</b>	<b>18.0</b>
		<b>TOTAL As Information</b>	<b><u>138.0</u></b>

C. Extension Training (To be used by the Certificate Training Course)

1. Overhead projector 250 x 250mm	1	.45	.45
2. Projector stand, portable	1	.15	.15
3. Projector, 35mm slide	1	.4	.4
4. Tape recorder, portable cassette type with speakers (AC/DC)	1	.35	.35
		<b>Subtotal</b>	<b>1.35</b>
		<b>Insurance and Freight</b>	<b>.65</b>
		<b>Subtotal CIF</b>	<b>2.0</b>
		<b>TOTAL Extension Training</b>	<b><u>2.0</u></b>

Equipment and Commodity List (\$ 000)

Subtotal Equipment (CIF)	250.0
Inflation	30.0
Contingency	<u>42.0</u>
TOTAL EQUIPMENT	322.0

NOTE: All electrical equipment must be 220V/50 Hz.

## III. Comodities

A. Research

1. Fertilizer, seeds, etc. for trials	52
2. Lab Supplies	52
3. Admin and Office Supplies	60
4. Consumables (Materials for farm implement research)	35
5. Research books and publications	80

Subtotal (includes inflation)	279
Contingency	<u>28</u>
TOTAL Research	<u>307</u>

B. Agricultural Information

Production commodities (printing materials, ink, posters, flip charts, slides, films, etc.)	270
Contingency	<u>27</u>
TOTAL Ag Information	<u>297</u>

C. Extension Training

1. Reference materials (books, films, slides, publications)	52
2. Training supplies (flip charts, posters, etc.)	<u>11</u>

Subtotal	63
Contingency	<u>6</u>
TOTAL Extension Training	<u>69</u>

SUBTOTAL Commodities (Includes Inflation)	612
Contingency	<u>61</u>
TOTAL Commodities	<u>673</u>

For expenditures by fiscal year and specific inflation factors,  
see Annex K, Financial Tables.

Waiver Justifications

## I. SUBJECT: Procurement Source/Origin Waiver

PROBLEM : Request for a procurement source/origin waiver from Geographic Code 900 (U.S. only) to Geographic Code 935 (Special Free World).

A. Cooperating Country:	Swaziland
B. Authorizing Document:	Project Agreement
C. Project:	Cropping Systems Research Grant
D. Nature of Funding:	Grant
E. Description of Goods:	(i) 2 each 35mm SLR Cameras with flash attachment and wide angle, macro and telephoto lenses. (ii) 1 each manual typewriter (iii) 4 each video cassette systems, including TV monitor, camera and playback unit (NTSC and PAL).
F. Approximate Value:	(i) \$3,864 (ii) 644 (iii) <u>\$1,942</u>
	TOTAL \$36,450
G. Probable Origin:	Japan and Europe
H. Probable Source:	Swaziland and South Africa

DISCUSSION: This equipment is needed in order to mount an effective agricultural information program to support the extension of new research recommendations. Without this equipment support, extension agents will be unable to impart this new knowledge, and skills learned in the in-service training programs to be developed under the project will not be fully utilized.

Handbook I, Supplement B, paragraph 5B46 provides a list of criteria for waiving the authorized procurement sources under a project. One of the criteria is that the commodity is not available from countries included in the authorized geographic code. The items covered by this waiver request are not manufactured in the United States.

RECOMMENDATIONS: On the basis of the above discussion, it is recommended that you approve this waiver request by certifying that exclusion of procurement from Free World Countries other than the cooperating country and countries included in Code 941 would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program.

II. SUBJECT: Vehicle Procurement Source/Origin Waiver

PROBLEM: Request for source/origin waiver from Geographic Code 000 (U.S. only) to Geographic Code 935 (Special Free World).

A. Cooperating Country:	Swaziland
B. Authorizing Document:	Project Authorization
C. Project:	Cropping Systems Research
D. Nature of Funding:	Grant
E. Description of Goods:	14 each 125cc or 150cc motor cycles and spare parts
F. Approximate Cost:	\$33,000
G. Probable Origin:	Japan
H. Probable Source:	Swaziland

The motorcycles will be used by the ten field Research Assistants and for Peace Corps Volunteers who will supervise the on-farm research trials. These personnel will be housed in Rural Development Areas (RDA) and will require transportation both inside the RDA and for travel to the 20-30 percent of the research farms that will be located outside the RDAs. Close supervision of the trials is an absolute necessity and small motorcycles are the most appropriate vehicles for such a use.

In accordance with Section 636(i) of the FAA, to be eligible for financing motor vehicles must have been manufactured in the United States unless "special circumstances" exist, in which case the requirement for manufacture in the United States may be waived. Per Handbook 1, Supplement B, "Circumstances which may merit waiving the requirement are (a) inability of U.S. manufacturers to provide a particular type of needed vehicle, e.g., light weight motorcycles and right-hand drive vehicles; (b) present or projected lack of adequate service facilities and supply of spare parts for U.S.-manufactured vehicles; or (c) an emergency requirement for which non-AID funds are not available, and which can be met in time only by purchase of non-US-manufactured vehicles." There are no light weight motorcycles manufactured in the U.S. for which there are service facilities and spare parts support in Swaziland. There are, however, support facilities available for non-U.S. units.

RECOMMENDATIONS: On the basis of the above discussion, it is recommended that you (1) determine that special circumstances

exist which justify waiving Section 636(i) of the FAA, and (2) certify that exclusion of procurement from Free World Countries other than the cooperating country and countries included in Code 941 would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program.

III. SUBJECT: Procurement Source/Origin Waiver for Construction Materials

PROBLEM: Request for a source/origin from Geographic Code 000 (U.S. only) to Geographic Code 935 (Special Free World).

- |                          |  |
|--------------------------|--|
| A. Cooperating Country:  | Swaziland  |
| B. Authorizing Document: | PAF  |
| C. Project:              | Cropping Systems Research Grant  |
| D. Nature of Funding:    | Grant  |
| E. Description of Goods: | Construction materials, including electrical wiring and fittings, plumbing fixtures, roofing materials and door and window frames. |
| F. Approximate Value:    | \$ 352,000   |
| G. Probable Origin:      | United Kingdom and South Africa  |
| H. Probable Source:      | Swaziland and South Africa   |

DISCUSSION: In order to maintain the facilities after construction is completed, it is essential that the construction materials be compatible with local standards for which local dealers have the capability and spare parts to service and maintain. Items such as electrical fittings and plumbing fixtures used by the building trade in Swaziland are manufactured in either the United Kingdom or the Republic of South Africa. For the other items involved, the small quantities required of each specific type of material make ordering from the U.S impractical and the long lead time for delivery would delay the construction of facilities and, consequently, overall project implementation.

RECOMMENDATION: On the basis of the above discussion, it is recommended that you approve this waiver request by certifying 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 and objectives of the foreign assistance program.

IV. SUBJECT: Geographic Source/Origin Waiver, Imported Shelf Items

**PROBLEM** : Request for a geographic source/origin waiver to permit the procurement of up to \$300,000 of shelf items imported from other than Code 941 Free World Countries.

- |                          |   |
|--------------------------|---|
| A. Cooperating Country:  | Swaziland   |
| B. Authorizing Document: | Project Agreement   |
| C. Project:              | Cropping Systems Research   |
| D. Nature of Funding:    |   |
| E. Description of Goods: | Shelf items imported from other than Code 941 Free World Countries, such as seeds, fertilizer, information production materials, including film, blank tapes, printing materials, etc., and equipment such as dry paper copiers |
| F. Approximate Value:    | \$300,000   |
| G. Probable Source:      | Swaziland   |
| H. Probable Origin:      | Japan, Europe and South Africa  |

**DISCUSSION:** It is anticipated that the total local currency costs for the project will be approximately \$466,000. Under the imported shelf item rule as set forth in Chapter 18 of Handbook 1, Supplement B, this amount would permit the procurement of \$46,600 of shelf items imported from other than Code 941 Free World Countries. It is estimated that the total requirement under the project for such imported shelf items will be approximately \$300,000. A great portion of the items will be for expendable supplies for each of the three entities involved in the project, with purchases by each entity of relatively small quantities taking place throughout the life of the project. While there may be economics to be gained by purchasing large quantities of such supplies, the cost of storage and control, coupled with losses, would off-set any possible savings. Also, there will be some units of equipment purchased off-shelf, such as the photo copiers, for which it is absolutely essential that local service facilities be available.

With further reference to Handbook 1, Supplement B, Chapter 18 requires that when shelf item procurement will exceed the limits set forth in paragraph 18A4b, they must be authorized as a source waiver. Thus, a source/origin waiver in the foregoing amount is justified in accordance with Section 5B4b(7) which provides that a waiver may be granted under "such other circumstances as are determined to be critical to the success of project objectives." The discussion above indicates that procurement of large numbers of small and varied items from Geographic Code 000 (U.S. only) would create inordinate project delays and dramatically increase the costs of these items.

The Office of Commodity Management concurs in the off-shelf procurement of the small amount of fertilizer required for research purposes.

RECOMMENDATION: On the basis of the above discussion, it is recommended that you approve this waiver request by certifying that exclusion of procurement from Free World Countries other than the cooperating country and countries included in Code 941 would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program.

5C(1) - COUNTRY CHECKLIST

Listed below are, first, statutory criteria applicable generally to FAA funds, and then criteria applicable to individual fund sources: Development Assistance and Economic Support Fund.

A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

1. FAA Sec. 116. Has the Department of State determined that this government has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, can it be demonstrated that contemplated assistance will directly benefit the needy? No Violation.
  
2. FAA Sec. 113. Has particular attention been given those programs, projects, and activities which tend to integrate women into the national economies of developing countries, thus improving their status and assisting the total development effort? Yes, as part of the overall development effort.
  
3. FAA Sec. 481. Has it been determined that the government of the recipient country has failed to take adequate steps to prevent narcotics drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the U.S. unlawfully? No.
  
4. FAA Sec. 620(b). If assistance is to a government, has the Secretary of State determined that it is not dominated or controlled by the international Communist movement? Yes.
  
5. FAA Sec. 620(c). If assistance is to a government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen

for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) the debt is not denied or contested by such government?

No. (a)

No. (b)

6. FAA Sec. 620(e)(1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities?

No.

7. FAA Sec. 620(a), 620(f), 620D; Continuing Resolution Sec. 511, 512 and 513; ISDCA of 1980 Secs. 717 and 721.

No in all instances.

Is recipient country a Communist country? Will assistance be provided to Angola, Cambodia, Cuba, Laos or Vietnam? (Food and humanitarian assistance distributed directly to the people of Cambodia are excepted). Will assistance be provided to Afghanistan or Mozambique without a waiver? Are funds for El Salvador to be used for planning for compensation, or for the purpose of compensation, for the confiscation, nationalization, acquisition or expropriation of any agricultural or banking enterprise, or property or stock thereof?

8. FAA Sec. 620(i). Is recipient country in any way involved in (a) subversion of, or military aggression against, the United States or any country receiving U.S. assistance, or (b) the planning of such subversion or aggression?

No. (a)

No. (b)

9. FAA Sec. 620(j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction, by mob action, of U.S. property?

No.

10. FAA Sec. 620(k). Does the program furnish assistance in excess of \$100,000,000 for the construction of a productive enterprise, except for productive enterprises in Egypt that were described in the Congressional Presentation materials for FY 1977, FY 1980 or FY 1981? No.
11. FAA Sec. 620(l). If the country has failed to institute the investment guaranty program for the specific risks of expropriation, inconvertibility or confiscation, has the AID Administrator within the past year considered denying assistance to such government for this reason? No.
12. FAA Sec. 620(m). Is the country an economically developed nation capable of sustaining its own defense burden and economic growth and, if so, does it meet any of the exceptions to FAA Section 620(m)? No.
13. FAA Sec. 620(o); Fishermen's Protective Act of 1967, as amended, Sec. 5. If country has seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters,  
 a. has any deduction required by the Fishermen's Protective Act been made?  
 b. has complete denial of assistance been considered by AID Administrator? No seizure or sanction.
14. FAA Sec. 620(g); Continuing Resolution Sec. 518. (a) Is the government of the recipient country in default for more than six months on interest or principal of any AID loan to the country? No. (a)  
 (b) Is the country in default exceeding one year on interest or principal on any U.S. loan under a program for which the Continuing Resolution appropriates funds? No. (b)
15. FAA Sec. 620(s). If contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the percentage of the country's budget which is for military expenditures, the amount of foreign exchange spent on military equipment and the amount Not loan or ESP.

spent for the purchase of sophisticated weapons systems? (An affirmative answer may refer to the record of the annual "Taking into Consideration" memo: "Yes, taken into account by the Administrator at time of approval of Agency OYB." This approval by the Administrator of the Operational Year Budget can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

16. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption? No.
17. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrears taken into account by the AID Administrator in determining the current AID Operational Year Budget? Paid.
18. FAA Sec. 620A; Continuing Resolution Sec. 521. Has the country aided or abetted, by granting sanctuary from prosecution to, any individual or group which has committed an act of international terrorism? Has the country aided or abetted, by granting sanctuary from prosecution to, any individual or group which has committed a war crime? No.
19. FAA Sec. 666. Does the country object, on basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. who is present in such country to carry out economic development programs under the FAA? No.
20. FAA Sec. 669, 670. Has the country, after August 3, 1977, delivered or received nuclear enrichment or re-processing equipment, materials, or technology, without specified arrangements or safeguards? Has it detonated a nuclear device after August 3, 1977, although not a "nuclear-weapon State" under the nonproliferation treaty? No.

B. FUNDING SOURCE CRITERIA FOR COUNTRY ELIGIBILITY

1. Development Assistance Country Criteria.

a. FAA Sec. 102(b)(4). Have criteria been established and taken into account to assess commitment progress of the country in effectively involving the poor in development, on such indexes as: (1) increase in agricultural productivity through small-farm labor intensive agriculture, (2) reduced infant mortality, (3) control of population growth, (4) equality of income distribution, (5) reduction of unemployment and (6) increased literacy.

Yes. See CDSS.

b. FAA Sec. 104(d)(1). If appropriate, is this development (including Sahel) activity designed to build motivation for smaller families through modification of economic and social conditions supportive of the desire for large families in programs such as education in and out of school, nutrition, disease control, maternal and child health services, agricultural production, rural development, assistance to urban poor and through community-based development programs which give recognition to people motivated to limit the size of their families?

Not appropriate.

2. Economic Support Fund Country Criteria.

a. FAA Sec. 502B. Has the country (a) engaged in a consistent pattern of gross violations of internationally recognized human rights or (b) made such significant improvements in its human rights record that furnishing such assistance is in the national interest?

NA

b. FAA Sec. 532(f). Will ESP assistance be provided to Syria?

NA

c. 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?

NA

d. FAA Sec. 620B. Will ESF be furnished to Argentina?

NA

## 5C(2) - PROJECT CHECKLIST

Listed below are statutory criteria applicable generally to projects with FAA funds and project criteria applicable to individual funding sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Economic Support Fund.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

A. GENERAL CRITERIA FOR PROJECT1. Continuing Resolution Unnumbered; FAA Sec. 634A; Sec. 653(b).

(a) Describe how authorizing and appropriations Committees of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$1 million over that figure)?

FY 1981 Congressional Presentation.

Yes.

2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be (a) engineering, financial other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

Yes. (a)

Yes. (b)

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?

NA

4. FAA Sec. 611(b); Continuing Resolution Sec. 501. If for water or water-related land resource construction, has project met the standards and criteria as set forth in the Principles and Standards for Planning Water and Related Land Resources, dated October 25, 1973?

NA

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? NA
6. FAA Sec. 209. Is project susceptible of execution as part of regional or multi-lateral 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 project 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. Project is expected to encourage efforts of country with regard to items b, c, d, and e and have little or no effect on items a and f.
8. FAA Sec. 601(b). Information and conclusion 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). NA
9. FAA Sec. 612(b), 636(h); Continuing Resolution Sec. 508. 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. The Government of Swaziland is contributing 25 percent in support funding for this project. The U.S. does not own Swazi currency.
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? No excess foreign currency owned.

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.

12. 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?

NA

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b), 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 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; and (e) utilize and encourage regional cooperation by developing countries.

The project will have a major impact upon items a, c and d. It is expected to be supportive of item b. It will not affect item e.

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: (include only applicable paragraph which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.)

(1) (103) for agriculture, rural development or nutrition; if so (a) extent to which activity is specifically designed to increase productivity and income of rural poor; 103A if for agricultural research, full account shall be taken of the needs of small farmers, and extensive use of field testing to adapt basic research to local conditions shall be made; (b) extent to which assistance is used in coordination with programs carried out under Sec. 104 to help improve nutrition of the people of developing countries through encouragement of increased production of crops with greater nutritional value, improvement of planning, research, and education with respect to nutrition, particularly with reference to improvement and expanded use of indigenously produced foodstuffs; and the undertaking of pilot or demonstration of programs explicitly addressing the problem of malnutrition of poor and vulnerable people; and (c) extent to which activity increases national food security by improving food policies and management and by strengthening national food reserves, with particular concern for the needs of the poor, through measures encouraging domestic production, building national food reserves, expanding available storage facilities, reducing post harvest food losses, and improving food distribution.

(2) (104) for population planning under sec. 104(b) or health under sec. 104(c); if so, (i) extent to which activity emphasizes a low-cost, integrated delivery systems for health, nutrition and family planning for the poorest people, with particular attention to the needs of mothers and young children, using paramedical and auxiliary medical personnel, clinics and health posts, commercial distribution systems and other modes of community research.

(4) (105) for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development; and (ii) extent to which assistance provides advanced education and training of people in developing coun-

Yes. The project aims to increase the income of the rural poor. It is directed toward meeting the needs of small farmers and makes extensive use of field testing. Although not specifically designed to improve nutrition, the project is expected to have positive impact upon nutritional levels in the rural areas. The project will increase national food security for Swaziland.

NA

NA

tries in such disciplines as are required for planning and implementation of public and private development activities.

(5) (106; ISDCA of 1980, Sec. 304) for energy, private voluntary organizations, and selected development activities; if so, extent to which activity is: (i) (a) concerned with data collection and analysis, the training of skilled personnel, research on and development of suitable energy sources, and pilot projects to test new methods of energy production; (b) facilitative of geological and geophysical survey work to locate potential oil, natural gas, and coal reserves and to encourage exploration for potential oil, natural gas, and coal reserves; and (c) a cooperative program in energy production and conservation through research and development and use of small scale, decentralized, renewable energy sources for rural areas;

NA

(ii) technical cooperation and development, especially with U.S. private and voluntary or regional and international development organizations;

NA

(iii) research into, and evaluation of, economic development process and techniques;

NA,

(iv) reconstruction after natural or manmade disaster;

NA

(v) for special development problems, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

NA

(vi) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

NA

c. (107) is appropriate effort placed 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

Yes. Host country contribution is 25 percent.

furnished (or has the latter cost-sharing requirement been waived for a "relatively least developed" country)?

e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?

No.

f. 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.

Project is directly responsive to needs, desires and capabilities of people of the country and will be of direct benefit to many of them. The staff and curricula of the University of Swaziland are an integral part of the project and will also benefit from it. Some 25 Swazi Nationals will be trained under the Project.

g. 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.

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.

NA

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?

NA

3. Project Criteria Solely for Economic Support Fund

a. FAA Sec. 531(a). Will this assistance promote economic or political stability? To the extent possible, does it reflect the policy directions of FAA Section 102?

NA

b. FAA Sec. 531(c). Will assistance under this chapter be used for military, or paramilitary activities.

NA

PARTICIPANT TRAINING FLOW CHART

ANNEX O

DISCIPLINE	TARGET DEGREE	TIME FRAME						STUDY MONTHS
		1982	1983	1984	1985	1986	1987	
<b>Agriculture Research</b>								
Rural Sociologist	M.Sc.	←	←	←	←	←	←	24
Agronomy	M.Sc.	←	←	←	←	←	←	24
Agriculture Economics	M.Sc.	←	←	←	←	←	←	24
Horticulture	M.Sc.		←	←	←	←	←	24
Ag. Engineering Farm Mech.	M.Sc.			←	←	←	←	24
Ag. Irrigation Technology	M.Sc.		←	←	←	←	←	24
Dairy Science	M.Sc.			←	←	←	←	24
Horticulture	M.Sc.			←	←	←	←	24
Agronomy	M.Sc.			←	←	←	←	24
<b>Agricultural Extension</b>								
Ag. Extension Education	M.Sc.		←	←	←	←	←	24
Ag. Information Systems	M.Sc.		←	←	←	←	←	24
Short Term Audio Visual	-	←	←	←	←	←	←	6
Work Study/Extension Training	-		←	←	←	←	←	12
<b>Crop Production Section</b>								
Agronomy	B.Sc.	←	←	←	←	←	←	48
Horticulture	B.Sc.	←	←	←	←	←	←	48
Agricultural Economics	B.Sc.	←	←	←	←	←	←	48
Agronomy/Soils	B.Sc.	←	←	←	←	←	←	48
Irrigation Technology	B.Sc.		←	←	←	←	←	48
Entomology	B.Sc.		←	←	←	←	←	48
Small Farm Mechanization	B.Sc.		←	←	←	←	←	48
Plant Pathology	B.Sc.		←	←	←	←	←	48
<b>Miscellaneous</b>								
Short Term Ag. Statistics	-	←	←	←	←	←	←	12
Work Study/Ag. Info Systems	-			←	←	←	←	12
Short Term Cropping Systems	-			←	←	←	←	15
Research Methods (Dev. Country) (5)	-			←	←	←	←	15
<b>TOTAL STUDY MONTHS</b>								<b>705</b>

INITIAL ENVIRONMENTAL EXAMINATION

Project Location:	Swaziland
Project Title:	Cropping Systems Research and Extension Training (645-0212)
LOP Funding: (FY 80 - FY 84)	<u>\$11,650,000</u>
Life of Project:	6 years (FY 80 - FY 86)
IEE Prepared by:	USAID/Swaziland and REDSO/EA
Environmental Action Recommended:	Negative Determination
Concurrence:	<u>Julius E. Colea</u> Julius E. Colea Director, USAID/Swaziland
Date:	<u>3/13/80</u>
Assistant Administrator's Decision:	Approved: <u>[Signature]</u>
	Disapproved: _____
	Date: <u>5/1/80</u>

## I. PROJECT DESCRIPTION

### A. Agro Ecology of Swaziland

Swaziland is a landlocked country of 17,500 sq km, geographically divided into four main ecological zones on a north to south axis.

The Highveld zone is a north-south strip on the western escarpment of the South African plateau. Altitudes range from 1000 to 1800 m. The topography is characteristically broken mountains with plateau areas. Soils are predominantly deep red and yellow ferralities on an ancient granite base. Climate is humid with rainfall between 1000 and 1750 mm annually, much of which falls between September and April. Climax vegetation is subtropical evergreen forest with a present vegetation of short upland (sour) grass. The area of the region is approximately 5200 sq km. Forestry is the most important industry, but there is some farming.

The Middleveld zone is north-south foothills to the east of the Highveld, encompassing approximately 4900 sq km. Topography is undulating and broken with altitude ranging from 350 to 1000 m. Soils are typically feralitic and ferruginous tropical overlying granite. Climate is sub-humid with annual rainfall of 750-1200 mm, falling mainly in the summer (October to April). Rainfall is lower and more erratic in the eastern area of the zone. The climax vegetation is mixed forest shrub which has given way to tall mixed grassland and open woodland. Agriculture is a complex mixture of ranching, mixed rainfed and irrigated field crops and horticultural crops.

The Lowveld zone is a north-south strip east of the Middleveld embracing about 6000 sq km of gently undulating topography ranging in altitude from 60 to 375 m above sea level. Climate is subarid with restricted and erratic rainfall of 500 to 800 mm annually. Drought hazard is marked, but frosts frequently occur in drainage lines during winter (June to August). Soils are derived from granite and Karroo sediments in the west and basic igneous rocks in the east. The original subtropical savannah climax has given way to sparse woodland, thorn scrub and tall grass (sweet veld). Cattle

ranching, sugar cane, citrus, rice and cotton under irrigation are the main agricultural activities.

The Lebombo Plateau zone is a north-south strip on the eastern border of Swaziland. Topography is rolling with deeply incised gorges, with altitudes ranging from 450 to 840 m. Soils are predominantly red and brown ferruginous derived from rhyolites and basalts. Climate is frost free with annual rainfall of 750 to 900 mm annually. Climax vegetation of mixed scrub forest has given way to mixed grassland and thornveld. Area of the region is about 1400 sq km. Main agricultural activities are ranching and mixed cropping.

#### B. Cropping/Farming Systems in Swaziland

Swazi cropping/farming systems on the SNL \* consists of communal livestock grazing (chiefly cattle and goats), small scale poultry and negligible por production, and mixed crop production on cultivated land. The cultivated land is fenced or otherwise set aside from the grazing land during the cropping season, which normally corresponds with the rainy season. At the end of the cropping season the crop land reverts to communal pasture, the livestock grazing the crop residue.

Land allocated to individuals for cultivation and other forms of management accounts for only about 12% of the total SNL in the country as a whole; 10-11% in the Highveld and the Lowveld, 15% in the Middleveld and only 6% in the Lubombo. The rest of the SNL is unallocated communal grazing land, or where too hilly or mountainous serves as source of fuelwood, etc. Classification of the homestead land is indicated in Table 1.

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\* SNL is Swazi Nation Land, owned by the nation rather than privately and comprises a good portion of the country. It is allocated by local chiefs to individual families who live scattered on homesteads rather than in communal villages. The land is theirs to use and usually to pass to their offspring but cannot be sold or traded.

Table 1. Land Use Patterns on SNL holdings  
Hectares and % area under.

	Total Ha	Crop- land	Fallow	Potent. Product.	Woods	Other
Swaziland	106 397	79.6	14.5	1.0	0.05	4.9
Highveld	19 195	81.1	10.3	3.5	0.2	6.4
Middleveld	45 281	81.1	14.6	0.6	0.02	3.7
Lowveld	38 086	77.3	17.0	0.4	-	5.3
Lubombo	3 833	84.9	9.3	0.4	-	4.4

About 4/5th the total holding area is planted with crops, 1/7th is fallow, 1/20th is occupied by houses, cattle sheds, wasteland, etc., 1% is potentially productive land, and woodland is almost negligible.

From 98 to 100% of the homesteads in all the regions grow crops, and nearly half of them keep some land fallow. However, in the Lubombo region, only one fourth of the holdings, and in the Lowveld two-fifths, have fallows. The percentage of holdings having some potentially productive land differs from over 2% in the Lowveld to about 11% in the Highveld. About 1% of the holdings in the Highveld and much less in the Middleveld have some woodland. The bulk of the cultivated land (including cropland and fallow) is found in the Middleveld and the Lowveld, and most of the potentially productive land lies in the Highveld and the Middleveld.

Average size of holdings in the different regions varies from a high of 4.51 ha in the Lowveld to 2.36 ha in the Middleveld, 2.08 ha in the Highveld and 1.98 ha in the Lubombo, with a national average in the SNL of 2.74 ha per homestead. The bulk of the cropland is subsistence crop production. Only 1/20 of the holdings in the country produce mainly for sale and crops are the main commodities sold. The holdings producing mainly for sale are chiefly those having 5 ha or more, and their income is derived from crops, livestock and other products. The major source of income on holdings producing mainly for home consumption is off-farm employment in non-agricultural sectors. In the country as a whole about 25% of holdings sell some produce.

The major crops grown on the Swazi Nation Land are maize, groundnuts, cotton, jingo beans, sorghum, beans, pumpkins, sweet potatoes and tobacco. Orchard crops, (citrus, avocado, banana, mango etc) are rarely grown except for a few scattered trees. Sugarcane and pine-apples are also scarcely found. Vegetables are grown only in a small fraction of area as garden crops.

About four-fifths of the total area under crops in the country is in the Middleveld and the Lowveld zones. These two regions contribute 98% of the country's total cotton area and 80 to 84% of the areas under all other major crops except maize and pumpkins for which their contribution is somewhat lower.

Mixed cropping is traditional among Swazis, both on SNL homesteads and otherwise. Maize is the basic staple food crop grown on all homesteads, often intercropped with pumpkins, groundnuts, beans or sweet potatoes. The bulk of the cropping is rainfed, irrigation being limited to hand watering if required to keep crops alive after transplanting where water is not too far to hand carry, or more extensively in the rare area where diversion of part of a stream is possible. In the Lowveld some small holding patches of maize and sugar cane are irrigated. Dryland farming during the dry season is restricted to some cotton plants near the end of the rainy season, pigeon peas, sesame, and sorghum. Wheat, grown during the dry winter season, is irrigated.

Kraal manure is used on the larger holdings where livestock management makes this feasible, and some fertilizer is used by many Swazi farmers on SNL homesteads.

A survey (Agr. Census SNL 1971-72) showed the following fertilizer and pesticide usage among farmers. These data suggest that Swazi small farmers on SNL have begun to utilize

Percent of Holdings using Fertilizers and Pesticides

Region	Fertilizers	Pesticides
Highveld	63.7	53.3
Middleveld	34.6	25.4
Lowveld	4.4	4.0
Lubombo	15.6	17.9

intensive inputs, and by now, 1980, costs and prices permitting, usage may have increased. Use of fertilizers appears to be highest on maize, tobacco and cotton

<u>Quantity of Total Fertilizers Per Hectare of Total Area</u>					
<u>Crop</u>	<u>Planted by Crop and Region (Pockets/ha)</u>				
	<u>Swazi-land</u>	<u>High-veld</u>	<u>Middle-veld</u>	<u>Low-veld</u>	<u>Lubombo</u>
Maize	1.3	3.6	1.1	0.3	0.6
Cotton	0.8	na	4.3	0.3	-
Beans	0.9	0.1	1.7	-	-
Groundnut	0.2	0.2	0.3	-	0.1
Tobacco	2.3	-	3.6	-	-
All Crops	1.2	3.5	1.1	0.2	0.5

### C. Agricultural Research in Swaziland

Agricultural research was begun in Swaziland with the establishment of the Research Division of the Ministry of Agriculture in 1959. It functioned under the direction of the Ministry until 1972 when it was transferred to the then University of Botswana, Lesotho and Swaziland. In 1978 the Research Division again placed under the Ministry of Agriculture.

Agricultural research in Swaziland traditionally has been directed at the needs of estates and large expatriate private land owners and has been carried out primarily by an expatriate research staff on research stations. This research system has remained unchanged in this regard since independence with Agricultural recommendations to Swazi Nation Land small farm operators being based on research that is more applicable to estate crops and large landholder operations.

The National Agricultural Research Centre was established at Malkerns in March 1962. It now consists of approximately 400 hectares of land which are available for experimentation purposes.

The Malkerns research station is well situated in the Middleveld zone of the country where experimentation can be conducted on practically all temperate, subtropical and some tropical crops that are produced in Swaziland.

Physical facilities at the station include; a central administration building which contains office space for the Chief Research Officer and twelve Research Scientists, housing or living quarters for the research scientists and their families, laboratory space for those scientists who are mainly involved with chemical analyses of plants and soils, including a relatively modern and well equipped soil and plant tissue testing laboratory, laboratory space for the entomology and plant pathology sections where testing can be done as well as the storing of collected specimens, a two-room small but functional library which is stocked with many key reference books, periodicals and research reports, a computer room containing a recently installed Hewlett Packer Model 9825A computer, greenhouse facilities consisting of one greenhouse section, a farm machinery shop equipped to handle the general repairs on most equipment operated at the station, farm machinery and field equipment for land preparation, cultivation and crop harvesting including the usual tractors, discs, plows, cultivators, harvestors, etc., and small sized plot equipment and hand tools.

In addition to the Malkerns Central Research Station, other research stations have been developed to cover the three main ecological cropping zones of the country. One station is located at Big Bend and is representative of the drier Lowveld zone. Sub-stations for the Middleveld zone are located at Nshlangano and Luye. Mangcongco and Hebron are sub-stations representative of the Highveld.

The overall aims of the research division are to find new methods of improving crop and pasture yields and to reduce production costs, and reduce damage and losses from pests and disease. Research programs, defined in consultation with Government and the farming community, are designed primarily to address the more immediate agricultural problems. Results emanating from past research have been largely responsible for improved productivity in Swazi agriculture.

Research policy is established by a National Research Council. Priorities are defined and then the research officers have the obligation to develop programs within their areas of expertise to satisfy the priorities that have been established for the country.

Fourteen disciplines have traditionally made up the areas where agricultural research has concentrated its efforts. Each of these units within the Research Division has normally been headed by a professional officer with two or three supporting technicians and the usual laboratory and field labourers. These disciplines included:

#### 1. Crop Agronomy

Investigations have centred around the introduction of field crops, variety evaluation, time of planting, population and spacing studies, herbicide usage and cultivation techniques. Crops tested include: maize, sorghum, winter cereals, groundnuts, beans, soybeans, cotton, sunflower, sesame, irish potatoes and sweet potatoes.

#### 2. Horticulture

Centred strongly around vegetable variety evaluation, a wide range of vegetables have been tested in most areas of Swaziland, both from the point of view of fresh production and for processing. Fresh vegetables tested were: carrot, cauliflower, cabbage, egg plant, peppers, onions, and tomatoes. The crops for processing were: tomatoes, asparagus and youngberries. The adaptation of strawberry varieties was also studied.

#### 3. Veld and Pasture Management

Pasture studies constituted part of the original research effort but were discontinued in 1969. Then in 1974, after a break of five years, they were started up again. The three basic activities associated with this program were: a) plant introduction and testing, b) nutritional studies and c) evaluation of management techniques with the ultimate testing of productivity on a field scale using livestock as the final yardstick.

#### 4. Dryland Crop Production

A new section established at the Lowveld station to develop methods of crop production suitable for rain-fed crops, or crops with minimal irrigation in the low rainfall region.

### 5. Soil Fertility and Crop Nutrition

The primary objective has been the definition of crop response to major nutrients throughout Swaziland. Other investigations have involved lime, trace elements and organic manures. Between 1966 and 1973 some 800 trials were conducted with the plan of developing a model to improve the predictive accuracy of fertilizer recommendations relative to the various ecological zones of the country.

### 6. Soil Chemistry

This section has been responsible for providing back-up soil and plant analysis data for the other research sections, Ministry of Agriculture and the private sector. It also includes a Soil Testing Unit.

### 7. Soil Physics

The broad terms of reference for this relatively new section are to evaluate the influence of soil physical structure on crop and pasture production and to describe optimum cultural techniques for the management of various soil types.

### 8. Plant Pathology

Both a research and service function are provided by this unit. As well as providing practical advice to farmers and controlling the country's Phytosanitary regulations, research has centered on disease control in citrus, pineapple, cotton, rice, groundnuts, beans, gladioli, wheat and vegetables.

### 9. Entomology

Past studies have centered almost exclusively on citrus and cotton. However efforts have also been made to catalogue the pests of the major crops, to re-establish the national insect collection and to develop a systematic program to evaluate economic control of insect pests in the major crops.

### 10. Cotton Breeding

The cotton breeding section has concentrated its efforts on developing varieties with high yield, high ginning percentages and a lint quality suitable for the textile industries of Southern Africa. While maintaining trials on irrigated varieties the main emphasis during recent years has been the development of cultivars suitable for rainfed production.

### 11. Eatton Entomology

Emphasis has been placed on the economic evaluation of insect control techniques, the development of application methods, and the role of new insecticides.

### 12. Biometry

This section was established to assist in the design and analysis of the Division's field trials, to provide assistance in agricultural survey and census work and to provide lectures in biometry within the University.

### 13. Forestry Research

The Ministry of Agriculture provides facilities at Malkerns for the Forestry Research Unit which is funded by the forestry industry of Swaziland. Studies include the investigation of nursery techniques, slash disposal, natural seeding regeneration, disease control, and needle analysis as an index of nutrition and growth curves of successive rotations.

### 14. Pineapple Research

This unit is fully funded by the pineapple industry and physical facilities are provided for research at the Malkerns Station.

Most of the research disciplines were generally well represented in the activities of the Division of Research until October 1978. Since that time research activities have dropped off considerably and at the present time only a skeleton research staff remains. No research scientists are presently under contract with the Ministry of Agriculture. The Soil Chemist and Plant Pathologist are continuing some of their research activities on an interim basis. A few other research programs are being maintained by technicians who are still on the payroll of the Ministry of Agriculture but they have only limited supervision.

This decline in research activity can be attributed to: a) changes that took place within the organizational scheme, b) the loss of trained research technicians who left the country after their contracts were terminated, and c) lack of Swazis trained in research techniques who could be assigned to the positions that were vacated ~~at the~~ departure of the expatriate staff.

The land and physical facilities continue to exist at Malkerns and Big Bend Experimental Stations as well as the sub-stations at Nhlanguano, Luve, Mangcongco and Hebron. With the limited staff and funds available to the Chief Research Officer, the most critical and long term research activities at the Malkerns Station such as the liming experiments and the response of maize to pH and various fertilizer treatments are continuing. The soil and plant analysis laboratory continues to function along with the plant pathology laboratory. A ph.D. student is continuing his studies at the Big Bend Station. The yield performance of promising cotton strains, cotton response to lime and fertilizer and methods of controlling verticillium wilt in cotton continues to be studied. Some of the technicians are continuing studies at the sub-stations.

D. The USAID Cropping Systems Research and Extension Training Project

The Swaziland Cropping System Research and Extension Training Project is directed toward increasing institutional capacities within the Ministry of Agriculture (MOA). Two MOA institutions will be assisted by the project: 1) the Agricultural Research Division and 2) the Extension Training Program with AID assistance focused in activities that will directly benefit the Swazi small farmer (defined as farmers on Swazi Nation Land with less than 5 hectares of arable land). Emphasis will be placed on inter-cropping and multi-cropping research that can significantly improve productivity and make cash-cropping more economically viable for the SNL farmer.

The research component of the project will include on-farm studies on which to base research, experiment station research, on-farm trials, and the development of economically and socially sound cropping systems packages. The research will be carried out by a multi-disciplinary team of U.S. advisors and their Swazi counterparts who will be trained in various research disciplines during the project. A feedback system will be established in order that the MOA can monitor the socio-economic and production impact of the research program. A limited amount of

commodities and equipment (eg laboratory equipment, farm implements, vehicles) will be procured for the research effort. No pesticides will be procured and no new pesticide use will be introduced by the project.

The extension component of the project will include technical assistance to the departments within the MOA responsible for the development of agricultural information and in-service training and consultancies to the certificate training program at the College of Agriculture (from which extension field officers are obtained). The U S advisors will be responsible for: 1) the development of information packages to be used by extension agents and other information techniques such as radio spots directed at the SNL farmer; 2) establishing a regular in-service training program for extension staff based on an assessment of the effectiveness of the current extension program; and 3) the revision of the certificate training program curriculum and the teaching of courses in the program. Swazi staff will be trained in agricultural education and agricultural information systems and commodities, equipment, and vehicles will be procured to improve institutional capabilities. The project will also double the enrollment capacity of the certificate training program, increasing total enrollment by 40 students.

In total, the project aims at determining the needs of the Swazi small farmer (production, nutrition, income) as a basis for research; translation of the research into practical, understandable packages; and the effective extension of research recommendations to the SNL farmer.

Construction for the project will include: 1) four staff houses, an office/laboratory building, a greenhouse complex and storage sheds to support research activities, and 2) six staff houses, an office building, a classroom and a dormitory for the extension program.

Four of the five research storage sheds will be constructed at Rural Development area centres, near the farm field trial plots. The remaining buildings for research will be constructed at the Malkerns Research Centre. The buildings for the extension program will be constructed at the Agricultural College in Malkerns.

## II. DISCUSSION OF IMPACTS

Construction and use of project facilities will have impacts on land and water resources and on use of support services.

All buildings will be constructed within the boundaries of the Research Center, the Agricultural College and the RDA Center. No new land outside of these areas will be required. Existing water and electrical supplies will be utilized. They are adequate for the extra facilities, staff and students. Sewerage disposal for the new facilities will be by septic tank system. The addition of forty students to the College will probably require double shift use of the existing dining facilities. Other student requirements can be accommodated by existing commercial services in the Malkerns area.

Project research and extension training activities will require use of some additional land outside of the Research Center and the College. As many as forty of the farm field trial plots will require about one half hectare of land. Ten to fifteen hectares of land are also required near the College for the extension training program. Simple irrigation will be used on some field trial and extension training plots where systems are already in place.

The projects most significant impact will be in the economic status of small farmers on Swazi Nation Land. The 42,000 homesteads that make up this group represent two-thirds of Swaziland's total population. The project is expected to make an impact on productivity of 23,000 of these homesteads by year five, and eventually, all will have an opportunity to share in the benefits through continuing agricultural extension programs. As a result of the project, it is anticipated that the percentage of small farmers involved in commercial agriculture as a principal source of income will increase from 10% in 1979 to 25% by 1991.

Extension of cropping systems research results to small farmers will probably have an impact on Swazi farming traditions. Currently, most small farmers in Swaziland are engaged in subsistence agriculture. Women and children perform about 70% of the agricultural labor. On the small proportion of homesteads that grow cash crops, women and children also perform much of the labor, but the income generated is usually controlled by the male head of the household. It is hoped that the project focus on commercial farming will induce males to return to the farm to provide the additional labor which will be necessary to grow cash crops. This will mean however, that the men, as well as the women, will have to perform such traditionally defined female agricultural tasks as weeding.

Although women head 31% of small farm households and play a key agricultural role in male headed households, more men than women are currently visited by agricultural extension agents and of these men are visited at more frequent intervals than women. One reason for the lack of extension agent contact with women is that the Swazi culture does not approve of male "strangers" visiting a woman when her husband or another male household member is not present. The project will address this issue by increasing the training of women as extension field officers and by developing research packages and information programs orientated towards females.

Although pesticides will not be bought for the project they will be used in conducting the research station and field-trials. The research teams will not be testing the pesticides but using them only for control purposes. In addition, they will be using those pesticides recommended by prior research. The pesticides will be used under strict supervision of project personnel, who will ensure that the manufactures' provide necessary toxicological and environmental data to safeguard the research personnel and the local environment; and that treated crops will not be used for human or animal consumption unless appropriate tolerances established by EPA or recommended by FAO/WHO are met. ((22CFT & 216.3 (b) (2) (iii))). Under these conditions the procedures described in 216.3 (b) (1) need not be applied to this project. ((22CFR & 216.3 (b) (2))).

It cannot be established at this time what pesticides will be used for research and field trials. Nor can it be determined what pesticides will eventually be recommended for the cropping systems package which the extension agents will eventually demonstrate. To the extent that the use of such pesticides should go beyond the research outlined above, no pesticides will be used until approved by the Assistant Administrator for Africa. ((22 CFR & 216.3 (b) (1) (v))).

### III. RECOMMENDATIONS FOR ENVIRONMENTAL ACTION

The proposed project is planned to improve and expand the capacity of the Ministry of Agriculture's research and extension training program to:

- 1) develop cropping systems recommendations relevant to the economic needs and social realities of Swazi Nation Land (SNL) farmers; and
- 2) effectively extend research recommendations to SNL farmers.

The project will have immediate, minor impacts on land and water sources within the context of agricultural research and training of extension field officers. Over the longer term, it is hoped that the project will have a significant, positive impact on the socio-economic environment of SNL farmers. To achieve this long term goal of increasing the average productivity of the Swazi small farmers, changes in traditional Swazi farming systems may be necessary. A rural sociologist on the project implementation team will conduct initial on-farm surveys and will monitor project activities to ensure that adverse impacts on the Swazi culture are avoided. No significant immediate or long term adverse impacts on the environment are anticipated from project activities. Therefore, it is recommended that a Negative Determination be made.