

5270170 (2)
PD-AAF-157-B1

UNCLASSIFIED

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

81p.

PROJECT PAPER
PERU
ON FARM WATER MANAGEMENT

Project Number: 527-0170

LA/DR:78-1

UNCLASSIFIED

4-28-77

OCT 26 1977

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR (LA)

FROM: LA/DR, Marshall D. Brown ^B

Problem: To authorize the \$497,000 FY 1978 Peru On-Farm Water Management Grant project.

Discussion: The Project Paper for the Peru On-Farm Water Management Grant was reviewed by the DAEC on May 19, 1977. Prior to recommending the project for approval, the DAEC requested that the choice of the three project demonstration sites be re-examined and the addition of a fourth be considered. The Mission's response is discussed briefly below.

In supporting the sub-goal of improving on-farm water management practices among small farmers, the purpose of the project is to develop and demonstrate the validity of alternative, improved on-farm water use management systems. Through assistance to the Directorate General of Water (DGA), the project will: (a) develop and demonstrate criteria for determining water requirements for several major crops; (b) develop and demonstrate irrigation system designs that maximize the efficiency of water application according to soil type; and (c) demonstrate the effects of improved water management practices on water use and crop production. To the extent possible, the project will also promote the possibility of utilizing alternative energy sources for pumping and irrigating, and extension bulletins will be developed and disseminated.

The GOP in collaboration with Utah State University (as part of an L.A. Regional project funded by TAB) has established an office in the DGA for conducting applied research and demonstration of on-farm water management of small irrigation systems. When the ProAg for this project was signed in February, 1975, it provided funding for approximately a two year period with the expectation for continuation after that time. Additional TAB funding, however, will not be forthcoming, and this project has been proposed in order to continue the work begun by the DGA and USU.

AID grant funds will finance a contract with USU to provide the full time services of an irrigation engineer, an agronomist, short-term T.A. in specialized fields, short-term participant training and a limited amount of commodities. The host country contribution will provide four full time counterpart technical personnel, demonstration sites, technical staff and field assistants for the demonstration sites, and commodities and equipment. Total project cost is \$707,000 of which the GOP contribution

is \$210,000 (30%), thus meeting the minimum contribution requirement of Section 110(a) of the FAA.

The \$182,000 of AID funds requested for the project's first year exceeds the level contained in the FY 1978 Congressional Presentation. An Advice of Program Change, therefore, was sent to Congress on October 4, 1977.

At the request of the DAEC, the Mission has carefully examined the desirability of adding a fourth demonstration site to the project (in the high jungle, an important agricultural area). After discussions with the DGA, it was determined that the project would be restricted to the original three sites for the following reasons: (1) highest priority is assigned to the coastal and sierra regions where most small farmers reside, irrigation is already practiced in these areas and water user organizations are also in place; (2) the development needs of the high jungle at this time are primarily for larger infrastructure projects; and (3) the DGA has installed capacity in the coast and sierra whereas it would have to finance a completely new effort in the high jungle. Given the current GOP economic austerity program, an investment of this nature is not possible. The Mission has indicated, however, that the situation will be reviewed again during the second year of the project and a recommendation made at that time regarding the appropriateness of adding an additional demonstration site.

We believe the Mission's assessment of the economic situation in Peru is accurate and that it precludes expansion of the project at this time. We therefore believe the project as presented in the PP should be approved.

Recommendation: That you approve the Peru On-Farm Water Management project by signing the attached Project Authorization and Request for Allotment of Funds (PAF) form, thus authorizing the Mission to negotiate and sign a project agreement.

Attachments: Project Paper (TAB A)
PAF (TAB B)

LA/DR:KKelly: gah:10/17/77

Wegman

AGENCY FOR INTERNATIONAL DEVELOPMENT
PROJECT AUTHORIZATION AND REQUEST
FOR ALLOTMENT OF FUNDS PART I

1. TRANSACTION CODE

A ADD
 C CHANGE
 D DELETE

PAF

2. DOCUMENT CODE
5

J. COUNTRY/ENTITY

Peru

4. DOCUMENT REVISION NUMBER

5. PROJECT NUMBER (7 digits)

[527-0170]

6. BUREAU/OFFICE

A. SYMBOL

LA

B. CODE

[05]

7. PROJECT TITLE (Maximum 40 characters)

[On-Farm Water Management]

8. PROJECT APPROVAL DECISION

ACTION TAKEN

A APPROVED
 D DISAPPROVED
 DE DEAUTHORIZED

9. EST. PERIOD OF IMPLEMENTATION

YRS. [0] [3]

QTR. [1]

10. APPROVED BUDGET AID APPROPRIATED FUNDS (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. 1ST FY 78		H. 2ND FY 79		K. 3RD FY 80	
		C. GRANT	D. LOAN	F. GRANT	G. LOAN	I. GRANT	J. LOAN	L. GRANT	M. LOAN
(1) FN	210	022		189		191		117	
(2)									
(3)									
(4)									
TOTALS				189		191		117	

A. APPROPRIATION	N. 4TH FY		O. 5TH FY		LIFE OF PROJECT		11. PROJECT FUNDING AUTHORIZED THRU (ENTER APPROPRIATE CODES) 1 - LIFE OF PROJECT 2 - INCREMENTAL LIFE OF PROJECT	C. FY
	D. GRANT	P. LOAN	R. GRANT	S. LOAN	T. GRANT	U. LOAN		
(1) FN					497			
(2)								
(3)								
(4)								
TOTALS					497			80

12. INITIAL PROJECT FUNDING ALLOTMENT REQUESTED (\$000)

A. APPROPRIATION	B. ALLOTMENT REQUEST NO.	
	C. GRANT	D. LOAN
(1) FN	189	
(2)		
(3)		
(4)		
TOTALS	189	

13. FUNDS RESERVED FOR ALLOTMENT

TYPLED NAME (Chief, SERVICEMEN) *180*

SIGNATURE: *Mansoor Baker*
DATE: *Nov. 4, 1977 (as of 10/1/77)*

14. SOURCE ORIGIN OF GOODS AND SERVICES

000 941 LOCAL OTHER

15. FOR AMENDMENTS, NATURE OF CHANGE PROPOSED

FOR PPC/PIAS USE ONLY	16. AUTHORIZING OFFICE SYMEOL	17. ACTION DATE	18. ACTION REFERENCE (Optional)	ACTION REFERENCE DATE
		MM DD YY		MM DD YY

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

**ASSISTANT
ADMINISTRATOR**

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS

PART II

Name of Country: Peru
Name of Project: On-Farm Water Management
Project Number: 527-0170

Pursuant to Part I, Chapter 1, Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize a grant to the Government of Peru (the "Cooperating Country") of not to exceed One Hundred Eighty-Nine Thousand United States Dollars (\$189,000) (the "Authorized Amount") to help in financing certain foreign exchange and local currency costs of goods and services required for a project which will establish three research/demonstration sites which will create and demonstrate alternative water/land use systems for increasing productivity on small farms ("Project"). One Hundred Eighty-Nine Thousand United States Dollars (\$189,000) of the A.I.D. financing herein authorized and approved for the Project will be obligated when the Project Agreement is executed.

I approve the total of A.I.D. appropriated funding planned for this Project of not to exceed Four Hundred Ninety-Seven Thousand United States Dollars (\$497,000) grant funding including the funding authorized above during the period FY 1978 through FY 1980. I approve further increments during that period of grant funding up to \$308,000, subject to the availability of funds in accordance with A.I.D. allotment procedures.

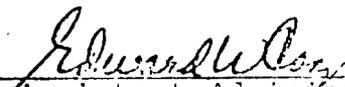
I hereby authorize the initiation of negotiation and execution of the Project Agreement by the officer to whom such authority has been delegated in accordance with A.I.D. regulations and delegations of authority subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate:

A. Source and Origin of Goods and Services

Except for ocean shipping, goods and services financed by A.I.D. under the Project shall have their source and origin in the United States or in the Cooperating Country, except as A.I.D. may otherwise agree in writing. Ocean shipping financed under the grant shall be procured in the United States.

B. Conditions Precedent to Initial Disbursement

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement, the Cooperating Country shall furnish in form and substance satisfactory to A.I.D.: (1) evidence that construction of the irrigation systems at the Canete and Huancayo Project Research/Demonstration Farm Sites has been completed; (2) evidence of satisfactory arrangements for DGA field staffing at all three Project farm sites and (3) a detailed plan, including timing and amounts, demonstrating the commitment of the Cooperating Country to contribute approximately 30% of the total direct Project costs required for implementing the Project.



Assistant Administrator
Latin America Bureau

Nov 3, 1977
Date

Clearances:

LA/DR, CWeinberg ^{CB} _____ Date _____
LA/SA, RWeber _____ Date _____
LA/DR, KKelly KL _____ Date 10/18/77


GC/LA, J/Kessler:lb:9/30/77

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

1. TRANSACTION CODE
 A ADD
 C CHANGE
 D DELETE

2. DOCUMENT CODE
3

3. COUNTRY ENTITY
PERU

4. DOCUMENT REVISION NUMBER

5. PROJECT NUMBER (7 digits)

6. BUREAU OFFICE
 A SYMBOL B CODE

7. PROJECT TITLE (Maximum 40 characters)

8. ESTIMATED FY OF PROJECT COMPLETION
 FY

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

10. ESTIMATED COSTS (\$000 OR EQUIVALENT \$)

A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FA	C. C	D. TOTAL	E. FX	F. C	G. TOTAL
AID APPROPRIATED TOTAL	175	14	189	458	39	497
GRANT	175	14	189	458	39	497
LOAN						
OTHER						
1. U.S.						
2.						
HOST COUNTRY		70	70		210	210
OTHER DONORS						
TOTALS	175	84	259	458	249	707

11. PROPOSED BUDGET APPROPRIATED FUNDS (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. 1ST FY <u>78</u>		H. 2ND FY <u>79</u>		K. 3RD FY <u>80</u>	
		C. GRANT	D. LOAN	F. GRANT	G. LOAN	I. GRANT	J. LOAN	L. GRANT	M. LOAN
(1) FN	210	022		189		191		117	
(2)									
(3)									
(4)									
TOTALS				189		191		117	

A. APPROPRIATION	N. 4TH FY		O. 5TH FY		LIFE OF PROJECT		12. IN-DEPTH EVAL. SCHEDULED MM YY <input type="text" value="18"/> <input type="text" value="1"/>
	C. GRANT	P. LOAN	R. GRANT	S. LOAN	T. GRANT	U. LOAN	
(1) FN					497		
(2)							
(3)							
(4)							
TOTALS					497		

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

n/a 1. NO
 2. YES

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE: **Leonard Yaeger** *[Signature]*

TITLE: **Acting Mission Director**

DATE SIGNED:

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

CONTENTS

	<u>Page</u>
Part 1. SUMMARY AND RECOMMENDATIONS	
a. Recommendations	1
b. Summary Description of the Project	1
c. Summary Findings	2
Part 2. PROJECT BACKGROUND AND DETAILED DESCRIPTION	
a. Background	6
b. Detailed Description	13
Part 3. PROJECT ANALYSES	
a. Technical Analysis	20
b. Financial Analysis	24
c. Social Analysis	24
d. Economic Analysis	31
Part 4. IMPLEMENTATION PLANNING	
a. Administrative Arrangements	37
b. Implementation Plan	38
c. Evaluation Plan	42
d. Conditions and Covenants	43
 <u>Annexes</u>	
A. Project Technical Details	
Attachment 1 - Illustrative Plan for Interaction Demonstration	44
Attachment 2 - Organization Chart of DGA	47
B. Logical Framework Matrix	48
C. Project Performance Tracking Network Chart	49
D. Statutory Checklist	51
E. Grantee's Application for Assistance	62
F. Initial Environmental Examination (IEE)	63
G. Draft of Project Description to be Used in Project Agreement (Project Agreement, Article 2, Section 2.1)	71

Part 1. SUMMARY AND RECOMMENDATIONS

a. Recommendations

USAID/Peru recommends that AID/W authorize a Grant of \$497,000 (to be incrementally funded, with an initial \$189,000 in FY 1978) to assist the Government of Peru, through its Directorate General of Waters of the Ministry of Agriculture, to implement the project for improved On-Farm Water Management for small farmers proposed in this Project Paper.

b. Summary Background and Description of the Project

Almost 50% of Peru's population resides in the Rural Sector and is dependent on agriculture for a livelihood. However, high underemployment, low-incomes and low productivity characterize the population of this sector. Despite notable GOP efforts in the last few years in a number of key development programs, including the Agrarian Reform Program, large public investment in irrigation, liberal production credit terms, etc., levels of living remain very low among the country's small farmers who comprise the bulk of the agriculture sector population. This is due largely to a number of reasons which include, inter alia, lack of technological know-how. Agricultural production is also severely constrained by the limited amount of arable land, harsh topography and climatic conditions in the Sierra, and scarce and uncontrolled water supplies.

Due to these factors irrigation and optimum utilization of scarce water resources to increase agricultural production rank among the Government of Peru's top development priorities. This proposed On-Farm Management Project is aimed at improving the incomes and overall economic status of the target farmer through the creation and demonstration of alternative water/land use systems for increasing productivity on small farms.

Specifically the project will:

- a. Conduct systematic research of soil, water and plant interrelationships for major crops in Peru;
- b. Demonstrate the effects of improved water management practices on water use and crop production; and
- c. Develop irrigation system designs that optimize water application according to soil type, fertilizer utilization and crop.

The project will be implemented at three different sites to test and demonstrate more precise coefficients of soil-water-fertilizer relationships. To the extent possible the project will also

promote the possibility of utilizing alternative sources of energy (gravity flow, wind, hydraulic, etc.) instead of diesel oil, gasoline or electricity for pumping and irrigating. Practical extension bulletins will be developed and disseminated.

The three locations where project research/demonstration sites will be established and operated are at La Molina (adjacent to the National Agrarian University) outside of Lima; Cañete approximately 148 Kms. south of Lima on the coast; and Huancayo, in the large agriculture producing Mantaro Valley (in the high Peruvian Sierra).

Utah State University (USU) will implement the project for AID under a contract whereby USU will provide the full time services of an Irrigation Engineer (36 months) and an Agronomist (24 months). Up to six months of short-term technical assistance in specialized fields of soil physics, biometeorology, field plot techniques and extension methods will also be provided by USU consultants. A limited amount of commodities will be provided under the AID grant, including laboratory equipment, water measurement devices, and soil sampling equipment. Some overseas training of Peruvian project counterparts will be provided in selected technical areas as irrigation research and extension methodologies, and other agronomic or engineering areas relevant to project needs. Training will be short term and academic, non-degree in nature.

The Government of Peru implementing agent will be the Ministry of Agriculture's Directorate General of Waters (DGA). The DGA will assign four full-time counterpart technical personnel, three demonstration farm engineers and other technical personnel and field assistants.

c. Summary Findings

1. Priority

A number of studies and evaluations have demonstrated that inefficient water use in Peru is a widespread phenomenon and is caused primarily by a lack of basic data on water requirements by crops and soils types. The proposed On-Farm Water Management Project provides for systematic research of key soil, water and plant (crop) interrelationships in Peru. This research and subsequent demonstration trials and outreach should contribute significantly to reduced crop production costs and conservation of scarce water supplies.

The proposed project is directly supportive of the high priority the GOP has assigned to increasing agricultural production and improved and increased use of scarce water resources for irrigation, and is responsive to Congressional directives in that it will lead to a corresponding increase in the economic welfare of the small farmer.

2. Readiness for Implementation

The Government of Peru in collaboration with Utah State University (under contract with AID through prior funding arrangements) has established a special office within the Ministry of Agriculture's Directorate General of Waters for carrying out applied research and demonstration of on-farm water management of small irrigation systems. Much basic research on water-soil type requirements has been undertaken to date at DGA headquarters site (La Molina) through a Project Agreement (ProAg 24) entered into between AID and the Ministry of Agriculture/DGA in February 1975. The proposed On-Farm Water Management Project will continue the work begun by the Ministry of Agriculture/DGA and Utah State University under ProAg 24 and will determine the necessary water-soil-fertilizer coefficients for major Peruvian crops, necessary for optimizing the use of scarce water resources while simultaneously maximizing small farmer agricultural production. The project will expand and strengthen the GOP's on-farm water use demonstration and irrigation extension network. Project research/demonstration sites have already been selected; one is in full operation (La Molina) and the other two are currently being set up for conducting necessary soil-water-fertilizer interaction studies for key crops.

It is the Mission's judgement that the project as outlined in the Project Paper will be ready for implementation according to the Project Implementation Plan/Schedule beginning January 1, 1978. In order to meet the project initiation target date the Ministry of Agriculture's Directorate General of Waters counterpart personnel must continue collaborative work with the University of Utah technicians to establish the remaining two project Research/Demonstration Farm sites at Cañete and Huancayo.

Funding in ProAg 24 in conjunction with funds under a TAB centrally funded contract with USU under which much of the pre-project activity is being developed will be exhausted shortly. ProAg 24 was signed in February 1975 and provided U.S. Technical Assistance for an initial period of approximately two year with the expectation for continuation after that time. It should be noted that even prior to the determination that the TAB Water Management Research Project would be phased out during FY 77, the Mission had indicated in May 1976 (LIMA 4169) that it highly recommended a Title XII project be developed to expand and extend the work initiated by USU under the regional project. With the unexpected notification that future TAB funding would not be available and in the interim while the Title XII board and guidelines were being organized, the proposed On-Farm Water Management project was developed as a regular USAID/Peru Technical Assistance project at a minimum level of effort to carry forward the applied research under-

way and planned. The project has been developed in full collaboration with USU, however, and may rightfully be considered a Title XII project. At AID/W's discretion the project may be implemented through Title XII mechanisms at the described or somewhat higher level of effort. In this regard the Mission and DGA envision the need for a third phase of collaboration to assist in the formal establishment of a national water management extension service beginning in FY 79 or 80. Such an effort could be incorporated into the currently proposed Title XII project or can be conceived as a subsequent separate activity.

To provide continuity between the prior TAB funded research effort and the project proposed herein, TAB has agreed to pick up and provide funding for the USU Irrigation Engineer (Olsen) through December 1977 and the USU Agronomist (Kidman) through June 1977. (See State 009823 and State 000589). In order to successfully achieve the outputs and purpose of the proposed On-Farm Water Management Project the full-time services of the USU Agronomist will be needed to complement the services of the full-time Irrigation Engineer during the first 2 years of the project. The services of the Agronomist are also crucial during the pre-project stage of setting up the project Research/Demonstration Farms. The Mission is therefore requesting that TAB also provide interim funding for the Agronomist through December 1977.

The Mission, USU and DGA technicians have worked closely to develop the proposed project which is essentially a refinement and expansion of work initiated under ProAg 24. The DGA has indicated the indispensable role it attributes to the USU technicians in implementing the proposed project. Under the project the number of counterpart personnel from DGA will be increased over those presently working with the USU technicians. The USAID is confident that DGA will continue to provide sufficient technical and administrative personnel of the same high calibre demonstrated to date.

It is important to note that the project is not creating new research per se. The project is one of applied research to refine water/soil (and as, appropriate, fertilizer) coefficients to optimize irrigation/land use practices in Peru. The technical and economic soundness of the types of applied research to be undertaken and demonstrated under the On-Farm Water Management Project have been proven through experiments and experiences in other countries, as illustrated in the examples contained in Part 3.d., Economic Analysis section, of this Project Paper.

The project meets all applicable statutory criteria as recorded in the Statutory Criteria Checklist (Annex D to the

Project Paper). The Mission has undertaken a complete Initial Environmental Examination of the environmental aspects of the project and has arrived at a recommendation for a Negative Determination.

Part 2. PROJECT BACKGROUND AND DETAILED DESCRIPTION

a. Background

1. General

Due to the limited agricultural land base, high population density, and erratic and/or limited rainfall, water is a scarce resource in Peru. The improved management of this limited resource could permit a substantial increase in agricultural production and a corresponding improvement in the economic and social welfare of small farmers which comprise the bulk of the country's agriculture sector population.

A number of studies have demonstrated that inefficient water use is a widespread phenomenon in Peru. One of the reasons for this is lack of basic data on water requirements by crop and soil type. In order to overcome this deficiency, a program was developed by AID and the Government of Peru (GOP) to provide for the systematic research of key soil, water, and plant interrelationships in Peru. AID contracted with Utah State University (Contracts AID/csd-2167 and AID/ta-c-1103) to assist selected countries in the optimum utilization of water resources for agricultural production. An agreement (hereafter referred to as ProAg No. 24) was made in February, 1975, between AID, Utah State University (USU), and the GOP represented by the Ministry of Agriculture (MinAg) through its General Directorate of Water (DGA) to undertake a project to:

- i. Develop criteria for the determination of water requirements of several major crops; and
- ii. Develop irrigation system designs that maximize the efficiency of water application according to soil type.

For these purposes AID has provided, through USU, the full-time services of an agricultural engineer, and since September, 1976, a full-time agronomist.

The February 1975 agreement (ProAg No. 24) provided for an initial project duration of two years, with further extension beyond the two years contemplated.

2. Accomplishments to Date

The collaborative efforts of DGA and USU have resulted to date in the following accomplishments:

A special office (Directorate of Conservation, DICO) has been established in the DGA for applied research and demonstration in the on-farm water management of small farmer irrigation systems. Three Peruvian agricultural engineers and one agronomist have been assigned as full-time counterparts for the agricultural engineer and agronomist from the USU, (henceforth referred to as the DGA team). In addition, the DGA has allocated a full-time secretary, office space, and equipment to the program. (Annex A, Attachment 2, contains an organization chart of the DGA.)

An agreement was signed between the MinAg and the Ministry of Food (MinFood) which allocated a one hectare plot of land for the DGA team to conduct research at the MinFood's Regional Center for Agricultural Research (CRIA) at La Molina on the outskirts of Lima. All facilities of the CRIA station have been made available as necessary in the development of experiments at that site.

One-half of the CRIA plot has a furrow irrigation and the other a drip irrigation system. Water control and measurement devices have been installed and have been in continuous use.

A corn experiment was carried out on both halves of the plot to train DGA counterparts in the operation of the total research system prior to an involvement in a more complex interaction study.

In collaboration with the International Potato Center (CIP) located adjacent to the CRIA plot, a water - fertilizer - production interaction study was inaugurated with potatoes on the furrow irrigated plot in December 1976. (See Annex A, Attachment 1, for further details and illustrative example of work plan and project layout for interaction study.) This experiment is still continuing and requires daily moisture monitoring and irrigation every other day, as well as the normal insect and weed control. Harvesting is expected in April, 1977 and a complete analysis by June, 1977.

A similar experiment with potatoes will be initiated on the drip irrigated side in June, 1977. In the interim period, i. e., March to June, four short-term vegetable crops will be planted in order to

give the DGA counterparts on -the-job training in using the drip irrigation system and to demonstrate its flexibility.

Close contacts are maintained with the professors of the Soil and Water Department (DRAT) of the National Agrarian University at La Molina located adjacent to the CRIA. The DGA team research plot is used as a field laboratory for certain classes. Some students have done parts of their B. Sc. thesis work on specific aspects of the DGA team's work. Upon graduation they are encouraged to continue working with the DGA program; some will likely be employed eventually by DGA. This integration of academic training, applied field research work and employment opportunities in the same subject area is expected to be an important part of both the DGA and University programs.

Cross-sectional meteorological data has been collected from over 50 weather stations in Peru. These data are being processed at USU in order to provide statistically based frequency and dependability of monthly rainfall data and to develop a method for the estimation of potential evapotranspiration.

A formal agreement has been signed between the MinAg and the Ministry of Education to develop a research/demonstration irrigation system on 8 hectares of the Agricultural Technical Institute located at Cañete, a large coastal agricultural area about 150 Kms. south of Lima.

3. Work Remaining to be Done

After some 8 months of deliberation and negotiations between the various institutions involved, the Cañete Research/Demonstration Farm is ready for implementation. The design of this system will be based on the recommendations of the DGA team. Implementation will be by students using the Agricultural Technical Institute's equipment. Short instructional sessions will be given to the students by various team members to complement the in-the-field training. Upon graduation many of these students will return to their family farms in areas scattered throughout Peru, and could serve as an important means of transferring new technology to these areas as well as acting as future possible extension agents.

An 8 hectare Research/Demonstration Farm is being established in Huancayo (in the large agricultural producing valley of Mantaro). It is expected to reach an implementation stage after the rainy season and before the end of 1977. All three DGA Research and Demonstration Farms, i. e., La Molina /CRIA, Cañete and Huancayo, will form a basis for developing an eventual planned national extension program in irrigation management.

Research should continue on the three farms initiated under ProAg No. 24 to develop fertilizer-irrigation recommendations for the important major crops in Peru and to confirm in the field that the consumptive use prediction equations are valid. In order to have statistically reliable recommendations, the research should be planned to be a continuing endeavor by the DGA. Each recommendation should eventually have back-up research data covering at least five cropping cycles. The fertilization and water requirement recommendations produced will not be site specific. They will be developed and presented in such a manner as to be applicable to all agricultural zones in Peru. The manner of applying the recommendations, however, will vary by site, mostly according to soil type. The site differences will necessitate adaptive demonstrations and farmer field trials in order to confirm the precise amounts and timings of water and fertilizer application for a specific crop on a certain soil type in a given irrigation district in Peru. For example: In Zone A the prediction equation based on climatological information for the zone determines that 32 inches of water will be required to bring to maturity the particular crop in question. The average daily demand being 0.5 inches per day. The crop in Zone A has a rooting depth of 24 inches, and the soil is capable of storing 2 inches of available water per foot of depth for a total of 4 inches in the effective root zone of the crop. Therefore, the crop must be irrigated at least 8 times to give the required 32 inches of water. With the crop using 0.5 inches per day from the 4 inches stored in the soil, 8 days will be required to consume all the water stored and the crop must be irrigated at the 3 day frequency. It has been determined from the water-fertilizer-production interaction studies that when 32 inches of water are applied 200 Kg/ha. of nitrogen must also be applied in the fertilizer in order to achieve the optimum economic return from this crop.

For Zone B the prediction equation for consumptive use of water determines that 25 inches of water will be required to bring

the same crop to maturity. The average daily demand being 0.36 inches per day. The crop in Zone B has the same rooting depth, but the soil has a heavier texture and is capable of storing 2.5 inches of available water per foot for a total of 5 inches in the effective root zone. Therefore, the crop must be irrigated only 5 times to give the required 25 inches of water. At a daily demand rate of 0.36 inches per day the crop will require 14 days to consume the 5 inches stored in the soil and must be irrigated again at a 14 day frequency. It has been determined from the water-fertilizer-production interaction studies that when 25 inches of water are applied under these conditions 175 Kg/ha. of nitrogen will give the optimum economic return.

Site specific recommendations can be made for any agricultural zone once a reliable prediction equation is available for determining the amount of consumptive use requirement from climatic data, the basic water-fertilizer-interaction function is understood for the crops in question, and data relating to soil physics are collected and analyzed. Demonstrations and farmer field trials in each specific zone will be needed to confirm and solidify the field recommendations for that zone.

Extension data will be developed relating the potential evapotranspiration and rainfall studies to local soil types and crop water requirements. The meteorological study will be correlated with the field results obtained from the intensively instrumented studies at La Molina as well as data forthcoming from the additional project Farms.

4. Relationship to Other AID Activity

In September 1976 a loan for US\$11 million was signed between the GOP and AID to establish a pilot project to improve water and land use in two large agricultural producing valleys of the sierra, the Mantaro and Cajamarca Valleys. The loan provides for limited technical assistance on the order of \$250,000* for improving the level of on-farm

* Total amount of TA in loan is approximately \$900,000. TA additional to the \$250,000 indicated above for improving on-farm technology of project beneficiaries is provided for assisting in sub-project implementation, overseas training, equipment for training and watershed planning studies.

technology of the project beneficiaries, i. e., small farmers. An Irrigation Research Advisor (Irrigation Out-Reach Advisor), an Irrigation Extension Specialist, and up to 14 man-months of short term consultation are provided for. The Irrigation Out-Reach Advisor was programmed for 18 months beginning in June, 1977, and the Irrigation Extension Specialist was programmed for 18 months beginning in January, 1978. The date of arrival of both experts will most probably be delayed at least six months.

The Irrigation Out-Reach Advisor will be responsible for conveying new technology related to improved irrigation efficiency to the farmers in the Mantaro and Cajamarca Valleys. Specific objectives of the program of research under the Irrigation Out-Reach Advisor are: (1) to determine water requirements for principal crops, and (2) develop criteria for designing alternative irrigation systems in order to obtain maximum efficiency in water requirements for varying soil types and crops. Areas to be investigated include: evapotranspiration, design of irrigation systems, scheduling water distribution and water measuring instruments.

Extensive consideration has again been given by USAID/Peru as to the precise relation of the On-Farm Water Management activity to the Sierra Irrigation loan. (At the time of the drafting of the Capital Assistance Paper for the loan, the USU Water Management Research project had only recently been initiated and its future direction and anticipated contribution to the Sierra loan activity could only be estimated projections. Similarly, approximately two years intervened between the drafting of the loan paper and the signing of the loan agreement requiring an updating of loan-funded TA requirements). The result of the review indicated the continuing requirement for site specific technical assistance under the loan building upon the complementary applied research and demonstration activities of the proposed grant project. The latter will reinforce and enhance the quality and timeliness of the technical assistance provided under the loan, as elaborated in the following paragraphs.

The work initiated under ProAg No. 24 and continued under the On-Farm Water Management Project will establish a Research/Demonstration Farm in the Mantaro Valley that will be generating much of the needed basic information necessary to

establish water requirements and fertilizer recommendations for the principal crops in the Mantaro Valley. During the limited 18-month period that the loan-funded Irrigation Out-Reach Advisor is in Peru he will be able to concentrate on the site specific recommendations for the various soil types and sub-climates within the Mantaro Valley using the basic principals and inter-relationships discovered by the DGA Research team. Using the DGA demonstrations and pilot field trials as a guide, the Irrigation Out-Reach Advisor will be able to establish a much denser network of farmer field trials in sites representing all conditions of soil, climate, and topography within the Mantaro Valley. He will be able to reach this stage of his work at a much earlier time after his arrival because of the work initiated by the DGA research team. There will be a written agreement between MinAg /AID to assure congruency between the Sierra Loan Technical Assistance Program and the On-Farm Water Management Program. This agreement will also assure appropriate participation by the two technicians to be financed here-under in both the Mantaro Valley and Cajamarca aspects of the Sierra Loan.

The Cajamarca area will also require detailed attention from the Irrigation Out-Reach Advisor. The same site specific objectives that apply in Mantaro will be required in Cajamarca. With the basic data provided by the DGA team and the experience gained by his counterparts on the accelerated Mantaro program, the Irrigation Out-Reach Advisor will be able to devote more time to a rational plan of site-specific research (if necessary, in addition to Huancayo) and demonstrations in the Cajamarca Valley. If a research/demonstration farm is deemed necessary for specific problems encountered in Cajamarca, the basic designs and experience gained from the Huancayo installation will accelerate the development of a Cajamarca research/demonstration farm. Most probably the Cajamarca Farm would be more demonstrative in nature. It would be used to confirm that the recommendations adopted from the basic information provided by the DGA research team are realistic and can be demonstrated to work in the Cajamarca situation. A dense network of farmer site specific field trials would then be developed to include all of the sub-climates and soil types to be found in the Cajamarca Valley.

The Irrigation Extension Specialist will be responsible under the terms of the Sierra Loan to participate in institutional development aspects, including: design of the regional extension program, organizing regional extension teams, and advising on training materials and methods. In addition he will assist counterparts in the DGA and Agrarian Zonal Offices in developing on-going training programs to upgrade the skills of existing extension specialists, etc.

The technical manuals, bulletins, and extension aids to be developed by the On-Farm Water Management Project will be designated to serve a national program of irrigation extension. The program to be assisted by the loan-financed Irrigation Extension Specialist will serve as a regional pilot program for the projected national effort. The materials prepared by the DGA research team will provide the loan-funded Irrigation Extension Specialist with reliable basic technical information at an earlier time so that he can concentrate on the development of the training programs and not on the preparation of the technical material. The work of the Irrigation Extension Specialist is the next logical step of development building upon the On-Farm Water Management Project and will be part of the core of a later expanded national network currently being proposed and planned by the DGA.

USAID/Peru also has other irrigation related projects to which the experts of the On-Farm Water Management Project will devote some of their time (about 10 percent). These include a Treated Sewage Project in Tacna which involves the design and development of a pilot study area to demonstrate the use of treated sewage effluent for irrigating certain agricultural crops. Also, the Mission has provided grant funds for a corn-soybean program which will require inputs from the On-Farm Water Management project experts regarding irrigation management practices related to optimizing production of corn and soybeans.

b. Detailed Project Description

1. Purpose

This project is aimed at improving on-farm water management practices among small farmers in order to increase production

by developing and demonstrating the validity of alternative, improved on-farm water use management systems. Research initiated under ProAg No. 24 will continue to develop fertilizer-irrigation recommendations for major Peruvian crops.

Using the results previously and currently being developed by the DGA team as a basis, a network of field irrigation trials will be established. This will put into actual practice the water management techniques developed on the Research/Demonstration Farm at La Molina and the Research/Demonstration Farms to be put into operation at Cañete and Huancayo.

Concurrently, the basis of a national program of irrigation extension will be developed to more effectively transfer to the small farmer the practices developed for improving on-farm water management. Appropriate technical literature and audio-visual training aids will be produced to provide for the future DGA irrigation extension program.

2. Project Outputs

The establishment and effective operation (with adequate staff and funds) of the three DGA Research/Demonstration Farms is a major output of the project. These farms will provide the basis for applied research as demonstration for application by the small farmer target beneficiary.

The project will also produce the trained technicians required to promote the demonstration and extension of better irrigation and agronomic practices among small farmers. It will expand and strengthen Peru's on-farm water use demonstration network. It will provide the data and materials necessary for the eventual development of a national program of irrigation extension. The overall agricultural production network will be increased by improving the efficiency of water and fertilizer use. Specific project outputs anticipated as a result of project activities include the following:

a. The water-fertilizer-production interaction studies initiated under ProAg No. 24 on the three Demonstration Farms will be continued throughout the duration of the project. Several

principal crops in addition to potatoes will be studied (to include, inter alia, corn, sweet potatoes, and lima beans). A minimum of 18 studies is anticipated during the 3-year project life. These investigations will provide the basic technical information necessary for the project farmer field-trial extension activities planned under the project. Approximately nine applied research reports will be written delineating the progressive results of the interaction studies.

b. The results of the evapotranspiration and irrigation water requirement studies initiated under ProAg No. 24 will be put into a practical form to be used on a regional basis. A National Irrigation Water Requirement Technical Manual will be produced within the initial year of the project delineating water requirements by crop, month, and soil type for each major irrigation district throughout Peru. Three additional extension-type irrigation manuals will also be produced during the lifetime of the project, one for each of Peru's major climatic zones.

c. The improvement of irrigation application efficiencies initiated under ProAg No. 24 will continue to be demonstrated and put into practice throughout the duration of the project. Outputs a. and b. described above cannot be achieved without the improvement of water measurement and application efficiencies. The former involves the development of simple weirs, flumes, siphons, and other control structures.

d. The results of the interaction studies which are determined to yield the optimum crop production will be put into practice on the Research/Demonstration Farms on plots of the same size as those of the small farmers in the general region. About 186 demonstrations will be conducted illustrating procedures and techniques discussed in outputs a., b., e., and d.

e. Irrigation-management field demonstration trials will be established on the plots of at least 54 local small farmers and agricultural cooperatives. These field trials are intended to show the practicing small farmer that he too can achieve the results attained on the DGA Research/Demonstration Farms by following the methods outlined by the DGA technicians.

f. About 30 extension bulletins will be prepared during the course of the project covering all aspects of improved methods of managing irrigation water on the small farm, e.g., water measurement, simple water control structures, irrigation methods, soil-plant relationships, irrigation scheduling for specific crops

and soil type, etc. To the extent possible these bulletins will be graphic and pictorial in nature.

g. Alternative energy sources for moving water will be promoted and demonstrated wherever feasible, e.g. windmills, hydraulic rams, and gravity pipe systems substituting for conventional pumping using more expensive electricity or carboniferous fuels.

h. It is not possible to predict at this time the number of small farmers which will be directly or indirectly exposed to project demonstrations. However, etween 750- 1,000 students, DGA technicians, field workers, and farmers will receive some degree of training or concentrated exposure at the three DGA Research/Demonstration Farm sites.

i. Other facets and outputs of the Project will likely include:

- promotion and adoption of improved multiple-cropping practices
- promotion and adoption of the concept of supplemental irrigation (supplemental to rainfall)
- promotion and adoption of improved surface drainage practices
- reduction in damage to crops due to frost
- reduction in plant diseases

3. Inputs

a. AID Contribution

The following description of the AID project contribution is broken down according to traditional cost input categories. Part 3 b. Financial Plan, contains a project budget breakdown (for both AID and GOP contributions) according to project specific inputs as they directly relate to projected project outputs.

(1) U. S. Technicians

In order to complete and maintain the Research/Demonstration Farms partially established under ProAg No. 24 as sources for generating data and as extension training sites, it will be necessary to

continue the technical advisory services of both an Irrigation Engineer and an Agronomist. The capability of each expert complements that of the other, and will result in a balanced broad development of the demonstration program, both at the three project Research/Demonstration sites, as well as for the field trials to be established with small farmers.

USAID and USU experience has been that a full-time irrigation engineer and full-time agronomist are adequate to perform the tasks envisioned by this project. The receipt of significant on-campus backstopping as well as assistance from short term consultants support the contention that the proposed level of technical assistance is adequate. In addition to carrying out current assignments under the TAB project, the USU technicians have also assisted in the development of the Sub-Tropical Lands project. Both the Mission and technicians believe that such periodic consultations on other DGA and AID projects will not interfere with the implementation plan of this project.

Long Term Assistance (sixty months) will be provided as follows: (Estimated cost is \$298,182)

i. Irrigation Engineer (36 months) to provide assistance in irrigation systems design, development of water measurement techniques, irrigation requirement determinations and scheduling, water quality evaluation, salt balance control, drainage, water well construction, pumping, small storage reservoirs, demonstration and extension techniques, and complementary irrigation engineering services to other on-going DGA and USAID programs in agriculture/irrigation, as needed, and time permits (but not to exceed 10 per cent of his time).

The Irrigation Engineer will provide the overall leadership to the project. He will have the prime responsibility, together with the Director of DGA, for all project relations with any other institutions, as well as all engineering aspects of the program, such as field layout, soil physics determinations, irrigation system design, water control and measurement, water quality analyses, etc.

Field work on the Research/Demonstration Farms will be a continuing year around effort (there is no winter season to interrupt the cropping schedule) leaving very little time between crops for the analyses of results and the planning of future demonstration for the personnel most directly concerned with the field work. The analyses of data and the projection of future activities as well as the generation of the necessary technical reports will necessarily be the major responsibility of the Irrigation Engineer, based upon the data provided him by the Agronomist.

ii. Agronomist (24 months) to provide assistance in the determination of crop water requirements, collection of meteorological data, soil-water-fertilizer analyses, irrigation timing and amount, crop management practices under irrigated conditions, soil/water determination, demonstration and extension techniques.

The Agronomist's deeper understanding of soil and plant water related problems as well as the cultural management practices related to crop growth will necessarily give him the key role in the development and management of the water-fertilizer interaction studies as well as the farmer field trials. Both the Irrigation Engineer and the Agronomist will play important parts in the development of training aids and extension bulletin type material required to implement extension activities and the projected national irrigation extension program.

(2.) Short-term consultants (Up to six months), when needed in specialized fields such as soil physics, biometeorology, field plot technique, small structure design and extension methods as related to on-farm water management. (Estimated cost is \$24,150).

(3.) Campus Technical Backstopping (Estimated cost is \$45,000).

On-campus computer facilities and technical assistance will be provided by USU for:

- i. The analyses of meteorological data on existing computer programs and the generation of the technical results required for the production of a National Irrigation Water Requirement Manual and the extension bulletins oriented towards evapotranspiration/water requirements.
- ii. The statistical analyses of the data produced by the water-fertilizer -production interaction studies and the presentation of the results in graphic form,
- iii. The development and calibration of simple water measuring devices and control structures.

(4.) Commodities Various imported items will be financed by AID. These include laboratory equipment, water measuring devices, soil water determination equipment, pipe, hydraulic rams, pumps, windmills, sprinklers, soil sampling equipment, and a four-wheel drive carry-all vehicle. (Estimated cost is \$19,000.)

(5) Participants

U. S. or third country short-term training will be provided to six (6) trainees selected from the DGA project counterparts and other professional DGA personnel connected with the project. The training will be of a specialized technical nature related to crop field plot technique, on farm water management practices and equipment, irrigation extension methods, or other agronomic or engineering topics related to the successful development of the project. (Estimated cost is \$18,000.)

(6) Other Costs

Included for AID financing under this category are such costs as expendable materials, supplies, in-country travel, and in-country training. Also included is a provision for USU overhead charge calculated at 30% of U. S. technicians salary costs. (Estimated cost is \$92,369 of which \$53,369 is overhead).

b. GOP and Local Inputs

The project contribution of the MinAg/DGA will include both administrative and technical personnel (including four full-time counterpart technicians, three project farm engineers, three project farm technical agricultural assistants, six or more permanent field workers for the Research/Demonstration Farms, land for the Research/Demonstration farm sites, agricultural machinery, vehicles, laboratory facilities, and office space with secretaries, as required. Operating expenses for the operation of the Research/Demonstration Farms (seeds, fertilizer, insecticide, herbicide, fuel, etc.) and facilities and materials for bulletin publication also will be budgeted for by MinAg. It is estimated that the GOP will contribute approximately 30% of the total direct project costs required for implementing the project, as well as the use of demonstration/research facilities not included in direct cost estimates. In addition, the participating communities, cooperatives, and small farmers will donate land, existing facilities, and considerable time and labor toward the execution of the project, at the farm field trial level.

Part 3. PROJECT ANALYSIS

a. Technical Analysis

Three Research/Demonstration Farm sites will have been initiated under ProAg No. 24 (at La Molina, Cañete, and Huancayo) and put into full operation under the On-Farm Water Management project. The La Molina site is the smallest, comprised of one hectare, and is the most intensively instrumented. The Cañete Research/Demonstration Farm site will have 8 hectares under development and the Huancayo site 16 hectares. Under the On-Farm Water Management project all three sites will have at least one hectare devoted to water-fertilizer-production interaction studies (see illustrative layout shown in Annex A, Attachment 1) from which the optimum economic combination of water and fertilizer application for maximized yield can be determined from a randomized split-plot design for a series of important primary crops, i.e., corn, potatoes, sweet potato, etc. If the availability of either water or fertilizer is a limiting factor during a given crop season, the optimum amount of the non-limiting component can be determined from the results of this type of study which will result in the maximum yield possible under the specific conditions prevailing.

The interaction studies will also yield accurate field data on the actual water use of the crops being studied. These field results will be compared with the crop consumptive use predictions made for the same geographic zone using the equations based on meteorological data developed under ProAg No. 24. If the comparison of the two methods shows a difference in the crop water requirement, the prediction equation can be modified to give results consistent with the field measurement.

An Irrigation Water Requirement Manual will be written at a national level. It will include a procedure for determining the potential evapotranspiration based on meteorological data for all zones in Peru. Monthly crop coefficients will be included in the manual for all of the types of crops encountered in all of Peru's major climatic zones. The required meteorological data from over 50 weather stations will also be incorporated as well as an analysis of the frequency and dependability of monthly rainfall. This National Irrigation Manual will be developed at a technical level, and will be used primarily by planning engineers and irrigation extension personnel.

Thirty extension bulletins will be written at a very simple level of comprehension for small farmer consumption. These will describe, pictorially where possible, the amount and timing of water necessary to irrigate the particular crops that are found in an irrigation district or valley. Where it is a major factor in a zone, the different soil types encountered will be treated as well. The bulletins will convey information as to how long to irrigate during each watering turn throughout the crop growing period, as well as how often it will be required to irrigate. The extension bulletins will also carry the fertilizer recommendations conducive to optimum yields under the irrigation regime recommended.

The project Research/Demonstration Farms at Cañete and Huancayo will have about seven hectares devoted to demonstrating at a practical level improved on-farm water management practices using surface irrigation methods. An efficient system of water distribution ditches will be constructed, and the lengths of irrigation runs will be selected according to soil type and slope to give as uniform water application as possible. Water measurement and control structures will be installed at inlet and outlet points in the fields to enable the amounts of irrigation to be known and controllable. The overall efficiencies of irrigating individual fields will be determined and will be maximized to the extent possible.

The Research/Demonstration Farm at Huancayo will have 8 hectares under sprinkler irrigation. The sprinkler system will be powered initially by a pump. However, as soon as water is available as a result of the development under the Sierra Irrigation Loan project, the pump will be discontinued and all pressure will be developed by the effects of gravity. The operation and management of the sprinkler system will be demonstrated for the crops being studied under normal growing conditions. More important, the use of a sprinkler system in preventing or reducing crop damage resulting from killing frosts will be demonstrated when circumstances permit. Frost damage is a recurring problem in Peru's high mountain valleys.

The demonstration of an irrigation system and of its management necessarily involves the presence of a crop on the land being irrigated. The health and production of that crop is a visual indication of the quality of the irrigation system design and of its operation. The crops investigated on the one hectare devoted to interaction studies will be planted on the larger surface and sprinkler irrigation demonstration fields (at all three locations) using the fertilizer and irrigation recommendations forthcoming from the complex interaction experiments. Thus, the surface and sprinkler irrigation management systems will demonstrate efficient irrigation

engineering design, methods of controlling and measuring irrigation water, irrigation application methods (furrows using siphon tubes and sprinklers using gravity as an energy source), recommended frequencies and amounts of irrigation, fertilizer amounts, and improved crop cultural practices, i.e., tillage, plant population, seeding technique relative to placement with irrigation furrows, weed and insect control, and harvesting techniques. Except for the design of the system and the water control methods, all of these factors will be different for each crop studied and require an agronomist knowledgeable in irrigated agriculture. The yields obtained from these fields, which will be similar in size to those of the small farmers in the area, will be compared with the yields currently being obtained by the small farmer. Field days will be held at strategic times during the course of the year to show local small farmers what is being accomplished using better on-farm water management methods. Visiting farmers will be encouraged to cooperate with the personnel of the Research/Demonstration Farm in establishing small field trials on their own farms utilizing the procedures being demonstrated. The trials will be conducted in tandem with the traditional methods used by the farmer.

The site of the Huancayo Research/Demonstration Farm is in the Mantaro Valley of the high sierra. Direct communication will be established between the Farm personnel and the small farmer beneficiaries of the USAID Sierra Irrigation Loan. Water management and crop cultural practices demonstrated at the Huancayo Farm will be directly transferable to the loan project small farmers.

The Cañete Research/Demonstration fields are located on the grounds of the Cañete Agricultural Technical Institute. Of the 118 students currently enrolled 80% are from the sierra regions of Peru. The water management practices demonstrated in Cañete will be transferable to all regions of Peru to which the students go upon graduation. The ideas of water measurement and control, i.e. the methodologies, are independent of climate. The methods developed for determining the physical size of an irrigation system and the amount and frequency of irrigation will be based upon soil and crop factors which may change according to region, but the methods of analysis and design will not change. The methods learned at Cañete in a coastal valley will be applicable throughout the sierra regions.

The situation in La Molina is similar to that in Cañete. DGA personnel and University students trained at this coastal applied Research/Demonstration Farm will learn methods and techniques which will be universally applicable throughout Peru. La Molina will serve as the initial training site for personnel assigned to both the Cañete and Huancayo Research/Demonstration Farms and the headquarters for the DGA team.

Rationale for Selection of Project Sites

1. La Molina was selected because it is also the location of the GOP Regional Center for Agricultural Research (CRIA), the world headquarters of the International Potato Center (CIP), and the National Agrarian University. Professional technical assistance, laboratory facilities, and field equipment of all of these institutions are available to the project by locating there. La Molina is on the outer fringes of Lima and therefore, receives much attention from different government agencies and officials. This type of environment gives the La Molina site top priority on the research aspects of the project. The demonstration features inherent in the Huancayo and Cañete sites will be indirectly applied in La Molina by other researchers of the above mentioned neighboring institutions incorporating the practices recommended by the project personnel in their own independent studies on fields surrounding the La Molina project site.

2. Huancayo was selected because of the priority given to this valley (Mantaro) by the development of the Sierra Irrigation Loan. Of the two valleys covered by the loan, Huancayo is the first to be initiated. The project will develop the criteria and guidelines to be used later by loan personnel in the development of the technical assistance aspects of the loan. The concepts and techniques developed under the project in Huancayo will be applied by the loan first in the Mantaro Valley and will later be duplicated by loan personnel with advice from this project in Cajamarca Valley.

Sub-centers of both the CRIA and the CIP each having field machinery and laboratory facilities, are also located in Huancayo and will be available to the project through the professional cooperation which already exists.

Huancayo is an excellent location for high altitude, sierra research and demonstration. The altitude of the valley floor at Huancayo is about 11,000 ft. above sea level yet it is only six hours by road from Lima and can be easily supervised by regular visits from Lima. About one hectare of the Huancayo site will be devoted to intensive interaction research studies in addition to the demonstration objectives.

3. Cañete was selected as a coastal area where the recommendations developed for the coastal situation could be demonstrated to practicing small farmers who are removed from any direct contact with the concentration of institutions at La Molina and Lima.

Cañete is one of Peru's major agricultural areas located to the south of Lima and is also easily reached by road from

the capital city. This proximity to Lima makes frequent direct supervision possible. The DGA has a large investment in irrigation and drainage works in this important agriculture producing valley.

Another major reason for selecting Cañete over other coastal valleys is the location there of an excellent agricultural school, the Agricultural Technical Institute of Cañete. This Institute showed considerable enthusiasm in cooperating with the project in respect to assignment of land to conduct the studies, field machinery, and (most of all) the use of professional staff, field workers, and students in the development and conduction of the studies. More important, the students at this institution come to Cañete from all over Peru, but mostly from the Sierra, and will have influence in applying the techniques learned at the Institute in their home regions. They will also be part of a pool of potential extensionists for the development of the projected national irrigation extension network.

The high jungle (ceja de selva) is another important agricultural area in Peru to which consideration was given for establishment of a fourth research/demonstration site. After discussions with the DGA, the decision was made to restrict the project to the above sites and exclude a fourth site. The major reasons for this decision are: (a) highest priority is assigned to the coastal and sierra regions where most of the country's small farmers reside, where irrigation is already practiced and where water user organizations are already in place. The priority development needs of the ceja de selva are and will continue to be of the larger infrastructure type projects which will contribute to the establishment of commercial agriculture, leading eventually to a demand for irrigation systems. Also, there currently is not sufficient demand for irrigated agriculture to warrant a research/demonstration site; and (b) the DGA would have to finance a completely new effort in the selva, whereas in the coast and sierra it already has installed capacity. The current severe GOP economic austerity program precludes such an investment undertaking in the near future. In the second project year (FY 1979) the Mission will, however, review the situation and again consider the creation of a ceja de selva project site.

b. Financial Plan

A breakdown of project financing is contained in the following tables. Table I indicates total financing estimated to be required to carryout the project and the projected sources of this financing broken down by Foreign Exchange Costs (FX) and Local Currency Costs (LC).

Table II presents total project specific inputs costed out according to their relation to project outputs.

Table III shows a detailed cost breakdown for the A.I.D. project contribution.

The \$497,000 total AID project grant will be incrementally committed in two increments. The minimum amount required for obligation in FY 78 is \$189,000. The Mission will request that the remaining \$308,000 AID contribution be obligated in FY 79, \$190,000 of which will be for second year project activities and \$118,000 for the third (last) year project activities.

c. Social Analysis

The ultimate beneficiaries of the project's efforts will be the target group of small farm families throughout Peru. The project will be especially relevant to the sierra regions where approximately 55% of the population is almost entirely dependent on agriculture for a livelihood, farming individually or on cooperatively-owned parcels of land, on the average, less than 2 hectares per family. Typically,

TABLE I
SUMMARY COST ESTIMATE AND FINANCIAL PLAN
(US \$000)

Source	AID		Host Country		TOTAL
	FX	LC	FX	LC	
<u>A.I.D.:</u>					
U.S. Technical Assistance (contract), including local support costs					
a. Irrigation Engineer	218.6	8.5			227.1
b. Agronomist	128.4	8.5			136.9
c. Short term consultants	28.7	9.0			37.7
d. Campus backstopping	45.0	-			45.0
Equipment and Commodities	19.0	-			19.0
U.S. training	18.0	-			18.0
In-country training	-	5.0			5.0
Publications preparation		8.0			8.0
<u>Government of Peru:</u>					
Personnel for project admin./ management, including project site directors and local support			88.8		88.8
Field Plots			15.0		15.0
Field staff/laborers			31.5		31.5
laboratory analysis			12.0		12.0
Commodities/Equipment			48.0		48.0
Publications			15.0		15.0
TOTAL	457.7	39.0	210.3		707.0

TABLE II
COST OF PROJECT OUTPUTS
(US\$000)

<u>Project Inputs</u>	<u>Output # 1</u>	<u>Output # 2</u>	<u>Output # 3</u>	<u>Output # 4</u>	<u>Output # 5</u>	<u>Output # 6</u>	<u>Output # 7</u>	<u>TOTAL</u>
	Research/Demo. Farms Estab- lished (3 sites)	Water Requirements for Major Crops (National Irrig. Manual Prepared)	Interaction Studies Yielding Coefficient for Major Crops	Trained Technicians (DGA)	Small Farmer Field Trials/ Demonstrations	Trained Exten- sionists and Agric. Students (Primarily at Cañete)	Irrigation Extension Bulletins Prepared	
I. <u>A.I.D.</u>	(61.3)	(90.8)	(86.6)	(82.6)	(41.2)	(41.7)	(70.5)	(496.7)
1. U.S. Technical Assistance (contract) including support costs								
a. Irrigation Engineer	45.4	45.4	22.7					227.1
b. Agronomist	27.4	13.7	27.4	34.1	11.4	22.7	45.4	136.9
c. Short Term Consultants	1.9	7.5	11.4	20.5	20.5	13.7	13.7	37.7
d. Campus Backstopping		18.0	18.0	7.5	5.6	3.8		45.0
2. Equipment and Commodities	6.6	3.8	6.7		1.9		9.0	19.0
3. U.S. Training				18.0				18.0
4. In-country Training				2.5	1.0	1.5		5.0
5. Publications Preparation		2.4	2.4		0.8		2.4	8.0
II. <u>Government of Peru</u>	(52.3)	(49.2)	(53.7)		(24.0)	(13.3)	(17.8)	(210.3)
1. Personnel for Project Admin- istration/Management, including project site directors and local support	17.8	13.3	17.8					88.8
2. Field Plots	15.0				13.3	13.3	13.3	15.0
3. Field Staff/Laborers	6.3	11.0	11.0					31.5
4. Laborator Analysis	3.6	3.6	3.6		3.2			12.0
5. Commodities/Equipment	9.6	16.8	16.8		4.8			48.0
6. Publications		4.5	4.5		1.5			15.0
	133.6	140.0	142.3	82.6	65.2	55.0	88.3	707.0

TABLE III

Detailed Breakdown of A.I.D. Project Costs

1. AID Financed Technical Assistance		
<u>Salaries</u>		\$200,399
<u>Field Staff - LT Technicians</u>	(162,899)	
Irrigation Engineer - 36 wm	100,929	
Agronomist - 24 wm	61,970	
<u>Short-Term Technicians</u>	(15,000)	
Agronomists - 4 wm	10,000	
Irrigation Engineers - 2 wm	5,000	
<u>On-Campus Staff</u>		
9 wm - \$2,500 p. wm	22,500	
<u>Benefits</u>		42,084
21% of total salaries \$200,399	42,084	
<u>Allowances - LT Technicians</u>		78,075
<u>Education Allowance</u>	(19,810)	
Engineer dependents	16,130	
Agronomist dependents	3,680	
<u>Housing Allowance</u>	(36,775)	
Irrigation Engineer - 3 yrs.	22,485	
Agronomist - 2 years	14,290	
<u>Post Differential - LT Technicians only</u>		
10% of Salaries \$162,899	16,290	

<u>Rest and Recuperation</u>	\$ (5,200)	
Irrigation Engineer	3,100	
Agronomist	2,100	
<u>Travel and Transportation</u>	(55,000)	\$ 55,000
Home Leave and Return Home of Irrigation Engineer	13,500	
Home Leave and Return Home of Agronomist	9,500	
In-country Travel and per diem for LT technicians	17,000	
In-country travel and per diem for ST technicians - 180 days	9,000	
International travel for ST	6,000	
<u>Overhead</u>		66,870
30% Field Staff - \$177,899	53,370	
60% On-Campus Staff - \$22,500	13,500	
<u>Miscellaneous Expenses</u>	(4,275)	4,275
On-Campus Support	4,275	
2. <u>Equipment</u>	(19,000)	19,000
Laboratory equipment, water measuring devices, soil water determination equipment, pipe, hydraulic rams, pumps, windmills sprinklers, soil sampling equip.	11,500	
Four-wheel drive carry-all	7,500	
3. <u>Participants</u>	(18,000)	18,000
6-8 months ST training in crop field plot technique, on-farm water management practices, irrigation extension methods, etc.	18,000	

4. <u>Other Costs</u>	\$(13,000)	\$ 13,000
Publications	8,000	
In-Country Training	5,000	
		<hr/>
GRAND TOTAL		\$496,703
		<hr/> <hr/>

these small farmer families have an annual per capita income of between \$125 and \$250, part of which may come from supplemental non-agricultural activities such as, work in nearby mines, cottage industry, seasonal employment on coastal farms, etc. Off-farm employment opportunities are few, however, and cannot absorb surplus farm family labor which exists as a result of ever-increasing pressure of population growth on a very limited land base.^{1/} By permitting intensified exploitation of existing land resource through the improvement of on-farm water management/irrigation, the project will contribute significantly to relieving income constraints of the small farmer family target group.

For additional information on the socio-economic characteristics of the project target group, please refer to USAID/Peru Project Paper for Program for Improved Water and Land Use in the Sierra (AID-DLC/P-2132), Part III.C.

Role of Women in the Project

Since this is essentially a research and demonstration project, there can be no valid measurement of direct project impact on women in the small farmer family. Furthermore, when talking of the small farmer families in terms of the ultimate project goal beneficiaries, it is erroneous to assume reference is made only to the titular head of the family. The traditional poor small farmer family must be viewed as it actually exists, i.e., as an integral unit. The role of the "campesino" women is considerably more significant than often perceived by outsiders. She is responsible for the nutrition, health, and education of the family. She also shares in the planning, planting, cultivation and harvesting process, and often also shares responsibility for the post-harvesting grain/seed selection, storage and marketing aspects of the agricultural cycle. To the extent, then, that the project is aimed ultimately at improving the production techniques and output (and therefore, increased income) of the small farmer, ultimate project benefits will also be shared equally by the entire small farm household, men, women and children.

Although the direct impact of the project per se on women will be more limited in the short-term, it will nevertheless be significant, and women can be expected to perform a vital role at almost every level of project activity. During the course of the

^{1/} Only 11.1% of the total soils in the sierra provinces are suitable for cropping.

research and demonstration studies physical and chemical analyses will be required on hundreds of soil and water samples and plant tissues. Laboratory facilities maintained by the MOA (Ministry of Agriculture) which will be used by this project are located in Huancayo, La Molina and Lima. These laboratories are directed by and staffed predominantly by women.

When outside technical assistance is required by project personnel on insects problems, plant diseases, and their control, the Ministry of Agriculture has professional researchers many of whom are women available for consultation.

Some women go through training at the National Agrarian University (La Molina) to become agricultural engineers or agronomists. Many of these women will be in contact with the La Molina project site in their course work at the University, and will compete equally with men to be selected as engineers or agronomists by the DGA to work on this project.

Additionally, temporary field workers that will be hired by the DGA for planting and harvesting the various study and demonstration crops will be predominantly women. As these tasks are done by hand in many instances, there may be a dozen or more per hectare provided with employment at these times.

d. Economic Analysis

The type of activity this proposed project deals with lends itself very well to traditional quantifiable economic analyses. However, since the project itself focuses on research, (and subsequent demonstration), it will not be possible to undertake project specific economic analysis until the research is actually adopted by the intended target small farmer beneficiaries.

The following are illustrative examples of types of economic analyses and economic benefits which can be expected through adoption of the water/land practice recommendations emanating from the project's research. Examples 2, 3 and 4 are actual results from applied research demonstrated under TA/Agriculture-funded R&D with Utah State University in other countries.

Example 1

A hypothetical irrigation demonstration could take place in a commercial field of corn. This site could be fairly uniform in

plant population. Assume that the field was furrow irrigated. Assume also that the soil was a silt loam texture with a fairly low water intake rate after the first few irrigations in the season. The demonstration could consist simply of a strip 12 corn-rows wide that would be irrigated when the first drought symptoms occurred during midday. Water could be applied to the 250 meter-long furrows for 8 to 10 hours at each irrigation to allow for at least 8 hours of time for runoff to occur. In other words, there would be 8 hours of contact time of water in the furrow for the full length of the irrigation run.

The 12-row "treated" strip would be compared with corn in adjacent "check" rows. The check rows would be irrigated on the same frequency as the treated rows. The check rows would be irrigated by the farmer according to his regular habits. Assume that this was to apply water to the furrow and shut it off within one or two hours after it began to run out of the bottom of the field. The data in Table I could represent the results of this trial. Table I shows that the customary irrigation method was resulting in decreased yield downfield. The yield decreased regularly in successive five-sample averages from 9.22 to 5.66 kg. per plot. This would be related to decreasing soil moisture availability with decreasing furrow water contact time. The treated plots gave essentially uniform yield the full length of the field. The average yield across the whole check plot was 7.6 kg. per plot and the average yield across the treated plots was 9.3 kg., giving a 22% average increase with the improved irrigation practice. This hypothetical increase in potential yield could be obtained with very little additional investment in time or financial resources on the part of the small farmer.

Table I. Shelled corn yield results from an irrigation demonstration trial. Data are in terms of dried corn kg/plot. 1/

<u>Farmer's</u> <u>plot</u>	<u>Demonstration</u> <u>plot</u>
9.3	8.6
8.7	9.0
9.7	9.2
8.5	8.9
9.9	9.5
(9.22, 0.27)	(9.04, 0.15)
7.9	9.9
9.7	10.0
8.2	9.5
8.4	9.1
7.4	8.9
(8.32, 0.38)	(9.48, 0.21)
8.5	9.0
7.4	9.4
6.8	10.2
6.2	9.8
7.1	9.0
(7.20, 0.38)	(9.48, 0.23)
5.5	8.9
5.5	8.5
5.9	8.9
5.0	9.5
6.4	10.2
(5.66, 0.23)	(9.20, 0.30)

1/ The data in parentheses are the mean and S \bar{x} of each successive 5 sub-sample group.

Example 2

TAB/USU project observations made in Chile's Aconcagua Valley indicated that a serious problem related to irrigation crop production was the very slow water intake rate of the silty soils in the valley. An experiment was established in which the variable imposed on the soil consisted simply of varying amounts of crop litter that were worked into the soil by plowing. This had the effect of allowing the irrigation water to enter into the soil and be retained there for crop use more effectively. The yield results on corn showed that this technique alone could increase yields by 38%. This increase in yield reflected the increased water availability which resulted from an improvement in soil moisture infiltration during irrigation.

The results of this pilot trial indicated that the problem of limiting soil moisture availability because of poor soil structure and poor irrigation water intake rate could be overcome through the adoption of specific water management practices. It was evident that crop residue incorporation, including that of corn, wheat, and many other crops grown in the area, should have been a standard practice. The added management costs with this practice would be insignificant compared with the benefits that would accrue. It is probable that a permanent adoption of this practice would have a cumulative effect. In other words, as root and top growth were increased by improved soil conditions, greater amounts of residue would be available for incorporation in subsequent seasons thus bringing a greater depth of soil to the optimum water holding capability.

Example 3

A three year program involving research and demonstration on modern concepts of irrigation management for corn was conducted in Chile's Aconcagua Province. Irrigation, land management, fertility, corn variety and plant population were emphasized. Results proved that yield potential of corn was well above the current level of production. By adopting the practices recommended, corn producers could increase yields at least 150% with the resources they currently had available. While all of the research was conducted in the Aconcagua Province, the technology can be transferred to other provinces in the corn producing area with slight modification or adaptation.

As an example of potential yield increases and their economic significance to corn producers, the average cost of production was computed using the data from the 1970-71 demonstration experiments. These cost figures were based on average corn yield of 45 qq/ha. for the period 1967-70. Total production cost per hectare, excluding

nitrogen fertilizer, was E° 4,251. The corn yield results were evaluated in terms of production costs. Figure 1 shows the relationship between production cost and returns. The average price for corn in 1971 was about E° 100 per quintal. Accordingly, the gross return per hectare and the cost of production are nearly equal at the 0-nitrogen level. At the 100 kg. of N per hectare there was an increase of 64% in yield of corn with only a 9% increase in production costs. At 200 kg. of N per hectare there is an increase of 96% in yield of corn with an increase of 21% in production costs.

It should be emphasized that the increase in corn yields presented here were obtained not only under controlled experimental conditions, but also under existing conditions of private farms and agrarian reform centers. While the program activities were limited to corn in the Aconcagua Province, the recommendations may be applied in the other corn producing areas, and many of the management techniques can be applied to other crops as well.

Example 4

Experiments in El Salvador and Brazil show that on certain soil types yields on corn were being depressed by 12% to 44% below the optimum possible by over irrigation which was eliminating the effectiveness of valuable nitrogen fertilizer in the root zone. The amount of yield depression was greatest (44%) where less nitrogen fertilizer had been applied. Once this problem was made apparent to the farmers and technicians in the area, adoption of better programs of managing the timing and amount of irrigation at essentially no additional cost to the farmer provided increased yields.

The research and demonstration program contemplated under this On-Farm Water Management Project will verify in Peru these and others examples of economic increase in agricultural production, and will make the improved water management practices available to the small farmer. The results of this program will also provide the means of making more precise economic analyses of the effect of improved practices on the future agricultural production for any region in Peru being considered for more development inputs.

Figure 1 to Example 3

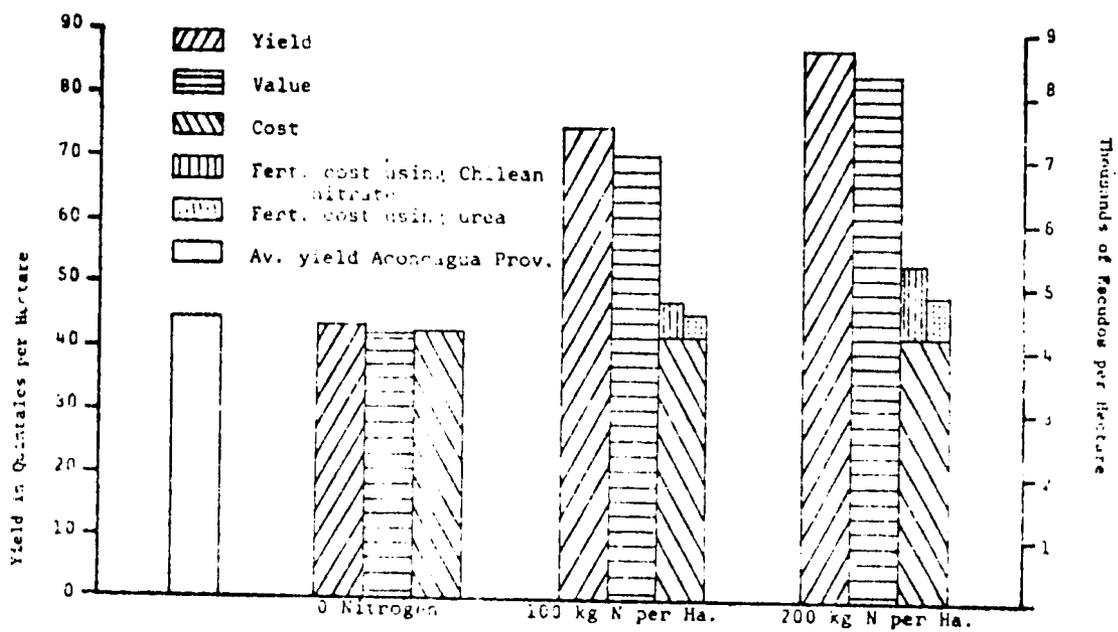


Figure 1. Average Yields, Production Costs and Gross Value of Corn Produced on Demonstration Plots - Aconcagua.

PART 4 - IMPLEMENTATION PLANNING

a. Administrative Arrangements

1. Participating GOP Agencies

Administration of project activities will be carried out by the General Directorate of Water Resources (DGA) in the Ministry of Agriculture (MOA).

MOA

The MOA shares its leadership of certain aspects of the agricultural sector with the Ministry of Food (MOF), but is the GOP agency most directly concerned with the preservation, improvement, and efficient use of renewable agricultural resources and the promotion of rural organizations associated with agriculture. Organizationally the MOA has clear lines of internal responsibility among its directorates, its small number of autonomous dependencies and its zonal administrations.

DGA

The Organic Law of the Agricultural Sector places the DGA in charge of the preservation, conservation, and utilization of water resources and preservation of agricultural lands. Specific objectives of the DGA are: i) the efficient administration of water and land resources; ii) rehabilitation and preservation of agricultural soils, and increased water supplies for agricultural production; iii) education of farmers on the importance of rational utilization and conservation of water and land resources; and iv) long term planning of water supplies to meet future demands.

In pursuit of these objectives the DGA prepares, executes, and evaluates short, medium, and long-term water utilization programs. It also engages in programs for river basin improvement and management, erosion and flood control, and irrigation and drainage infrastructure. In addition, the DGA in conjunction with its regional staffs in its Zonal Offices, coordinates and evaluates irrigated crop plans, supervises operation and maintenance of irrigation infrastructural works, establishes and enforces water tariffs and quotas, studies and implements surface and sub-surface water projects, and trains district irrigation technicians. An organization chart of the DGA appears in Attachment No. 2 to Annex A.

The unit of DGA directly involved in the implementation of this Project will be the Directorate of Conservation (DICO), one of three divisions of DGA. The major function of DICO is to inventory, analyze, and implement new small scale irrigation systems. These

activities are intended to contribute to increased food production through rational use of scarce water and land resources and by bringing new land into production. The staff of DICO is composed of 52 engineers (5 of which hold advanced academic degrees), 72 non-degree specialists (technicians, surveyors, and draftsmen), 51 clerical workers, and 78 laborers.

2. A.I.D.

The Project will be implemented for A.I.D. through a contract with Utah State University (USU). Under the contract USU will provide the full-time services of an Irrigation Engineer (36 months) and an Agronomist (24 months). The Irrigation Engineer will have primary implementation/coordination leadership responsibilities for A.I.D.'s project inputs, in addition to his other technical responsibilities.

During the past several years, the DGA has demonstrated excellent collaboration with a high degree of coordination with USU technicians (over two years with regard to the Irrigation Engineer). This is expected to continue throughout the implementation of the Project. Consequently, there appears to be no need for rigid schemes of approval and monitoring. Mission project monitoring responsibilities for the Project will reside in its Rural Development Office. The Chief Rural Development Officer has been designated Project Manager. He will be assisted by the Mission's Chief Engineer and local-hire Agricultural Economist, as needed, for project technical related matters. The Mission Deputy Program Officer charged with Mission evaluation responsibilities will participate in the annual DGA/USU evaluation of Project progress.

Procurement of commodities from the U.S. and arrangements for participant training will be handled outside of the contract and will be administered directly by USAID utilizing standard AID procurement procedures. The limited amount of A.I.D. financed local costs for in-country training and in-country travel of USU technicians will be handled by a USAID direct local contractor (Osorio). USAID will issue purchase orders for the small amount of materials and supplies to be provided locally.

b. Implementation Plan

A Project Performance Tracking network (PPT) chart is presented in Annex C. It shows milestones against which project progress and planned implementation are to be measured. The more critical milestones as contained in the PPT are shown with an asterisk in the Project Implementation Plan/Schedule outlined below.

CY 1977	A c t i o n	Time (in months) from Project Inception	Responsible Agent
May 77	1. Site for Huancayo Research/ Demonstration Farm selected	-8	DGA
	2. Huancayo Irrigation System designed	-6	DGA
	3. Cañete irrigation systems designed	-5	DGA
	4. Construction of irrigation systems at Cañete and Huancayo	-4	DGA
	5. Initial corn crop planted at Huancayo and Cañete to remove residual nitrogen from inter- action (I.S.) study areas	-3	DGA
	*6. ProAg signed	1	USAID/GOP
=====			
Jan. 78	Expected initiation of activities under On-Farm Water Management Project		
=====			
	*7. Field staffing complete at all sites	1	DGA
	*8. Annual Work Plans developed for all sites	1	DGA
	9. Corn harvested from I.S. plots in Huancayo and Cañete	1	DGA
	10. I.S. planted in La Molina	1	DGA
	11. I.S. planted in Huancayo and Cañete	2	DGA
	12. 1st. Demonstration crops planted in Huancayo and Cañete	2	DGA
	13. La Molina I.S. harvested (1st. harvest)	5	DGA
	14. Huancayo and Cañete harvested (1st)	6	DGA
	15. Replanting all sites	7	DGA

<u>CY 1977</u>	<u>A c t i o n</u>	<u>Time (in months from Project Inception</u>	<u>Responsible Agent</u>
	*16. Analyses of data and preparation of technical reports	8	DGA/USAID
	*17. First extension bulletins prepared	9	DGA/USAID
	18. First field days at all sites	10	DGA
	*19. Small farmer field trials undertaken	10	DGA
	20. Harvesting at all sites (2nd.)	11	DGA
	*21. National Irrigation Manual prepared	12	DGA
	22. Planting all sites	12	DGA
<u>CY 1979</u>			
Jan. 79	23. Analyses of data and technical reports	13	DGA
	*24. Second annual Work Plans developed	13	DGA
	25. First Annual Evaluation/Report	14	DGA/USAID
	26. Second Field Days	15	DGA
	27. Small Farmer field trials established	16	DGA
	28. Harvesting all sites (3rd.)	16	DGA
	29. Plant all sites	17	DGA
	30. Analyses of data and technical reports	18	DGA
	*31. Second group of extension bulletins and regional irrigation manuals prepared	19	DGA/USAID

<u>CY 1979</u>	<u>A c t i o n</u>	<u>Time (in months) from Project Inception</u>	<u>Responsible Agency</u>
	32. Third Field Days	20	DGA
	33. Small farmer field trials established	21	DGA
<u>CY 1980</u>			
Feb.80	34. Harvesting all sites (4th)	25	DGA
	*35. Third annual Work Plan developed	25	DGA
	36. Planting all sites	26	DGA
	37. Analyses of data and technical reports	26	DGA
	38. Second Annual Evaluation/Report	27	DGA/USAID
	*39. Third group of extension bulle- tins and irrigation manuals	29	DGA/USAID
	40. Fourth Field Days	29	DGA
	41. Small farmer field trials established	30	DGA
	42. Harvesting all sites (5th)	30	DGA
	43. Planting all sites	31	DGA
	44. Analysis of data and technical reports	31	DGA
	45. Fifth field days	34	DGA
	46. Harvesting all sites (6th.)	35	DGA
	47. Analyses of data and technical reports	36	DGA
<u>CY 1981</u>			
Feb.81	*48. Final Report/Evaluation	37	USAID/DGA

The DGA is the GOP implementing agency for the project and as such is responsible for developing the three project Research/Demonstration Farms, the annual Work Plans for each Farm, and the overall execution of the Project. The results of all of the research and demonstration studies will be disseminated by the DGA to the small farmers as timely as feasible through the use of extension bulletins, field days at the Research/Demonstration Farms, and field trials to be established by DGA project personnel with cooperating small farmers and small farmer cooperative members on their own plots of land.

The DGA personnel will form the core training unit for a national irrigation extension program proposed by the DGA to be developed as an out-growth of this project. The technical reports, bulletins, and techniques developed by the Project will be used as training aids for the future irrigation extension program. The three Project Research/Demonstration Farms will later serve a double use as centers for the training of the future irrigation extensionists as well as for developing and demonstrating better on-farm water management techniques for the small farmer.

c. Evaluation Plan

Three annual evaluations are scheduled, the first one to be undertaken in February 1979. These evaluations to be jointly conducted by DGA/USAID/USU will measure project progress during the course of the preceding year against output levels and other benchmark indicators contained in the Project Logical Framework (Annex B) and Annual Work Plans to be developed for each Project Farm site.

All recommended practices and inputs to the farmer field trials will be monitored and measured during the life of each field trial, e.g., irrigation system design, seed bed preparation, seeding rate and placement, fertilizer, weed control, plant protection, irrigation amounts and timing, etc. The traditional practices and inputs of the cooperating farmer will also be determined on the same crops as used in the field trials which are being cultivated simultaneously along side the field trial. Yields from both the field trial and the traditional practice will be determined and compared along with an economic evaluation of the two methods. Follow up visits will be made during later cropping seasons to determine to what extent the field trial effected changes in the traditional practices and economic well-being of the cooperating farmer. The extent to which any new practices incorporated by the small farmer who participated in the field trial are incorporated by his neighbors will also be determined.

d. Conditions and Covenants

This proposed project was jointly elaborated by the GOP personnel of the General Directorate of Water Resources (DGA) and Utah State University technicians working with DGA under other AID funding arrangements. Pre-project activities have already begun and activities to be undertaken under the On-Farm Water Management project beginning January 1, 1978, will be a continuation of work already underway.

In the Mission's judgement there are no major outstanding issues to be negotiated. However, prior to initial disbursement of funds under the project (beginning January 1978) the following conditions shall be required to have been met:

- 1) Construction of the irrigation systems at the Cañete and Huancayo Project Research/Demonstration Farm sites will have been completed.
- 2) Arrangement made for DGA field staffing at all three Project Farm sites.
- 3) Annual Work Plans for all three Project Farm sites will have been developed and concurred in by AID.
- 4) There will be written agreement for an understanding between MOA/DGA and USAID to assure congruency between the Sierra Irrigation Loan technical assistance program and the On-Farm Water Management project. This agreement will also assure appropriate participation by the two technicians to be financed under the On-Farm Water Management project in both the Mantaro and Cajamarca aspects of the Sierra Irrigation Loan.

Introducción .- incluir la descripción del suelo.

Objetivos .-

1. Determinar la relación agua y fertilidad más apropiada para cultivar la papa en suelos .
2. Servir como demostración de las interacciones envueltas con las variables de agua y fertilidad.

Diseño Experimental .-

Este será un experimento de interacción de humedad y fertilidad, con un diseño factorial completo, en bloque, randomizado con parcelas divididas. El cultivo será la papa, y la variedad y el número de plantas será el designado por técnicos del Centro Interregional de la Papa. Los tratamientos de humedad serán cada parcela completa, 4^o bloque, siendo las dimensiones de cada una de ellas de 4.32 m. x 60 m. Los tratamientos de fertilizante nitrogenado serán cada subparcela, y las dimensiones de cada una de ellas será de 4.32 m. x 12 m. Los niveles de fertilizante nitrogenado serán 5.

Tratamientos de humedad .-

El riego será por surcos, y el agua en los tratamientos de humedad serán medidas a la entrada de cada parcela empleando sifones calibrados, y también a la salida empleando un Parshall flume. La cantidad de agua a aplicarse será la cantidad calculada necesaria para humedecer el suelo hasta una profundidad de 45 cm. en capacidad de campo.

El primer riego después de la siembra será uniforme para todas las parcelas. Cuando el grado de humedad esté en su capacidad de campo, los riegos serán aplicados de la siguiente manera:

Tratamiento N°1 .- El agua será aplicada a 0.2 atmósferas.

Tratamiento N2 .- El agua será aplicada a 0.5 atmósferas .

Tratamiento N°3 .- El agua será aplicada a 2.0 atmósferas .

Tratamiento N°4 .- El agua será aplicada a 15 atmósferas.

La tensión de humedad del suelo será determinada en todos los tratamientos mediante el uso de una sonda emisora de neutrones para medir la humedad del suelo hasta una profundidad de 45cm.

Tratamientos de fertilidad .- Durante la preparación del terreno para la siembra de la papa, los fertilizantes serán aplicados al voleo en forma uniforme sobre el área de cada subparcela dividida (4.32 x 12 m). Estos serán aplicados de acuerdo a las siguientes proporciones:

<u>Clase</u>	<u>Formulación</u>	<u>Cant. / Há.</u>	<u>Kg. de fert./sub-parcela dividida</u>
Fósforo	Superfosfato triple (46%)	50 P ₂ O ₅	1.690
Potasio	Cloruro de Potasio(62%)	100 K ₂ O	3.780

Nitrógeno Tratamientos	Urea (46 %)		
(1)		ON	0
(2)		75 N	0.845
(3)		140 N	1.690
(4)		225 N	2.536
(5)		300 N	3.381

Antes de la aplicación de los fertilizantes, el lote experimental será cuidadosamente medido, y cada esquina de las subparcelas divididas serán marcadas con estacas.

Los fertilizantes serán pesados o medidos usando un envase que contenga el peso exacto del fertilizante requerido para los tratamientos respectivos de las subparcelas, colocándose en bolsas individuales de papel o plástico marcadas por tratamiento. Las bolsas de fertilizantes serán luego colocadas en las áreas de las subparcelas marcadas con las estacas de acuerdo con el diseño randomizado que se adjunta. Luego se hará un chequeo para asegurar que las bolsas individuales con fertilizantes estén colocadas apropiadamente antes de que el fertilizante sea aplicado.

Sembría - Luego de que el terreno haya sido preparado para la siembra, estando el suelo firme (no compacto), y sin que causarían rápidas pérdidas de humedad por evaporación, se harán los surcos con un distanciamiento de 72 cm. entre ellos y, 10 cm. de profundidad. Las semillas de papa serán colocadas en surcos aproximadamente 20 Cm. de distanciamiento entre ellas. Luego se harán los surcos empleando el mismo equipo, y con un distanciamiento de exactamente 72 cm. entre surcos, y estos se harán de tal manera que cubran las semillas de papa con cerca de 15 cm. de suelo, y dejando surcos adecuados para el riego.

Control de Plagas y Enfermedades .-

Las plagas de insectos y enfermedades serán controladas durante el ciclo vegetativo del cultivo empleando métodos y materiales recomendados por técnicos calificados del Centro Internacional de la Papa.

Datos a tomarse .-

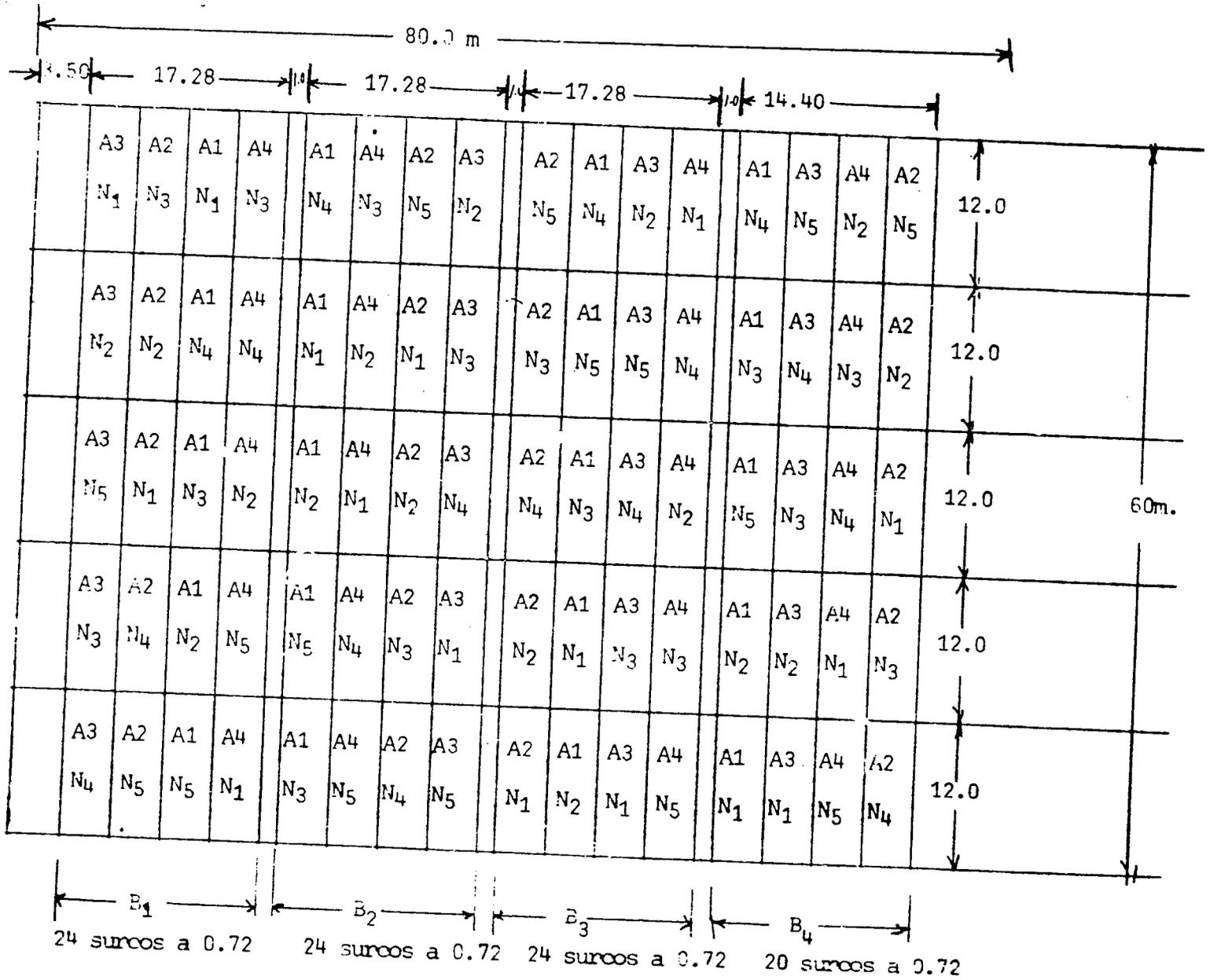
Se harán observaciones periódicas en los diferentes tratamientos del cultivo, toles como, crecimiento de las plantas, color de las plantas, marchitez, incidencia de enfermedades si las hay, y daños ocasionados por insectos. Los rendimientos serán tomados, al momento de la cosecha, de las cuatro rayas centrales de cada subparcela dividida nitrogenada, sin considerar 1 metro de los extremos, y los pesos serán registrados de acuerdo a la calidad de la papa.

Kg/ha.

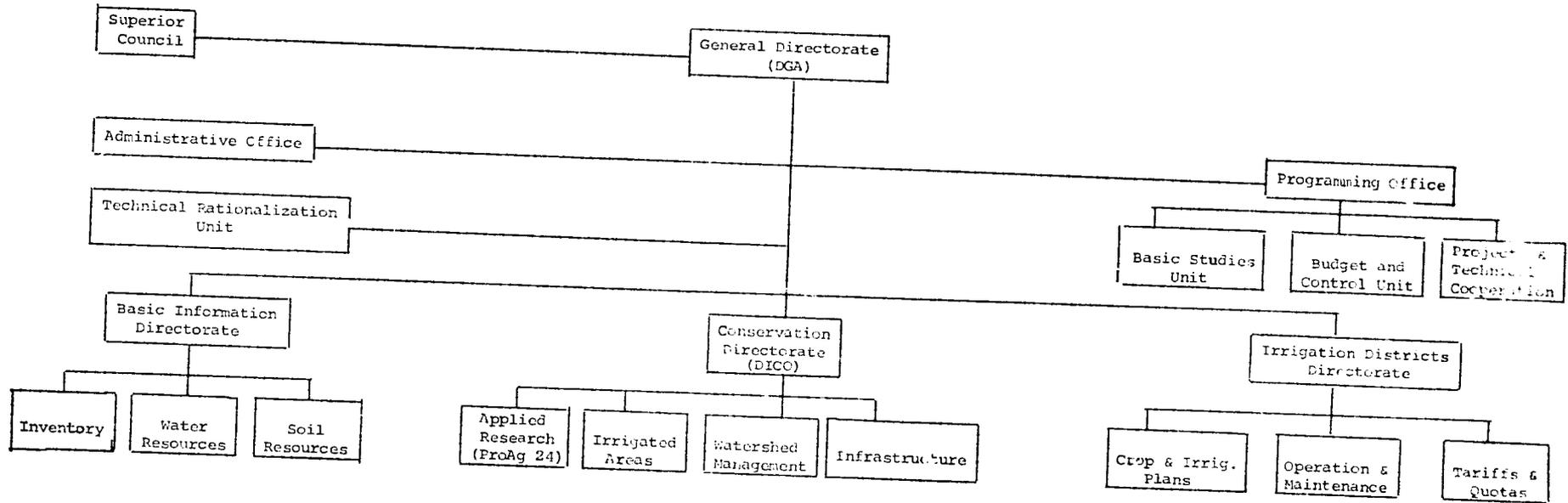
- N₁ = 0
- N₂ = 75
- N₃ = 150
- N₄ = 225
- N₅ = 300

Disponibile

- A₁ = 100 %
- A₂ = 50 %
- A₃ = 25 %
- A₄ = 05 %



ORGANIZATION CHART OF DGA



PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

ANNEX B

Date of Project: _____
From FY _____ to FY _____
Total U.S. Funding: \$487,000
Date Prepared: April 1977

Project Title & Number: On-Farm Water Management (527-0100)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS									
<p>Program or Sector Goal: The broader objective to which this project contributes: To increase the agricultural productivity and incomes of Peru's rural poor.</p> <p>Sub-Goal: To improve on-farm water management practices among small farmers.</p>	<p>Measures of Goal Achievement</p> <ul style="list-style-type: none"> - Increase in per capita crop production - Increase in per capita income among small farmers 	<ul style="list-style-type: none"> - National Statistics 	<p>Assumptions for achieving goal targets</p> <ul style="list-style-type: none"> - No major natural disasters in project area - Continued political stability - Continued GOP emphasis on agricultural sector development. 									
<p>Project Purpose:</p> <p>To develop and demonstrate the validity of alternative, improved on-farm water use management systems.</p>	<p>Conditions that will indicate purpose has been achieved: End of project status.</p> <ul style="list-style-type: none"> - DGA research/demonstration farm sites functioning with adequate budgets/staff - Increase in efficiency of water use in project area (improvement of irrigation efficiencies) - Average increase of crop yields in project areas 	<ul style="list-style-type: none"> - Project monitoring - Agrarian Zonal Offices data - DGA records 	<p>Assumptions for achieving purpose:</p> <ul style="list-style-type: none"> - Continued MirAg/DGA and GOP priority support for small farmer irrigation improvement/expansion. 									
<p>Outputs:</p> <ul style="list-style-type: none"> - Continuous demonstration of improved irrigation water management on DGA Research/Demonstration Farm sites. - Water/fertilizer combinations established - Irrigation water requirements manuals published - Technical irrigation/water management data generated - Extension bulletins developed - Establishment of farmer field trials - Students and other trained at DGA res./demonstration farms - Promotion of alternative energy sources for water movement, e.g. gravity flow, windwills, etc. 	<p>Magnitude of Outputs:</p> <ul style="list-style-type: none"> - 3 research/demonstration farms: La Molina, Huancayo and Chete - 204 applied/research/demonstration studies on primary crops such as potatoes, corn and soybean (including, 18 in-depth interaction research studies) - 4 irrigation manuals, 9 applied research reports - 30 extension bulletins prepared - 54 farmer field trials - 750-1000 trained 	<ul style="list-style-type: none"> - DGA team records - MirAg confirmation 	<p>Assumptions for achieving outputs:</p> <ul style="list-style-type: none"> - Continued local level institutional support - Continued University/technical school student interest - DGA and AID inputs indicated below 									
<p>Inputs:</p> <p>AID:</p> <ul style="list-style-type: none"> US technicians Equipment and materials Training Other <p>DGA:</p> <ul style="list-style-type: none"> Administrative & technical personnel Other, including field labor, land, equipment and materials 	<p>Implementation Target (Type and Quantity)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">1978</th> <th style="text-align: left;">Future Years</th> <th style="text-align: left;">Total</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">189</td> <td style="text-align: center;">308</td> <td style="text-align: center;">497</td> </tr> <tr> <td style="text-align: center;">70</td> <td style="text-align: center;">140</td> <td style="text-align: center;">210</td> </tr> </tbody> </table>	1978	Future Years	Total	189	308	497	70	140	210	<ul style="list-style-type: none"> - Project monitoring - GOP records 	<p>Assumptions for providing inputs:</p> <ul style="list-style-type: none"> - AID/W backstopping - USU backstopping - Timely GOP and AID budgetary and staff support
1978	Future Years	Total										
189	308	497										
70	140	210										

COUNTRY PERU	PROJECT NO. 527-0170	PROJECT TITLE On-Farm Water Management	DATE	<input checked="" type="checkbox"/> ORIGINAL <input type="checkbox"/> REVISION # _____	APPROVED
-----------------	-------------------------	---	------	---	----------

PROJECT PURPOSE (FROM APPROPRIATE PP Logical Framework)

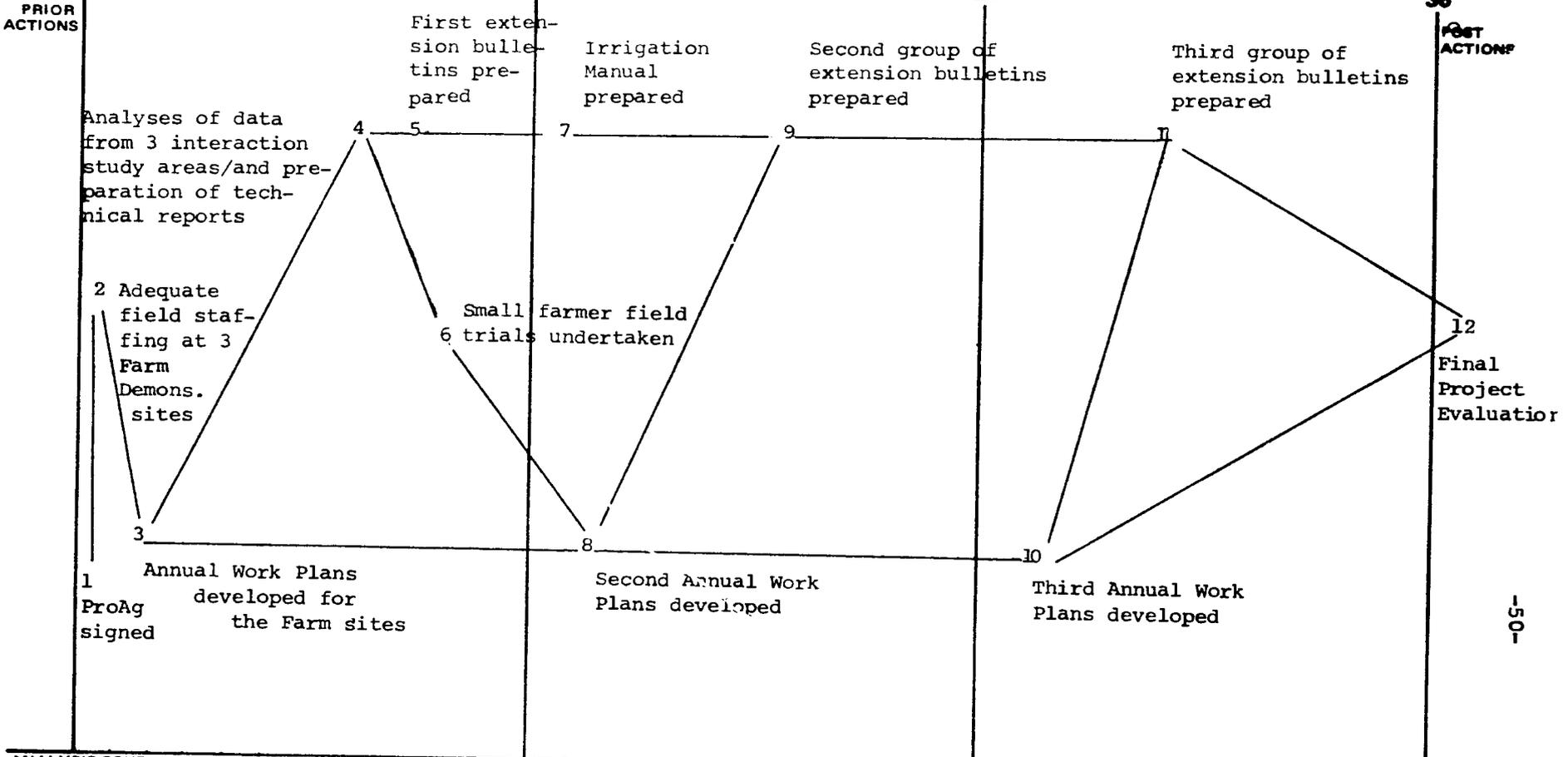
To improve on-farm water management practices among small farmers in order to increase agricultural production by: developing and demonstrating the validity of alternative, improved on-farm water use management systems.

CPI DESCRIPTION	ACTION AGENT	DATE
1. Project Agreement signed	USAID/DGA	1/78
2. Adequate field staffing at 3 Farm Research/Demonstration sites	DGA	1/78
3. Annual Work Plans developed for the Farm sites	DGA	2/78
4. Analyses of data from 3 interaction study areas/and preparation of technical reports	USAID/DGA	8/78
5. First extension bulletins prepared	USAID/DGA	9/78
6. Small farmer field trials undertaken	DGA	10/78
7. Irrigation Manual prepared	DGA	1/79
8. Second Annual Work Plans developed	DGA	2/79
9. Second group of extension bulletins prepared	USAID/DGA	7/79
10. Third Annual Work Plans developed	DGA	

CPI DESCRIPTION	ACTION AGENT	DATE
11. Third group of extension bulletins prepared	USAID/DGA	5/80
12. Final Project Evaluation		1/81

COUNTRY PERU	PROJECT NO. 527-0170	PROJECT TITLE On-Farm Water Management	DATE	<input checked="" type="checkbox"/> ORIGINAL <input type="checkbox"/> REVISION #	APPROVED
-----------------	-------------------------	---	------	---	----------

FY OR CY	1978												1979												1980												
MONTH	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan



ANALYSIS SCHEDULE:			
PROGRESS VS FINANCIAL			
EVALUATION SCHEDULE	X		X

AID PROJECT STATUTORY CHECKLIST

FOR

ON-FARM WATER MANAGEMENT

Prepared

April, 1977

6C(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 Security Supporting Assistance funds.

A. GENERAL CRITERIA FOR COUNTRY

- | | |
|---|---|
| <p>1. <u>FAA Sec. 116.</u> Can it be demonstrated that contemplated assistance will directly benefit the needy? If not, has the Department of State determined that this government has engaged in consistent pattern of gross violations of internationally recognized human rights?</p> | <p>The project is designed to increase small farmer agricultural production (and incomes) through improved irrigation and land/fertilizer use on small farms.</p> |
| <p>2. <u>FAA Sec. 481.</u> Has it been determined that the government of 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 in 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?</p> | <p>The GOP has taken such measures as are within its capacity to control narcotics traffic and is cooperating with U.S. efforts to eliminate production and trade in narcotics.</p> |
| <p>3. <u>FAA Sec. 620(a).</u> Does recipient country furnish assistance to Cuba or fail to take appropriate steps to prevent ships or aircraft under its flag from carrying cargoes to or from Cuba?</p> | <p>No longer applicable.</p> |
| <p>4. <u>FAA Sec. 620(b).</u> If assistance is to a government, has the Secretary of State determined that it is not controlled by the international Communist movement?</p> | <p>Yes.</p> |
| <p>5. <u>FAA Sec. 620(c).</u> If assistance is to 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) debt is not denied or contested by such government?</p> | <p>No known instance.</p> |
| <p>6. <u>FAA Sec. 620(e) (1).</u> If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has 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?</p> | <p>The GOP is fully aware of USG requirements for prompt, adequate and effective compensation regarding expropriation of U.S. investments. To date there have been several expropriation claims settled to the satisfaction of both Governments, including Marcona Mining Company's claim in September 1976. The only outstanding expropriation claim is that of Gulf Oil Corp. Negotiations are continuing and a resolution is expected shortly.</p> |

A

7. FAA Sec. 620(f); App. Sec. 108. Is recipient country a Communist country? Will assistance be provided to the Democratic Republic of Vietnam (North Vietnam), South Vietnam, Cambodia or Laos? No.
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.
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(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? The Administrator has taken Peru's limited guaranty program into consideration in determining to continue to furnish assistance to Peru.
11. FAA Sec. 620(o); Fishermen's Protective Act, Sec. 5. If country has seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters,
 - (a) No deduction has been required.
 - (b) The Administrator has taken into consideration prior seizure of U.S. fishing vessels by the GOP in his determination to continue to furnish assistance to Peru. There has been no such seizures or sanctions since the 1972-73 fishing season.
 - a. has any deduction required by Fishermen's Protective Act been made?
 - b. has complete denial of assistance been considered by AID Administrator?
12. FAA Sec. 620(q); App. Sec. 504. (a) Is the government of the recipient country in default on interest or principal of any AID loan to the country? (b) Is country in default exceeding one year on interest or principal on U.S. loan under program for which App. Act appropriates funds, unless debt was earlier disputed, or appropriate steps taken to cure default? No.
13. FAA Sec. 620(s). What percentage of country budget is for military expenditures? How much of foreign exchange resources spent on military equipment? How much spent for the purchase of sophisticated weapons systems? (Consideration of these points is to be coordinated with the Bureau for Program and Policy Coordination, Regional Coordinators and Military Assistance Staff (PPC/RC).) Approximately 15% of the GOP's current budget is allocated for military expenditures.

A

14. 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.
15. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget? In March 1976 State/IO advised the following with respect to Peru's UN obligations: "The amount currently owed by Peru to the UN is not sufficient to trigger the 620(u) provision."
16. FAA Sec. 620A. Has the country granted sanctuary from prosecution to any individual or group which has committed an act of international terrorism? No.
17. 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. there to carry out economic development program under FAA? No.
18. FAA Sec. 669. Has the country delivered or received nuclear reprocessing or enrichment equipment, materials or technology, without specified arrangements on safeguards, etc.? No.
19. FAA Sec. 901. Has the country denied its citizens the right or opportunity to emigrate? No.

8. FUNDING CRITERIA FOR COUNTRY

1. Development Assistance Country Criteria

a. FAA Sec. 202(b)(1). Have criteria been established, and taken into account, to assess commitment and progress of country in effectively involving the poor in development, on such indexes as: (1) small-farm labor intensive agriculture, (2) reduced infant mortality, (3) population growth, (4) equality of income distribution, and (5) unemployment.

b. FAA Sec. 201(b)(5), (7), & (8); Sec. 208; 211(a)(4), (7). Describe extent to which country is:

- (1) Making appropriate efforts to increase food production and improve means for food storage and distribution.
- (2) Creating a favorable climate for foreign and domestic private enterprise and investment.

Yes. The GOP has assigned priority to these areas in its development plans.

The GOP has assigned high priority to increasing food production. A Ministry of Food was established in 1975 with responsibility for technical assistance in production and marketing of food crops. In the context of its industrial reform program and its balance of payment management, the GOP is seeking foreign and domestic private investments in areas identified as being essential to growth. (Also, see Item No. B.1.b.5.)

FORM NO. 6C(1)-4	EFFECTIVE DATE November 10, 1976:	FRANC. DESIG. NO. 3:11	AID HANDBOOK 3, App. 6C
---------------------	--------------------------------------	---------------------------	----------------------------

81b

- (3) Increasing the public's role in the developmental process.
- (4) (a) Allocating available budgetary resources to development.
- (b) Diverting such resources for unnecessary military expenditure and intervention in affairs of other free and independent nations.
- (5) Making economic, social, and political reforms such as tax collection improvements and changes in land tenure arrangements, and making progress toward respect for the rule of law, freedom of expression and of the press, and recognizing the importance of individual freedom, initiative, and private enterprise
- (6) Otherwise responding to the vital economic, political, and social concerns of its people, and demonstrating a clear determination to take effective self-help measures.
- c. FAA Sec. 201(b), 211(a). Is the country among the 20 countries in which development assistance loans may be made in this fiscal year, or among the 40 in which development assistance grants (other than for self-help projects) may be made?
- d. FAA Sec. 115. Will country be furnished, in same fiscal year, either security supporting assistance, or Middle East peace funds? If so, is assistance for population programs, humanitarian aid through international organizations, or regional programs?
2. Security Supporting Assistance Country Criteria
- a. FAA Sec. 502B. Has the country engaged in a consistent pattern of gross violations of internationally recognized human rights? Is program in accordance with policy of this Section?
- b. FAA Sec. 531. Is the Assistance to be furnished to a friendly country, organization, or body eligible to receive assistance?
- 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?
- Programs in Industry (Industrial Law), Fishing (Fishing Law), Mining (Mining Law), Agrarian Reform, and Social Property are especially designed to achieve this objective.
- Sizeable portions of the GOP's current budget are being allocated to top priority programs in educational, agricultural and industrial reform.
- See Item No. A.13.
- Tax collections have improved and land reform has received top Government priority. Much of the press is Government managed. The current regime has slowed the tendency toward expansion of state enterprises, e.g., currently the GOP is selling the country's fishing fleet back to private enterprises.
- The reforms of the present Government are founded on the principles of equity and active participation for all Peruvians.
- 201(b) - Yes.
- 211(a) - Peru is among the countries in which development assistance grants may be made.
- No.
- No.
- Yes.
- Not applicable for this project.

6C(2) - PROJECT CHECKLIST

Listed below are, first, statutory criteria applicable generally to projects with FAA funds, and then project criteria applicable to individual fund sources: Development Assistance (with a sub-category for criteria applicable only to loans); and Security Supporting Assistance funds.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? IDENTIFY. HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

A. GENERAL CRITERIA FOR PROJECT.

1. App. Unnumbered; FAA Sec. 653(b)
 - (a) Describe how Committees on Appropriations 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 plus 10%)?

(a) Through AID's yearly Congressional Presentation. This project was included in the FY 1978 Congressional Presentation.

(b) Yes.
2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?
 - (a) Yes.
 - (b) Yes.
3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

No such legislative action expected to be necessary.
4. FAA Sec. 611(b); App. Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per Memorandum of the President dated Sept. 5, 1973 (replaces Memorandum of May 15, 1962; see Fed. Register, Vol 38, No. 174, Part III, Sept. 10, 1973)?

Yes.
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 the country's capability effectively to maintain and utilize the project?

Not applicable for this project.

A.

6. FAA Sec. 209, 619. 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. If assistance is for newly independent country, is it furnished through multi-lateral organizations or plans to the maximum extent appropriate?

The initial phase of this project was executed under a regional project. It is now at a stage of intensive direct application in Peru.

7. FAA Sec. 601(a); (and Sec. 201(f) for development loans). 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; (c) encourage development and use of cooperatives, 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.

In that project activities will assist small farmer cooperative members, it should help strengthen the cooperative movement in Peru.

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).

The bulk of the AID project funds will finance technicians from a U.S. University. There will be some limited amount of commodities, most of which will be procured from U.S. private enterprises.

9. FAA Sec. 612(b); Sec. 636(h). 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 to meet the cost of contractual and other services.

No excess U.S. owned foreign currencies are available in Peru. About 29% of project costs will be borne by the GOP.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency and, if so, what arrangements have been made for its release?

No excess U.S. owned foreign currencies are available in Peru.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(c); Sec. 111; Sec. 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production, spreading investment out from cities to small towns and rural areas; and (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?

The project is aimed at the small farmer and efforts whereby he will learn to improve his own well-being through adoption of the simple methodologies and water/soil improvement packages developed under this project.

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: [include only applicable paragraph -- e.g., a, b, etc. -- 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, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;

The project is specifically designed to improve the water/land use practices of the small farmer, with special emphasis on simple irrigation practices suited to small farms.

(2) [104] for population planning or health; if so, extent to which activity extends low-cost, integrated delivery systems to provide health and family planning services, especially to rural areas and poor;

(3) [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;

(4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:

(a) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;

The bulk of the AID project funds is for U.S. technical assistance. U.S. technical assistance will be provided through a U.S. university.

(b) to help alleviate energy problem;

(c) research into, and evaluation of, economic development processes and techniques;

(d) reconstruction after natural or manmade disaster;

(e) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

(f) 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.

81

(5) [107] by grants for coordinated private effort to develop and disseminate intermediate technologies appropriate for developing countries.

c. FAA Sec. 110(a); Sec. 208(e). Is the recipient country willing to contribute funds to the project, and in what manner has or will it provide assurances that it will provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?

d. 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?

e. FAA Sec. 207; Sec. 113. Extent to which assistance reflects appropriate emphasis on; (1) encouraging development of democratic, economic, political, and social institutions; (2) self-help in meeting the country's food needs; (3) improving availability of trained worker-power in the country; (4) programs designed to meet the country's health needs; (5) other important areas of economic, political, and social development, including industry; free labor unions, cooperatives, and Voluntary Agencies; transportation and communication; planning and public administration; urban development, and modernization of existing laws; or (6) integrating women into the recipient country's national economy.

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 civic education and training in skills required for effective participation in governmental and political processes essential to self-government.

The GOP's direct project contribution amounts to almost 29% of project costs. Funds for the GOP's contribution will be requested by the Ministry of Agriculture for inclusion in the GOP's federal budget.

The AID grant funds are not for capital assistance.

The project places special emphasis on the small farmers, individually and as members of cooperatives, and therefore encourages self-help participation at the local level in economic development. The efficiencies resulting from the small farmers utilization of improved irrigation land practices will result in (a) increased food production, and (b) self-help measures in meeting Peru's food needs.

This project responds directly to GOP priority efforts to expand and improve the use of irrigation to maximize utilization of scarce water resources and a limited land base, thereby effecting increased farm production. The project will also train needed technicians in more effective/efficient water/land utilization, and form the basis for an irrigation extension service.

g. FAA Sec. 201(b)(2)-(4) and -(8); Sec. 201(e); Sec. 211(a)(1)-(3) and -(8). 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; or of educational or other institutions directed toward social progress? Is it related to and consistent with other development activities, and will it contribute to realizable long-range objectives? And does project paper provide information and conclusion on an activity's economic and technical soundness?

The project paper provides information on the economic and technical soundness of the project. The project is specifically designed to establish demonstration sites for conducting demonstration which will serve as models for replication by small farmers, thereby contributing to self-sustaining growth.

h. FAA Sec. 201(b)(6); Sec. 211(a)(5), (6). Information and conclusion on possible effects of the assistance on U.S. economy, with special reference to areas of substantial labor surplus, and extent to which U.S. commodities and assistance are furnished in a manner consistent with, improving or safeguarding the U.S. balance-of-payments position.

The total amount of local costs under the project is so small as to have negligible effect on the U.S. economy and insignificant adverse effect on U.S. balance of payments.

2. Development Assistance Project Criteria (Loans only)

(This is a grant project.)

a. FAA Sec. 201(b)(1). Information and conclusion on availability of financing from other free-world sources, including private sources within U.S.

b. FAA Sec. 201(b)(2); 201(d). Information and conclusion on (1) capacity of the country to repay the loan, including reasonableness of repayment prospects, and (2) reasonableness and legality (under laws of country and U.S.) of lending and relending terms of the loan.

c. FAA Sec. 201(e). If loan is not made pursuant to a multilateral plan, and the amount of the loan exceeds \$100,000, has country submitted to AID an application for such funds together with assurances to indicate that funds will be used in an economically and technically sound manner?

d. FAA Sec. 201(f). Does project paper describe how project will promote the country's economic development taking into account the country's human and material resources requirements and relationship between ultimate objectives of the project and overall economic development?

e. FAA Sec. 202(a). Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurements from private sources?

f. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, 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?

3. Project Criteria Solely for Security Supporting Assistance

FAA Sec. 531. How will this assistance support promote economic or political stability?

4. Additional Criteria for Alliance for Progress

[Note: Alliance for Progress projects should add the following two items to a project checklist.]

a. FAA Sec. 251(b)(1), -(8). Does assistance take into account principles of the Act of Bogota and the Charter of Punta del Este; and to what extent will the activity contribute to the economic or political integration of Latin America?

b. FAA Sec. 251(b)(3); 251(h). For loans, has there been taken into account the effort made by recipient nation to repatriate capital invested in other countries by their own citizens? Is loan consistent with the findings and recommendations of the Inter-American Committee for the Alliance for Progress (now "CEPCIES," the Permanent Executive Committee of the OAS) in its annual review of national development activities?

This is not a Security Support Assistance project.

(a) Sound monetary and fiscal policies coupled with significant economic and social reforms designed to restructure Peruvian society along more equitable lines, indicate Peru's compliance with Alliance for Progress goals. The relatively small assistance to this project is not expected to have a significant impact on the economic and political integration of Latin America.

(b) This is a development grant project.

Uso,

OFICIO N° 0422/77-DGA-DG

Señor : Ingeniero Luis J. Paz Silva
 Director General
 Oficina Sectorial de Planificación Agraria

Asunto : Solicitud de Cooperación Técnica Internacional
 con AID : Programa Sobre Manejo del Agua a
 Nivel Parcelario con Proyecciones a Extensión.

Tengo el agrado de dirigirme a usted, con el fin de poner en su consideración y trámite regular, la Solicitud de Cooperación Técnica Internacional ante AID para un Programa sobre el asunto indicado con duración de tres años y bajo las características que se detallan en el formulario adjunto.

Como le manifestara en Oficio N° 0422/77-DGA-DG del 17 de Febrero de 1977, es inquietud de esta Dirección General propender al establecimiento de un Programa de Extensión a Nivel Nacional como una continuación del Convenio N° 24 en el que vienen laborando eficientemente el Dr. Edwin Olsen y el Ing. Mac. Don Kidman como especialistas del AID. A través del Proyecto se espera disponer inicialmente de los recursos técnicos que necesitan divulgarse a la par de adiestrar personal en procedimientos de extensión.

Creemos que dándosele la prioridad debida a esta Solicitud se contribuirá a establecer las bases de un Servicio altamente requerido en el país, que concuerda con los lineamientos de Política y los Objetivos del Sector.

Por lo expuesto agradeceré la atención preferente de su Despacho a fin de que se gestione con alta prioridad la solicitud que adjunto.

BEST AVAILABLE COPY

Dios guarde a Usted,

Enrique F. Franco M.
 Director General de Agua
 (Encargado)

JAC/lot.
 c.c. DIPRECO-Dirección
 Sub-Direc. Invest. Aplicada
 Oficina de Programación.
 Archivo (2)
 Asesor]

ANNEX F

ENVIRONMENTAL THRESHOLD DECISION

Location : Peru

Project Title : On-Farm Water Management - 527-0170

Funding : FY 78 - \$189,000 - Grant
(First FY)
Total Life of Project - \$497,000 - Grant

Life of Project : Three Years (FY 78 - FY 80)

Mission Recommendation:

Based on the Initial Environmental Examination, the Mission has concluded that the Project will not have a significant effect on the human environment and therefore recommends a Negative Determination.

The Latin America Bureau's Environmental Committee has reviewed the Initial Environmental Examination for this project and concurs in the Mission's recommendation for a Negative Determination.

AA/LA Decision:

Pursuant to the authority vested in the Assistant Administrator for Latin America under Title 22, Part 216.4a, Environmental Procedures, and based upon the above recommendation, I hereby determine that the proposed project is not an action which will have a significant effect on the human environment, and therefore, is not an action for which an Environmental Impact Statement or an Environmental Assessment will be required.

Assistant Administrator
for Latin America

Date

Clearances:
LA/DR:
LA/Environmental Coordinator:
SER/ENG:
LA/DR:

INITIAL ENVIRONMENTAL EXAMINATION (IEE)

Project Location: Peru

Project Title: On-Farm Water Management

Funding: FY 78 - \$189,000 - Grant
(First FY)
Total Life of Project - \$497,000 Grant

Life of Project: Three Years (FY 78 - FY 80)

IEE Prepared by:

Date Prepared: April, 1977

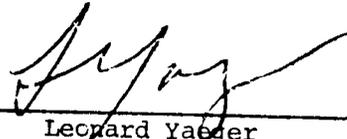
Mr. Louis Macary, USAID/PERU/PRM
Mr. Dallas D. Fowler, USAID/Peru/Environmental Coordinator
Mr. Milton Lau, USAID/Peru/AGR

Environmental Action Recommended:

The USAID/Peru project committee for the On-Farm Water Management project has undertaken a complete Initial Environmental Examination (IEE) of the environmental impact aspects of the project and has arrived at a recommendation for a Negative Determination, as indicated in the Threshold Decision section, of the IEE.

Concurrence:

I have reviewed the Initial Environmental Examination prepared by the project committee for the On-Farm Water Management project and concur in the recommendation for a Negative Determination.



Leonard Yaeger
Acting Director
USAID/Peru

April 28, 1977

Date

Examination of Nature, Scope, and Magnitude of Environmental Impact

a. Description of Project

Peruvian agricultural production is severely constrained by the limited amount of accessible arable land resulting in large part from scarce and uncontrolled water supplies.

The project is aimed at improving the incomes and nutritional status of the poor small farmer through the creation and demonstration of alternative water/land use systems for increasing productivity on small farms.

The Government of Peru in collaboration with Utah State University (USU) has established a special office in the Ministry of Agriculture for applied research and demonstration of on-farm water management of small irrigation systems. Several demonstration sites have been selected and are currently being set up for conducting systematic research of key soil, water and plant interrelationships with emphasis on major Peruvian food crops.

The On-Farm Water Management project will continue the work begun by the Ministry of Agriculture and USU and will expand and strengthen the Government of Peru's on-farm water use demonstration and extension network. The project will be implemented at three different sites to test and demonstrate more precise coefficients of soil and water relationships. To the extent possible the project will also promote the possibility of utilizing alternative sources of energy (gravity flow, wind, hydraulic, etc.) instead of diesel oil, gasoline or electricity for pumping and irrigating. Practical extension bulletins will be developed and disseminated.

The three locations where project demonstration sites will be established and operated are at La Molina (adjacent to the National Agrarian University) outside of Lima, Cañete, approximately 148 Kms. south of Lima on the coast, and Huancayo in the large agriculture producing Mantaro Valley (in the high Peruvian Sierra).

Utah State University (USU) will implement the project for AID under a contract whereby USU will provide the full time services of an Irrigation Engineer (36 months) and an Agronomist (24 months). Up to six months of short-term technical assistance in specialized fields of soil physics, biometeorology, field plot techniques and

extension methods will also be provided by USU consultants. A limited amount of commodities will be provided under the AID grant, including laboratory equipment, water measurement devices, soil/water determination equipment, piping, sprinklers and soil sampling equipment. Some overseas training of Peruvian project counterparts will be provided in selected technical areas as field plot technique, irrigation extension methodology, and other agronomic or engineering areas relevant to project needs. Training will be short term and academic, non-degree in nature.

The Government of Peru implementing agent will be the Ministry of Agriculture's General Directorate of Water (DGA). The DGA will assign to the project four full-time counterpart irrigation engineers, three demonstration farm engineers and other technical personnel and field assistants.

b. Identification and Evaluation of Environmental Impacts

The project basically entails technical assistance related directly to research for generation of technical data, training, and demonstration for improved land/water utilization. Its main concern is the transfer of relatively simple irrigation methodology to improve the utilization of the scarce land/water resources among Peru's poor small farmers. Project construction will be limited essentially to a small amount of irrigation works at the project research demonstration farm sites. These constructions will be so small as to have very limited, if any, effect on the natural defenses of the soil. Land leveling where determined to be needed while altering the present natural land configuration will probably improve on existing conditions.

To the extent this project primarily deals with training and demonstration there is little direct impact per se on the environment. There are, however, considerable indirect, longer-term impact's on the environment as a result of the irrigation practices expected to be adopted by small farmers exposed to the project. The elements within the project where these impacts are likely to become significantly measurable are mainly in the areas of land use, water quality, and natural resources. (See Impact Identification and Evaluation Form, attached to this Annex.) With respect to all three areas, potential impacts would be medium-to-high and, if project knowledge is properly adopted, impacts will be very favorable.

With respect to impacts on water quality and conservation of natural resources it should be noted that the project responds directly to the high priority the Government of Peru has assigned to optimum utilization of water resources. Through higher water use efficiencies promoted under the project, additional water will be available to enable more land to be irrigated. The effects of periodic drought in the sierra can be reduced by promoting the concept of supplemental simple irrigation. Management of water resources in the Huaracayo area will be used to reduce the effect of frost damage where practical. The incidence of plant and animal disease will also be reduced through improved management of water conditions on the soil. Finally, it should also be pointed out that water use methodologies and practices introduced under the project will be applied primarily on small farms; large scale irrigation is not contemplated. In the unlikely event that a newly introduced practice is misused by a small farmer, any adverse effects would likely be limited to his small plot of land.

Likewise, the impacts of the project on land use and soil (moderate-to-high) are expected to be favorable. Control of water flows and proper application of water for irrigation will help promote soil conservation and stem soil erosion which is a special problem in the Sierra. The development and application under the project of irrigation system designs that maximize efficiency of water application according to soil type, crop, etc. will lead not only to better conserved but also more productive soil.

II. Recommendation for Environmental Action

The nature and scope of the On-Farm Water Management project have been thoroughly considered with respect to the criteria contained in the Impact Identification and Evaluation Form (Attached to this Annex) with the conclusion that the project will have favorable impacts on the state of water and soil conditions in Peru, with little if any potential negative impact on the environment.

Threshold Decision: For the reasons cited above, the Mission believes that no further environmental study is necessary and therefore, recommends a Negative Determination.

IMPACT IDENTIFICATION AND EVALUATION FORM

Impact
Identification
and Evaluation 1/

A. LAND USE

1. Changing the character of the land through:
 - a. Increasing the population N
 - b. Extracting natural resources N
 - c. Land clearing N
 - d. Changing soil productivity capacity M/H
2. Altering natural defenses L
3. Foreclosing important uses N
4. Jeopardizing man or his works N
5. Other factors
- Soil conservation M/H

B. WATER QUALITY

1. Physical state of water M/H
2. Chemical and biological states L
3. Ecological balance N
4. Other factors NONE

1/ Use the following symbols:

- N - No environmental impact
- L - Little environmental impact
- M - Moderate environmental impact
- H - High environmental impact
- U - Unknown environmental impact

Impact
Identification
and Evaluation

C. ATMOSPHERIC

- | | |
|--------------------|------|
| 1. Air additives | N |
| 2. Air pollution | N |
| 3. Noise pollution | N |
| 4. Other factors | NONE |

D. NATURAL RESOURCES

- | | |
|--|-----|
| 1. Diversion, altered use of water | M/H |
| 2. Irreversible, inefficient commitments | N |
| 3. Other factors | |
| - Conservation of water | M/H |

E. CULTURAL AND SOCIO-ECONOMIC

- | | |
|-----------------------------------|------|
| 1. Altering physical symbols | N |
| 2. Changes of cultural traditions | L |
| 3. Changes in population | N |
| 4. Other factors | NONE |

F. HEALTH

- | | |
|-----------------------------------|------|
| 1. Changing a natural environment | L |
| 2. Eliminating an ecosystem | N |
| 3. Other factors | NONE |

G. GENERAL

- | | |
|--------------------------|---|
| 1. International impacts | N |
| 2. Controversial impacts | N |

**Impact
Identification
and Evaluation**

3. Larger program impacts

M

4. Other factors

NONE

ANNEX G

Draft Project Description (to be used in Project Agreement, Article 2, Section 2.1)

The project will develop and demonstrate the validity of alternative, improved water use systems for increasing agricultural productivity on small farms. Specifically, the Project will assist the Ministry of Agriculture's, Directorate General of Water (DGA), to:

- a. Develop and demonstrate criteria for determining water requirements for several major crops.
- b. Develop and demonstrate irrigation system designs that maximize the efficiency of water application according to soil type, and
- c. Demonstrate the effects of improved water management practices on water use and crop production.

This will be accomplished by the installation of three Research/Demonstration Farm sites (at La Molina, Cañete, and Huancayo) where DGA technicians, students, irrigation extensionists and farmers will be trained in better irrigation and agronomic practices. Also, small farmer field demonstration trials will be developed in cooperation with local farmers.