

UNCLASSIFIED

PD-AAB-410-121

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

PROJECT PAPER

Proposal and Recommendations  
For the Review of the  
Development Loan Committee

PERU - Program for Improved Water and Land Use in the Sierra

PTD-DLC/P-2132

UNCLASSIFIED

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

UNCLASSIFIED

AID-DLC/P-2132

December 16, 1975

MEMORANDUM FOR THE DEVELOPMENT LOAN COMMITTEE

SUBJECT: Peru, Program for Improved Water and Land Use in the Sierra

Attached for your review are the recommendations for authorization of a loan not to exceed Eleven Million U.S. Dollars (\$11,000,000) to the Government of Peru ("Borrower") to assist in improving water and land use in the sierra through: (a) an increase in crop yields; (c) expansion of cropping alternatives; (d) an increase in the efficiency of water use; (e) reduction in soil loss from erosion; and (f) the strengthening of GOP technical capacity at the regional level.

The loan is scheduled for consideration by the Development Loan Staff Committee on Monday, December 22, 1975, at 9:30 a.m. in Room 3524 NS; please note your concurrence or objection is requested by close of business on December 24, 1975. If you are a voting member a poll sheet has been enclosed for your response.

Development Loan Committee  
Office of Development Program Review

Attachments:

Summary and Recommendations  
Project Analysis  
Annexes I - IV

PROJECT PAPER - USAID/Perú

PROGRAM FOR IMPROVED WATER AND LAND USE IN THE SIERRA

Table of Contents

	<u>Page</u>
<u>PART I</u> - PROJECT SUMMARY	
A. Face Sheet	1
B. Recommendation	2
C. Description of the Project	2
D. Summary Findings	3
1. Technical Analysis	4
2. Economic/Financial Analysis	5
3. Social Analysis	6
E. Project Issues	7
PART II - PROJECT BACKGROUND AND DETAILED DESCRIPTION	
A. Background	12
1. Description and History of the Development Problem	12
2. Role of Irrigation	17
3. Development of the Project	20
B. Detailed Description	23
1. Logical Framework	23
2. Sub-Project Profiles	24
3. Technical Assistance Program	27

	<u>Page</u>
4. Sub-Lending Program	33
C. Other Relevant Donor Activity	35
 PART III - PROJECT ANALYSES	 38
A. Technical Analysis	39
1. Selected Technology	39
2. Environmental Impact	43
3. Technical Feasibility	44
B. Economic/Financial Analysis	48
1. Analytical Procedures Used	48
2. Results of Sub-Project Analyses	54
3. Macro and Micro-Economic Impact of the Project	63
4. Analysis of Overall Investment Program	72
5. Analysis of Credit and Fertilizer Availability	85a
C. Social Analysis	86
D. Policy Analysis	95
1. National Four-Year Development Plan (1975-78) and GOP Investment Budgets	95
2. Major GOP Measures Affecting Water and Land Use	98
E. Project Budget Analysis	101
1. Source and Allocation of Project Funds	101
2. Water Charges	103
 PART IV - PROJECT IMPLEMENTATION	 112
A. Participating GOP Agencies	112
B. Implementation Plan	126
C. Evaluation Plan	135
D. Conditions and Covenants; Negotiating Status	137

- ANNEXES: I Statutory Checklist
- II Section 611(e) Certification
- III DAEC Cable - IRR Approval
- IV Draft Loan Authorization
- V Technical Annex
- A. Standard Designs
  - B. Plans for Five Sub-Projects
  - C. Construction Specifications for Five Sub-Projects
  - D. Water Use Efficiency in the Sierra
- VI Economic/Financial Annex
- A. Shadow Price Calculation for Unskilled Labor
  - B. Selection of Cropping Patterns
  - C. Selected Computer Print-outs
- VII Social Annex
- A. Field Questionnaire Used in Social Survey of Sub-Project
  - B. Categorization and Values Assigned to Five Sub-Project Areas
- VIII Relevant GOP Legislation
- IX CPI Narrative
- X Maps

\* File in LA/FR, not included herein.



## GLOSSARY OF TERMS AND ABBREVIATIONS

ZONE, Zonal Office	- Agrarian Zonal Offices
Zone II - Cajamarca	(Zonas Agrarias)
Zone X - Huancayo	
MOA	- Ministry of Agriculture
MOF	- Ministry of Food
AgBank	- Agrarian Bank
DGA	- General Directorate of Water Resources (Dirección General de Aguas)
DGFF	- General Directorate of Forestry & Wildlife (Dirección General de Forestal y Fauna)
DIPRECO	- Directorate of Preservation & Conservation (Dirección de Preservación y Conservación - DGA)
DDR	- Directorate of Water Districts (Dirección de Distrito de Riego - DGA)
DASS	- Directorate of Surface & Subterranean Waters (Dirección de Aguas Superficiales y Subterráneas-DGA)
INP	- National Planning Institute (Instituto Nacional de Planificación )
SINAMOS	- National System of Social Mobilization (Sistema Nacional de Apoyo a la Movilización Social)
CAP	- Agricultural Production Cooperative (Cooperativa Agraria de Producción)
CAS	- Agricultural Service Cooperative (Cooperativa Agraria de Servicios)
SAIS	- Agrarian Social Interest Society (Sociedad Agraria de Interés Social)
ENCI	- National Agency for Marketing of Agricultural Inputs (Empresa Nacional de Comercialización de Insumos)
OSPA	- Sectoral Office for Agricultural Planning (Oficina Sectorial de Planificación Agrícola - MOA)
ONERN	- National Office for the Evaluation of National Resources (Oficina Nacional para Evaluación de Recursos Naturales)

B. Recommendation: USAID/Peru recommends that a \$11.0 million loan be authorized in FY 76 under the Food and Nutrition funding category (FAA Section 103) for the purposes of planning and implementing the Loan Project proposed in this Project Paper.

C. Description of the Project: The proposed Loan will contribute to the planning and implementation of a program of improved water and land use in the sierra conceived and initiated by the Dirección General de Aguas (DGA) of the Ministry of Agriculture (MOA). The Project will be implemented in two project areas --Cajamarca and Mantaro-- in the rural mountain regions of Perú (the "sierra"), and will include 1) construction of irrigation and drainage works for up to 27 sub-projects; 2) implementation of a complementary program of protective afforestation to prevent erosion, to conserve water, and to protect irrigation structures in the sub-project areas; 3) strengthening of regional irrigation offices in the two Project areas with additional personnel and required machinery and equipment; 4) establishment of a special fund in the Agrarian Bank (AgBank) for sub-lending to participating farmers for investments in on-farm land development; 5) 102 man-months of U.S. or third-country high-level technical advisory services to the DGA in planning and project analysis and 72 man-months of locally-procured advisory services to the DGA sub-project teams in both the Lima office and the 2 Regional Project offices; 6) approximately \$155,000 for long and short-term training of MOA staff; 7) an informally conducted on-farm demonstration program of technical assistance to benefitted farmers in efficiency of water use; and 8) approximately \$250,000 to finance watershed planning studies.

The Project will be directed and administered by the DGA in the MOA, with primary administrative responsibility vested in the Dirección de Preservación y Conservación (DIPRECO). (See Organizational Chart, Part IV A.) DIPRECO engineers will draw up plans and specifications for the irrigation and drainage works in each sub-project, organize the local labor force for the construction of works in the sub-project areas, and provide necessary technical expertise and supervision of construction. DIPRECO will collaborate with the Dirección de Distrito de Riego (DDR) and DDR counterparts in the Agrarian Zonal Offices to set up strengthened regional irrigation offices in the two Project areas. The purpose of these regional offices is to assist in supervision of construction, to organize water-user associations in sub-project areas, to monitor routine operation and maintenance of irrigation systems, and to provide required technical assistance in water-use and on-farm improvements.

Participating with the DGA in implementation of the Project will be the Dirección General de Forestal y Fauna (DGFF-General Directorate of Forestry and Fauna), which will provide technical advice in designing and implementing the program of protective afforestation in sub-project areas.

Additionally, the AgBank will participate as financial agent for the special credit fund established for sub-lending to benefitted farmers.

The Project is designed with the objective of providing the optimum number and level of inputs to complete up to 27 integrated sub-projects to improve water and land use in two Project areas. These inputs will include construction materials and equipment, construction labor costs, tree plantings, credits for investments in on-farm improvements, staff and equipment for regional offices, and technical assistance in planning to the DGA and in efficient use of water to farmers.

Construction of small dams will enlarge capacity to store water for use in between rainy seasons and for regulation of water flow throughout the year. Construction and improvement of canal systems, including the installation of water weirs to measure and distribute water, will minimize loss of water through seepage and run-off and will assure efficient distribution of water. Construction of drainage systems will channel off excess water in low-lying areas for use as irrigation water and will serve to avert salinization of the soil. Afforestation of selected hillsides in sub-project areas will control soil erosion, conserve run-off rain water, and protect irrigation structures from landslides and torrential water courses during heavy rains.

The results of achieving these Project outputs -- an increase in on-farm water supply with a regularized flow throughout the year and an improved water distribution system -- will make possible the anticipated Project purpose, i.e. improved water and land use in the Project areas, through an increase in the total amount of sierra land in productive use, an increase in the crop yields on land already productive, and an assurance of adequate water supply which will encourage farmers to commit labor and costly agricultural inputs to what had heretofore been high-risk, rain-fed cultivation.

In addition, Loan-financed technical assistance and equipment, machinery, and materials, together with GOP budget and staff support, will be designed to strengthen institutional capacity in both Lima and at the regional level in the two Project areas in the identification, planning, and designing of sub-projects, the construction and supervision of sub-projects, the organization and administration of water user associations, and the monitoring of routine system operation and maintenance. The anticipated result of the placement of these inputs will be strengthened regional offices, with adequate support staff and equipment and machinery to perform on-going functions of providing necessary expertise and technical assistance to implement this Project and to assume increasing responsibility for the performance of field operations of the Lima office of the DGA.

These Project activities will be directed to the target group of small farm families in the selected Project areas of Cajamarca and Mantaro. This target group is almost entirely dependent on marginal agriculture for their livelihood, farming individually or cooperatively-owned parcels of crop or pasture land (on the average, less than 2 hectares per family) in the low and high sierra regions of the Project areas. Typically, these farm families have an annual per capita income of between \$150 and \$250, part of which may come from non-agricultural activities, such as wage-employment in nearby mines, commerce, small-scale cottage industry, and seasonal employment on coastal farms.

Off-farm employment opportunities are few, however, and cannot absorb the current surplus of labor which exists in the Project areas as a result of ever-increasing pressure of population growth on limited productive land. While permanent migration channels some of this surplus labor to the coastal cities, those who do not leave the sierra face severe income constraints imposed by a series of factors, a key one being an increasing man-land ratio. By permitting intensified exploitation of existing land resources through the expansion and improvement of irrigation and drainage systems in the Project areas, Project activities will contribute significantly to relieving income constraints on the target group of farm families.\*

\*Please see Part III C ("Social Analysis"), pp.86-88, for additional information on the socio-economic characteristics of the target group.

#### D. Summary Findings

After working closely with the DGA staff in the design and feasibility study of this Project, the Project Development Committee is confident that sufficient technical and management capacity exists to execute the Project effectively and efficiently. Given this determination, the Mission has decided to proceed with the Project after a careful examination of five sub-projects for technical, economic/financial and social feasibility. These five are judged to be representative of all (up to 27) sub-projects to be financed under the Project in their technical, economic/financial, and social characteristics. Determination of their feasibility (summarized below and more fully presented in Part III - "Project Analyses") is considered by the Mission to reflect first, the existence of feasible sub-projects of this type in the Project areas; and, second, the capacity of the DIPRECO staff to identify sub-projects and to establish feasibility according to acceptable professional standards.

Project funds will be provided to finance an on-going process of sub-project identification and feasibility study while actual construction of previously analyzed sub-projects is undertaken. Moreover, since the current DGA program of operation allows for simultaneous sub-project study and construction, using distinct teams for each, this procedure is best adapted to the existing GOP implementation procedures.

##### 1. Technical Analysis

The planning, design and cost calculation for construction which the DGA has done to date on the five sub-projects analyzed has essentially followed irrigation planning practice which has been used and refined in Perú over the past years and which is now accepted as standard for small irrigation projects. From the Mission's close working association with the DGA staff engineers, the Project Development Committee has concluded that they approach sub-project planning with professional competence in each of several engineering disciplines. Their field investigations have been in sufficient depth to assure that adequate data is available to their planning engineers for laying out all elements of irrigation and drainage requirements for each sub-project.

In their approach they make maximum use of Standard Designs. USAID/ENG has reviewed the DGA standard designs which will be used on these sub-projects and find them to be technically satisfactory. The technical soundness embodied in their standards indicates that when unusual conditions are met in the field during construction they will generally be quite capable of designing to meet those conditions. All new designs or modifications to existing standards made by the DGA will be reviewed by USAID engineers to assure their adequacy.

The DGA engineers normally develop their own construction specifications for each project rather than relying on Peru's standard construction specifications in use throughout the country. Their practice is to start with the closest applicable standard specifications

and re-write them tailoring each paragraph to the particular requirements of the project or several sub-projects. USAID/ENG has reviewed examples of these specifications and find them technically sound and quite appropriate for the specific works for which they were intended for the five sub-projects analyzed. There is every reason to believe that the DGA will develop satisfactory construction specifications properly tailored to all the small sub-projects to be financed under the Loan.

## 2. Economic/Financial Analysis

The economic and financial acceptability of sub-projects will be determined through a sequence of four basic tests. The first, an economic rate of return to the economy as a whole, must be at least 15% to insure that the sub-project is an efficient use of the economy's resources. If a sub-project passes this first test, three financial rates of return will be tested: the first and second measure the financial incentives to the farmers in the sub-project areas, and show the rate of return to their labor, management, and investment and the rate of return to their management and investment; a third measures the financial rate of return on the sub-project per se (not the incremental benefits) to insure that it will generate sufficient cash flows to repay any amortization costs.

Five representative sub-projects were submitted to this sequence of analysis, and each was found to have an economic rate of return of over 15%, thus demonstrating its utility to the economy as a whole, and sufficient financial incentives to the farmers to warrant the supposition that they will collaborate with the Implementing Agency in the construction and maintenance phases of Project implementation.

Analyzing the results of the economic and financial tests, it was found that in each case the sub-project will provide the following benefits to farmers in the selected areas:

(1) increase farm-generated income; (2) provide for expanded employment opportunities in agriculture; (3) increase overall production and expand consumption opportunities.

In terms of the macro-economic benefits to accrue to society as a whole, the Project will act to increase the amount of land suitable for agricultural production, increase yields on sub-project lands, allow for some multiple-cropping, and serve to reduce risks associated with agriculture solely dependent on rainfall. The combination of these will result in increases in agricultural production, most of which will be sold and consumed locally providing for increased food consumption in the Project areas. Moreover, both Project areas serve important urban areas-- the Mantaro area markets production in the

Lima-Callao metropolitan area, and Cajamarca markets to the northern coastal centers of Trujillo and Chiclayo-- and the growing population in each of these will insure that surplus production has a ready outside market. To the extent that this increased production can be substituted for currently imported foodstuffs, the Project will have a positive effect on Peru's balance of payments and foreign exchange situation.

### 3. Social Analysis

An analysis of five illustrative sub-project areas shows considerable interest in and community support for the proposed irrigation and drainage sub-projects. The awareness on the part of local farmers of their dependence on irrigation water supplies and the potential benefits from increases in these supplies is very well-developed in most of the communities to be benefitted by sub-projects, and, in general, enthusiasm for water-related projects is high.

Farmer experience in operating and using rustic, often highly inefficient, irrigation systems is extensive and surprisingly successful, contributing to a solid foundation of familiarity with at least the basic concepts of irrigated agriculture. Effective and quite sophisticated norms of communal organization exist in most communities providing a sound basis for efficient social organizational infrastructure for farmer participation in sub-project construction and assumption of responsibility for routine system operation and maintenance. In several communities, communal construction of water works and other infrastructure is currently underway with minimal, if any, outside assistance.

Some problems in inter- and intra-community cooperation exist, however. These problems spring from a variety of sources which can be expected to be common for most sub-projects in both Project areas; resentment against neighboring communities due to long-standing rivalries, or new rivalries created by land ownership changes effected under the Agrarian Reform; minor disputes over commonly-held land; and disproportionate benefits within and among communities accruing as a result of irrigation and drainage investments are the most frequent sources.

Such minor conflicts are inevitable in the Project, given its broad provision for extensive local participation and its significant socio-economic impact. The Project Development Committee believes, nevertheless, that the value of the Project derived from its social involvement and impact makes it worthwhile and possible to cope with these potential social conflicts. Moreover, the Committee is confident that the economic motivation for and awareness of potential benefits from participation in the Project is sufficiently powerful to outweigh the tendencies toward minor social conflict apparent in two of the communities studied.

7

The DGA staff is highly sensitive to these potential social conflicts and has indicated its interest in financing the services of experienced social scientists to advise and assist the regional staff in identifying and resolving them. With the DGA's careful collaboration with community leaders and local farmers, and with the financial incentives demonstrated in the rates of return analyses of sub-projects, the Committee considers the Project, as designed, socially feasible.

#### E. Project Issues

1. Responsibility for Project Administration - The issue of assigning central operational responsibility for Project administration (cited on pp. 16-17 of the IRR) has been resolved by limiting the selection of sub-projects to only those technically non-complex sub-projects the design and implementation of which are fully within the technical and administrative competence of the DGA. Consequently the final Project design does not envision any dependence on support and/or technical input from the General Directorate of Irrigation (Dirección General de Irrigaciones- DGI), which has responsibility for planning and executing large-scale technically complex irrigation projects. By excluding the need for DGI participation in Project implementation, then, the problem of devising adequate coordination among these MOA offices is obviated, as is the possibility of duplication of and/or conflict with a possible second-stage IDB loan tentatively programmed for 1978 to finance medium-scale irrigation projects to be administered by the DGI.

2. Respective Roles of Project and IDB "Linea Global" - As cited in the IRR (pp. 12-13), the IDB is currently financing medium-scale irrigation projects in the coast and the sierra, providing under a 1971 loan a \$9.0 million contribution to a line of credit totalling \$23.3 million. Twelve projects have been identified and are being studied or are under construction, seven in the sierra\* and five on the coast. Ten of these, including all those in the sierra, are to be or are being constructed by contractors, all under the supervision of the General Directorate of Irrigation (DGI). The IDB staff in Lima expect that two more years are required before the loan will be completely disbursed.

In early 1975, the IDB and the GOP initiated discussion relating to the possibility of extending a second-stage loan to continue and expand activities begun under the "Linea Global" program. Shortly thereafter, the IDB expressed concern that the present Project, as proposed in the IRR, may duplicate or conflict with a second-stage "Linea Global," in the event such a loan was made. After several discussions with IDB staff in which USAID officials clarified aspects of the proposed A.I.D. Project design, the IDB was satisfied that activities under the A.I.D.

---

\* 1 in Arequipa, 2 in Ayacucho, 1 in Apurimac, 2 in Cuzco and 1 in Puno.

Project would not disrupt or duplicate a continuation of the "Linea Global" program, given the following considerations.

First, "Linea Global" is under the exclusive supervision of the DGI, which, as noted above under Issue #1, is not expected to be participating to any significant extent in this Project. The dangers of duplication of efforts, straining existing DGI technical personnel capacity, and lack of administrative coordination are thus eliminated.

Second, the natures of "Linea Global" projects and those sub-projects to be financed under the A.I.D. Loan are quite dissimilar. Those financed under the IDB loan are of a medium scale and considerable technical complexity, requiring a degree of technical expertise and sophistication not anticipated to be required under the A.I.D. Project. Owing to this degree of complexity, dependence on outside contractors for both design and construction has characterized most of these "Linea Global" projects. The technical simplicity of sub-projects under the A.I.D. Loan, on the other hand, will permit reliance on the DGA staff both for design and construction and will maximize participation of local communities in sub-project implementation, which has not been contemplated under the IDB loan.

These factors clarify the respective roles of the proposed A.I.D. Project and of the current and proposed activities under IDB's "Linea Global," which have been judged by IDB and USAID officials to be quite distinct and independent. However, a minimum of coordination will be required in the identification of sub-projects under each loan to maintain the distinctive roles of each program, and USAID, in conjunction with the IDB, will take appropriate steps to assure collaboration between the DGA and the DGI on identification and selection of sub-projects under their respective jurisdictions.

3. Effect of the Agrarian Reform on Project Implementation - The GOP's Agrarian Reform program aims: i) to expropriate large holdings for the benefit of those who work the land and ii) to consolidate the minifundio into economically viable production units. These efforts may have an impact on implementation of this Project. In the short term, Agrarian Reform activities invariably create some instability of land tenure in affected areas and some confusion in the initial months of operation of newly-created production units. This disrupts agricultural production whenever an adjudication process is underway or only recently completed. (About one year is needed to finalize the adjudication process.) However, where the Agrarian Reform has established new production units, the aggregation and mobilization of small farmers in these new structures should, in the medium-to long-term, remove the traditional structural constraints of latifundia and minifundia land tenure patterns and the short-term constraints imposed by instability and organizational disruption.

It is expected that most, if not all, of the sub-projects to be implemented under the Project will be in areas where adjudication of land-holdings affected by the Agrarian Reform has been completed, where determination of new boundaries for new production units has been made, if not formally adjudicated, or where official certificates of "non-affectibility" have been issued, indicating that no land ownership changes will be effected. Prior to USAID approval of individual sub-projects the Mission will require assurance that land ownership in the sub-project area is stable or has been firmly established.

4. Inclusion of Sub-lending Program - Reference was made in the IRR (p. 18) to the possibility of including under the Project a program of sub-lending to farmers for investments in on-farm improvements, including construction of distribution canals, water weirs, and land-shaping. This possibility was further explored in subsequent discussions with the DGA and the Ag Bank, which confirmed both the desirability and feasibility of such a program. (Please refer to Part II - B for a full description of the proposed credit program.)

5. Effect of Division of Ministry of Agriculture - Shortly before the IRR was submitted, the MOA was split into two Ministries: the MOA was charged with responsibility for carrying out the Agrarian Reform and for establishing norms and implementing programs affecting the use of renewable resources, while a new Ministry of Food (MOF) was created to increase the production of food crops and to design and implement programs for the processing and marketing of such crops. As noted in the IRR (p. 18), it was unclear at the time how this reorganization would affect the Project. Subsequent clarification of the delineation of responsibilities of the respective Ministries indicates that the Project lies entirely within the administrative competence of the MOA; the implementation of Project activities both in Lima and in the Project areas will be carried out by MOA staff.

6. Inclusion of Sub-Projects with a Power Component - An issue cited in the IRR (pp. 18-19) was whether or not to finance under the Project sub-projects which included the development of hydroelectric power potential. Since the selection of sub-projects was limited to those technically non-complex sub-projects within the DGA's designing and construction capacity, this issue disappeared. None of the selected sub-projects involve the development of hydroelectric power potential, so there is no need to provide for coordination with the Ministry of Energy and Mines.

7. Five -Year Loan Disbursement Period - While USAID/Perú fully recognizes the thrust of A.I.D's preferences for short (three year) disbursement periods, the Project Development Committee, after careful consideration of this preferred option, determined that a five-year disbursement period is appropriate for this Loan to assure quality Project implementation. Several key considerations must be taken into account when reviewing this determination.

First, the activities to be undertaken in the context of the Project comprise what is essentially a comprehensive new GOP program, involving the establishment of new (or the significant strengthening of former) lines of inter- and intra-agency coordination. The principal institutional objective of the Project is to achieve a significant and much needed decentralization of technical functions in water and land resource management. While this decentralization is enthusiastically supported at all levels of the DGA,\* functional decentralization is a time-consuming effort, requiring careful execution of individual steps all along the way.

Moreover, such a process requires build-up of technical and administrative capability at the regional levels. In this Project, teams of experienced technicians will be created to work in the Project areas to carry on continuous identification and prefeasibility studies of potential sub-projects, which has previously been done by Lima staff. These teams will progressively train and turn over to permanent field staff personnel those responsibilities, which will assure continuation of these activities beyond the life of the Project itself.

A second institutional development goal of the Project is that of up-grading the technical capacity of the DGA Lima staff in project planning. A significant activity under the Project is the performance of sub-project feasibility analyses which will necessitate careful examination of such factors as the potential environmental effect of the sub-project and the impact of the sub-project on demand and supply of production credit, farm labor, and marketing facilities. (See Part III introduction). Compliance with these requirements under the Project will necessitate additional time for sub-project study (especially in data collection) and for the provision of on-going technical assistance to the DGA study teams.

Particularly severe constraints to reducing the disbursement period are imposed by the nature of the sub-projects and the peculiar conditions of their implementation. First, some sub-projects will require the improvement of large areas which are already being cultivated. It can be expected that the work in the cultivated areas will be slower than in those areas which will be irrigated for the first time. Second, in pursuit of maximum employment effect and farmer participation in the Project, most of the sub-project workers will be farmers. It must be expected that these will return to their farms from time to time in accordance with their traditional farm schedules and practices. This lengthens the realistic construction period estimated to be required for sub-projects. Third, all sub-project construction will be subject to the harsh conditions imposed by the topography and weather of the Andean mountains. Each year from mid-December to March, construction in the Peruvian sierra slows down considerably. Heavy rains and floods often make it advisable to stop all field activities during this period. Fourth, past experience with similar types of projects indicates that procurement delays are possible, if not likely.

---

\*It was proposed in a 1973 report by the Sub-Directorate of Watershed Resource Management which was officially adopted by the DGA in 1974.

All of these factors contribute to lengthen required construction periods for sub-projects to be implemented under the Project.

Given these considerations -- the institutional development aspects of the Project, the fact that this is essentially a new GOP program requiring considerable intra- and inter-agency coordination, the broad scope of feasibility studies required for sub-project approval, and the length of construction periods required in sub-projects of this nature -- USAID/Peru has determined that a 5-year disbursement period is the appropriate and realistic period in which to implement this Project.\*

---

\*The breakdown of time requirements for specific Project elements is given in Part IV B 1 and Chart G.

## PART II - BACKGROUND AND DESCRIPTION

### A. Background

#### 1. Description and History of the Development Problem

About 45% of the population of Peru is located in the sierra, approximately 55% of which is dependent on agriculture for their livelihood (See Table 1). Underemployment, low incomes, and low productivity characterize the rural population of the sierra despite notable GOP efforts during 1971-75 in a number of key development projects. These include: the Agrarian Reform program, large public investment in irrigation, liberal production credit terms, training programs for managers and ambitious potential program in marketing. Levels of living remain low among people engaged in agriculture in the sierra owing to a scarcity of natural resources and to a series of structural constraints, including a minimum of technology and physical infrastructure, and traditional socio-economic structural patterns.

The first of these limiting factors --that imposed by the harsh natural conditions-- is severe. Only 11.1% of the total soils in the sierra provinces are suitable for cropping, another 74.4% can be utilized for pastures, 7.4% is suitable for forestry, and the remaining 7.1% is wasteland. This limited agricultural base is subject to heavy population pressure. Despite a high rate of out-migration from the sierra, especially during the last two decades, the population growth rate of 2.9% has resulted in a ratio of less than 0.2 hectares per family dependent on agriculture in the country as a whole (1.9 hectares in the sierra). These ratios have remained virtually constant since 1960. Sierra farmers must cope with widely variable climatic conditions, owing to the rugged topography of the Andes mountains. Severe temperature variations occur in most high-mountain valleys and rainfall, while sufficient for agriculture on the average during traditional growing seasons, is highly variable both seasonally and between years (Table I).

The increasing population pressure on land resources has forced the exploitation of ever steeper slopes, contributing to erosion which is progressively reducing the productivity of an extremely scarce resource. Denudation of natural forest growth began many centuries ago and overgrazing in many areas contributes to an already serious soil erosion problem.

Structural constraints on increased production and income are imposed by low levels of technology and scarcity of physical infrastructure. Sierra farm families typically use primitive agricultural techniques with the result that very little surplus, generally less than 20% of total crop production, is available for sale after immediate

TABLE I

Selected Indexes Characterizing Resource Availability and the  
Technological Condition of Agriculture in the Peruvian Sierra\*

CATEGORY	Item	Unit and Time Period	Level	Rate of Growth/% of Total/Range
I	<u>POPULATION</u>			
	1. Total population of Peru	million/1972	14.8	2.9
	2. Population actively dependent upon agriculture in Peru	million/1972	6.5	44.6
	3. Population of the Sierra	million/1972	6.6	44.5
	4. Sierra population dependent upon agriculture	million/1972	3.6	54.5
II	<u>LAND IN SIERRA</u>			
	5. Total land area in the Sierra	million hectares	19.3	100.0
	6. Area apt for crops (Class I - IV soils)	million hectares	2.1	11.1
	7. Area apt for pastures (Class V - VI soils)	million hectares	14.4	74.4
	8. Area apt for forests (Class VII - IX soils)	million hectares	1.4	7.4
III	<u>RAINFALL &amp; TEMPERATURE</u>			
	9. Waste land		1.3	7.1
	10. Mean annual rainfall in Cajamarca and Huancayo	mm/1952-74	600	S.D. $\pm$ 200**
	11. Mean rainfall during Nov. April in Cajamarca and Huancayo	mm/1952-74	400	S.D. $\pm$ 200**

\* As defined by the MOA, the sierra comprises that land area above 1,500 m. on the western flank and above 2,000 m. on the eastern flank of the Andes Mountains.

\*\* SD = standard deviation from the mean.

Table 1 (Cont'd)

CATEGORY	Item	Unit and Time Period	Level	Rate of Growth/% of Total/Range
	12. Mean daily maximum temperature in Cajamarca or Huancayo	C°/1952-1974	20	20 to 30
	13. Mean daily minimum temperature in Cajamarca and Huancayo	C°/1952-1974	5	-5 to 10
IV	<u>AG. TECHNOLOGY</u>			
	14. Crop land per family in the sierra	hectares/1972	1.9	-
	15. Incidence of labor in total cost of producing: potatoes, corn and beans	Percent	Over 80%	-
	16. Level of fertilizer use in <u>corn</u> production	kgs. of Nitrogen/ Hectare 1972-1974		
	Sierra		<10 Kg.	-
	Coast	"	>70 Kg.	-
	Peru	"	40 Kg.	-
	17. Price of nitrogen fertilizer	\$/MT of Urea		
	Peru (CIF Pisco)	" August 1975	250.00	-
	New York (FOB)	"	167.50	-

family requirements are met. Most sierra farmers use no fertilizers at all. The average consumption of nitrogen, for example, is 10 kgs/ hectare, less than 13% of the level employed by their coastal counterparts. Ignorance of the potential benefits of fertilizer combined with high fertilizer prices has led the sierra farmer to practice a highly wasteful scheme of land-fallowing --in many mountain areas land is used only one year in three. This primitive practice contributes to a worsening of already acute land constraints in the area.

Difficult communications --i.e., scarcity of all-weather roads, limitation to high-mountain roads whose use is often interrupted by landslides, and the great distances that separate the widely scattered productive valleys-- contribute to a continued low-level of production technology. Government efforts to provide technical assistance to these farmers are greatly reduced in efficiency, and result in unusually high unit costs of providing information about improved farming practices. High operating costs for extension services and a general scarcity of trained extension personnel have led to a dearth of technical assistance for farmers in the sierra. The quality of assistance is also low. For example, more than 70% of the extension workers in Zones II and X (which include the Cajamarca and Huancayo areas, respectively) have 2 or less years of formal training in agricultural science and technology; and most of these have less than 5 years of experience as extension agents.

Absence of adequate physical infrastructure also limits marketing of agriculture production. Agricultural marketing facilities in the sierra are less adequate than those of the coast, presenting an additional constraint. Poor roads are only part of the problem. Rural collection facilities are almost totally inadequate in most sierra provinces, making it necessary for small producers to seek out itinerant truckers who serve the areas as outlets for their surplus production, or to sell in small lots to hundreds of small, part-time buyers. The present system is costly, owing largely to high spoilage losses and transport costs. Inadequate market information and lack of competition among local buyers contribute to pricing inefficiencies which operate to the disadvantage of the small producer and raise consumer prices as well. While definitive steps are being taken to remove these constraints, the problem has traditionally posed disincentives to production and efficiency. These disincentives have operated to depress demand for agricultural inputs, the supply of which depends on capital accumulation, storage, and transportation facilities not now available in sufficient quantities in the Project areas.

Additional factors limiting increased standards of living in the sierra are those of the traditional socio-economic structural patterns, especially land tenure. In the Department of Cajamarca, by

all criteria a priority target for activity designed to improve land and water use, agriculture is characterized by "postage-stamp" farming with 98% of land holdings falling between 5 and 25 hectares. Here, the Agrarian Reform program has made relatively slow progress in expropriating larger holdings, with only 38% of the Department's 508,678 hectares of cultivable land initially ear-marked for expropriation. This contrasts dramatically with most coastal areas, where land expropriations and transfers have already brought about a near total change in land tenure patterns. However, the outlook is bright for completing the formation of viable production units in time to receive the benefits of this Loan Project. In January, 1975, the local leagues of the National Agrarian Confederation (CNA) obtained the MOA's agreement to correct the unsatisfactory situation described above. In Cajamarca the GOP is now committed to: a) complete the transfer of 116,356 hectares already expropriated to 3,565 families by December 1975, b) expropriate 300,000 hectares in 1975 and 15,560 in 1976 to benefit an additional 24,000 families by the end of 1976.

Agrarian Reform has progressed much more quickly and efficiently in the Mantaro Valley. There, as of December 31, 1974, almost 65% (1,361,821 hectares) of the programmed goal of adjudicating and transferring 2,095,109 hectares of cultivable land to 34,464 recipient families had been accomplished. As of this writing the following disposition of expropriated lands has been made:

- 1) 31 production cooperatives have been formed covering 193,898 hectares and benefitting 2,489 families;
- 2) Six SAIS covering 625,631 has. and benefitting 9,187 families have been established;
- 3) 65 Indigenous Communities have been designated covering 307,241 has. and benefitting 17,276 families;
- 4) 42 Campesino groups (loosely federated individual farmers' organizations) have been formed with a total area of 178,064 has. benefitting 2,1123 families; and
- 5) 184 individual parcels totalling 3,825 has. have been distributed.

The Government plans to expropriate and transfer about 403 additional farms totalling 228,470 hectares in the Mantaro Valley during the 1975-76 biennium. Of this amount, 195,250 hectares will be grouped into 59 cooperative enterprises with the remainder going to individual farmers.

Despite these past accomplishments and ambitious GOP policies vis a vis the sierra, the harsh natural conditions and severe structural constraints described above present a dismal outlook on the viability of agricultural production in the sierra. This outlook is shared in large part by many Peruvian economists and officials, and it appears to many observers that the long-term prospects for the Peruvian economy largely lie in an urbanized and industrial sector. In the long-run, incremental population growth in the sierra will have to be absorbed by this modern sector, as the limits of increases in productivity and expansion of cultivated land are reached.

However, urbanization and industrialization can only be long-term goals, as the current limited availability of capital resources and technical and management capabilities establishes a low ceiling to the capacity of the modern sector to absorb additional workers and to provide social services for them. Growth of the modern sector will be consequently slow in the short- to medium-term, leaving over half of Perú's population with no alternative to marginal agricultural activities but migration to slum conditions and underemployment in the coastal cities. Some steps, then, must be taken to raise productivity and employment in sierra agriculture as, if nothing else, a "stop-gap" measure in the medium term.

Moreover, the needs of the Peruvian economy for foreign exchange are bound to continue increasing in the short-term as industrialization progresses through its early stages. To meet these industrial input needs, the competing demand for foreign exchange to import the country's food requirements must be progressively dampened. In recognition of this, the stated GOP policy is to encourage and stimulate increased domestic food production. Much of this required production increase must necessarily come from the fertile coastal valleys, but the balance will have to be met through increases in the productivity of sierra agriculture. As the following analysis demonstrates, there is much room for improvement in sierra agriculture through more rational use of the scarce water and land resources.

## 2. Role of Irrigation

Agriculture in the sierra is basically dependent on rainfall, although in many areas extensive irrigation systems, dating in some cases from the pre-Inca era, exist in various states of use and varying conditions of repair. In many important valleys rainfall is too variable or too low to sustain viable agriculture without supplementary irrigation, while in others agricultural exploitation is not possible at all without irrigation. While reliable rainfall data for the sierra is difficult to obtain, the above conclusions are substantiated by interviews with producers and agricultural officials in the region. The following

limited information on the Cajamarca and Mantaro valleys serves to illustrate the rainfall characteristics of much of the sierra.

Readings from 7 weather stations in the Condebamba River Basin (Cajamarca area) indicate that June, July, and August are very dry, with peak rainfall occurring in the December - March growing season. Annual levels of rainfall ranged between 23" and 32" at elevations between 2,000 and 3,000 meters, which is sufficient to grow a crop of corn or potatoes if rainfall is concentrated in critical months of the growing season. Readings from 6 stations in the Mantaro watershed indicate rainfall patterns virtually identical in distribution and amount to that observed for Cajamarca.

Although average annual levels of rainfall appear adequate to support viable agriculture, seasonal and annual variability is high. For example, using all available observations, precipitation in the growing season (Nov.-May) varied from 367.5 to 758.2 mm at Huancayo stations (Mantaro Valley) and from 317.7 to 969.5 at Cajamarca.

More important, rainfall in November, the critical month for planting most crops, varied from 5.8 mm to 136.2 mm at the Cajamarca stations and from 32.0 mm to 148.6 mm at the Mantaro Valley station, and could be expected to be below 66 mm 50% of the time in the latter valley. The dry season (June-August) ended as early as August and as late as October over the years at the Mantaro station (assuming that 1/2 inch during the month is sufficient for planting most crops).

Given the above patterns of rainfall, it is clear that supplementary irrigation has a high potential payoff. The benefits from supplemental supplies derive principally from:

- a. Eliminating restrictions on the timing of planting,
- b. Reducing risk of loss due to lack of water at critical periods during the growing season,
- c. Increasing the yield potentials through use of fertilizers and pesticides (or reducing risk of monetary loss), and
- d. Enabling the introduction of multiple cropping in many areas, temperature regimes permitting.

Significant gains in agricultural output and increases in producers' incomes are thus possible with irrigation. The major activities required to permit effective use of supplemental water in the sierra are:

- a. Increasing water storage capacity in order to regulate seasonal availability of water,
- b. Capturing run-off water to increase total supply,
- c. Increasing the efficiency of water use by improving existing canals and reservoirs and introducing proven irrigation techniques,
- d. Conserving soils and regulating run-off rates through complementary afforestation, and
- e. Draining and desalinating to improve land already under irrigation.

As mentioned earlier, extensive irrigation systems exist in most areas of the sierra. However, they are quite ancient for the most part, badly in need of repair, and generally inadequate relative to potentially irrigable land. Problems with most existing systems include:

- a. Susceptibility to flood damage,
- b. High rates of loss through seepage,
- c. Inadequate or non-existent turn-out devices,
- d. Inadequate secondary and on-farm canals, and
- e. High maintenance costs owing to silting, flash flooding and use of primitive construction methods and materials.

The following description of a selected irrigation system in the Department of Ancash (the zone affected by the earthquake of 1970) will serve to illustrate the typical irrigation problems confronting farmers in the sierra. The canal "Chuyas-Huaychao", located on the right bank of the Pomabamba River, is 22 kms. long and irrigates 1,500 has. of cropland in the Districts of Pomabamba and Huayllan. Over 600 families farm the land served by the canal. The canal has functioned unsatisfactorily since its construction in 1958 because inadequate provisions were made for continuous maintenance and no forestation was included to protect the canal as it passes through the roughest terrain. Landslides and silting have damaged most of its length and floods have half-destroyed the intake dam and other relatively expensive works. This example underlines the need for financing to rehabilitate older structures.

Producers themselves have long recognized the potentially large benefits that could arise from a relatively low-cost program of improvement of existing facilities, afforestation to protect these

structures, river defense systems, and construction of new systems where feasible. In response to a series of requests from concerned groups, dating back to the early days of the current Government, the MOA financed a special program -- "Technical Assistance to Communities and Cooperatives" in 1973. This program, managed by the newly formed Sub-Directorate of Watershed Management of the General Directorate of Water Resources, was designed to develop and finance small-scale irrigation projects in the sierra. Funding for the project during the 1973-74 biennium was low-- less than \$250,000. Nevertheless, despite limited manpower and capital resources, the program managed to initiate 5 separate projects improving or providing irrigation on 1,500 hectares. Liberal use was made of self-help labor and cheap, local materials, thereby reducing total costs per hectare by as much as 50% compared to the norm in projects of this type.

The successful experience described above led the GOP in 1974 to set aside \$500,000 (operational budget) for the 1975-76 biennium to assist in the creation of a permanent agency, with at least 5 regional offices, to promote the expansion of the activity begun under the special program. The objectives of this expanded program, for which financial assistance from AID is being sought, are:

- a. To increase agricultural production in the sierra through intensive and rational exploitation of water resources,
- b. To improve use and conservation of soil resources,
- c. To bring new lands into production by expanding water supplies, and
- d. To reduce unemployment and increase the well-being of farmers in the sierra.

### 3. Development of the Project

Identification of the Project as a potential AID loan arose from USAID's contacts with DGA technicians, and direct USAID experience with the problems posed by sierra agriculture and irrigation gained under other on-going AID loan projects.

USAID representatives and contract advisors established contacts with the Sub-Directorate of Watershed Management during 1973, largely in the form of advisory services to the DGA's Lima based technicians. An agricultural engineer, a specialist in on-farm water-use efficiency, assisted the DGA in developing an incipient water-use research program which included the sierra in its proposed scope. However, other more direct contacts with the problem and its emerging solutions included USAID loan activities with ORDEZA in Ancash (zone affected by the 1970

earthquake). Investments in irrigation structures in high-mountain valleys which were damaged by the quake were made under subloans financed by the AID Supervised Agricultural Credit Loan (527-L-054) and the Community Development Loan (527-L-052).

The flood of 1972, which severely damaged irrigation canals, dams, etc, as well as on-farm works in the northern zones (including the sierra) brought the problem into bold relief. AID Supervised Agricultural Credit Loan 527-L-056 was designed to finance the reconstruction of infrastructure damaged in the flood. These reconstruction activities helped clarify the nature of the more general problem and it became increasingly evident that insufficient river defenses, outdated and poorly constructed irrigation structures, and soil erosion problems owing to a lack of sufficient forest and grass cover in the high mountains should receive priority attention. One significant element of Loan 527-L-056 was a \$50,000 River Defense Study, focussed on the Chira-Piura watershed which was developed in 1973 and begun in 1974. Its preliminary results are already indicating new policy directions vis-a-vis the sierra areas of Peru's watersheds. One of these is that feasible, effective, and relatively simple measures exist for protecting small-scale irrigation developments under the rugged conditions found in source areas of Peru's major river systems.

The USAID was contacted by the DGA formally in July 1974 to explore possibilities for a possible future loan or technical assistance program in the field of water resources. After preliminary review it became apparent to both the GOP and USAID, that USAID's resources could best be directed towards the problems of small-scale, irrigated agriculture in economically depressed sierra provinces. Such focus was judged to be fully consistent with AID's Congressional Mandate to direct programs to the poorest economic stratum.

Early field trips (August/September 1974) served to refine USAID's conception of the problem and its ultimate solution. USAID's engineers, economists, and agronomists, travelling with GOP technicians and officials concluded then that a very large number of apparently feasible projects of small size (less than 1,000 Has.) of technically simple design (earthen dams, earth and rock canal linings, etc.) of low cost, and having great potential benefits, exists over a wide range of the Peruvian sierra.

Given this highly positive impression from visits to selected north, south, and central valleys in the sierra, the USAID and the GOP agreed to proceed to develop a loan project which would 1) create the administrative structure, both in Lima and in each major target region, necessary to carry financial and technical resources to the beneficiaries; 2) provide capital and technical assistance for building irrigation works and for investments in on-farm development; 3) provide extension services

to upgrade farm technology; 4) provide financial and professional assistance to develop the economic, technical, and social studies required to implement the development project; and 5) initiate and implement on a pilot basis a program which could be replicated in other regions of the sierra.

In November 1974 - January 1975, a USAID-contracted consultant (Engineer/Economist) working with one of the top irrigation engineers in the DGA, developed a comprehensive preliminary survey of the problem areas. Their report\* formed a solid basis for development of the project by 1) narrowing the target focus to 2 priority regions (Cajamarca and Mantaro) and 2) laying the foundation for in-depth study of sub-project feasibility, economic costs and benefits, and technical assistance needs.

The DGA, following the recommendations of the report cited above, moved quickly to form 5 work teams to begin collecting the necessary information and applying appropriate analytical techniques. These teams of researchers, with assistance from USAID and contracted experts, developed technical and economic/financial feasibility analyses for the 5 sub-projects presented in Part III, identified an additional 22 technically feasible sub-projects, and calculated global cost estimates for these 22 projects. In addition, a social survey of 5 sub-project areas was conducted by USAID-financed social scientists, and an analysis of the Project's socio-cultural feasibility was made jointly by these contractors, the DGA, and USAID. These technical, economic/financial, and social analyses combined to demonstrate the feasibility of the Project, and are presented in Part III of this document.

---

\* See W. Shaner and A. Dourojeanni Report on "Water Resources Projects to Aid Peasant Farmers in the Peruvian Sierra," January 1975.

**B. DETAILED PROJECT DESCRIPTION**

**1. LOGICAL FRAMEWORK**

(INSTRUCTION: THIS IS AN OPTIONAL FORM WHICH CAN BE USED AS AN AID TO ORGANIZING DATA FOR THE PAR REPORT. IT NEED NOT BE RETAINED OR SUBMITTED.)

Life of Project:  
From FY 76 to FY 80  
Total U.S. Funding: \$11.0 million  
Date Prepared: October, 1977

Project Title & Number: IMPROVED WATER & LAND USE IN THE SIERRA-USAID/PERU

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p><u>A. Sector Goal:</u> The broader objective to which this project contributes:</p> <p>Increase income &amp; employment opportunities of the rural sierra population.</p> <p><u>B. SECTOR SUB-GOAL:</u></p> <p>Increase food production in the sierra.</p>	<p><u>A. Measures of Goal Achievement:</u></p> <ol style="list-style-type: none"> <li>Increase in imputed gross per capita income in the rural sierra.</li> <li>Increase in man-days of on-farm labor required in the rural sierra.</li> </ol> <p><u>B. Measures of Sub-goal Achievement:</u></p> <p>Increase in total production of food crops in the sierra.</p>	<ol style="list-style-type: none"> <li>INP statistics.</li> <li>MOL &amp; ILO statistics.</li> <li>ONERN baseline data.</li> <li>Planning model developed under USAID agricultural grant program.</li> <li>Project evaluation conducted as part of watershed planning studies financed under Project.</li> </ol>	<p>Assumptions for achieving goal targets:</p> <ol style="list-style-type: none"> <li>Continued high GOP priority to rural sierra.</li> <li>Major GOP measures undertaken to improve marketing system in rural sierra.</li> <li>No disruptive effects of Agrarian Reform.</li> <li>No adverse changes in real farm-gate prices of food crops.</li> </ol>

LOGICAL FRAMEWORK

Life of Project: \_\_\_\_\_  
From FY \_\_\_\_\_ to FY \_\_\_\_\_  
Total U.S. Funding \_\_\_\_\_  
Date Prepared: \_\_\_\_\_

Project Title & Number: \_\_\_\_\_

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Project Purpose:</p> <p>Improved Water and Land Use in the Project areas of Cajamarca &amp; Mqntaro.</p>	<p>Conditions that will indicate purpose has been achieved: End-of-Project status.</p> <ol style="list-style-type: none"> <li>1. 14,900 has. newly irrigated.</li> <li>2. 13,00 has. under improved irrigation.</li> <li>3. Increase in total production (per Tables III &amp; XII*).</li> <li>4. Average increase in crop yields (per Table II*).</li> <li>5. Average increase in length of growing season.</li> <li>6. More optimal cropping patterns.</li> <li>7. Reduction in soil loss from erosion.</li> <li>8. Increase in efficiency of water use.</li> </ol> <p>*Orders of magnitude for these increases are given in cited Tables in Part III B.</p>	<ol style="list-style-type: none"> <li>1. Agrarian Zonal Offices data.</li> <li>2. MOA &amp; MOF Statistical Reports.</li> <li>3. Ag Bank data on sub-borrowers.</li> <li>4. Regional research centers data.</li> <li>5. Feasibility studies data.</li> <li>6. Project evaluation (see #5 under goal above).</li> <li>7. Project monitoring.</li> </ol>	<p>Assumptions for achieving purpose: (B-4)</p> <ol style="list-style-type: none"> <li>1. Adequate supply of seeds, fertilizer, water, credit, and technical assistance.</li> <li>2. Willingness and ability of farmers to use water efficiently.</li> <li>3. Adequate research and extension services.</li> <li>4. Favorable climatic conditions.</li> <li>5. Absence of major socio-political instabilities or conflict.</li> </ol>

AID 1020-20 (1-73)  
SUPPLEMENT 1

## LOGICAL FRAMEWORK

Life of Project:  
From FY \_\_\_\_\_ to FY \_\_\_\_\_  
Total U.S. Funding \_\_\_\_\_  
Date Prepared: \_\_\_\_\_

Project Title &amp; Number: \_\_\_\_\_

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>A. <u>Project Outputs:</u></p> <ol style="list-style-type: none"> <li>1. New irrigation structures and canal networks.</li> <li>2. Improved irrigation systems.</li> <li>3. Drainage systems.</li> <li>4. Dams to increase storage capacity.</li> <li>5. Afforestation program.</li> <li>6. Fully-staffed Regional Project offices.</li> <li>7. On-farm land development investments.</li> <li>8. Watershed Planning Studies.</li> </ol>	<p>B. <u>Magnitude of Outputs:</u></p> <ol style="list-style-type: none"> <li>1. 650 kms. of new canals.</li> <li>2. 500 kms. of improved canals.</li> <li>3. 1,500 has. drained.</li> <li>4. 8 dams.</li> <li>5. 1,200 has. afforested.</li> <li>6. 2 offices established and staffed with irrigation and agronomic specialists and extension technicians.</li> <li>7. \$4 million of investments in land development financed under sub-loans.</li> <li>8. 2 studies (per Part B3(f)).</li> </ol>	<p>A.</p> <ol style="list-style-type: none"> <li>1. Statistical offices of MOA &amp; MOF,</li> <li>2. Project monitoring               <ol style="list-style-type: none"> <li>a) by USAID &amp; DGA</li> <li>b) by Regional Project Offices</li> <li>c) by Agrarian Zonal offices</li> </ol> </li> <li>3. Sub-project feasibility studies</li> </ol>	<p><u>Assumptions for achieving outputs:</u></p> <ol style="list-style-type: none"> <li>1. Acceptance of sub-projects by local communities.</li> <li>2. Availability &amp; adequacy of local labor.</li> <li>3. Prompt availability of machinery, equipment, and materials.</li> <li>4. Willingness of trained MOA staff to work in Regional Project offices.</li> <li>5. Adequate promotion of credit fund and effective demand for land development investment credit.</li> </ol>
<p>B. <u>Intermediate Outputs:</u></p> <ol style="list-style-type: none"> <li>1. Sub-project feasibility studies.</li> <li>2. Terms of Reference for Watershed Planning Studies.</li> </ol>	<p>B. <u>Magnitude of Intermediate Outputs:</u></p> <ol style="list-style-type: none"> <li>1. Up to 27 sub-project feasibility studies.</li> <li>2. Terms of Reference for planning studies of 2 watersheds.</li> </ol>	<p>B. USAID review &amp; approval:</p>	<p>B. Consultants' availability and MOA approval</p>

LOGICAL FRAMEWORK

Project Title & Number: \_\_\_\_\_

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Project Inputs:</p> <p>1. USG: TA (consultants, training, studies) Construction machinery, equipment, and materials. Tree plantings Contribution to special credit fund</p> <p>2. GOP: Staff &amp; offices TA to Regional Project Offices &amp; to farmers Local materials and equipment Local labor costs Local cost support of research, advisory, and evaluation services. Contribution to credit fund.</p>	<p>Implementation Target (Type and Quantity)</p> <p>1. TA advisors in DGA 90 days after Loan Agreement signed. 2. Regional Project offices staffed 120 days after CPs met. 3. Imported machinery delivered 6 mos. after CP's met.</p> <p>4. Equipment &amp; machinery purchased prior to 1st disbursement for sub-project construction. 5. Tree plantings purchased. 6. GOP budgetary support for '77-78 . biennium approved by mid-1976. 7. Credit fund in Ag Bank established 12 mos. after Loan Agreement signed.</p>	<p>1. Project monitoring. 2. GOP Controlaria reports.</p>	<p>Assumptions for providing inputs:</p> <p>1. Inflation within Project estimates. 2. AID/W back-stopping. 3. Timely GOP decree authorization of budgetary and staff support.</p>

## 2. Sub-Project Profiles

The central Project element is the implementation of up to 27 sub-projects selected and designed to improve the use of scarce water and land resources in the Project areas of Cajamarca and Mantaro. These sub-projects include the construction of technically simple infrastructure works using local labor and materials to irrigate or drain agricultural and pasture lands in the Project areas and to improve inefficient or incomplete irrigation systems already in existence. Works to be included typically will be small dams, lined and unlined canals, and water intakes. Water control and measuring devices will be installed as part of the irrigation systems. Profiles and costs\* of the engineering works to be included in 5 analyzed sub-projects follow, illustrating the types of engineering structures to be built under the Project.

### Mantaro Area

#### 1) Chupaca

The Project site is on the right bank of the Cunas and Mantaro rivers. 1977 new has. will be brought under production and old irrigation structures for another 1,328 has. that are presently being irrigated will be improved, at an estimated sub-project cost of approximately \$1.4 million.\*\*

The Huarisca water intake in the Cunas River will be modified and a stone rip-rap protection structure will be built downstream from the intake. Existing canals will be improved and new ones will be constructed. Of these, the most important one is a lateral canal 7.8 Km. long, having a capacity of 0.55 m<sup>3</sup>/second.

#### 2) Chicche

The area to be newly irrigated is about 580 has. and lies between 3,500 and 4,000 meters elevation. The estimated sub-project cost is approximately \$0.5 million.\*\*\*

A water intake will be placed about 3 Km. downstream from the Pomacocha lake in its natural drainage course. A main canal of about 9 Km. in length and 5 small reservoirs will also be constructed.

---

\* The costs cited here in the following profiles include studies, construction of works, and on-farm land development (which includes protective afforestation and development of tree crops).

\*\* Approximately \$600,000 of this total represents costs of land development, of which approximately 50% will be financed under sub-loans.

\*\*\* Approximately \$100,000 represents costs of land development, of which approximately 50% will be financed under sub-loans.

3) La Huaycha

The sub-project is located on the right bank of the Mantaro River. About 515 new has. will be brought into production at an estimated total cost of approximately \$0.2 million.\* Irrigation water will be tapped from springs and led into a 6 km.-long main canal having a capacity of 0.60 m<sup>3</sup>/second.

Cajamarca Area

1) Chingol

The sub-project site is on the left bank of the Condebamba River. About 1,000 new has. will be brought under production and old irrigation structures that now serve approximately 1,200 has. will be improved. The approximate estimated cost of the sub-project is \$0.8 million.\*\* Irrigation water will enter from the Condebamba River into a new main canal of 30 Km. in length and existing secondary canals and roads will be improved.

2) Negritos-Tual

920 new has. will be put under irrigation at an estimated cost of \$0.8 million.\*\*\* The area to be irrigated is between 2,900 and 3,500 meters elevation. The total length of the main canal will be 24.5 Km., divided into three segments of 6.8 Km., 1.3 Km. and 16.4 Km. The first segment will carry irrigation water from the Colorado Creek and deliver it into the La Quinoa Draw. About 2 kilometers downstream, the second segment will lead the water into another draw and then, one kilometer downstream, the third segment will carry the water to the irrigation zone.

In each of these sub-projects minor substructures such as lateral canals, drains, access and feeder roads, fences, gates, small concrete structures, and minor appurtenances will also be constructed. Land development activities in each sub-project include clearing and leveling of the land, rock removal, and protective afforestation.

Given the increased availability of irrigation water through the construction of these works, an integral element of sub-project implementation is the re-ordering of farm production patterns to maximize efficient use of land resources. Revised production plans

---

*	Approximately \$100,000	represents costs of land development, of which				
	approximately	50% will be financed under sub-loans.				
**	Approximately \$400,000	"	"	"	"	"
***	Approximately \$200,000	"	"	"	"	"

will be worked out with the farmers to expand cultivation of food crops and to shift less productive land into tree and forage crops and pasture.

Afforestation of sub-project areas will also comprise an essential sub-project element. Under an afforestation program, eucalyptus and pine trees will be planted in those parts of the sub-project areas which are particularly subject to soil erosion from water run-off or which are critically located in relation to infrastructure and consequently require ground cover to protect the structures from mud-slides and torrential water-courses.

Up to approximately \$13.7 million of Project funds are allocated to implementation of sub-projects. This allocation is based on pre-feasibility cost estimates for implementation of 5 illustrative sub-projects and preliminary cost estimates based on unit cost figures, for an additional 22 identified sub-projects. These cost estimates include the cost of studies and design, construction machinery, equipment, and materials, labor and technical supervision, and land development required to assure efficient water distribution such as levelling and terracing. A provision of 15% was included in infrastructure construction costs to allow for inflation. 15% of the total sub-project implementation costs was added to provide for construction contingencies\*, to arrive at the total allocation for sub-project implementation. (See Part III-E--"Financial Plan"-- for a detailed budget breakdown of Project costs.)

---

\* USAID conversations with IDB technical staff relating to their experience with cost over-runs under the "Linea Global" loan project indicated that, given the natural conditions of the sierra, a provision for contingencies is essential to provide added funds for reconstruction of works affected by landslides or earth tremors.

### 3. Technical Assistance Program

Technical assistance will be required under this Project for the implementation of activities at 3 levels: a. for advising high-level GOP managers and analysts in techniques of water-related sub-project development, analysis, administration, and evaluation; b. for implementation of sub-projects, including performance of pre-feasibility and feasibility studies, effective organization of farm groups, and on-going functions of regional administration; and c. for improving the level of on-farm technology of Project beneficiaries. Additional TA funds will finance: d. short- and long-term training; e. training equipment, and; f. watershed planning studies.

#### a. Advising High-Level GOP Managers and Analysts (Estimated Loan financing: \$255,000).

It is estimated that 2 high-level foreign advisors will be required to assist in sub-project analysis and implementation of the administrative system for the Project. They will also help ensure successful evaluation of the Project and prepare for its expansion into other regions of the sierra by assisting in the development of an integral watershed studies of the Project areas. (See sub-section f, below.) Specific qualifications, estimated time and cost requirements, and counterpart personnel for the required advisors are:

#### (i) U.S. Advisors

-- Economist, specialist in project analysis, with a minimum of 10 years experience in practical application of analytical methods to irrigation problems (24 m/m.)

-- Irrigation Engineer, with a minimum of 10 years experience in administration of projects involving small-scale irrigation and conservation of water and soil resources (24 m/m.)

-- Short-term Consultants, required to provide specialized services, would include: 1) an agricultural economist, with a specialty in water resources research, 2) a civil engineer specialized in irrigation infrastructure, and 3) an agronomist/soils expert, with experience in hydrology and study of plant/soil/water relationships (up to 15 m/m.)

#### (ii) GOP Counterparts:

-- Chief Economist for the Sierra Water and Land Use Improvement Program, located in Lima, and employed by the Directorate of Preservation and Conservation (DIPRECO) of the DGA. The Chief Economist will head a team comprised of, at a minimum, the following technicians: 1) 3 agronomists, 2) 3 civil engineers, and 3) 3 hydrologists.

-- The Director of Watershed Management, who will have overall responsibility for project implementation. His primary responsibility is to coordinate sub-project analysis and implementation including development of Regional Project Offices which will assume increasing responsibility for sub-project development and for providing technical assistance to Project beneficiaries.

b. Implementation of Sub-projects (Estimated Loan financing: \$85,000)

In order to insure proper identification of sub-projects and development of adequate economic, technical, and social analyses, it will be necessary to finance a team of highly-trained Peruvian technicians to augment the staff of the DGA. Their task, estimated to require 2-3 years\*, will be: a) to advise DGA sub-project teams on methods of data collection, processing, and analysis and b) to provide on-the-job training for additional teams as they are formed. The qualifications and estimated cost and time requirements for a minimum of 3 advisors are as follows:

(i) Long-term Peruvian Advisors to sub-project teams

-- Agricultural Economist, Ph.D., with at least 5 years of experience in agricultural projects analysis who will advise the DGA and Regional Project Office teams and provide training in sub-project analysis.

-- Civil Engineer, with at least 5 years of experience in irrigation works to advise the sub-project teams on engineering aspects of actual sub-project works and to develop and implement, with the foreign advisors, in-country training programs to up-grade the skills of DGA and Regional Project Office staff.

-- Agronomist/hydrologist, with at least 5 years experience in research in and implementation of irrigation projects, to coordinate the advisory team, to advise the DGA and Regional Project Office teams on feasibility studies, to advise implementation teams on agronomic and hydrologic aspects of sub-project works, and to work with the on-going training program for Regional Project Office teams.

---

\*NOTE: The disbursement period of the Loan is 5 years, with disbursements expected to begin in July-August, 1976. To insure maintenance of the momentum generated in the DGA by joint USAID/GOP efforts to design this Project and to provide essential data for on-going sub-project analysis while awaiting signing of the Loan Agreement, 3 technicians are being financed from grant funds (Special Study Fund, ProAg 22) from July 1975 through June 1976.

(ii) DGA counterpart personnel for these advisors are estimated to total 30 middle-level technicians, including 15 members of Regional Project. Office teams and 15 members of the DGA teams. These teams are to be composed of engineers, economists, topographers, agronomists, and social scientists.

c. Improving the Level of On-Farm Technology of Project Beneficiaries (Estimated Loan financing: \$190,000)

This element of the TA program includes both basic research in plant/soil/water relationships and development and improvement of extension services to Project beneficiaries. Sub-project success will depend to a large degree on being able to deliver tailor-made new technology to sierra farmers, especially the technology of improved irrigation efficiency. The latter, for purposes of this Project, is divided into two parts: water conveyance efficiency and water application efficiency.\* Other important technological factors include soil fertility and use of fertilizers in irrigated farming and plant varieties as they relate to consumptive use of water. In short, supportive research is needed to provide information on new water-use technology for use by extension agents in providing technical assistance to farmers.

Specific objectives of the program of research are:  
1) to determine water requirements for principal crops that fall within the National Crop Plan, and 2) develop criteria for designing alternative irrigation systems -- including furrow type, flooding, sprinklers and drip-systems-- in order to obtain maximum efficiency in water consumption for varying soil types and crops. Areas to be investigated include:

Evaporation- Transpiration

a) Meteorological information will be analyzed to formulate equations for estimating consumptive use of water by crops.

b) Field experiments will be conducted using such methods as gravimetrics, neutron scattering, solid moisture tension, and electrical conductivity, to measure consumptive use for purposes of adjusting the basic equations derived above.

Design of Irrigation Systems

a) Field tests to determine the necessary criteria for recommending improved methods of irrigation based on soil texture, crops and availability of water. Alternatives to be analyzed include furrow systems, flooding, sprinklers, and drip-systems.

---

\* See Annex V for analysis of water use efficiency.

b) Recommendations for improved on-farm practices will be developed from the above studies.

#### Scheduling Water Distribution

The basic water-use information will be used to design procedures for allocating water among irrigation districts.

#### Water Measuring Instruments

Adequate control of water distribution requires development of a simple, inexpensive measuring device at the point where water enters the individual farms. This will be tailor-made to suit existing conditions. Training of research and extension workers and development of programs for carrying research results to farmers are an integral part of the project.

USAID is currently supporting a small, regionally-financed research project\* in this area but it is evident that a greatly expanded effort is essential. Minimum assistance should include the following inputs over a 5-year period:

(i) Long-term Research Advisor, a Senior Irrigation Engineer with research experience to coordinate the activity, select study sites, evaluate existing meteorological data and initiate procedures for data compilation and analysis. (24 m/m).

(ii) Short-term Consultants, to advise on specific problems, as identified by the principal researchers, in the following fields: a) Soil Physics, b) Engineering specialist in evapo-transpiration, c) Engineering Specialist in system design, d) Agronomy, e) Agricultural Economics, and f) Meteorology (15 m/m).

#### (iii) GOP Counterpart

A research director  
 2 principal researchers  
 10 research assistants  
 secretaries  
 10 Field laborers  
 Computertime, equipment and office space; and  
 Funds for Special Studies.

---

\* This project, supported by a 2-year TAB contract with Utah State University includes an Irrigation Engineer for 24 m/m, 18 m/m of short-term consultants, and miscellaneous equipment.

The second critical need, in addition to basic research, in the improvement of the level of on-farm technology is the development of effective extension services to Project beneficiaries. The newly established Regional Project Offices, in coordination with the already existing extension system located in the Agrarian Zone Offices, will deliver the required technology in efficient water use to the farmers. This technology will consist of the following broad elements:

1. efficient use of water, including timing, amount, etc. coordinated with specific crop requirements,
2. changes in farming techniques which should accompany irrigation of crop and pasture land, and
3. land shaping techniques, on-farm canals, and other engineering measures required to insure efficient on-farm distribution of water.

To make this technology available to the farmers, the following GOP support staff will be provided:

(iv) GOP Counterpart

DGA and Regional Project Office personnel required to implement this extension program in the Project areas (Zones II and X) are estimated as follows:

- 4 Agricultural Engineers, specialists in extension
- 20 Medium-level extension workers

This core group, specially trained in extension methods and the specialized information described above, will begin to work with sub-project beneficiaries immediately upon initiation of the sub-project studies. This is necessary to insure that the farmers are properly prepared to take full advantage of the irrigation system once it is completed. It is expected that they must continue working with the beneficiaries at least 2 full years, and that they will coordinate closely with Agrarian Zone's general extension personnel.

As technical support to the GOP extension staff, Loan funds will be provided, as available, to finance:

(v) One foreign advisor, an extension specialist in irrigation who will be required 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, this advisor will assist counterparts in the DGA and Zonal Offices in developing ongoing training programs to upgrade the skills of existing "sectoristas," extension specialists, etc. (up to 24 m/m).

d. Training Requirements (Estimated Loan financing: -\$100,000)

It is imperative for the maximization of the long-run net benefits of this Project that 2 training programs be financed under this Loan. First, PhD-level degree-training at foreign institutions in disciplines essential for supporting on-going research in water-use efficiency is necessary for a small, select group. Second, short-term training tours (invitational travel) for key MOA personnel are essential to enable an effective transfer of existing technical and administrative expertise to Perú during the life of this Project.

Details of the 2 training programs are:

- (i) 2 long-term participants for degree training in Agricultural Engineering and Hydrology (36 m/m).
- (ii) Short-term training visits for high-level administrators and experts in the DGI and DGA. Visits will be made to the U.S. Soil Conservation Service, Secretaria de Recursos Hidráulicos de Mexico, international seminars in irrigation and drainage, short courses in planning, economic analysis, and other water resources related activities, and for other appropriate courses. (36 m/m)
- (iii) GOP Counterpart costs, to include salaries of the participants.

e. Equipment for Training and Planning Programs (Estimated Loan Financing: \$75,000)

Specialized training materials, including computer software (programs, etc.) photo interpretation equipment, books, printing and other visual aids equipment, and laboratory equipment will be required for the planning group in the DGA for training in extension services.

f. Watershed Planning Studies (Estimated Loan Financing: \$175,000)

As noted above in sub-section a, a task of the high-level foreign advisors will be the development of terms of reference for watershed planning studies. These studies will be designed to establish an analytical framework necessary to measure the socio-economic impact of the Project in the valleys of Cajamarca and Mantaro. In addition, the development of the terms of reference will improve the capacity of the DGA in the future to plan, execute, and manage integrated watershed development schemes such as those initiated under this Project.

This total package of technical assistance to be provided under the Project will complement technical assistance currently provided under the Iowa University Contract in research on water allocation efficiency and agricultural project analysis. Additionally, these technical assistance elements will be coordinated with the supplemented by proposed German and Canadian technical assistance programs in irrigation and forestry, described below in Section C. These activities collectively constitute a comprehensive technical assistance program tailored to the needs of the MOA in the planning and execution of this Project and of the broader GOP water resources management program.

#### 4. Sub-lending Program

A third Project element has been included to maximize the potential benefits from sub-projects constructed under force account by the DGA. A special fund for investments in on-farm land development and improvements will be established within the Agrarian Bank, composed of up to \$1 million of AID Loan funds and up to \$2 million of GOP counterpart funds. Credits from this fund will be made available on concessional terms for use in integrated medium - to long-term investment programs designed to maximize efficiency of water distribution and application and to finance supplementary on-farm improvements. Such programs will include, (1) land clearing, (2) land levelling, (3) installation of lateral canals and drains, and (4) minor land formation (ditches and mounds). These represent investments which will contribute to maximize irrigation efficiency.\* Other medium - to long-term on-farm investments, such as construction of minor storage facilities and installation of fences, will also be eligible for financing with these credits. Sub-borrowers will be Water User Associations and individual farmers in those areas benefitted by the construction of infrastructure works under the sub-projects in each Project area.

The Project funds for this sub-lending program will be allocated to the Ag Bank, where a special line of credit (Cuenta Ajena\*\*) will be established. The credit will be managed by the division of international credit in the Lima office of the Ag Bank, with active participation in promotion, sub-loan processing, and collection by the Ag Bank's branch offices and agencies in the Project areas. The DGA will have a particularly active role in the sub-lending program in policy coordination, promotion, and technical assistance in identifying and implementing investment programs.

Applications for sub-loans under this special line of credit will be prepared by eligible Water User Associations or individual farmers in the sub-project areas with technical guidance from the DGA and Regional Project office staff. Eligible sub-loans will be those on-farm investment programs in the sub-project areas for which the DGA has prepared a feasibility analysis and approved a sub-loan application. Other eligibility criteria will be consistent with standard Ag Bank regulations. No preferential treatment will be accorded to any particular tenure structure. The Ag Bank will make final approval of each sub-loan application prior to disbursement. Specific terms and conditions will be established for each sub-project on a case-by-case basis. Sub-loans will be medium- to long-term, ranging from six to 20 years maturity. The maximum interest rates for Ag Bank loans is 14%, but it is expected that the range of rates on sub-loans under this program will be from 7-10%\*\*\* Interest rates to be charged to sub-borrowers will vary in each Project area according to investment returns projected

\* See Annex V for a description and analysis of water use efficiency.

\*\* Funds under a Cuenta Ajena are not considered part of the Ag Bank's capital; they are generally funds which are managed by the Ag Bank on behalf of another GOP agency, in this case, the MOA.

\*\*\* 10% is currently being charged on loans to Water User Associations under a separate line of credit to Water User Associations throughout the country; since this credit is largely targeted to the coastal farmers, a lower, subsidized rate is likely to be applied to the sierra farmers under this Project.

by feasibility study and to social-political criteria, in accordance with Title VI, Article 318 of the Law of the Agrarian Bank which defines "Special Projects and the Treatment of Interest Rates". Limits to the size of each sub-loan are negotiable, but are estimated to be established at either \$400 per farm family or \$500,000 per sub-loan, whichever limit will assure the maximum spread of benefits among prospective beneficiaries. Up to 100% of the cost of land development works identified in each investment program will be eligible for financing. However, it is expected that approximately 40% of the total investment cost in each sub-loan investment will be labor contribution by the sub-borrower. Some sub-loan investment cost may be for foreign exchange to purchase equipment, but the great majority will be local costs of technical assistance, tools, and materials.

Responsibility for the collection of sub-loan repayments will rest exclusively with the Ag Bank, which has established procedures and adequate staff to assume this responsibility. Reflows from the sub-loans will be used to establish a permanent revolving fund for continued financing of similar, water resource-related investments.

Up to \$3 million of Project funds (including \$1 million of Loan funds) have been allocated to this line of credit for on-farm investments in land development and improvements. This total represents approximately 50% of the total cost of land development requirements in up to 27 sub-project areas, according to DIPRECO estimates. In conversations with DGA technical staff, it was determined that roughly half of the identified land development requirements are critical to the minimally efficient and effective use of the sub-project works, and therefore are considered integral to each sub-project and included in sub-project costs. The remainder of the land development activities will be financed under the Ag Bank sub-lending program.

The estimated total demand for these credits, then, is based on a technical determination of the requirements for land development investments in the 27 identified sub-project areas. Other criteria for projecting demand for this kind of credit are unavailable, as experience with investments of this nature in the sierra is extremely limited. Effective demand for the credits available under the Project will in effect be created by the DGA and Regional Project office staff through technical assistance to farmers in the sub-project areas in the identification of profitable land development investments, through their promotion of the credit program, and through their assistance in the preparation of feasibility studies of each investment and sub-loan application. Success in effectively creating credit demand under the Project will depend in large part on the effectiveness of the DGA and Regional Project office staff in providing this technical support.

Creating demand for these credits will also depend on the success of the sub-projects themselves in raising farmer purchasing power to permit potential sub-borrowers to assume additional credit obligations. The financial analyses of five sub-projects (described in Part III B) demonstrate that financial rates of return to these illustrative sub-projects are more than sufficient to justify the assumption that potential sub-borrowers will be able to afford taking out these medium - to long-term credits. There are risks in depending on creating demand for these credits, but it is believed that these risks, inherent in undertaking this innovative project element, are warranted, owing to the competence and commitment of the DGA staff and to the projected financial profitability of the sub-projects.

C. Other relevant donor activity in sierra water and land use

The critical role of improving water and land use in the sierra as a means of removing major bottlenecks in agriculture production and increasing farm income and employment is recognized by several other donor agencies in their Peruvian programs. Of these, the program most likely to contribute directly to this Project is a German program of technical assistance in rural infrastructure development. This program, begun in 1967, comprises a group of up to 8 technicians which, in co-operation with GOP community development agencies (since 1972, SINAMOS - "Sistema Nacional de Apoyo a la Movilización Social"), has directed its efforts principally to the identification and development of small and medium-scale water-related projects. In recent years, such efforts have been focussed in the rural zones of Huaraz and Huancayo\*, where 2 technicians have been assisting local community groups and government offices in the development of small-scale irrigation systems.

In June, 1975, the MOA/DGA made a request to the Chief of the German Program and to SINAMOS that these 2 technicians collaborate with the DIPRECO engineers in sub-project selection and analysis for purposes of developing this Project. In addition, the MOA/DGA directed a formal request to the German Embassy to extend their contracts beyond the current termination date of August 31, 1975, to December 31, 1975, and to initiate official procedures to begin a program of technical co-operation to support the planning and execution of this Loan Project. This new program would include 2 technicians (presumably those who have had prior experience under the former program mentioned above) to support directly the work of the Peruvian staff in implementation of Project activities in the pilot zones of Cajamarca and Huancayo. Additionally, a third technician, an engineer to serve as Chief of the Program, would work in the DGA in Lima, assisting in the establishment and evaluation of technical norms and standards for sub-projects and preparing for the expansion of comparable sub-project activities into other sierra regions.

USAID has indicated by letter to the current Chief of Program its interest in the extension of the existing contracts and in the establishment of a new technical assistance program; however it remains unclear whether the German Government will extend such a program. If it does, the Project will gain considerably, particularly from the several years of experience in small-scale irrigation development brought to the Project staff by the 2 technicians previously mentioned.

---

\* The technician in Huancayo was instrumental to the DGA and to the Mission in identifying and selecting potential sub-projects for this Loan, and is currently working directly with the DGA in Lima in the preparation of technical analyses of identified sub-projects.

Another donor agency program which might directly support the Project is one currently under negotiation between the GOV and the Canadian Government. A DGA request for technical assistance in watershed resource management was made to the Canadian Government in late 1974, initiated by the Sub-Director of Watershed Management. The proposed program which has been developed in collaboration with the DGA would finance \$900,000 of Canadian technical assistance in identifying and proposing solutions to problems of watershed management in the coastal, sierra, and jungle region of Peru. 4 Canadian technicians would provide full-term advisory services over a 4-year period, and some short-term consulting services would also be offered. Approximately \$100,000 would additionally finance degree-training of DGA staff in Canadian or US universities. 3 DIURECO engineers, including the Director, will be travelling to Canada and to the US in September-October 1975 to explore the offerings and capacity of various academic programs. While the details of this proposed Canadian-DGA program remain to be defined, it is expected that a significant component of the program will be focussed on sierra watershed resource management, and will certainly lend considerable technical support to the AID Loan Project.

Other donor programs in water and land-use in the sierra include a British-financed group of 5 experts in dairy livestock production working in Cajamarca. This group consists of a veterinarian, 2 agricultural engineers, and 2 lab technicians, who are directing, in conjunction with the Ministry of Food and the Zonal Offices, a pilot project (based close to the city of Cajamarca in a co-operative in La Colpa) in pastures, forage crops, quality of milk, and dairy cattle diseases. An integral part of the pilot project is a demonstration center at the co-operative to which members of other co-ops are invited to be exposed to improved techniques of pasture development, cattle grazing and care of dairy cattle. This pilot project is very likely to contribute at least indirectly to achieving the objective of the proposed DGA-AID Project, since it is very likely that sub-projects financed under the Project in Cajamarca will increase the potential for dairy livestock production by making possible, through new irrigation systems, the expansion or improvement of pasture lands.

A fourth technical assistance program relevant to the Project is a Canadian-financed training program in forestry development, currently underway with the DGFF in the MOA. Up to \$500,000 has been made available to the MOA to finance short and long-term training of DGFF technicians in Canadian universities.

The Belgian-financed technical assistance program in Cajamarca, cited in the IRR (p. 12), which is conducting a pilot project in coordinated regional development, is due to terminate at the end of CY 1975. A mission of approximately 10 technicians has been over the past several years initiating and developing small-scale innovative projects in alternative land use patterns, forestry, health, education, and tourism.

The experience gained under these projects has been invaluable in fostering strong and enthusiastic inter-institutional co-ordination among the INP regional office, the AgBank, the Technical University of Cajamarca, and the Agrarian Zone, as well as in exploring regional economic development alternatives. These benefits will undoubtedly be captured in the implementation of activities under the AID Loan Project.

Another donor agency program of considerable significance for this Project is an IDB loan project in Mexico. This loan (420/SF), signed in February 1975, is substantially similar in many respects to the proposed Project, as it is designed to invest in minor water works for improvement of pasture and cultivated land in the poorer, less productive regions of Mexico. The total value of the Mexican project is \$97.20 million, of which \$37 million represents IDB Loan 420/SF, \$8 million IDB Loan 278/OC, and \$52.20 million of the Mexican Government counterpart contribution. It is expected that 680 minor water works will be constructed under the project, benefitting 23,000 families and improving pasture and cultivation of 60,000 has.

The Director of DIPRECO visited this IDB project during 1975 (under USAID financing), and returned with extremely favorable impressions as to its potential economic impact and administrative feasibility. He and 2 other DIPRECO engineers will make another visit to the project in September-October 1975, joined by the Mission's Agricultural Economist, to review administrative aspects of the project with the objective of returning with specific ideas gained from the experience in Mexico for the implementation of this AID Project.

### PART III - PROJECT ANALYSES

The feasibility of this Project has been analyzed on ? levels -- first, the overall administrative feasibility of the entire Project, which is reviewed in Part IV ("Project Implementation") and second, the technical, economic/financial, and social feasibility of 5 individual sub-projects, which comprise Stage I of the Project. The remaining sub-projects, up to 22 more, will be analyzed pursuant to the same procedures and terms of reference used in the analyses presented in this document. This continuing process of sub-project analysis is considered an integral part of the Project itself, insofar as a major objective of the Project is institutional development of the DGA and participating agencies in the field, and will be conducted throughout the period of Project implementation with guidance from highly qualified Peruvian professionals -- an economist, an agronomist, and a civil engineer -- with assistance from foreign advisors, all to be financed with Project funds.

Terms of reference for the analysis of sub-project feasibility to be conducted under the Project will be agreed upon between USAID and DGA and will be formalized in subsequent Loan Project documentation. These terms of reference will serve as a precise framework for the performance of definitive feasibility studies of each sub-project following the general pattern already established in the feasibility studies presented below in the following sections. The refined terms of reference will necessarily include certain additional elements, which are:

1. An analysis of the impact of the sub-project on:
  - a. producer demand for agricultural inputs (seeds, fertilizers, etc.);
  - b. producer demand for annual production credit;
  - c. farm labor requirements;
  - d. the level of commodity surpluses generated that will enter commercial marketing channels; and
  - e. the required level of extension services to farmers.
  
2. A determination of availability of:
  - a. agricultural inputs;
  - b. sufficient annual production credit to finance the purchase of agricultural inputs required in the sub-project areas;
  - c. additional labor to farm newly cultivated land;
  - d. adequate storage and marketing facilities to absorb the increment in surplus production in the sub-project area; and
  - e. adequate and appropriate extension services to farmers.

3. An analysis of the projected income effects of production increases in the sub-project area and an examination of policy actions required to maximize the transfer of these into cash income for farmers in the sub-project area.

4. An assessment of potential environmental effects of the sub-project both during and after infrastructure construction and a determination of preventive measures required to eliminate or mitigate potential negative environmental effects.

The results of these analyses will be reviewed by the Mission in consultation with the DGA to determine the over-all feasibility of each sub-project prior to its approval for financing under the Project (See Part IV D, "Conditions and Covenants; Negotiating Status").

What follows in the sections below are a series of feasibility analyses of the first 5 sub-projects which have been selected for Project financing -- Chingol and Negritos-Tual, both in Cajamarca, and Chupaca, La Huaycha, and Chicche in Mantaro.\* These 5 represent the final selection from among 7 potential sub-projects identified and studied in this initial stage.\*\*

The Project Development Committee is confident that the analyses of these 5 sub-projects are sufficiently representative of the total number to be financed to justify the commitment of AID Loan funds in the amount requested, and confident as well that there is an adequate number of identified potential sub-projects, allowing for elimination of infeasible sub-projects, to assure full expenditure of

---

\* These are considered to be representative of the types of sub-projects which will be considered for Project financing. Chingol is representative of Cajamarca low sierra (i.e. less than 3,000 meters elevation); Negritos-Tual of Cajamarca high sierra; Chupaca and Chicche are representative of Mantaro low sierra and high sierra, respectively; and La Huaycha, of drainage sub-projects.

\*\* One, Porcon Alto, was eliminated during the technical analysis, as it was shown that there was insufficient water for both Porcon and Negritos-Tual. Negritos-Tual was preferred owing to its acceptable economic return and greater social feasibility. A second was dropped in the early stages of sub-project identification owing to technical problems presented by geological formations in the area.

the Loan funds allocated to sub-project implementation.\*

A. Technical Analysis

1. Selected Technology

A controlling approach in the design of this Project is that all construction works required must be technologically simple in both design and construction. Simplicity of design will build upon DGA's particular experience and strength, which is concentrated in the design of rustic, low-cost, structures, adapting standard designs to peculiarly local conditions. To the maximum extent possible, standard designs for engineering structures are to be used; standards already in use by the DGA make up the majority of the design requirements. While DGA engineers are quite capable of designing for special conditions as they are met, where individual sub-projects include a design element requiring special expertise, such as a high dam, experienced and readily available Peruvian consulting engineers may be contracted.

Construction simplicity will strongly favor the use of locally available unskilled labor and materials. As the DGA engineers are designing the construction plans with intensive labor in mind, it is essential that all or nearly all construction be of a technical level that can be understood and performed by the farm people in the Project areas, with limited technical guidance and engineering advice from the DGA. Digging canals, excavating for foundations and for water control works, and the laying of the service roads will be done in large part by manual labor. All needed labor hands will come from the immediate sub-project areas. This unskilled labor will be supported as required by selected skilled laborers, works foremen, and superintendents. Additionally, maximum use will be made of local materials. For example, extensive use will be made of rock foundations and revetments plus rock masonry, to substitute where possible for reinforced concrete. Plenty of head-sized rock is available in the Project areas and the local farmers understand this kind of work much better than building forms for reinforced concrete. USAID/ENG, working closely with DGA engineers, will review the proposed structures of each sub-project with these concepts in mind.

5 sub-projects evaluated in depth to date are typical and representative of the general technical simplicity of all sub-projects to be financed. These are Chingol and Negritos-Tual in

---

\* Lists of 22 additional identified sub-projects are given in Section B 4, Tables VII - X, giving preliminary technical characteristics, and tentative magnitudes of costs and benefits.

Cajamarca and Chupaca, Chicche, and La Huaycha in the Mantaro Valley. The engineering works in these sub-projects can be classified into only 10 structural types:

- 1) Intakes and Sandtraps
- 2) Canals
  - Primary
  - Laterals
  - Canal Drops (Rápidas)
  - Canal lining
  - Canal improvement
- 3) Culverts
- 4) Aqueducts
- 5) Crossing (intermittent streams over canals)
- 6) Weirs
- 7) Distribution Boxes
- 8) Drainage Ditches
- 9) Roads
  - Access
  - Feeder (Improvement only)
- 10) Bridges, small

All of these are simple in design and construction. Most of the work can be accomplished by manual labor. Relatively little equipment or skilled labor will be needed. Typical examples of standard designs to be used in construction of works described below are in Annex V. Sierra farmers are familiar with the labor requirements on these kinds of works.

The intakes and sandtraps, perhaps the most complex structures of these sub-projects, will be built with rock rubble (up to head sized) covered with concrete or reinforced concrete.

Each intake and sandtrap will present special engineering problems, particularly in their foundations, and the designs will have to be adjusted to each situation. Excavations for foundations may require some drilling and blasting. A bulldozer will be needed

to move large rocks and for limited similar heavy earth moving. Trucks to haul aggregates, cement and some form lumber will be needed for limited amounts of time. A cement mixer will be kept fairly busy as the structures take final shape.

Most excavation for primary canals, laterals and for improving existing canals will be accomplished manually. (Standard designs for normal and unusual conditions are shown in Annex V.) Drilling and blasting will occasionally be required. At a few locations rock masonry walls will have to be constructed to carry primary canals around very steep or unstable terrain. Canal linings, where required, will be made with rock masonry. Frequently it will be necessary to drop water in a canal from a higher elevation to a lower. This is done by building small falls, or rapidas, in the canal. Conditions vary greatly and call for numerous solutions.

Culverts of appropriate size will be used where canals cross under roads. Small canyons and gullies tributary to the main stream which canals will frequently parallel present special problems in the Andes. Their flows are intermittent with occasional great torrents resulting from cloud-burst rains higher in the mountains. On such occasions the waters carry tremendous volumes of rock and debris. Canals crossing these water courses require special protection to keep from being periodically destroyed. Depending upon the size and other characteristics, a canal is either carried over the area in concrete aqueduct, or a crossing (quebrada puente) carries the intermittent water and debris over the canal. With the experience that DGA engineers have with these situations no special design or construction problems are foreseen.

Weirs and distribution boxes for measuring and controlling water flows will generally be constructed of reinforced concrete properly formed to assure design shape and size, these being important for good water control. Experienced carpenters will be needed for making all such forms.

The access and feeder roads to be built or improved will basically be 3 meters wide, with occasional wide spots for passing. Surfacing, where necessary, will be of readily available stream gravels. A combination of medium bulldozers, drilling and blasting equipment, laborers, motorgraders and trucks will excavate, make embankments, cut drainage ditches and finally shape and gravel these roads. Necessary culverts, other drainage structures and bridges will be constructed by teams having the expertise.

Bridges, where required, will be a standard 3 meters wide, designed for 15-ton loading. The foundations of each bridge must be properly designed, taking into account the special soil and

rock characteristics at each site. Simplicity of design and construction is stressed by the DGA.

The technology chosen for this Project closely reflects existing socio-economic and technical conditions in the Project areas. An abundance of labor in most of the communities permits dependence on locally available unskilled labor, providing, moreover, much needed cash income from the construction wages to be paid. In general, too, the sierra farmers have long experience in building their own rustic irrigation systems; these systems, however, more often than not suffer from poor design, which shortens the system's useful life and can in fact endanger crops through extensive erosion and sudden ruptures in the dikes or distribution canals. Considerable technical guidance and supervision, then, will be necessary, but will be based on a strong foundation of farmer experience and interest in irrigation infrastructure construction. This foundation, coupled with DGA technical direction in construction of standard water works, will likewise facilitate and accelerate the diffusion of Project activities into additional, nearby, areas.

The selected technology is also appropriate to the capacity of the DGA to plan, design, and supervise the construction of the sub-projects. To a great extent, the existence of the DGA, and particularly DIPRECO, stems from the realization based on experience that adequate and timely technical assistance to interested communities in the design and construction of rustic water works is an essential, and yet low-cost, contribution to improved agriculture in the sierra. The Sub-Directorate of Watershed Resource Management in DIPRECO, was specifically created to respond to farmers' requests for such technical assistance. As is more fully described in Part IV ("Project Implementation"), DIPRECO has considerable experience in the design and execution of projects very similar to those to be financed under this Loan. 5 such projects were undertaken in the 1975-76 biennium, of which 1 is completed and 3 are at least 50% completed. In the course of working with USAID engineers on this Project and in the past, the DGA has amply demonstrated that they are fully capable of meeting the demands of detailed design, quality construction, and adequate supervision. Their staff to date has been characterized by fully professional technical competence.

The capability of the water users to operate and maintain the sub-project works also exists, owing to many generation of irrigated agriculture under community management. The tradition of communal responsibility for routine operation and maintenance is well-grounded throughout the sierra. Water users' capability of making efficient use of the systems may, however, be problematic.

Most sierra farmers now irrigate with much less than the optimum quantity of water, with their existing systems generally supplying only a part of what the land could use. For centuries they have practiced making a little water go a very long way in irrigating crops on very steep land and seldom do they make inefficient use of scarce water or permit water courses to erode cultivable land.

Scattered erosion problems are evident, however, and severe. Generally these occur in ravines or small water courses where a badly designed or unfinished irrigation canal has concentrated runoff in periods of heavy rains to trigger the cutting of the land.

Working with a minimum of water, only intermittently available, these farmers are quite expert at operating and also maintaining their small systems, making maximum use of the water. This they understand. It is when they have more water than they are used to that problems may develop in both erosion and in drainage. Since these sub-projects are designed to supply farmers with ample water whenever needed, they will need technical guidance in the proper management of these greater volumes. They will have to be taught not to waste water just because it becomes available to them in quantities they are not used to. This needed technical assistance will be made available by agronomists and irrigation engineers assigned from the DGA and the Regional Project Offices in sub-project areas, as more fully described in Part IV B.

## 2. Environmental Impact

From an overall view, the sub-project planning and development for improved water and land use in the two Project areas of Cajamarca and Mantaro should result in a net environmental benefit. The proposed construction and improvements (small dams, river intake works, irrigation systems, drainage works and access roads) will provide a means for more efficient and productive water and land use, and selected afforestation in sub-project areas will reduce soil erosion.

The environmental consequences and impact of each sub-project, including its construction and ensuing operations, however, will need to be examined in more detail. An assessment of these implications will be prepared during the planning and development of the sub-projects (See Part III Introduction). Presentation of such an assessment will be part of the documentation, together with plans and financial analyses, needed for approval of Loan financing for construction and implementation of each sub-project.

These environmental assessments will be conducted by qualified experts with the participation of the appropriate GOP institutions. The Mission will encourage and assist the GOP to involve broad elements of the country's population in the activity and the decisions to be taken, particularly those potentially most affected by any environmental consequences.

Environmental considerations which need to be evaluated will include the following for both the proposed construction and later operational environmental implications of the overall improved water and land use program.

Land Resources:

- Construction related impacts.
- Siltation/sedimentation/erosion problems.
- Changes in soil/water, soil/vegetation relationships.
- Effect of access road, small dam, and irrigation construction on natural drainage patterns.

Ecology:

- Effect on flora and fauna.
- Aquatic plant nuisance growth.
- Salt, pesticide and fertilizer contamination.

Socio-Cultural:

- Changes in land use patterns and population redistribution and/or migration.
- Socio and cultural effects of relocation on people and community.
- Plans for community development at relocation sites.

Public Health:

- Possible introduction of new vectors and disease.
- New public health problems due to changes in population density and redistribution.

A small amount of direct assistance in environment analysis is reportedly presently available from AID/W offices, such as SER/ENG, TA/H, and TA/AGR. Problems of staffing and organization to carry out the considerable work load created by PD-63, Environmental Aspects of Development Assistance, are now in the process of resolution, and guidelines are expected to be issued in the near future.

Although some of this environmental assessment work could be performed by current technical staffs at the Missions and in Washington, the magnitude and scope of this proposed assessment work will require external assistance in the form of individual expert consultants or consulting firm. A yet to be issued working report, Manpower and Cost Estimates for Conducting Environments of FY 76 Programs (now being drafted by SER/ENG), has tentatively identified the maximum environmental assessment requirements for this program as 160 man-days of consultant services, plus 37 man-days of Mission and Washington participation, at a projected cost of nearly \$65,000. It is proposed to contract consultant services with either Project funds or AID grant-financed technical support to accomplish this using the SER/ENG Requirements Contractor system because of its quickness in response.

### 3. Technical Feasibility

The first stage of sub-project selection is the determination of technically feasible sub-projects. This process, as conducted for the 5 selected sub-projects, begins with the identification of potential sites, which, for the 5 sub-projects studied, were selected by teams of DGA engineers and economists, with inputs from sociologists and local officials from INP, SINAMOS, Agrarian Zonal Offices II and X, and related organizations. Some of the sub-project sites examined were those identified in requests made directly by farmers in the areas to the Government.

The physical boundaries of the sub-project areas are defined after making site inspections and studying previously prepared topography maps and aerial photos. The topography maps are relied upon for laying out the irrigation structures, while the photographs are the primary basis for estimating existing land use. Soil maps for each area aid in estimating actual and potential yields from existing and proposed cropping patterns, following standard classification procedures.\*

Given the location, potential land use, and cropping possibilities, a water balance is prepared for each area. These balances compare the monthly timing of water availability with crop requirements using a 75 percent probability that the required amount of water will be available when needed.

The design of appropriate engineering structures is performed entirely by DIPRECO engineers based on on-site inspections. As discussed above, this group of engineers has considerable design and field experience concerning the types of facilities to be built in the sub-project areas. This experience was brought to bear in locating, estimating the number, and determining the types of structures for the 5 sub-projects studied. Construction activities for these will include major and minor works and land preparation. Small dams, river intakes, main irrigation and drainage canals with associated appurtenances, and access roads fall within the category of major works. Secondary and tertiary canals and related structures are considered minor works. Land preparation covers clearing and leveling, ditching, fencing, and similar items. Farm housing, community facilities, and the like are not included in the design and cost estimates, since the sub-projects are located in areas where these facilities already exist. Improvements to them would undoubtedly be socially desirable; but they are not considered as being essential to the viability of the sub-projects.

The structures included in the 5 sub-projects are of the type commonly built by communal labor, with some technical assistance from engineers employed by the DGA, the Agrarian Zones, and similar organizations. They are labor-intensive and make considerable use of materials and services available in the area. Some heavy earth moving equipment, such as bull-dozers and motor-graders are recommended when reliance on hand labor would excessively lengthen construction time.

Costs of study, design, supervision of construction, and building of major irrigation works were analyzed in considerable detail for the Chingol sub-project. This degree of detail served as a basis for estimating the proportions of skilled and unskilled labor, materials, transportation, supervision, and similar items. Costs of drainage, minor

---

\* Land Capability Classification System of the United States  
Department of Agriculture, Soil Conservation Service.

works, and on-farm development are based on more global quantities and estimates. Costs for Chupaca are updated from those of a study published several years earlier. Similar costs for the other sub-projects are estimated on a more aggregated basis.

For illustrative purposes a cost breakdown is given of the Chupaca project in the Mantaro Zone:

<u>Cost of</u>	<u>S/. (in millions)</u>	<u>\$ (in thousands)</u>
Final Study	0.7	15.3
Construction	34.2	788.5
Land Development	<u>23.3</u>	<u>538.0</u>
TOTAL	S/.58.2	\$1,341.8

The construction costs can be broken down as follows:

Labor	S/. 5.7	\$ 130.9
Materials	15.9	366.5
Tools and Equipment	6.8	157.1
Overhead	3.5	79.7
Supervision	0.6	14.9
Contingencies	<u>1.7</u>	<u>39.4</u>
TOTAL	S/.34.2	\$ 788.5

The detailed land development costs are:

Labor	S/. 4.3	\$ 99.6
Materials	6.5	150.6
Tools and Equipment	9.6	221.0
Overhead	1.2	27.7
Supervision	0.5	11.1
Contingencies	<u>1.2</u>	<u>27.7</u>
TOTAL	S/.23.3	\$538.0

These cost figures should be representative of the work to be done and are consistent with USAID/ENG's experience with unit costs in comparable construction activities.

This element of the overall project, i.e. financing irrigation construction and related expenditures, is functionally equivalent to the establishment of a credit fund for irrigation sub-project activities in the geographic regions identified insofar as the number and specifications of the sub-projects to be financed will be determined by the DGA with USAID review and approval. It is the Project Committee's judgment that the DGA, and in particular DIPRECO, have the competence, experience and technical capacity, and have demonstrated a satisfactory program planning capability as reflected in the engineering plans and financial analysis developed for five of the sub-projects to satisfy statutory requirements. All cost data are consistent with USAID/ENG experience with unit costs in comparable construction activities. Based on the aforesaid, a reasonably firm estimate of the cost of the program has been developed.

## B. Economic/Financial Analysis

### 1. Analytical Procedures Used

During the course of Project development, a computer procedure was established to test the financial and economic acceptability of sub-projects. Four basic tests --one economic and three financial-- were used to accept or reject a sub-project for financing. The following is a description of the decision criteria used in the analysis of the first 5 sub-projects, the cash-flow procedures specific to sub-project analysis, and the sequence of tests used in establishing the economic and financial viability of each sub-project.

#### a. Decision Criteria

The rate of return method of economic and financial analysis has been used for evaluating individual sub-projects, as well as for considering alternative inputs to each sub-project. A target rate of 15% was used for measuring the economic efficiency of the sub-projects and their components. When sub-project activities were purely economic in nature, their inclusion was dependent on exceeding this minimum acceptable rate of return. When certain crops or activities caused this rate of return to drop significantly below 15%, they were eliminated and other, more economic, crops suitable to the geographic area were substituted. Investment in protective afforestation did not, however, have to meet this test, but was rather considered an essential element for overall sub-project success.

Benefit-cost ratios were calculated for each sub-project, considering the national point of view. While decisions can be taken with reference only to rates of return, the ratios have been calculated, as well, in conformance with U.S. Federal regulations for investments in water resources projects. An interest rate of 15 percent is used for discounting future benefits and costs. In this way consistency is maintained between results from both methods. Costs used in this ratio are those for investment. Operating costs are netted out from revenues to give the benefits. While operating costs can instead be added to investments, leaving both benefits and costs larger, the decision to accept or reject a sub-project based on a benefit-cost ratio of 1.0 would not be changed.

#### b. Cash-Flow Analysis

In the cash flow procedures used in the economic and financial calculations of the 5 individual sub-projects certain basic assumptions are made, the more important of which are outlined below:

- 
- \* Investment in forestry for productive purposes and membrillo are examples of cropping possibilities that were eliminated for failure to meet the rate of return test.

1) "With" and "Without" Approach:

Economic and financial tests are made on the incremental increases in benefits and costs associated with each sub-project. This approach involves estimating conditions that would exist in the area were the sub-project not undertaken. The assumption is made that the level of output and the profitability of existing activities would remain unchanged throughout the analysis period. Considering the low level of productivity and the antiquated methods of production in most areas, this simplifying assumption is believed to be realistic. Any slight increase in the level of production technology would, moreover, be compensated for by decreased soil fertility.

2) Analysis Period:

A sub-project life of 40 years is assumed, reflecting the long-lived nature of investments in irrigation, drainage and land improvement. Benefits and costs occurring after 40 years have negligible effects upon rates of return above 15%. Values falling between the 21st and 40th year are annualized, when necessary, at an interest rate of 15% to fit the computer program (which was designed for a project life of 20 years). This annualization together with an accumulation factor for the 20th year allows the program to be adapted to a 40-year analysis period.

3) Working Capital:

Farm families are assumed to require working capital during the cropping season to cover the costs of seed, fertilizers, and pesticides. Seasonal credit costs of 10% of the annual amounts spent for these 3 items are included directly in the cash flow estimates. Amounts spent for farm tools, small equipment, and miscellaneous supplies are considered as annual costs.

4) Rate of Development:

4 years are allowed for the full development of sub-project lands and for the assimilation of a modest level of improved technology. During the 4 years following the completion of construction sub-project lands will be irrigated, technological improvements put into effect, and the associated problems of adjustment overcome. The basis for this rather short period rests on the simplicity of the measures to be introduced, the farmers' desire to receive irrigation assistance, and their prior exposure to such improvements through contact with other farmers within the same region. DGA staff members have stated that some sub-project areas could be fully developed within 2 years of construction completion. But this probably represents optimal, rather than average, conditions.

5) Contingency Factor:

A contingency factor of 15% is added to construction costs. This reflects the uncertainties and risks associated with construction activities in the sierra, where flash floods, landslides, and earth tremors are common.

6) Crop Losses:

Crop yields are reduced by 10% without the Project and 5% with the Project. These reductions are intended to reflect the losses incurred from the point of harvest to the point of consumption or farm-gate sales. The yields from which these reductions are made are therefore those expected to be obtained under average conditions and thus include consideration of better-than-average and worse-than-average years. The smaller reduction in losses with the Project is based on the assumption that a better-managed farm, through improved extension and other services, will aid the farmers in reducing their on-farm losses.

7) Inflation:

Inflationary impact on the Project can be treated in 2 ways. For the economic and financial rates of return, constant prices as of October 1974 are assumed. Working with constant prices is based on the assumption that long-term price trends will leave future prices in roughly the same relationship as encountered in October 1974. However, for estimating Loan requirements for construction, technical assistance, and credit, inflation must be taken into account. For this portion of the study, an average annual inflationary rate of 15% during Loan disbursement has been assumed, and provision was included in the costs of sub-project construction.

8) Price Adjustments:

When moving from the financial analysis from the private point of view to the economic analysis from the national point of view, certain price adjustments are made. In the economic literature, these fall under the heading of transfer payments. Wheat is subsidized to the extent that its market price is some 20% above its equivalent import price. Meat is effectively rationed, which means that its economic value is above the market price. In this calculation the effect of such rationing has been passed on to the value of forage crops, since livestock production has not been included as one of the

project activities.\* Similarly, an increase in economic value of 20% is applied to farm-gate prices of both alfalfa and pasture crops. Fertilizers are subsidized to the extent that their price to the farmers is 40% below their cost of acquisition.

The possibility that current subsidies will decrease before the time the sub-projects are completed and the likelihood of increased fertilizer production from new Peruvian plants have led to the assumption that future non-subsidized fertilizer prices will be one-third above the current subsidized price. Water charges are omitted from the economic calculations on the assumption that if the water is not used by the farmers on existing sub-project lands it will not have an alternative use.

#### 9) Shadow Prices:

Shadow prices are necessary when making the economic calculations from the national point of view. Rough estimates are made for the values of unskilled (farm and construction) labor in the Cajamarca and Mantaro valleys and for foreign exchange. A shadow price for the cost of capital is based on A.I.D.'s suggested 15% rate of return.\*\* Shadow wages for the Cajamarca region are taken as 40% of the official farm and construction wage rates; for the Mantaro region this shadow value is 50%. These values reflect those estimated by the National Planning Institute. The shadow value of foreign exchange is assumed to be 20% higher than the official rate of 43.38 soles per U.S. dollar. Calculations supporting the shadow wage of labor are presented in Annex VI.

Shadow wages are applied to both construction and farm labor. Foreign exchange premiums were applied to the values of wheat production, fertilizer expenditures, and machinery and transportation costs. Wheat production will result in a savings of foreign exchange; fertilizer use will require either its importation or the

---

\* It is fully expected that livestock instead of alfalfa and forage production for sale to others will occur on sub-project lands. The unavailability of reliable data on livestock and dairy production forced the use of these crops as a surrogate for the value of livestock and dairy production.

\*\* It is also considered that 15% is close to the real opportunity cost of capital, given expected rates of inflation. The 7%-11% interest rates charged by the Agrarian Bank are clearly intended as a subsidy to farmers to stimulate production.

foregoing of its export, should local production be sufficient to meet domestic demands; and machinery, vehicles, and petroleum products likewise involve either direct foreign exchange expenditures or foregoing the opportunity to earn foreign exchange through export.

c. A Sequence of Tests

A computer program was developed to give results for 4 tests, whose values convey the economic and financial viability of each sub-project. The logic of the sequence of tests is as follows. The economic rate of return indicates whether a sub-project is in the national interest. A rate of return above 15% satisfactorily meets this test, while a rate below 15% suggests that the sub-project is an inefficient use of the country's investment and other resources. Aside from welfare considerations, a sub-project with an economic rate of return below 15% would be rejected even if it were to have a favorable financial return to the farmers. That is, a sub-project failing the economic test need not be tested for its financial return.

For sub-projects passing the economic test, the financial tests become necessary to determine if the financial rates of return will be sufficient to interest the farmers in carrying out the sub-project. 3 financial tests are carried out for each sub-project: one that measures returns to farmers' labor, management, and investment; a second in which labor is valued at the going farm-labor rate, measures returns to his management and investment; and a third which shows the rate of return on the sub-project per se (not the incremental benefits). The usefulness of this last test is to assure lending institutions that the sub-project will generate sufficient cash flows to repay any amortization costs. It ought not, however, to be used as a measure of economic viability, since it does not measure the net increases in costs and revenues accruing to the farmers and to the economy.

Specific rates of return that will assure farmer participation are conjectural at present other than to note that values over 30% or so are intuitively attractive. Should the financial return be judged low, the GOP has the option of subsidizing the sub-project to increase the farmers' financial rate of return. The most obvious way to subsidize these sub-projects is for the government not to recover all of its investment --a policy which the GOP has followed in the past.

It should be noted that the financial returns from the computer runs do not include such a subsidy, i.e., full investment costs are included. This is probably an overstatement of the amount the farmers will be expected to pay in the form of initial investment and loan amortization costs. Thus, the results shown for the first, second, and fourth rates of return on the printout substantially understate the financial rates of return that they are actually expected to

realize. Stated somewhat differently, for any sub-project with an economic rate of return passing the 15% criterion for the economic analysis, the financial rates of return to the farmers are expected to be very profitable due to the fact that the farmers' financial contributions (those investment costs borne by them) are likely to be significantly less than 100%.

d. Sensitivity Analysis\*

Various sensitivity tests are conducted to represent situations which might occur during Project implementation, and which could affect the economic rate of return of the various sub-projects. The following situations were tested.\*\*

- 1) A 50% increase in construction costs.
- 2) A 25% decrease in yields.
- 3) A shadow wage of 70% for the Cajamarca region and 75% for the Mantaro region.
- 4) A 10% premium on foreign exchange.
- 5) Changes in the prices of certain agricultural crops. In the case of Chingol, it was assumed in the original analysis that certain crops would suffer a drop in price in the "with" analysis. A sensitivity analysis was performed to show what would occur if such a price drop did not occur. In the case of Chupaca, the opposite was assumed in the original analysis --i.e., that prices would remain constant with the project; a sensitivity test was conducted to determine what would happen if prices fell.

---

\* In future sub-project analyses, it is expected that sensitivity analysis will be used when the economic rate of return is close to 15%.

\*\* Complete sensitivity tests were run for Chingol and Chupaca. The resulting variations can be applied to the other sub-projects to determine approximately the magnitude of changes in sub-project returns under varying conditions.

## 2. Results of Sub-Project Analysis

Each of 5 sub-projects was subjected to the analytic procedures described above in Section 1. All were found to have an economic rate of return above 15%. The results for each sub-project, along with a brief description of geography and sub-project works, are given below.

### a. CHUPACA (MANTARO)

The Chupaca sub-project is located at the confluence of the Mantaro and Cunas Rivers 8 kilometers from Huancayo. The elevation of the sub-project is 3,200 meters. Freezing temperatures occur with some frequency during the winter months, which makes cropping during this season risky. Only forages are considered suitable for year-round production. The sub-project area considered for the present analysis is 3,390 hectares. With the development of additional water sources, irrigation can eventually be extended to 4,600 hectares. Principal engineering structures include an intake on the Cunas River and main irrigation canals.

<u>ITEM</u>	<u>EXISTING CONDITIONS</u>		<u>PROPOSED CONDITIONS</u>	
LAND USE	Cereals	1226	Cereals	1208
	Vegetables	270	Vegetables	300
	Beans	67	Beans, peas	246
	Garden Crops	243	Alfalfa	262
	Alfalfa	155	Pasture	878
	Pasture	719	Potatoes	411
	Potatoes	291	Forestry	85
	Unused	419		<u>3390</u>
		3390		
AMOUNT IRRIGATED		1328 Has.		3305 Has.
AMOUNT NOT IRRIGATED		2062 Has.		85 Has.
GROSS ANNUAL OUTPUT AT FULL PRODUCTION		\$1,018,055		\$2,488,473
NET ANNUAL OUTPUT AT FULL PRODUCTION*		\$885,829		\$1,672,443
NUMBER OF FARM FAMILIES		3000		3000
NET ANNUAL OUTPUT PER FARM FAMILY		\$295		\$557
INVESTMENT IN PHYSICAL WORKS AND LAND IMPROVEMENT FOR 3305 Has.				\$1,341,795
INVESTMENT PER FARM FAMILY				\$447
INVESTMENT PER HECTARE OF PROJECT LAND (3305 Has.)				\$405

\* Gross annual output less farm and project operating costs (which have excluded farm labor costs).

## CHUPACA (cont'd)

MEASURE OF PROFITABILITY

ECONOMIC RATE OF RETURN	37.77%
ECONOMIC BENEFIT/COST RATIO	3.18
FINANCIAL RETURNS TO FARM MANAGEMENT AND LABOR	37.23%
FINANCIAL RETURNS TO FARM MANAGEMENT	33.98%
GROSS FINANCIAL RETURNS TO THE PROJECT**	48.34%

SENSITIVITY ANALYSIS ON THE  
ECONOMIC RATE OF RETURN

ORIGINAL RATE OF RETURN	37.77%
50% INCREASE IN INVESTMENT COSTS	28.25%
25% REDUCTION IN YIELDS	22.13%
SHADOW WAGE AT 75% OF MARKET VALUE	35.52%
FOREIGN EXCHANGE PREMIUM OF 10%	39.46%
COSTS OF FARM INPUTS UP 50% ***	26.87%
REDUCTION IN CROP PRICES WITH THE PROJECT****	35.77%

CONCLUSION: Economic and financial profitability measures are good, sensitivity analysis shows that the project is not subject to excessive risk; farm family income is raised substantially; project should be included in the overall investment program.

b. CHICCHE (MANTARO)

The Chicche sub-project is located on the left bank of the Mantaro River, 30 Km. north of the city of Huancayo. The elevation of the sub-project ranges from 3,500 to 4,000 meters. This area is subject to freezing temperatures during the winter months and occasional frost periods during the rest of the year. The elevations and the temperature pattern determine one agricultural crop per-year with only forages produced on a

---

\*\* Same as financial returns to farm management except the cost and value of existing production is not excluded.

\*\*\* Includes all but farm labor, i.e., oxen, seed, fertilizers and pesticides.

\*\*\*\* No change in the price of wheat, alfalfa and pasture; a 5% decrease in the price of corn, potatoes, barley and yuca; a 10% decrease in the price of bean, peas, sweet corn and sugar cane, and a 15% decrease in the price of vegetables and fruits. (See Section 1d.)

continued basis. Water will be taken from a natural lake, and principal engineering structures to irrigate 580 hectares will be one intake and 9 km. of main canals passing through an aqueduct and 3 major culverts.

<u>ITEM</u>	<u>EXISTING CONDITIONS</u>	<u>PROPOSED CONDITIONS</u>		
LAND USE:	Potatoes	185	Potatoes	290
	Root crops	104	Root crops	50
	Cereals	145	Cereals	215
	Beans, peas	79	Beans, peas	145
	Oca	37	Pasture	598
	Pasture	44	Forestry Cons.	115
	Unused	919	TOTAL	1513
	TOTAL	1513		
AMOUNT IRRIGATED	0 Has.	580 Has.		
AMOUNT NOT IRRIGATED	1513 Has.	933 Has.		
GROSS ANNUAL OUTPUT AT FULL PRODUCTION	\$218,246	\$755,290		
NET ANNUAL OUTPUT AT FULL PRODUCTION *	\$176,387	\$480,729		
NUMBER OF FARM FAMILIES	1,500	1,500		
NET ANNUAL OUTPUT PER FARM FAMILY	\$ 117	\$ 320		
INVESTMENT IN PHYSICAL WORKS AND LAND IMPROVEMENT FOR 1513 Has.	-	\$527,570		
INVESTMENT PER FARM FAMILY	-	\$ 351		
INVESTMENT PER HECTARE OF PROJECT LANDS	-	\$ 349		

---

\* Gross annual output less farm and project operating costs (which have excluded farm labor costs).

Chicche (cont'd)

MEASURE OF PROFITABILITY

ECONOMIC RATE OF RETURN	29.20%
ECONOMIC BENEFIT/COST RATIO	2.36
FINANCIAL RETURNS TO FARM MANAGEMENT AND LABOR	29.22%
FINANCIAL RETURNS TO FARM MANAGEMENT	25.92%
GROSS FINANCIAL RETURNS TO THE PROJECT **	32.65%

CONCLUSIONS: Economic and financial probitability measures are good; farm family income is raised; project should be included in overall investment program.

c. LA HUAYCHA (Mantaro)

The sub-project is located at the right side of Mantaro River 18 km., northwest of Huancayo. The elevation of the sub-project ranges from 3,220 to 3,270 m. In this area, due to freezing temperatures in winter, only one crop per year is recommended, with the exception of forages. The sub-project includes 515 hectares to be drained and irrigated, and major structures include 6 km. of main irrigation canals and 6 major culverts. The source of water is a spring whose waters will be carried to the irrigation system by a special intake structure.

<u>ITEM</u>	<u>EXISTING CONDITIONS</u>		<u>PROPOSED CONDITIONS</u>	
LAND USE:	Cereals	140	Cereals	207
	Alfalfa	4	Alfalfa	75
	Pastures	313	Pastures	269
	Unused	331	Potatoes	90
		<u>788</u>	Vegetables	45
		Beans and peas	60	
		Roads, canals	<u>42</u>	
			788	

\*\* Same as financial return to farm management except cost and value of existing production is not excluded.

La Huaycha (Cont'd)

<u>ITEM</u>	<u>EXISTING CONDITIONS</u>	<u>PROPOSED CONDITIONS</u>
AMOUNT IRRIGATED	0 Has.	515 Has.
AMOUNT NOT IRRIGATED	788 Has.	273 Has.
GROSS ANNUAL OUTPUT AT FULL PRODUCTION	\$25,547	\$538,705
NET ANNUAL OUTPUT AT FULL PRODUCTION *	\$22,117	\$351,923
NUMBER OF FARM FAMILIES	700	700
NET ANNUAL OUTPUT PER FAMILY	\$31	\$501
INVESTMENT IN PHYSICAL WORKS AND LAND IMPROVEMENT FOR 788 Has.	-	\$193,755
INVESTMENT PER FARM FAMILY	-	\$276
INVESTMENT PER HECTARE OF PROJECT LAND	-	\$246

MEASURE OF PROFITABILITY

ECONOMIC RATE OF RETURN	> 50%
ECONOMIC BENEFIT/COST RATIO	10.81
FINANCIAL RETURNS TO FARM MANAGEMENT AND LABOR	> 50%
FINANCIAL RETURNS TO FARM MANAGEMENT	> 50%
GROSS FINANCIAL RETURNS TO THE PROJECT **	> 50%

CONCLUSION: Economic and profitability measures are very good; actual situation is below subsistence level; family income will be raised substantially; project should be included in overall investment program.

---

\* Gross annual output less farm and project operating costs (which have excluded farm labor costs).

\*\* Same as financial return to farm management except cost and value of existing production is not excluded.

d. CHINGOL (CAJAMARCA)

The Chingol sub-project is located in the Department of Cajamarca, 10 Km. west of Cajabamba on the left margin of the Condebamba River. The elevation of the sub-project ranges from 2,100 to 2,300 m., hence, the climate is milder, although less humid, than other sub-project areas. The sub-project includes the irrigation of 1,000 new hectares of land and 1,200 additional hectares subject to irrigation improvement. This is an area of low frost risk and multiple cropping will be an expected benefit from irrigation. Major engineering structures for the sub-project include an intake, an aqueduct, 15 culverts, and 30 km. of principal canals. Due to the proximity of the river a proportion of the lands have too high a water table a considerable part of the year, so drainage is also part of the investment for physical development.

<u>ITEM</u>	<u>EXISTING CONDITIONS</u>	<u>PROPOSED CONDITIONS</u>	
LAND USE:	Cereals	323	Cereals , 314
	Fruit crops	9	Fruit crops 391
	Alfalfa	776	Alfalfa 257
	Pastures	132	Pastures 859
	Sugar cane	32	Sugar cane 69
	Unused	953	Potatoes 119
	TOTAL	2225	Vegetables 64
			Beans, peas 84
		Unused 68	
		TOTAL 2225	
AMOUNT IRRIGATED	1238 Has.	2157 Has.	
AMOUNT NOT IRRIGATED	987 Has.	68 Has.	
GROSS ANNUAL OUTPUT AT FULL PRODUCTION	\$307,412	\$1,240,475	
NET ANNUAL OUTPUT AT FULL PRODUCTION *	\$250,190	\$874,821	
NUMBER OF FARM FAMILIES	300	300	
NET ANNUAL OUTPUT PER FAMILY	\$833	\$ 2,827	
INVESTMENT IN PHYSICAL WORKS AND LAND IMPROVEMENTS FOR 2157 Has.	-	\$838,174	
INVESTMENT PER FARM FAMILY	-	\$2,794	
INVESTMENT PER HECTARE OF PROJECT LAND (2157 Has.)	-	\$ 389	

\* Gross annual output less farm and project operating costs (which have excluded farm labor costs).

Chingol (cont'd) MEASURE OF PROFITABILITY

ECONOMIC RATE OF RETURN	26.27%
ECONOMIC BENEFIT/COST RATIO	2.37
FINANCIAL RETURNS TO FARM MANAGEMENT AND LABOR	22.71%
FINANCIAL RETURNS TO FARM MANAGEMENT	18.86%
GROSS FINANCIAL RETURNS TO THE PROJECT **	25.73%

SENSITIVITY ANALYSIS ON THE ECONOMIC RATE OF RETURN

ORIGINAL RATE OF RETURN	26.27%
50% INCREASE IN INVESTMENT COSTS	21.26%
25% REDUCTION IN YIELDS	14.60%
SHADOW WAGE OF 70% OF MARKET VALUE	23.14%
FOREIGN EXCHANGE PREMIUM OF 10%	27.65%
COSTS OF FARM INPUTS UP 50% ***	15.46%
NO REDUCTION IN CROP PRICES WITH THE PROJECT ****	28.73%

CONCLUSION: Economic and financial profitability measures are good; sensitivity analysis shows that the project is not subject to excessive risk; farm family income is raised substantially; investment per farm family is high, but justified, in terms of substantial increase in food production; additionally the Agrarian Reform process is currently adjudicating adjacent lands to the Chingol CAP, thus enlarging the total population which will be benefitted by production increases; project should be included in the overall investment program.

---

\*\* Same as financial return to farm management except the cost and value of existing production is not excluded.

\*\*\* Includes all but farm labor; i.e., oxen, seed, fertilizers, and pesticides.

\*\*\*\* On the basic "with project" analysis we assumed the following: No change in the price of wheat, alfalfa and pasture crops; a 5% decrease in the price of corn, potatoes, barley and yuca; a 10% decrease in the price of beans, peas, sweet corn and sugar cane; and a 15% decrease for vegetables and fruit. (See Section 1 d.)

e. NEGRITOS-TUAL (CAJAMARCA)

The sub-project is located 8 km. northwest of Cajamarca. The elevation of the sub-project ranges from 2,900 to 3,500 m. In this area, although the climate is milder than in Mantaro, there is frost risk during the winter months. Hence, only forages are recommended year-round. This sub-project will consist of 920 hectares of irrigated land and will include 3 water intakes, and 24.5 km. of main canals passing through 7 major culverts.

<u>ITEM</u>	<u>EXISTING CONDITIONS</u>	<u>PROPOSED CONDITIONS</u>		
LAND USE	Potatoes	27	Potatoes	78
	Maize	10	Maize	20
	Oca	37	Oca	15
	Pasture	725	Pasture	1138
	Cereals	294	Cereals	220
	Unused	395	Forestry	320
	Natural growth	548	Unused	107
		<u>2036</u>	Natural growth	<u>138</u>
			2036	
AMOUNT IRRIGATED	0 Has.	920 Has.		
AMOUNT NOT IRRIGATED	2036 Has.	1116 Has.		
GROSS ANNUAL OUTPUT AT FULL PRODUCTION	\$68,005	\$356,016		
NET ANNUAL OUTPUT AT FULL PRODUCTION *	\$50,395	\$204,452		
NUMBER OF FARM FAMILIES	1,000	1,000		
NET ANNUAL OUTPUT PER FARM FAMILY	\$ 50	\$ 204		
INVESTMENT IN PHYSICAL WORKS AND LAND IMPROVEMENT FOR 2036 Has.	-	\$800,553		
INVESTMENT PER FARM FAMILY	-	\$ 800		
INVESTMENT PER HECTARE OF PROJECT LANDS	-	\$ 393		

\* Gross annual output less farm and project operating costs (which have excluded farm labor costs).

Negritos-Tual (cont'd)

MEASURE OF PROFITABILITY

ECONOMIC RATE OF RETURN	18.81%
ECONOMIC BENEFIT/COST RATIO	1.36
FINANCIAL RETURNS TO FARM MANAGEMENT AND LABOR	16.78%
FINANCIAL RETURNS TO FARM MANAGEMENT	14.98%
GROSS FINANCIAL RETURNS TO THE PROJECT **	18.84%

CONCLUSION: Economic and profitability measures are acceptable; family income currently below subsistence level and will rise substantially with project; project should be included in overall investment program.

---

\*\* Same as financial returns to farm management except the cost and value of existing production is not excluded.

### 3. Macro and Micro Economic Impact of Project

#### a. Macro-Economic Aspects

The Project is designed to have its primary impact upon the small farmers--both those farming individual plots of land and those who are members of associative enterprises working the land cooperatively--in the selected target areas. It does not pretend to offer a final solution to the prevalent problems of poverty, malnutrition, and social alienation which characterize much of the Peruvian sierra, but rather to provide a vehicle for the target farmers to move from their present position which might be described as "low technology - low resources - low income" to one of a "medium" magnitude.

The general conditions of the rural sierra in Peru are such that very rapid technological changes designed to bring about very rapid economic improvements may well be more disastrous than a stagnant situation. First, farmers' inexperience with modern technology nearly always dictates early failures when these are introduced and such early failures may lead to a total rejection of further technological innovation (which may be seen as the "cause" of failure). Second, current methods of sierra farming are deeply ingrained in the target population, and to attempt to induce a rapid changeover from traditional to modern farming methods may cause a sense of alienation among the farmers, reducing individual (or collective) incentives to work the land. Third, and most important, this Project attempts to create the type of agricultural conditions which can be replicated in other areas of the sierra. To achieve this goal, sub-projects must be relatively unsophisticated, using local labor and materials where possible, and the necessary financial resources for sub-project completion and subsequent production increases (i.e. purchase of fertilizers, pesticides, etc.) must be kept at a level where farmer groups can readily participate. Following this, future yield estimates used in analysis of sub-projects are based upon only modest increase in actual farm technology and while yield increases are impressive (see Table II in this section) they are not optimum yields associated with high level technology on similar types of lands. Estimates of fertilizer requirements, for example, reflect this shift to medium-level technology\*, and it is assumed that farmers will continue to use oxen instead of tractor power in preparing the land and harvesting crops.

---

\* For example, in calculating fertilizer requirements with the sub-project, the following estimates were used; on a per hectare basis:  
Potatoes and Maize: 174 kgs. urea, 400 kgs. super phosphate,  
 76 kgs. potassium chloride.  
Wheat, Rye, Oats: 87 kgs. urea, 100 kgs. super phosphate.  
Vegetable Crops: 130 kgs. urea, 100 kgs. super phosphate, 40 kgs.  
 potassium chloride.

Currently most of the sub-project lands are farmed with little or no fertilizer, although in some of the Mantaro lowland areas, as much as 100 kg/ha. is currently being applied on cash crops.

The benefits quantified here are thus of a magnitude consistent with the assumption that a low-to-medium level of technology is employed in the Project.

The Project's major elements--construction and improvement of small irrigation and drainage works, protective afforestation, technical assistance to small farmers, and an increased supply of investment credits to project beneficiaries--will combine to give the following results: (1) an absolute increase in the amount of land in crops or forage; (2) an increase in the amount of land suitable for multiple cropping; (3) an increase in yields per hectare; (4) a reduction in risks associated with agriculture solely dependent on rainfall; and (5) as a result of the combination of the above, an increase in agricultural production, employment opportunities and income.

(1) Increase in land suitable for agricultural production

In the 5 sub-projects analyzed in depth, there is a total of 9,952 Has. of which 2,566 hectares are currently irrigated, and 7,386 are dry. Cropping patterns are limited to a handful of traditional crops such as potatoes, oca, olluco and other root crops on non-irrigated land, soil erosion is prevalent, and fertility is being reduced at a rapid rate due to limited possibilities of crop rotation. Once land is depleted, it generally goes into marginal pasture land, and the MOA estimates that on such land, 1-1/2 to 2-1/2 hectares are necessary to support one cow unit (depending on elevation). 20% of the total land in the 5 sub-project areas is currently dedicated to these marginal pastures. When the land is incapable of supporting even a minimal number of livestock, it is abandoned. Currently 3,017 Has. (30%) of the total sub-project area is unused, due to lack of water or depletion of soil.

With the addition of water under the Project, the total of irrigated land will be increased by 4,911 hectares to a total of 7,477 hectares, with 2,475 hectares remaining dry. Pasture land will almost double to 3,842 hectares and where investments are made in forage improvement and alfalfa, the land will be capable of supporting one to two cow units per hectare. Unused land will drop to only 175 hectares (.17% of the total). See Table I for a breakdown of existing and projected land use, with and without the Project, for the 5 sub-projects analyzed.

TABLE I LAND USE IN 5 SUB-PROJECT AREAS

<u>STATUS OF LAND</u>	<u>HECTARES AND PERCENTAGE OF TOTAL AVAILABLE LAND</u>			
	<u>WITHOUT</u>	<u>%</u>	<u>WITH</u>	<u>%</u>
TOTAL AVAILABLE LAND	9,952	100	9,952	100
UNDER IRRIGATION	2,566	26	7,477	75
RAINFED	7,386	74	2,475	25
CROPLAND	4,454	45	5,335	54
PASTURELAND	1,933	19	3,742	38
UNUSED	3,565	36	175	2
FORESTRY CONSERVATION	0	0	520	5
MULTIPLE CROPPING	0	0	1,298	13

(2) Increased possibilities of multiple cropping

The DGA estimates that multiple-cropping can be carried out on irrigated land at lower elevations (less than 3000 meters above sea level). One of the 5 sub-projects analyzed--Chingol--falls into this category.

In this and similar areas, 3 crops can be produced every 2 years. In the case of Chingol, a total of 1298 hectares (total irrigated hectares less hectares dedicated to pastures) can be multiple-cropped. Thus the effective amount of irrigated land in the 5 sub-projects increases from 7,477 hectares (see (1) above) to 8,126 hectares.\*

(3) Increased yields per hectare

On non-irrigated lands, crop yields range from 30% to 80% of yields on irrigated land (depending upon elevation, soil

---

\* 9,461 hectares is reached by multiplying the area apt for multiple cropping (1,298 Has.) by a factor of 1.5.

type and technology employed). In the 5 sub-projects analyzed, yields will increase significantly as a result of the Project. Table II illustrates the magnitude of yield increases expected:

TABLE II

YIELDS PER HA. WITH AND WITHOUT PROJECT, 5 SUB-PROJECTS

<u>Sub-Project</u>	<u>Without Project</u> (Kg./Has.)	<u>With Project</u> (Kg./Has.)
<u>Chingol</u>		
Corn	400- 1,440*	4,100
Wheat	480- 1,500	3,000
Alfalfa	22,970	48,000
Rye	640- 1,690	3,500
Sugarcane	47,340-59,175	80,000
<u>La Huaycha</u>		
Alfalfa	12,000	40,000-50,000
Pastures	5,000-7,053	19,000-30,000
<u>Chupaca</u>		
Vegetables	8,000-18,000	22,400-25,000
Alfalfa	12,000-30,000	40,000-50,000
<u>Negritos Tual</u>		
Potatoes	2,800- 4,900	13,300
Maize	700- 1,200	38,400
Oca	1,700- 3,100	7,400
<u>Chicche</u>		
Potatoes	6,508	12,000-15,000
Olluco	4,495	8,000
Beans	923	7,000- 8,000
Pastures	7,923	12,000

\* Where more than one yield is given it is due to soil type variations within the sub-project and the amount of water currently available.

(4) Reduction in risk

Agriculture solely dependent on rainfall is subject to a high degree of risk because rainfall and temperature are highly variable in the Peruvian sierra. January through March is the normal rainy season. Late or early rains normally cause yield decreases, because lands are prepared in November and December on the assumption that the rains will come on schedule. With a secure water supply through the construction of an irrigation system, risk is significantly decreased. The economic and financial analyses applied assume a 50% reduction in on-farm losses with the Project\*, which is considered quite conservative by MOA agriculture experts.

(5) Increased production

The combination of the above factors-- increase in exploitable lands, multiple-cropping opportunities, increased yields, and reduction in risk--should combine to produce an absolute and significant increase in agricultural production. Table III indicates the potential increase in production in 6 food commodities for the 5 sub-projects analyzed:

TABLE III

PRODUCTION OF FOOD COMMODITIES IN 5 SUB-PROJECTS  
WITH AND WITHOUT PROJECT (In Metric Tons)

Commodity	Current Production	Projected Production with Irrigation
Potatoes	3,212	13,421
Beans, Peas	178	3,214
Vegetables	4,058	9,884
Fruits	56	2,807
Corn	695	2,328
Grains and Cereals	1,901	4,078

\* From 10% of production "without" the sub-project to 5% "with."

01.-

Additionally, improved pastures should significantly increase livestock production--dairy cattle in the Cajamarca lowlands and beef cattle in the lower areas of the Mantaro Valley--although this has not been quantified in the analysis. These production increases will have 3 effects: (1) increased consumption possibilities within the Project regions; (2) an increase in the amount of food in the urban areas which serve as markets for Cajamarca and Mantaro (Chiclayo and Trujillo in the case of the former, and Lima in the case of the latter); and (3) a savings in foreign exchange for the economy as a whole, to the extent that nationally produced grains, potatoes, and beef are substituted for imports. A fourth possible benefit would accrue if production increases--especially in fruits--could be linked to new agro-industry.

b. Micro-Economic Impact of Project

The increased production as a result of sub-project implementation will have a number of primary benefits to the individual beneficiaries of the Project, the small farmers of the selected areas who either individually or cooperatively farm the lands. These benefits include: (1) increased family income; (2) increased employment opportunities; and (3) increased consumption opportunities. Again it must be noted that the benefits are not optimal, but rather of an "intermediate" range consistent with Project inputs.

(1) Increased family incomes

The socio-economic indicators for the areas to benefit from this Project show an extremely depressed population (see Part III.C.) and income levels are well below the national average which in 1973 was approximately \$563 per capita (\$2815 for a family of five). Since the bulk of wealth is in urban coastal areas, average sierra income is significantly lower, and although accurate statistics are not available, sierra per capita incomes may be estimated to range between \$150 and \$250, depending on location. Table IV indicates present farm cash income levels in each of the 5 sub-projects analyzed, and projected farm cash income levels after the sub-projects reach full production (seventh year).

TABLE IV

FARM-GENERATED CASH INCOME IN 5 SUB-PROJECTS \*  
(Figures in US\$)

Project	Current Income		With Project Income		% Change
	Family	Per Capita**	Family	Per Capita	
Chupaca	\$207	\$41	\$ 474	\$ 95	229%
La Huaycha	22	5	426	85	1,936
Chicche	82	16	298	60	363
Chingol	584	117	2,403	480	412
Negritos-Tual	35	7	173	35	495

In terms of percentage increase in farm cash income, the greatest increases occur in the 2 sub-projects, La Huaycha and Negritos-Tual. In only one case, Chingol does projected income exceed the average national income, and none of the others approaches even the average sierra income.

\* Farm cash income refers only to cash income derived from agricultural activities within the sub-project area; other activities, such as seasonal labor in mines or other agricultural areas, commerce or artisanry is not included, so these figures do not represent actual per capita income in those sub-project areas where there is substantial off-farm employment. La Huaycha and Negritos-Tual both reportedly have large numbers of persons so engaged. Actual farm family income has been derived by estimating net annual output per family (See sub-project analysis results, Section 2) and subtracting 30%, which represents estimated on-farm consumption. It is recognized that this percentage varies from case to case, but is considered to be representative for the types of areas under analysis. In "with Project" 15% has been subtracted, since production will be increasing at a greater rate than consumption increases.

\*\* Per capita income assumes an average family of 5 persons.

(2) Increased employment opportunities

One problem in most areas of the sierra is the lack of adequate employment opportunities. Land is scarce, and after generations of farming without the benefits of modern technology, production per hectare has reached very low levels. The problem is aggravated by the lack of alternative non-farm employment opportunities. As a result there is increasing population pressure on the land, with consequent lowered per capita incomes. This Project, by bringing new land into cultivation and by introducing some multiple-cropping and new techniques designed to increase yields, will increase the number of man-days of labor needed per year per hectare. Table V quantifies this for the 5 sub-projects analyzed.

TABLE V

MAN-DAYS OF LABOR PER YEAR AND PER HECTARE IN 5 SUB-PROJECTS,  
WITH AND WITHOUT PROJECT

Sub-Project	Current Man Days of Labor		Man Day with Project	
	Per Year	Per Ha.	Per Year	Per Ha.
Chingol	42,357	33	91,221	43
Negritos Tual	7,552	4.6	21,876	11.3
Chupaca	137,037	46	221,756	56
La Huaycha	3,765	8.2	38,853	52
Chicche	10,500	17.6	52,659	35

Taking the actual population for each sub-project, an Employment Index was calculated for each. For each family of 5, we assume 2.25 workers (the head of household is calculated at 1.0; spouse is calculated at .75; oldest child at .5, based on the amount of time they can devote to agriculture). The index is presented in Table VI, together with the man-days needed, with and without the Project. This shows the percentage of utilization of available manpower, and indicates the level of under-employment which is characteristic of sierra agriculture. In all sub-projects the

utilization percentage increases with the Project, but only in the case of Chingol does this pass 50%.\*

(3) Increased consumption opportunities

Nutrition levels in the sierra are generally considered to be far below the national average. This is due to the fact that farmers generally receive little, if any, cash income, and must rely upon their own production or what they can obtain by barter, for food. The economic analysis of the 5 sub-projects analyzed assumes no on-farm consumption (which would lower net income by transferring sales to consumption), based on the theory that such consumption is a trade-off to purchasing food with the additional income. This is undoubtedly true, and the additional cash income detailed (See Table IV) above, should have a positive effect on family consumption and nutrition.

TABLE VI

EMPLOYMENT INDEX: 5 SUB-PROJECTS

Project	ACTUAL SITUATION			WITH PROJECT (AT YEAR 7)	
	Man-Days** Available	Man-Days Needed	Employment Index	Man-Days Needed	Employment Index
Chingol	135,000	42,357	.31	91,221	.68
Negritos-Tual	450,000	7,552	.02	21,876	.05
Chupaca	1,350,000	137,037	.10	221,755	.16
La Huaycha	315,000	3,765	.01	38,853	.12
Chicche	675,000	10,500	.02	52,659	.08

\* The above refers only to agriculture possibilities in the sub-projects. There are, of course, other employment possibilities including seasonal labor in other farm areas (especially the large complexes on the Northern Coast) and in the mines in the area of Mantaro.

\*\* 22.5% of total population, available 200 days per year.

#### 4. ANALYSIS OF OVERALL INVESTMENT PROGRAM

The foregoing 5 sub-projects are illustrative of the characteristics and viability of the entire investment in sub-projects. This section describes the basis for establishing the inputs and outputs of the fully expanded program. Included are: 1) the basis for identifying additional sub-projects; 2) a brief description of each; and 3) orders of magnitude estimates for sub-project inputs and outputs.

##### a. Identification of Remaining Sub-Projects

The sub-projects described below have been selected by the staff of Sub-Directorate of Watershed Management based on the following sources: i) a file of such projects kept by the DGI; ii) The National Water Plan; iii) requests from local groups submitted directly to the DGA; and iv) experience and first-hand knowledge of the DGA staff. The DGI has not acted on most of the requests for small projects received from local groups because of its emphasis on larger-scale projects. During the first year and a half of the Project, these sub-projects will be subjected to the same type of technical and economic scrutiny as the 5 sub-projects presented in this document. Final selection will be based on these analyses.

##### b. Description of Additional Projects

Tables VII and VIII contain lists and description of sub-project possibilities in Cajamarca and Mantaro. In the Cajamarca area, 10 projects have been identified amounting to a total of 6,700 hectares. Of this total, 3,300 hectares correspond to improvements to existing irrigation systems, 2,900 hectares of new irrigated lands, and 500 hectares in drainage works. The structures to be built include 96 kilometers of irrigation canals, 50 kilometers of canal lining, 35 kilometers of drains, a diversionary structure for each of the 10 sub-projects, and miscellaneous works. The 7 sub-projects labelled as "low sierra" are between 1,500 and 3,000 meters elevation, which means that multiple-cropping and a wide section of cropping possibilities are possible.

In the Mantaro region, 12 sub-projects have been identified. Total hectarage for this group is 9,000, of which 6,500 is new irrigation, 2,000 is improved irrigation, and 500 is for drainage. This set of sub-projects will require construction of 147 kilometers of irrigation canals, 105 kilometers of canal linings, 53 kilometers of drains, a diversionary structure for all but the Tarma sub-project, and miscellaneous works. 8 of these sub-projects (5,900 hectares) are at high elevations, which effectively limits cropping to one crop per year.

TABLE VII

LIST OF IDENTIFIED SUB-PROJECTS IN CAJAMARCA AREA

NUMBER	SUB-PROJECT	AREA (HAS)			INFRASTRUCTURE					LOCATION
		Drainage	Improvements	New Irrigation	Intakes	Canals Excav. (Km.)	Canals Revetem'ts (km.)	Special Structures	Drains (km.)	
1	CAUDAY (L)	---	---	500	1	8	4	2	---	CAJABAMBA
2	CHAQUICOCHA (L)	500	300	---	1	15	8	1	35	CAJABAMBA
3	PAMPA MILCO (H)	---	---	500	1	10	4	1	---	CAJABAMBA
4	COSEAN (L)	---	---	400	1	8	5	2	---	CAJABAMBA
5	NAMORA (L)	---	700	---	1	8	5	1	---	CAJABAMBA
6	ICHOCAN (H)	---	---	300	1	5	3	1	---	CAJABAMBA
7	SAN MARCOS (L)	---	700	500	1	15	8	2	---	CAJABAMBA
8	ASUNCION (H)	---	700	300	1	9	4	1	---	CAJAMARCA
9	CASCABAMBA (L)	---	900	---	1	12	6	1	---	CONTUMAZA
10	SAN GREGORIO (L)	---	---	400	1	6	3	1	---	(HUALGAYOC)
TOTALS		500	3,300	2,900	10	96	50	13	35	

(L) low sierra (&lt; 3,000 m.)

(H) high sierra (7 3,000 m.)

TABLE VIII

LIST OF IDENTIFIED SUB-PROJECTS IN ALTO MANTARO AREA

NUMBER	SUB-PROJECT	AREA (HAS)			INFRASTRUCTURE					LOCATION
		Drainage	Improvements	New Irrigation	Intakes	Canals Excav. (km.)	Canals Revetem'ts (km.)	Special Structures	Drains (km.)	
1	COTSH (H)	---	600	400	1	25	8	3	---	TARMA
2	SHULCAS (L)	---	500	500	1	---	18	3	---	HUANCAYO
3	ULLAPATA (H)	---	---	800	1	12	6	1	---	HUANCAYO
4	PUCARA (L)	---	200	200	1	10	6	1	---	HUANCAYO
5	APATA (L)	---	100	900	1	18	8	1	---	JAJJA
6	SAPALLANGA (L)	---	200	200	1	10	6	1	---	HUANCAYO
7	FAMPAS (L)	300	400	300	1	15	6	2	---	HUANCAYO
8	PACCHA (L)	---	---	900	1	25	12	2	---	JAJJA
9	PACA (L)	---	---	1,000	1	8	4	2	---	JAJJA
10	TARMA (L)	200	---	---	--	--	---	--	---	TARMA
11	LETICIA (H)	---	---	300	1	8	3	1	---	HUANCAYO
12	TUCLE (H)	---	---	1,000	1	16	8	2	---	HUANCAYO
TOTALS		500	2,000	6,500	11	147	105	21	---	

(L) low sierra (&lt; 3,000 m.)

(H) high sierra (≥ 3,000 m.)

c. Estimates of Inputs and Outputs

Global estimates of the market value of investment costs in physical works for the 22 sub-projects are shown in Table IX. The total of S/. 450 million (\$10,373,443) covers costs of major and minor irrigation and drainage facilities, on-farm clearing, levelling, and initial preparation of ditches. Included in these itemized costs, although not shown, are the costs of construction supervision and contingencies. Studies and design for these projects amounts to an additional S/. 11.5 million (\$266,000). Hectares to be affected are given in Table X according to geographic area and elevation.\*

TABLE X

22 ADDITIONAL PROJECTS

LOCATION	ELEVATION	No. OF HECTARES TO BE AFFECTED
CAJAMARCA	low sierra	4,900 has.
CAJAMARCA	high sierra	1,800 has.
MANTARO	low sierra	5,900 has.
MANTARO	high sierra	3,100 has.
TOTAL		15,700 Has.

\*Low sierra ranges from 1,500 to 3,000 meters elevation; high sierra is above 3,000 meters.

TABLE IX

COST ESTIMATES FOR 22 ADDITIONAL SUB-PROJECTS IN CAJAMARCA AND MANTARO

Type of Infrastructure	Number	Unit Cost (in Soles)	TOTAL INVESTMENT	
			(in Soles) 1974 Values	(in US Dollars)*
a) Works				
1. Small dams	5	S/. 2,500,000	S/. 12,500,000	\$ 288,150
2. Intakes	21	1,000,000	21,000,000	484,090
3. 34 special structures (bridges, siphons, etc.)	34	1,000,000	34,000,000	783,770
4. Principal irrigation canals	155 km.	400,000/km.	62,000,000	1,429,230
5. Secondary irrigation canals	245 km.	155,000/km.	36,750,000	847,160
6. Principal drainage canals	30 km.	1,000,000/km.	30,000,000	691,560
7. Secondary drainage canals	60 km.	200,000/km.	12,000,000	276,620
b) On-Farm Improvement				
1. Physical development of new irrigated lands	9,400 has.	15,000/ha.	141,000,000	3,250,340
2. Physical development of improved lands	5,300 has.	10,000/ha.	53,000,000	1,221,760
3. Miscellaneous complementary works (roads, etc.)	-	-	47,750,000	1,100,740
Total			S/. 450,000,000	\$ 10,373,420
Cost of Studies			S/. 11,500,000	\$ 266,000
GRAND TOTAL			S/. 461,500,000	\$ 10,639,420

\* U.S. dollars are calculated at S/.43.38 to \$1.00

Additional costs of the program, based on estimates from the Chingol and Chupaca sub-projects, are as follows:

(i) One-time Costs

On-farm investment in fruit trees on 10% of sub-project lands in the Cajamarca lowlands (10% x 4,900 hectares = 490 hectares):

	<u>Peruvian Soles</u>	<u>U.S. \$ equivalent</u>
1st year expenditure 490 ha. x S/.29,470/ha. =	S/.14,440,300	\$332,879
Average annual expenditure from 2nd to 4th year, which is the period until production first occurs:		
490 ha. x S/.3,700/ha./yr x 3 yrs =	S/.20,139,000	\$464,246

Investment in forestry for soil conservation for all projects (5% x 15,700 ha. = 785 ha.):

Expenditures over 4-year period:

785 ha. x S/.18,200/ha. =	<u>S/.14,287,000</u>	\$329,345
TOTAL-----	<u>S/.48,866,300</u>	<u>\$1,126,470</u>

(ii) Annual Costs

Average annual costs of farm tools for 70% of project lands:

70% x 15,700 ha. x S/.500/ha./yr. = S/. 5,495,000/yr \$126,671

Administration and Control of water:

15,700 ha. x S/.200/ha./yr. = 3,140,000/yr 72,384

Maintenance and Repairs:

15,700 ha. x S/.600/ha./yr. = 9,420,000/yr 213,000

Extension Services:

15,700 ha. x S/.200/ha./yr. = 3,140,000/yr 73,384

TOTAL-----	<u>S/.21,195,000/yr</u>	<u>\$488,589</u>
------------	-------------------------	------------------

An indication of the market values of farm inputs and outputs once full production is reached can be obtained for these 22 potential sub-projects by referring to the results obtained for the 5 sub-projects for which pre-feasibility studies have been completed.

Values for 4 representative sub-projects are shown in Table XI; Table XII shows present, projected, and incremental net values of annual productions for 22 sub-projects. In Table XI it will be noted that in the two low sierra sub-projects, Chingol and Chupaca, increases in both gross and net value of output are significantly higher than in the case of the high sierra sub-projects of Negritos-Tual and Chicche. This is due to the nature of the terrain, soil conditions, and the possibilities for multiple-cropping below 3,000 meters elevation. In extrapolating these output values for application to 22 additional sub-projects, in Tables XII and XIII, it has been determined that the cases of Chingol, Negritos-Tual, and Chupaca are representative of conditions in similar areas (Cajamarca low sierra and high sierra, and Mantaro low sierra, respectively). Their averages have thus been applied to the hectares for the additional 22 sub-projects in Table XIII to give total output, increases in output, total inputs, and net values of production with the Project. The case of Chicche, however, is somewhat atypical of the Mantaro high sierra, since in this particular case soil conditions are extremely poor, there is a great deal of erosion, and slopes are steeper than in most other areas. Due to these conditions, Chicche requires higher input costs--both with and without the Project--than is considered normal for the Mantaro high sierra. Input costs were therefore adjusted slightly downwards to arrive at what is considered a more typical situation for application to Mantaro high sierra sub-projects in Table XII.

Global estimates (not the increases) of expenditures for seed, fertilizers and pesticides, and the amount of production credit for these 3 items can be derived by applying the per hectare averages of Chingol, Negritos-Tual, Chupaca, and Chicche\* to the respective areas in Huancayo and Cajamarca. Average expenditures, which represent the amount of annual production credit needed, are shown in Table XIII.

Table XIV shows that total gross annual output from these 22 sub-projects will amount to \$9.4 million after the sub-projects are fully operational. Total increase in output will amount to \$4.9 million. Net value of output is \$7.2 million, an increase of \$3.3 million over the "without Project" status.

\* In the case of Chicche, input requirements have been adjusted downward to more accurately reflect Mantaro high sierra conditions.

TABLE XI

FARM INPUT AND OUTPUT VALUES AT FULL PRODUCTION FOR  
REPRESENTATIVE PROJECTS IN CAJAMARCA AND HUANCAYO REGIONS

(DOLLARS PER HECTARE PER YEAR IN 1974 VALUES)

SUB-PROJECT		<u>Output</u> <sup>*</sup> Market Revenues at Farm Gate	<u>Input</u> <sup>**</sup> Market Costs of Farm Production Excluding Labor	NET
CAJAMARCA	<u>CHINGOL: (L)</u>			
	With project	\$ 575	\$ 122	\$ 500
	Without project	<u>241</u>	<u>15</u>	<u>217</u>
	Difference	334	107	283
	<u>NEGRITOS TUAL: (H)</u>			
	With project	248	82	166
Without project	<u>55</u>	<u>9</u>	<u>46</u>	
Difference	193	73	120	
HUANCAYO	<u>CHUPACA: (L)</u>			
	With project	753	211	541
	Without project	<u>343</u>	<u>44</u>	<u>298</u>
	Difference	410	167	243
	<u>CHICCHE: (H)</u>			
	With project	540	196	344
Without project	<u>368</u>	<u>70</u>	<u>297</u>	
Difference	172	126	47	

\* Gross Sales divided by No. Has. in use.

\*\* Expenditures minus Family Labor.

TABLE XII

PRESENT, PROJECTED AND, INCREMENTAL NET OUTPUT VALUES AT

FULL PRODUCTION FOR 22 PROJECTS

(In US Dollars per Hectare)

Present Net*	Low sierra	in Cajamarca	\$ 217
Value of Output	High sierra	in Cajamarca	46
	Low sierra	in Mantaro	298
	High sierra	in Mantaro	313
Projected Net*	Low sierra	in Cajamarca	\$ 500
Value of Output	High sierra	in Cajamarca	166
with Project	Low sierra	in Mantaro	541
(At Full Production)	High sierra	in Mantaro	401
Increase in	Low sierra	in Cajamarca	\$ 283
Value of Output	High sierra	in Cajamarca	120
	Low sierra	in Mantaro	243
	High sierra	in Mantaro	88

\* Per hectare values are taken from Table XI in cases of Camajarca lowsierra and highsierra and Mantaro lowsierra. Mantaro highsierra values are calculated using Chicche as a base, but adjusting input costs to reflect normal conditions.

TABLE XIII

COSTS OF SELECTED, ANNUAL INPUTS AT FULL PRODUCTION FOR 22 PROJECTS\*

(In U.S. Dollars at 1974 prices)

CAJAMARCA LOW SIERRA

SEEDS	:	4,900 has. at	\$ 28/Ha.	=	\$ 137,200
FERTILIZER	:	4,900 has. at	\$ 58/Ha.	=	284,200
PESTICIDES	:	4,900 has. at	\$ 36/Ha.	=	<u>176,400</u>
TOTAL	:	4,900 has. at	\$122/Ha. **	=	\$ 597,800

CAJAMARCA HIGH SIERRA

SEEDS	:	1,800 has. at	\$ 28/Ha.	=	\$ 50,400
FERTILIZER	:	1,800 has. at	\$ 37/Ha.	=	\$ 66,600
PESTICIDES	:	1,800 has. at	\$ 17/Ha.	=	<u>\$ 30,600</u>
TOTAL	:	1,800 has. at	\$ 82/Ha.	=	\$ 147,600

MANTARO LOW SIERRA

SEEDS	:	5,900 has. at	\$ 76/Ha.	=	\$ 448,400
FERTILIZER	:	5,900 has. at	\$ 93/Ha.	=	\$ 548,700
PESTICIDES	:	5,900 has. at	\$ 42/Ha.	=	\$ 247,800
TOTAL	:	5,900 has. at	\$211/Ha.	=	\$1,244,900

MANTARO HIGH SIERRA

SEEDS	:	3,100 has. at	\$ 35/Ha.	=	\$ 108,500
FERTILIZER	:	3,100 has. at	\$ 58/Ha.	=	\$ 179,800
PESTICIDES	:	3,100 has. at	\$ 46/Ha.	=	\$ 142,600
TOTAL	:	3,100 has. at	\$139/Ha.	=	\$ 450,221
TOTAL ANNUAL INPUT NEEDS FOR 22 PROJECTS:				=	\$2,440,521

\* Per hectare costs have been extrapolated from Chingol, Negritos-Tual, Chupaca, and Chicche Sub-projects.

\*\* Total costs correspond to total inputs "with" project in Table XI

TABLE XIV

VALUES OF ANNUAL OUTPUT AT FULL PRODUCTION FOR 22 PROJECTS

(In U.S. Dollars)

GROSS VALUE OF OUTPUT:

Low Sierra	in Cajamarca :	4,900 has.	at \$575/Ha.	=	\$2,817,500
High Sierra	in Cajamarca:	1,800 has.	at \$248/Ha.	=	446,400
Low Sierra	in Mantaro :	5,900 has.	at \$753/Ha.	=	4,442,700
High Sierra	in Mantaro :	3,100 has.	at \$540/Ha.	=	<u>1,674,000</u>
TOTALS :		15,700 has.		=	\$9,380,600

INCREASE IN GROSS VALUE OF OUTPUT:

Low Sierra	in Cajamarca :	4,900 has.	at \$334/Ha.	=	\$1,636,600
High Sierra	in Cajamarca:	1,800 has.	at \$193/Ha.	=	347,400
Low Sierra	in Mantaro :	5,900 has.	at \$410/Ha.	=	2,419,000
High Sierra	in Mantaro :	3,100 has.	at \$172/Ha.	=	<u>533,200</u>
TOTALS :		15,700 has.		=	\$4,936,200

NET VALUE OF OUTPUT:

Low Sierra	in Cajamarca :	4,900 has.	at \$500/Ha.	=	\$2,450,000
High Sierra	in Cajamarca:	1,800 has.	at \$166/Ha.	=	298,800
Low Sierra	in Mantaro :	5,900 has.	at \$541/Ha.	=	3,191,900
High Sierra	in Mantaro :	3,100 has.	at \$401/Ha.	=	<u>1,243,100</u>
TOTALS :		15,700 has.		=	\$7,183,800

INCREASE IN NET VALUE OF OUTPUT:

Low Sierra	in Cajamarca :	4,900 has.	at \$283/Ha.	=	\$1,386,700
High Sierra	in Cajamarca:	1,800 has.	at \$120/Ha.	=	216,000
Low Sierra	in Mantaro :	5,900 has.	at \$243/Ha.	=	1,433,700
High Sierra	in Mantaro :	3,100 has.	at \$ 88/Ha.	=	<u>272,800</u>
TOTALS :		15,700 has.		=	\$3,309,200

\* Per hectare values taken from Tables XI and XII.

### Cost-Benefit Estimate for 22 Sub-Projects

Table XV shows the costs for 22 sub-projects, by principal investment category, along with incremental net benefits as a result of the Project, phased over the expected 40-year life of the sub-projects. As in the case of the original 5 sub-projects analyzed, it is assumed that full benefits are reached in incremental steps -- 33% of benefits are reached in the third year, 66% in the fourth year, and 100% in the fifth year. Inputs and outputs have been derived from Tables IX, XII and XIII, and are based upon values extrapolated from the 5 sub-projects studied in detail. Since specific physical conditions, cropping patterns and yields will vary from sub-project to sub-project, both Project inputs and projected outputs should be taken to be representative estimates and in no way firm expectations.

Using these figures, net present worth was calculated, using a 15% discount rate, and an overall benefit-cost ratio of 1.18 was reached. In and of itself this figure is of little value, since data used to derive it have been estimated. It is significant, however, in that it provides a basis for believing that refined sub-project analysis will demonstrate a Project which is consistent with an overall rate of return of over 15%.

TABLE XV

PROGRAM OF INVESTMENTS AND INCREMENTAL NET BENEFIT FOR 22 ADDITIONAL SUB-PROJECTS

BENEFIT COST  
RATIO: 1.18

NET INCREMENTAL  
BENEFIT

\$1,103,067  
(33% new production)

\$2,206,133  
(66% new production)

\$3,309,200  
(100% new production) → 40

	0	1	2	3	4	5	6	40
<u>COSTS</u>								
Investment Costs	\$2,127,884	\$4,255,768	\$4,255,768					
Fruit Trees			\$ 332,879	\$464,246	\$ 464,246	\$ 464,246		
Forestry		\$ 244,294	\$ 45,240	\$ 23,525	\$ 16,286			
Farm Tools*				\$126,671				→ 40
Admin. and* Control				\$ 72,384				→ 40
Maintenance and* Repairs				\$213,000				→ 40
Extension*			\$ 73,384					→ 40
TOTAL BENEFIT INCREMENTAL NET	-\$2,127,884	-\$4,500,062	-\$4,707,271	\$129,857	\$1,240,162	\$2,359,515	\$2,823,761	→ 40

\*Costs are constant through year 40

## 5. Analysis of Credit and Fertilizer Availability

### a. Prospects for the Availability of Production Credit in Project Target Areas

During 1974 the Agrarian Bank supplied \$1.28 million in production credits to agricultural units in the Cajamarca Valley and \$8.90 million in the Mantaro Valley. Estimated additional credits needed to finance seed, fertilizer, and pesticide requirements for lands developed under this Project amount to \$.89 million for Cajamarca and \$2.11 for Mantaro. Combining credit needs for both valleys and comparing this figure to the amount of credit actually supplied in 1974, the relative increase in credit needs for the Project area amounts to approximately 30%. Put in this perspective, there can be little doubt that the Agrarian Bank will be able to meet the increased demand for production credit generated by this Project.

Four factors support the above conclusion. First, high ranking officials of the Agrarian Bank have assured USAID that their general policy is to give preferential consideration to the development of sierra agriculture and, moreover, that they especially stand ready to provide resources in support of priority MinAg development projects. Second, Article 10 of the new Organic Law of the Agrarian Bank (D.L 21227) authorizes \$333.3 million in capital for the six-year period beginning January 1, 1976, which represents a 50% increase over that authorized in prior years. Third, Article 84 of the above-cited law establishes the Special Operations Fund (SOF), amounting to approximately \$100 million, which has as its primary purposes: 1) to rehabilitate irrigated lands on the coast and in the sierra and 2) to establish forestry plantations for protection and conservation of watersheds. Fourth, credit requirements generated by this Project will come on-stream gradually over a five-year period. Bank representatives also maintain that the relatively low levels of financing made available in the Cajamarca and Mantaro areas are largely due to a lack of loan applications and do not reflect a shortage of available resources. They attribute the low level of applications to a lack of sufficient extension personnel to assist farmers in identification of improved practices, credit requirements, and in completing the necessary loan applications. Extension services supported under this Project should stimulate producers to request the credit necessary to maximize returns. The Bank in turn has the flexibility to reallocate resources to the Project area based on increases in loan applications.

### b. Prospects for the Availability of Fertilizer

Peru is expected to be self-sufficient in nitrogen fertilizer by the end of 1975, with the new plant at Talara expected to produce over 75,000 MT of urea annually by 1976 and with other sources producing another 26,000 MT. The situation also appears encouraging for phosphates, with the Bayovar plant expected to produce 240,000 MT of phosphate by the end of 1977, compared to a consumption level of 20,000 MT in 1974. The Bayovar plant is also expected to produce sufficient potassium to meet projected needs.

Internal distribution problems have been serious in the past, especially in the sierra region, owing to lack of sufficient storage capacity, transportation facilities, and retail outlets. The GOP has taken steps to remedy the situation by creating a new state fertilizer marketing agency, ENCI, charged with coordinating fertilizer sales according to regional requirements and constructing storage and marketing facilities. At present ENCI operates storage facilities with capacity for 300 MT in Cajamarca and 4,000 MT in Huancayo. The GOP has allocated approximately \$6 million to ENCI for the 1975-76 biennium for construction of additional facilities. Storage capacity will be expanded by 1,500 MT in Mantaro and 700 MT in Cajamarca by August of 1977. USAID has concluded that ENCI has the capacity to ensure sufficient fertilizer supplies to meet Project needs.

### C. Social Analysis

The social impact of this Project is potentially very great, as the Project will affect the participating farm families at virtually every step of implementation. Farmers have been, and will continue to be, consulted regarding potential sub-project sites; they will be required to organize into local Irrigators' Commission prior to sub-project construction; they will contribute unskilled labor in the construction of works; they will be expected, under the direction of their Irrigators' Commission, to operate and maintain the new irrigation systems, and to pay their water quota and tariff obligations; and they will be urged to participate in technical assistance programs to improve their efficiency of water use. In this Project, then, where direct farmer participation is so essential to Project implementation and achievement of Project purposes, a full analysis of socio-cultural feasibility and impact must be an integral element in determining over-all Project feasibility.

The farm families who will be involved in these Project activities are those living and farming in the areas to be benefitted by selected sub-projects. In general, these belong to the universe of the Peruvian rural poor -- small-scale farmers and their families, living in the sierra, who depend almost exclusively on low-level agricultural production for their meager incomes and limited employment opportunities. Such families have increasingly been the object of priority GOP programs (such as the Agrarian Reform), consistent with the Government's strong commitment to social justice which is stated in terms of equality of access to land, employment, and other economic resources. In addition, more GOP investment resources have recently been allocated to the sierra farmers, as the production inefficiency of small-scale sierra farmers is now seen as an important bottleneck to increased food production in a country whose food import requirements have increased significantly in recent years.

In the Project areas of Cajamarca and Mantaro, these families typically have an annual per capita income of approximately \$175. In Mantaro, the average family land-holding is 0.7 has.; in Cajamarca, 2.0 has. much of which is not now suitable for food cropping. These farm families are generally members of some agricultural enterprise, be it a CAP, SAIS, or comunidad, although may retain individual title to all or part of their formerly-owned agricultural lands.\* Educational and medical facilities are few and concentrated in small population and commercial centers, which are often distant from many of the rural farmers. Even these facilities are considerably less in number and quality than those in the rural areas on the coast; they typically consist of a small medical clinic staffed by one part-time para-professional and an untrained assistant

---

\* Most recent Agrarian Reform legislation (Amendment to D.L.#20136) permits a maximum of individually-owned land of 30 has. in the sierra. Furthermore, as a matter of practice farm families organized in cooperatives generally retain between .5 and 1.0 hectare for production for household consumption.

or a small primary school in which one teacher manages several primary-level classes.

Despite the efforts of the Agrarian Reform, migration is an increasingly frequent pattern in both Cajamarca and Mantaro, owing to the severely limited economic opportunities in these areas. In Cajamarca, the dominant pattern is one of seasonal migration, in which the male head of the household and frequently one or two of his sons will travel to the coastal departments of Lambayeque and La Libertad to harvest the rice and sugar crops, returning again to their villages after the harvest. It is reported\*, however, that this pattern is one dictated only by economic necessity; the farmers' stated preference is to remain in their villages throughout the year if they could find economic opportunities obviating the need to migrate.

Permanent migration is, nevertheless, a major demographic factor in Cajamarca. According to a 1973 Government study,\*\* the Cajamarca sub-region (principally the valley lands) witnessed a permanent out-flow of 150,000 migrants over the most recent 11 years, or 13,600 annually. The option of permanent out-migration is, moreover, becoming increasingly attractive to even more remote areas in the region,\*\*\* as the population pressure on the land increases and soil fertility decreases.

Migration is even more significant in Mantaro, where the proximity to Lima and ease of transportation facilitates travel. Permanent migration to Lima from Mantaro is the most widespread pattern, although it is reported\*\*\* that many of these would-be permanent migrants eventually return to their villages owing to the high cost of living in Lima. Mantaro is also a center for permanent in-migrants from more rural and poorer sierra regions -- e.g. Ayacucho and Huancavelica -- who are attracted by the more urbanized area of Huancayo, and the associated economic opportunities.

There are also opportunities for seasonal migration, although less so than in Cajamarca. During January-March, farmers will migrate to assist in the harvest on nearby coffee plantations. Nearby mining operations also offer alternative, very highly-paid, work opportunities for day labor.

---

\* Report financed by USAID/Peru, Estudio Social de Pequeñas Irrigaciones en la Sierra: Cajamarca y Mantaro, by Alfonso Chirinos A. and Otto Flores Sáenz, 1975; and related conversations with the authors.

\*\* Análisis de la Sub-Región de Cajamarca, Oficina Regional de Desarrollo del Norte; cited in MOA, et.al, Estudio de Diagnóstico Socio-Económico del Area de Influencia del Proyecto Piloto Cajamarca-La Libertad (Cajamarca-Cajabamba); Cajamarca, 1974, p.3

\*\*\* Chirinos and Flores, op.cit.

The socio-economic profile of the target farm families, then, is one of (1) severely limited employment and income opportunities owing to their ultimate dependence on agricultural production from small plots of marginal land, leading to (2) consistently low standards of living (in all cases below the national average), and consequent (3) widespread economically-motivated migration in an attempt to escape the severe employment and income constraints. By increasing, through improved water and land use, the total amount of land suitable for productive crops and pasture, and the production potential of that land, the proposed Project is designed to alleviate these constraints on income and employment, improving the standard of living in Project areas, and thereby reducing the motivation for migration.

The socio-cultural feasibility of this Project rests on 3 key issues: the incentives to the farmers to participate in Project activities (such as sub-project construction), the individual farmer's capability to use effectively and efficiently the newly-available water and land resources; and the organizational capacity in the sub-project areas to administer an irrigation system, including control and measurement of water use, operation and maintenance, and collection of water charges.

To approximate, as available time, resources, and data permitted, an analysis of the socio-cultural feasibility of the first 5 selected sub-projects, Peruvian sociologists\* conducted a study (previously cited) of sub-project areas in Cajamarca and Mantaro, drawing on currently available data and relevant written reports, as well as an interviews with local leaders and farmers who would be benefitted\*\*.

In general terms, it was found that the farmers in the sub-project areas showed great interest in the proposed irrigation works, and were fully aware of the potential economic benefits which would accrue to them as a result; farmers routinely cited the additional land area which could be farmed as well as new, more productive, cropping alternatives. Their understanding and appreciation of the benefits of irrigation, founded on many generations of dependence on scarce rainfall and limited irrigation water, enabled the great majority to recognize immediately and respond enthusiastically to the inherent economic incentives to participate.

---

\* Alfonso Chirinos and Otto Flores, currently associate professors in the Department of Social Sciences at the National Agrarian University, La Molina, Lima, Perú.

\*\* In Cajamarca, interviews were held with 19 leaders and 35 farmers; in Mantaro, with 16 leaders and 34 farmers. Interviews were not drawn from a random sample, but an attempt was made to interview farmers whose lands were at varying distances, and who would thus reap differential benefits, from selected sub-project sites.

Consequently, it was concluded that strong motivation and economic interest in the selected sub-projects indeed existed among the local farming communities.

This motivation was enthusiastic in all but two communities studied. One of these is Negritos, in Cajamarca (one of 3 communities which will benefit from the Negritos-Tual sub-project), which does not at present have any irrigation on its lands, which are currently in use as pasture. Lacking experience in irrigated agriculture, it can be expected that the farmers can not readily anticipate the benefits which can accrue from it. The local leaders in Negritos, more experienced, were, however, much more interested in the sub-project, noting that with irrigation, some of land now in pasture could be put into "rye-grass".

The relative lack of interest in Negritos is not expected to be a continuing problem in sub-project implementation given, first, the interest expressed by the local leaders, and second, the involvement in the sub-project of the community of Tual, which is characterized by extremely high farmer initiative.

The second community which showed relatively less interest in a selected irrigation sub-project is that of La Huaycha, in Mantaro. La Huaycha is considered the most traditional Mestizo area in the Mantaro region, although in recent years it has turned increasingly to more modern, coast-oriented, influences. Land in La Huaycha is almost exclusively devoted to pasture, and some of the local farmers do not immediately see the potential in irrigated agriculture. There is considerable out-migration from the area owing to the population increase on a static amount of productive land. If the farmers can be convinced that irrigation can open up new lands and new production alternatives, providing more employment, interest in the sub-project among the local leaders could be aroused. This will be a priority task for the DGA regional staff (including a Project-financed social scientist staff member), facilitated by careful instruction, in collaboration with community leaders, of local farmers using the example of the benefits nearby communities have reaped from irrigated agriculture. This task will undoubtedly have to precede any sub-project construction.

Given considerable farmer interest in sub-projects, incentives to participate in Project activities can be logically derived. For purposes of Project design, the Project Development Committee was particularly interested in establishing the minimum jornal (daily wage for unskilled labor) which would be required to assure contribution of labor by farmers. While most of the communities expressed a willingness to contribute their labor for no pay, the Committee and the DGA decided to provide under the Project for a minimum payment to local labor\*. To

---

\* In Tual, where local farmers are currently building an irrigation canal with no financial or technical help (CARITAS is donating food), the farmers indicated that they would gladly work on a sub-project with no pay; but in this case, they continued, the system would be "theirs", and they would not then feel obliged to pay water charges.

establish the minimum desirable jornal to be paid, Chirinos and Flores compared the official GOP-determined jornal for each area with past going rates being paid by other agencies or local employers for comparable work. Table I shows the current (at both official and going rates) jornal in sub-project areas, and those proposed as a minimum to assure full farmer collaboration in sub-project construction\*. These rates are proposed not only with the objective in mind of ensuring consistent availability of labor to complete sub-project construction efficiently, but also that of maximizing, within reasonable limits, the income and employment effects of the Project\*\*.

In terms of the individual farmers' capability to use water effectively in order to achieve production, income, and employment objectives of the Project, it was found in all communities that had prior experience with irrigated agriculture such experience was and continues to be highly successful, within the technical limitations of unsophisticated, often poorly designed, water delivery systems. Individual farmers' perceptions of the efficacy of different forms of irrigation are well-developed. While in some areas even the technical subtleties of efficient water distribution and application are appreciated, it is nevertheless clear that farmers in most areas will need considerable training in improving efficiency of water use, particularly in on-farm water application practices. In all such cases there exists strong support for this kind of training among the farmers, who have indicated their willingness to learn more about improved irrigation methods which, in turn, indicates a sufficient understanding of irrigation agriculture that they are at least aware of its technical subtleties and their potential for maximizing profitability.

A critical social pre-requisite to Project success --in terms of both implementation and achievement of objectives-- is adequate organizational infrastructure in the communities to establish a socially viable local Irrigators' Commission to participate in sub-project

---

\*These rates appear high, relative to official jornal rates; but assuming a significant inflationary effect over the life of the Project, they may, in fact, be quite realistic. In any event, these are proposed rates, and will be subject to review and revision by the MOA.

\*\*While the option was considered of reducing the financial inputs required by the Project by paying part of the jornal in food, the Committee, in consultation with the DGA, rejected it due to the variability of success of this form of payment in Perú and the inherent added administrative burden, in terms of distribution, it would impose.

TABLE I

CURRENT AND PROPOSED DAILY WAGE RATES

	Current*		Proposed				
			<u>W/out Food</u>		<u>With Food</u>		
	S/.	\$	S/.	\$	S/.	\$	
CAJAMARCA	1. Negritos-Tual	43.00 (25.00)	0.97 (0.55)	70.00	1.59	50.00	1.10
	2. Chingol	43.00 (70.00)	0.97 (1.59)	90.00	2.04	70.00	1.59
	3. Chupaca	66.00 (70.00)	1.50 (1.59)	90.00	2.04	70.00	1.59
MANTARO	4. La Huaycha	66.00 (80.00)	1.50 1.81	100.00	2.20	80.00	1.81
	5. Chicche	66.00 (80.00)	1.50 (1.81)	100.00	2.20	80.00	1.81

\* Official jornal rates, established by Department pursuant to legislation, are given first. Rates given in parentheses are those currently or recently paid in sub-project areas by other employers or are inferred from sub-region income data.

Source: Chirinos and Flores report, Estudio Social de Pequeñas Irrigaciones en la Sierra: Cajamarca y Mantaro, 1975.

construction, and to carry on operation, maintenance, and administrative functions associated with the irrigation systems. In all those communities with some existing irrigated agriculture, experience in communal work construction, water use supervision, and routine maintenance is both extensive and highly successful. Several communities have recent or current experience in building their own irrigation works with minimum (or no) outside assistance.

In Tual, for example, 8 km. of canal have been constructed by farmers of surrounding communities (including a significant participation by farmers from Negritos\*); this project was begun on their own after waiting 2 years for a favorable GOP response, in the form of technical assistance and machinery, to their formal request. Chingol's 3 canals, which make up its entire irrigation network, were built by the members of the newly-organized production cooperative using plans drawn up by the former hacendado.

Last year farmers in Chupaca repaired a badly eroded section of a canal and have organized work groups to enlarge other canals. With SINAMOS assistance, 200 farmers in Chicche have been alternating work shifts over the past 3 years to build a canal planned 5 years ago. The indigenous ~~serra~~ communal ethic is apparently still strong, and, more important, supported by efficient and effective social organization norms.

Such organizational infrastructure is weak in the sub-project area of La Huaycha. While there is reportedly a rebirth of the tradition of communal work here with the recent creation of groups to build schools and clean streets, the interest is strong only among the local leaders. Moreover, this area is composed of two comunidades (recognized "indigenous communities") which have an outstanding disagreement over farming rights to land which lies between them and which would be affected by the selected drainage sub-project. This is potentially a serious obstacle to cooperation between the two comunidades and will undoubtedly require the DGA's special attention to effect its resolution (possibly in the form of a compromise backed by government officials) prior to sub-project implementation.

A second potential problem in inter-community cooperation is a rivalry between Negritos and Tual. Both formerly independent comunidades --Negritos with 120 families and 14,375 has. (mostly in marginal pasture) and Tual with 180 families and 2,200 has.-- Negritos was, in June, 1974, adjudicated to Tual under the Agrarian Reform and incorporated into a loose confederation of communities (specifically, a SAIS). The farmers of Negritos resent the implied loss of independence (although it is largely nominal) and the fact that they were not consulted prior to the decision, and consequently they resist the idea of

---

\* On the day the work site was visited by the sociologists, 65 people were at work, including 30 from Tual and 15 from Negritos.

cooperation with Tual. However, as indicated above, farmers from Negritos are already working with those from Tual on a canal, and it is expected that this number will increase, as, over time, the resentfulness directed toward Tual subsides. In sub-project implementation, however, special care must be taken not to exacerbate this potential conflict.

In projects of this sort, there is always potential for conflicts arising from changes in the distribution of power and participation within and among the communities involved. In general terms, it is expected (as described above) that for purposes of this Project, conflicts between and among communities will be few and manageable. Conflict within communities, however, will certainly arise, as they have in the past and will continue to long after the Project. These typically relate to use of an differential benefits from irrigation water. A common problem is unauthorized use of water, when individual farmers divert more than the allocated amount of water from a canal for their own use by making a hole in a distribution canal or widening a diversion canal. Such problems are invariably brought to the attention of the local Irrigators' Commission, or, in some communities, a "water judge", and corrective action is taken on behalf of the community. This procedure is reportedly well-established in the norms of the local communities.

Another source of conflict is the distribution of the benefits of irrigation water, which in the past has invariably been in favor of the status quo; those benefitted farmers with extensive land or rich soils will be benefitted disproportionately more than those with little land and poor soils\*. To a great extent, this biased distribution is inevitable in irrigation projects, where the area to be benefitted by each project is defined on technical, not social welfare, grounds. This kind of social conflict will, however, be less pronounced in those instances where the sub-projects benefit cooperatively-owned or communally-farmed land parcels. In any case, it must be expected that these potential problems are largely outside the control of the Project, and that the responsibility and capacity for their resolution lies primarily within the local communities, where a strong communal ethic and effective community organization will serve to reduce social conflict to manageable proportions. Furthermore, since DGA and Zonal officials will coordinate closely with the farmers to establish Irrigators' Commissions and to organize a construction staff and work schedule prior to construction of each sub-project, such problems will surface and be confronted in the initial stages of sub-project implementation. Based on conversations with several

---

\* This was explicitly cited to be the case in Chupaca, where one farm family owns 16 has., many times more than the average land-holding in the area.

social scientists experienced in similar projects, the Project Development Committee is confident that these problems, since they will be identified and confronted promptly, will be manageable owing in great part to the overriding importance of and economic interest in irrigation, which is a powerful motivation for their resolution by the committee.

The impact of the Project on Peruvian women is expected to be significant, insofar as women are highly active participants in the sierra agricultural sector. The basic economic unit in the Project areas of Cajamarca and Mantaro, as in the rest of the sierra, is the farm household, in which women play significant roles in providing additional labor when required, in marketing production, and in managing the household economy. By expanding the area of cultivated land and increasing production, the Project will necessarily expand the scope of these traditionally female roles, increasing the economic participation of women and consequently, their contribution to development in the rural sector.

A corollary impact of the Project will be to integrate women more fully into the national economy. As active and integral participants in the basic economic unit in the sierra agricultural sector, women will accrue the economic benefits of increased production and consumption and increased employment and income opportunities expected under the Project. Moreover, as women are less likely to migrate out of the sierra than their male counterparts, improving the viability of the sierra economy under this Project will have a relatively greater positive impact on female beneficiaries.

In the course of Project implementation, Mission and DGA staff personnel will ensure that woman's participation in sub-project implementation will be maximized. This will require assurances that female farm-operators will not be discriminated against in the establishment of Water Users' Associations, the organization of construction and operation and maintenance work groups, access to credit, and participation in training and on-farm technical assistance programs. Since female farm-operators are not a rarity in the Peruvian sierra, ensuring their participation in the Project equal to that of their male counterparts should not require radical changes in awareness, procedures, or institutional structures. The Peruvian Government, moreover, has taken a strong public position supporting the recognition of women's traditional contribution to Peruvian socio-economic life and encouraging the expansion of women's active participation in the economic development of the country. The Mission can expect to receive the GOP's full support in its efforts to maximize women's participation in this Project.

D. Policy Analysis

1. The National Four-Year Development Plan (1975-78)  
and GOP Investment Budgets

The current GOP National Development Plan, issued in June 1975, highlights key development policies which give strong policy support to the objectives of this Project. First, the Plan gives great weight to the importance of further developing the country's water and land resources. As one of the two major policies under the general rubric of "Multisectoral Policies Fundamental to the Organization of Economic Space", the Natural Resource and Environmental Policy cites 6 priority objectives, 2 of which have particular relevance to this Project:

- Intensification of activities related to the evaluation and rational use of renewable resources as well as non-renewable resources.
- Preferential utilization of soil, water and wildlife resources for satisfaction of domestic needs, particularly those of food consumption. (p.18)

Two of the 8 priority policies stated for the Agrarian Sector are directly supported by Project activities:

- Intensification of programs for the use, conservation, and protection of water, soil, and natural pasture resources, to:
  - (1) improve systems of capturing, distribution, use and control of surface and subterranean water;
  - (2) bring into production and rehabilitate land with erosion, salinity and drainage problems, fostering appropriate cultural practices to guarantee their conservation;
  - (3) accelerate forestation programs in the sierra, as well as the rationalization of the use, management and conservation of natural pasture.
- Establishment of priority to drainage and small irrigation projects in the coast and the sierra .... (pp. 33-34)

Similarly, included among the policies for the Forestry Sector is "the rational exploitation of natural forests ... intensifying forestation activities, fostering the maintenance of ecological equilibrium, integrating harmoniously the potential of the zone with the development of agriculture.... (p.34)

The National Plan also places high priority on investments with short-term returns, on those which increase domestic food production, and on those which are aimed at a decentralization of economic activity. Priority will be given to:

- The allocation of resources to new projects of short maturity ... (and to) those oriented to achieve decentralization of economic activity (p.20)
- new projects of short maturity, in particular, those designed to increase food production....(p.34)

It is clear, then, that this Project fits well within the National Development Plan, and, as such, should receive strong support and high priority within the GOP's overall investment program.

Moreover, recent policy actions indicate that the sierra is receiving increasing priority in allocation of investments in water-and land-use projects.

This increased priority is reflected in part in the re-organization of the General Directorate of Water Resources. This re-organization, by creating the General Directorate of Irrigation (DGI), separates out the responsibility for planning and implementation of large-scale programs requiring complex engineering works and permits the DGA to concentrate its efforts and resources on watershed management and formulating and implementing water use policy.

Supporting evidence of an incipient shift in GOP priorities from large-scale, coastal irrigation projects to smaller-scale irrigation improvement, soil conservation, and reforestation, especially in the sierra, is shown in the following tabulation which presents the 1973-74 and 1975-76 combined operating and investment budgets for selected programs and projects:

PROGRAM	1973-74	1975-76
1. Improvement of Irrigation Infrastructure in the Sierra	9,000,000	20,000,000
2. Large-scale Coastal Irrigation Projects (Majes, Tinajones, Chira-Piura)	5,403,790,000	6,104,050,000
3. Budget of the DGA	197,367,000	302,924,000

Item # 1 of the tabulation indicates a greater than two-fold increase in the budget earmarked for the irrigation improvement project, the one to which the present loan proposal contributes most directly. Item # 2 indicates that expenditures for large, on-going irrigation projects were only increased by slightly more than 10 percent between the 1973-74 and 1975-76 budget periods, showing a leveling off this category of expenditures as compared to previous years. Simultaneously, Item # 3 shows that the DGA's budget was increased by over 50 percent for the current biennium. The DGA's function, as detailed in Part IV A, is to evaluate (in collaboration with ONERN) resources for all major watersheds, plan their exploitation and conservation, and implement development programs. At present the latter programs emphasize development of the sierra segments of the total watershed system. Moreover, much of the investment budget is earmarked for activities relating to improving existing systems of irrigation and conservation.

In more concrete terms, the DGA's total 1975-76 action plan calls for basic studies of irrigation improvement projects involving 800 Km. of canals effecting irrigation of over 300,000 has. The 1975-76 budget (written in early 1974) anticipated installation of 40 Km. of canals affecting 1,000 has. during the two-year period, representing only a modest contribution toward the goal. However modest this initial step, the relative increase in the investment and operating budgets for this agency signals a new emphasis on improving the efficiency of existing irrigation systems, conserving soil and water resources, and systematic planning of watershed development in the sierra.

The investment budgets thus confirm the public statements of high-level GOP officials who have, in television addresses and official press statements, strongly endorsed shifting priorities away from large-scale, coastal irrigation schemes and increasing the focus on improving water and land use in the sierra.

## 2. Major GOP Measures Affecting Water and Land Use

Annex VIII lists those GOP statutes which have relevance to the Loan Project. These, together with their respective implementing regulations and the decisions of the Agrarian Courts, already constitute a substantive body of law which comprises the statutory boundaries of and legislative support for activities related to this Project. The various legal measures should not be construed individually but rather as parts of a whole, not yet complete, the primary aim of which is to shift power over basic resources away from special interest groups and gradually transfer it to the users. The fundamental concepts of the legislation seek social justice for small-scale farmers, both those grouped in associative enterprises as well as those farming individually, by assuring that land, water, credit and technical resources are distributed according to the needs of the users.

While all of the legislation is significant, there are 5 laws which form the core of the GOP's thrust and provide the direction for the radical changes it seeks. It should also be made clear that the Government is receptive to changes in these laws as experience is acquired. Thus, this legislation is, as is the entire Revolutionary process, subject to incremental and progressive adjustments which respond to structural and policy changes and to acquired experience.

The legislative cornerstone is the Agrarian Reform Law (Decree Law No.17716) which established the process for expropriation of lands and their transfer to farmers, organized in a wide range of associative enterprises. The other pieces of legislation are closely related to this fundamental measure. The Water Resources Law (Decree Law No. 17752), as discussed in Part III E 2, rescinded all private rights to water resources, placing these in the control of the Government. As with the Agrarian Reform Law, the fundamental concept is social -- to make water available to users according to their needs. The Law establishes mechanisms to assure that these scant resources are fully utilized when available, and are not subject to loss, waste, and contamination. Under the Law, local users are obliged to organize into Water Associations (Juntas de Usuarios) and Irrigators' Commissions (Comisiones de Regantes) which have been given responsibilities and rights within their respective valleys and Irrigation Districts. These organizations exist as a means of attaining more effective control and efficient use of water, through constant education of the users, supervision of infrastructure and irrigation practices, and coordination with local Government agencies. The Law also provides that farmers will discuss their Crop Cultivation and Irrigation Plans, either as individuals or as an associative unit, with a local irrigation technician to match consumption demands for irrigation water with its predicted availability. But to benefit from this provision of the Law, the farmer must maintain his irrigation infrastructure in operating

condition and pay his tariff and quota obligations.

While the Agrarian Reform Law, mentioned above, provided a new framework for small farmers to organize themselves economically, it left a substantial number of that group without such a structural basis. To fill this gap, Decree Law No.19400 was promulgated, providing disenfranchised and landless peasants with the opportunity to integrate themselves into local leagues and federations to which the Government would give priority in allocation of resources, and an eventual voice in local government.\* The process of educating farmers in better uses of water and in maintenance of irrigation infrastructure, and developing his awareness of greater responsibilities, is made more efficient and feasible by their association.

However, the magnitude of these changes has frequently created confusion among the farmers. The implementation of some of these measures, particularly those which resulted in expropriation of land, cattle, and other chattels, gave rise to legal difficulties and even more significant, to clashes between the old and the emerging power structure. The rapidly changing situation often found farmers devoid of sufficient financial and management resources with which to assume their new responsibilities. In other instances, they found their efforts effectively blocked by the personal interests of the former owners. As a partial measure to assist local governments to implement all these laws, the Government, through Decree Law No.18896, created the National System for Social Mobilization (SINAMOS). This organization has since 1971, assumed the functions of both political mobilization of the rural and urban population in support of GOP policies (particularly, in the rural sector, of the Agrarian Reform) and technical assistance in community development infrastructure projects; scores of young promoters doubled as teachers, agriculture extensionists, construction supervisors, and ombudsmen. Although SINAMOS has been severely criticized especially for its occasionally forceful, politicized, and unsuccessful attempts to assume control in some rural areas, it is generally conceded that it provided a valuable technical contribution in many areas to economic development projects. SINAMOS is currently under complete reorganization, and it is expected that it will be refocussed to concentrate on its technical function.

The reorganization of the Ministry of Agriculture through Decree Law No.21022, is also considered a significant benchmark in providing greater field support to the rational use of water resources throughout the country. The Law establishes a new Directorate (DGI) to administer the numerous large-scale irrigation projects in

---

\* After 18 months of making and approving applications, there are about 18 departmental federations, hundreds of leagues, and a National Confederation. This latter organization looms as the main political force of campesinos.

execution in the country, allowing the DGA to concentrate its efforts on small rural projects. The Law also provides additional qualified technicians to field offices, setting up regional offices of both the DGA and DGFC, and increases its biennial budget allocations.

The Ministry of Food, established in January 1975, through Decree Law No.21169, followed the example set by the Water Law and recently created local Production Committees, which work in coordination with the Water Users' Associations in reviewing and providing technical support to those cultivation plans under which primarily foodstuffs are produced.

Two other measures which are designed to reinforce the social objectives of the GOP are the Social Property Law (Decree Law No.20598) and the reorganization of the Agrarian Development Bank (Decree Law No.21227).

The former provides for organization of workers as managers of their enterprises in a financial structure which provides them with the initial capital management, and other inputs necessary to start or operate small business. The Law also offers incentives such as housing, equity building for pension plans, etc. to encourage participation in the Social Property Sector, which is, according to GOP policy, to become the most important sector in the Peruvian economy. While it is difficult to predict the implications of Social Property for rural agricultural enterprises, it is likely that Social Property will be particularly encouraged in the establishment of agro-industry.

The Law which reorganized the former Agricultural Development Bank into the Agrarian Bank provides a much more significant capital outlay and greater autonomy to its branch and zonal agencies. It also provides powerful incentives to farmers to organize into associative enterprises rather than to continue to farm individually-owned lands, by giving preference to these organizations in the Bank's lending. Individual farmers who are grouped into Juntas de Usuarios are considered, pursuant to Supreme Resolution No.0749-74-AG, "organized", and are given the same preferential lending terms as selected associative enterprises.

## E. Project Budget Analysis

### 1. Source: Allocation of Project Funds (\$000)

<u>Project Activities</u>	<u>Sub-Total</u>	<u>Total</u>	<u>A.I.D.</u>	<u>GOP</u>
<u>SUB-PROJECTS</u>				
Infrastructure				
-- 5 analyzed sub-projects	3,700	8,000	5,910*	2,090
-- 22 identified sub-projects	4,300			
Land Development - 27 sub-projects				
-- land-shaping, <u>protective</u> <u>afforestation</u>		2,800	1,900*	900
Development of Tree Crops				
-- fruit	500	1,000	350	650
-- other	500			
Sub-Total		11,800	8,160	3,640
Contingencies at 16%		1,935	950	985
TOTAL		13,735	9,110	4,625
<u>CREDIT FUND</u> - On-farm Improvements		3,000	1,000	2,000
<u>TECHNICAL ASSISTANCE PROGRAM</u>				
Advisory Services to DGA		485	255**	230
-- 2 long-term advisors/24 mm each				
-- short-term advisors/15 mm total				
Sub-Project Implementation		85	85	-
-- 3 Peruvian (PhD) advisors to study teams/24 mm each				
On-farm Technology		190	190**	-
-- 1 agronomist/24 mm				
-- 1 extension specialist/24 mm				
-- short-term specialists/15 mm total				
Training		155	100**	55
-- short-term visits/24 mm				
-- degree training/2 pple.				

	Sub-Total	Total	A.I.D.	GOP
Training Equipment		95	75**	20
Watershed Planning Studies (incl. socio-economic evaluation of Project)		250	175	75
<b>TOTAL</b>		1,260	380	380
<b>REGIONAL AND ZONAL OFFICES ***</b>				
Office Facilities -- space, equipment, support personnel		400	-	400
Personnel -- sub-project implementation -- on-farm extension	415 } 430 }	845	-	845
Vehicles		25	10**	15
<b>TOTAL</b>		1,270	10	1,260
<b>TOTAL PROJECT COST</b>		19,265	11,000	8,265
<b>INFLATION PROVISION at 11%</b>		2,135	-	2,135
<b>GRAND TOTAL</b>		21,400	11,000	10,400

Total project cost is estimated at \$21.4 million, of which \$11.0 million will be financed under the AID Loan. The balance, or \$10.4 million, will be provided by the GOP, of which at least \$10.0 million represents additional GOP financial resources to be budgeted in the '77-'78 and '79-'80 biennial budgets in direct support of the project.

\* Some proportion of these costs will be U.S. dollar costs of imported equipment and machinery for sub-project implementation. It is estimated that up to \$2.5 million of Loan funds will be used for this purpose.

\*\* FX costs.

\*\*\* Roughly half of these project costs will be GOP in-kind contributions (installed administrative capacity and office facilities) which do not represent new GOP funding requirements.

## 2. Water Charges

The long-term financial viability of an investment program such as is being initiated under this Project depends on the continued availability of funds to cover the costs of operation and maintenance of the newly constructed irrigation and drainage works, to finance the study of and investment in new infrastructure, and the technical and administrative staff to support these activities. In many respects, the success of this Project will determine future GOP commitment to and budgetary support of the continuation or expansion of similar activities. The GOP has traditionally provided budgetary resources to finance such programs, and remains committed to government subsidy of technical studies and plans of small-scale irrigation projects and of technical assistance in construction and extension services. This is especially true for projects undertaken in the sierra, where such projects are innovative and include a substantial element of much-needed technical assistance to water users. Nevertheless, in water related projects, a significant opportunity to cover costs of on-going system operation, maintenance and administration and to recover some part of investment costs is presented in the context of a system of water charges.

The principle of recuperation of investment, administration, operation and maintenance, and other costs related to irrigation works and structures through water charges paid by water users was first codified in Peru in 1902 ("Código de Aguas"). The system practiced under this Water Code was applied in Peru, with several amendments made over time, until 1969. In 1969 a new Water Law (D.L. N° 17752) superceded this Water Code. The new Law completely restructures the former system, re-ordering priorities to favor low-income groups, and attempting to increase economic and administrative efficiency, as shown in the detailed description presented below.

The new system is not being fully implemented as yet. The DGA expects to complete the transition from the old to the new system during the approaching 1977-78 biennium; however, realistically, it may well require an additional biennium, given the complexity and additional refinements apparently required for optimum implementation. Also, the social and political implications of full enforcement of the new tariffs may contribute to a further delay.

### The System under the 1902 Water Code

The former system required that water users absorb administrative, maintenance and operational costs, as well as construction costs of minor works, e.g., small water intakes and small canals. Users also

contributed to a very limited extent to a reserve fund for unexpected services or works. Farmers traditionally preferred to contribute labor rather than cash to this fund. Administrative costs were covered by quotas paid on an annual basis by most users in major coastal valleys. However, quotas in sierra valleys were not fully reinforced owing to the geographical remoteness of production units, low agricultural incomes, inadequacy of administrative collection channels and mechanisms and the indifferent attitude of most indigenous farmers. Quotas were fixed on the basis of hectares irrigated, cubic meters of water used, private acquired rights, and other related indicators.

Supplementary quotas for operation and maintenance, construction of minor works and extraordinary quotas for special works were fixed locally by Water Users Associations and were based on hectares, cubic meters, private rights, etc. These could be paid on an annual, semestral, quarterly or monthly basis. These revenues were collected by local agencies of the forerunner of the National Bank, or the Technical Water Valley Administration of the Ministry of Agriculture. Revenues collected were relatively small, being usually insufficient for maintenance and improvement of the existing irrigation infrastructure.

The old system was largely inoperative, biased in favor of large landholders, and political beneficiaries, and ultimately inefficient.

#### The New System under the 1969 Water Law (D.L. 17752)

Article 1 of the Water Law states that all water resources\* in the country belong to the Government and that no individual has a proprietary right to these resources. It also provides that water resources can be utilized only for purposes that contribute to, or are compatible with, economic and social interests of the country. This Article is very significant, insofar as it eliminates the private rights and biased allocations of water resources that were previously made under the former system, especially regarding agricultural uses. Moreover, it introduces social and economic criteria in water use regulations that give all farmers equal access, rights, and obligations (payment of tariffs and quotas) in relation to irrigation water in accordance to their current and potential production requirements.

Article 12 of the Law indicates that water users have the obligation to pay tariffs to defray the investment costs of exploitation and distribution of all water resources, as well as the costs of studies

---

\* Including ocean, lake, river, rain, glacier, underground, mineral, sewage, and any other water resource.

necessary for water resource development. Article 18 of the Law states that the Government will charge the cost of water works executed with public funds to both direct or indirect beneficiaries.

### Tariffs

Tariffs are to be fixed per cubic meter of water utilized. They are to be a function of net returns to water that is utilized for agricultural purposes\*. They are approved at the national level, paid on a quarterly or yearly basis, and collected by the National Bank.

Tariffs comprise 3 major components: (1) cost of water use, (2) service, and (3) amortization. The cost-of-water-use component ( $t_1$ ) is fixed by the DGA and applied to cover costs of studies and works related to development, conservation, preservation, and efficient management of water.

The service component ( $t_2$ ) of the tariff is fixed by the Technical Office of Water Administration at the level of the Water District and is paid by users to finance costs of administration, infrastructure maintenance, and operation of the Water District, including annual depreciation of equipment and installations.

The amortization component ( $t_3$ ) of water tariffs is fixed by the Agrarian Zone Office, approved by the DGA, and is paid by users of the Water District to finance amortization of Government investments in infrastructure works. Direct and indirect beneficiaries are obligated to cover only net investments. Interest on capital is absorbed by the Government.

The sum of the above components ( $t_1 + t_2 + t_3$ ) constitute the total water tariff ( $T$ ) which is fixed by applying special formulas established by the DGA. These formulas include such variables as annual net returns to water for various economic sectors benefitting from a common water resource during a period of 12 months, the annual costs covered by each tariff component, and the volumes of water required for agricultural production in a Water District.

In addition to these technical considerations, ultimate tariff levels are affected by the agricultural policy of the Government. For instance, tariff levels may be arbitrarily increased for selected

---

\* Net returns to water utilized by the various economic sectors are to be estimated by the Central Reserve Bank, in the near future.

Water Districts if the GOP considers that those users are responsive to and capable of assuming increased financial obligations. On the other hand, tariff levels may be decreased to a minimum in other Districts where tariffs are being enforced for the first time. This latter case is applicable to most areas of the sierra where farmers are traditionally accustomed to the concept of toma libre (free use of water). Here, the objective is to introduce to the farmers the idea that water is a valuable input, comparable to conventional agricultural inputs.

### Mechanisms for Establishing and Collecting Tariffs

During June of each year tariffs to be paid by each water user during the following year in a Water District are tentatively established and a first estimate is prepared by the corresponding Agrarian Zone\*. This estimate plus supporting documentation is submitted to the DGA by the end of August for its review and approval. By the end of November the DGA will have reviewed and approved the tariffs to be paid by water users in each Agrarian Zone and authorized the Agrarian Zones to prepare the corresponding water bills\*\*. By the end of December the Agrarian Zones will have prepared and distributed bills to water users and check lists to the National Bank and the DGA. Water users are informed of payment dates through local Water Users Associations (Juntas de Usuarios), local newspapers, and radio stations.

Farmers can pay their water bills in the local agency of the National Bank until December of the current year, or until January of the following year, including a 10% late payment charge. Non-payment of bills beyond January leads to legal intervention for recuperation of the corresponding amount. Non-payment of bills during 3 consecutive years permits the GOP to expropriate the land.

An additional control requires that farmers show cancelled bills for the previous year before they may be considered for inclusion on the following-year Crop and Irrigation Plan. Non-payment of bills excludes farmers from their right to utilize water during the following production season.

---

\* The Agrarian Zone calculates components  $t_2$  and  $t_3$ . The  $t_1$  estimate is calculated and communicated by the DGA to the Agrarian Zone. With these 3 components the Zone prepares a first estimate of the total tariff (T) value.

\*\* Water bills are processed by the "Oficina de Procesamiento Electrónico de Datos" (OPEDSA) and put in IBM printouts in the necessary order, number, and distribution.

Annual tariff revenues are reported to the Agrarian Zone by the National Bank during January of the following year for accounting purposes and the DGA is informed through its own channels. Total funds collected are channelled by the National Bank to a special account in the Public Treasury earmarked for reinvestment in the Water Districts.

### Quotas

Water users, according to Article 25 of the Regulations on Tariffs and Quotas, must pay a fixed annual quota to cover emergency works and services which may be required in their District. The quota is fixed by the Agrarian Zone on the basis of size, characteristics, existing infrastructure, usual maintenance problems of the District, financial capabilities of users, etc. The value of the quota will be at least 10% of the "service" component ( $t_2$ ) of the tariff in the District and is determined by dividing the total annual revenue from quotas by the annual volume of water required and considered in the calculation of tariffs for the same District.

The Agrarian Zone informs the Water Users Association during July of the previous year as to the amount of the Reserve Fund to be provided by them during the following year. 6 months later the Association submits to the Zonal Office a list of the quotas to be paid by each user. The Association has the responsibility of collecting all quota payments within its jurisdiction during the first quarter of the year. Funds collected are deposited by the Association in a special "Emergency" account opened in a local bank.

### The Current Situation

The description of the system given above assumes that all regulations under the new Water Law are applied and enforced. Presently they are not. The most relevant omission is that the water use ( $t_1$ ) and amortization ( $t_3$ ) tariff components have not yet been applied. Current tariff revenues cover only administrative, maintenance, and operation costs of irrigation infrastructure in Water Districts. Investment costs and interests on capital are currently absorbed by the GOP. The DGA still has under review formula<sup>s</sup> and socio-economic criteria relative to the amortization system appropriate for water users in the sierra\*. The GOP plans to introduce the amortization tariff component in the

---

\* The work of Dr. James Seagraves, under the USAID-financed contract with Iowa State University, has been instrumental in providing an analytical base for the current GOP review of tariff policy.

sierra during the next 1977-78 biennium. It will have retroactive effect, recuperating investments made since 1974. In this respect, current regulations indicate that water users must begin amortizing investments in improved irrigation systems as of the date they begin to operate. Therefore it is expected that net sub-project investment made under this Project, if approved, would be at least partially recuperated, assuming their construction begins during 1977-78 and assuming that they will begin operations during late 1978. The corresponding administration, operation, and maintenance costs during such period, as fixed by the Agrarian Zones and the DGA, will likewise be recuperated through tariffs.

#### Analysis of Past Receipts

An analysis of past tariff revenues in the Project areas provides some idea of the potential for future recuperation of planned Project costs. The scarce and limited data available for this exercise does not permit as exhaustive treatment of the subject as would be desired. Data on tariff revenues are available only for the 1970-73 period. An additional major limitation has been the lack of appropriate and sufficient data on detailed expenditures of Water User Associations, Water District Administrations, and Agrarian Zones on the administration, operation, and maintenance of irrigation systems, making it impossible to include a comprehensive financial analysis.

Nevertheless, the available information is sufficient to make a meaningful analysis, from which can be inferred significant facts and observations deserving special consideration.

The areas of study are the Water Districts of Cajamarca in the northern sierra and Alto Mantaro in the central sierra. The existing irrigation infrastructure in these two Districts is largely composed of minor structures, such as small and medium-size water intakes, reservoirs, and networks of canals bordering hillside contours. Farmers generally contribute to operation and maintenance of these irrigation systems with labor or through payment of water tariffs. Labor, which appears to be the most significant contribution, is used primarily for cleaning and partial reconstruction of deteriorated canals.

Expected tariff revenues were apparently more than sufficient for covering annual operation and maintenance costs of water districts. But historical payment records show very large outstanding balances to be collected, inhibiting operation and maintenance of infrastructure. This problem is due to inadequacies, particularly in the field, of administrative and collection mechanisms, including enforcement and control devices, and the lack of required support staff. It has been

TABLE I -- REVENUES FROM WATER TARIFFS (in dollars)

CAJAMARCA W.D.						ALTO MANTARO W.D.				
Year	Tariff (\$/m <sup>3</sup> )	Expected Revenues	Tariffs Paid	Outstanding Balance	Proportion Outstanding %	Tariff (\$/m <sup>3</sup> )	Expected Revenues	Tariffs Paid	Outstanding Balance	Proportion Outstanding %
	(1)	(2)	(3)	(4)	(5) = (4) / (2)		(6)	(7)	(8)	(9) = (8) / (6)
1970	N/A*	2,109	1,416	693	32.85	N/A*	16,776	16,768	8	0.04
1971	0.0002	4,118	2,494	1,624	39.44	0.0002	17,140	17,128	12	0.07
1972	.0002	4,492	2,366	2,126	47.33	.0002	34,823	30,190	4,633	13.30
1973	.0002	5,957	2,749	3,208	53.85	.0002	31,410	28,090	3,320	10.57
<b>TOTAL</b>		16,676	9,025	7,651	45.88		100,149	92,176	7,973	7.96

\* Not available.

Source: Sub-Directorate of Tariffs and Quotas, DGA.

reported that national budget requirements necessary for integral solution of these problems are high, and can not currently be met.

In recognition of this budgetary constraint and consistent with the social implication of the 1969 Water Law, the Government has adopted the policy of pardoning all water bills corresponding to the 1960-69 period. It will only consider the recuperation of outstanding balances since 1970. This lenient policy plus inadequate implementation of the collection mechanism at the field level means the loss of approximately \$1 million annually of theoretically available revenues.

Table I shows expected and actual revenues from water tariffs during 1970-73 in the Water Districts of Cajamarca and Alto Mantaro. It is noted that a single tariff of \$0.0002 has been applied throughout this period in both Water Districts.

The table shows a total expected revenue of \$16,676 and \$100,149 for Cajamarca and Alto Mantaro, respectively. The difference between these amounts is due largely to differences in the type of irrigation practiced, size of the valley (volume of water consumed annually), age of existing irrigation infrastructures, implementation of the collection mechanism, Agrarian Reform effects, etc.

The table also reveals an abrupt increase of expected revenues from 1970-1971 in Cajamarca. It has been reported that during this period political pressures induced the MOA to give special attention to the development of agriculture in Cajamarca. These pressures necessarily implied the focus of efforts on improvement of the water control mechanisms in the valley, contributing to the increase in expected revenues from \$2,109 in 1970 to \$4,118 in 1971.

A similar abrupt change occurred in Alto Mantaro during 1971-72 but in this case pressures behind such change were not political but technical. The MOA accelerated programmed implementation actions to improve the administration of the irrigation system, including an increased control of water used and consequent increase in number of bills issued.

In general, then, the increase in expected revenues during 1970-73 for both Water Districts apparently reflects an annual increase in issuance of water bills, implying that more farmers are being controlled and incorporated into the tariff system. However, the annual increase in billing was only partially supported by parallel improvements in the revenue collection mechanism at the field level; the magnitude of such improvements did not appear to be always consistent with the amount of additional bills issued, meaning that in fact the system cannot collect revenues at the same rate bills are issued.

The high outstanding balance in Cajamarca (\$7,651) represents on the average about 46% of expected revenues, as compared to that in Alto Mantaro (\$7,973) representing only 8% of expected revenues. The difference in collection records is reportedly due to the status of field administrative mechanism and collection channels existing in each District. Greater efforts, including additional resources and personnel, have been allocated by the DGA to improve collection performance in the Alto Mantaro Water District, accounting for the minimum outstanding balance there. The DGA will need to put the same emphasis on the Cajamarca Water District to reduce future outstanding balances to a comparable minimum.

Furthermore, it is apparent that the Agrarian Reform process, which was intensified during 1970-73 in Cajamarca, further impeded development of an efficient collection system in this District. Changes in ownership and establishment of new associative enterprises have been significant factors contributing to late payments and occasional refusal to pay water bills. New landowners, principally associative enterprises have generally been refusing to assume payment of water bills originated and accumulated under the prior tenure structure.

In summary, it is clear that significant progress has been made in implementing the new Water Law from the perspective of improving control and measurement of water use in the sierra, reflected in the progressive increases in expected revenues. However, greater efforts and resources must be allocated to improve the mechanism for tariff collection, and MOA officials plan to give greater priority to this objective in the coming biennium. The current position of the MOA remains, nevertheless, in support of significant government subsidy of infrastructure investment costs in those areas where the farmers' ability to absorb the amortization costs of new investments is severely constrained by low cash incomes, as is the case in much of the sierra, most strikingly in Cajamarca. The Project Development Committee has received GOP assurances that in those cases where these and other, recurrent, costs of Project-related activities cannot be absorbed by the water users, budgetary funds will be made available to meet the short-fall.

PART IV. PROJECT IMPLEMENTATION

A. Participating GOP Agencies

Administration of Project activities will be conducted by the General Directorate of Water Resources (DGA) in the MOA, in coordination with the General Directorate of Forestry and Wildlife (DGFF). Both Directorates are organized regionally with technical assistance capability in the field. The DGA will coordinate with the Agrarian Bank (Ag Bank), which, as Financial Agent of the credit fund for on-farm development investments, will play a key role under the Project. Of special importance to Project implementation will be the decentralized administrations of the MOA and of the AgBank in Agrarian Zones II and X and their subordinate Zonal and branch offices and field agencies.

Ancillary institutional, technical, and administrative support will be furnished to the Project by the following GOP agencies: i) the National Office of Evaluation of Natural Resources (ONERN); ii) the National System for Social Mobilization Support (SINAMOS); and possibly the General Directorate of Irrigation (DGI). This section describes these Government agencies in terms of their objectives, organization, functions, budgets, and capabilities.

1) MOA

The MOA shares its leadership of the agricultural sector with the Ministry of Food (MOF) and is the GOP agency most directly concerned with the preservation, improvement, and efficient use of renewable agricultural resources and the promotion of rural organizations.

Organizationally the MOA has clear lines of internal responsibility among directorates, its small number of autonomous dependencies, and its zonal administrations. Though personnel management problems exist, the MOA, and the GOP as a whole, are moving toward a personnel classification and salary scale system which is intended to resolve these. The MOA has been a leader in decentralization and delegation of authority to zone administrations which play an integral part in planning and budgeting and have a high degree of autonomy for budget execution under authority granted by the Minister. Individual MOA Directorates and Zones are described below.

a) DGA

The Organic Law of the Agricultural Sector places DGA in charge of the preservation, conservation, and utilization



of water resources and the conservation 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 the 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. The organization of the DGA appears below in Chart A.

The unit of DGA most directly involved in the implementation of this Project will be the Directorate of Preservation and Conservation (DIPRECO), one of three divisions of DGA. The major function of DIPRECO is to inventory, analyze, and implement programs related to rehabilitation of agricultural lands affected by salinity and drainage problems in coastal and sierra regions, and to engage in projects to improve existing 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 DIPRECO is composed of 52 engineers (5 of which hold an advanced degree), 72 non-degree specialists (technicians, surveyors, and draftsmen), 51 clerical workers, and 78 laborers.

The total 1975-76 DIPRECO budget is \$5.19 million which represents a 49% increase over the 1973-74 biennial budget. A breakdown by category appears below:

TABLE I

DIPRECO BUDGET 1973-74, 1975-76  
((\$000))

<u>Budget Category</u>	<u>1974-75</u>	<u>1975-76</u>
Operations	141	1,313
Investment	2,239	1,153
Special Projects	<u>1,101</u>	<u>2,720</u>
Totals:	<u>\$3,481</u>	<u>\$5,186</u>

Source: DGA

b) DGI (General Directorate of Irrigation)

The DGI is the MOA Directorate primarily responsible for large, new irrigation projects such as Olmos, Majes, and Tinajones. According to law it is responsible for preparing terms of reference and supervising studies of large-scale irrigation projects, controlling the execution of special irrigation projects, and administration of the National Hydraulics Laboratory. DGI's role in this Project will be limited to providing services and expertise not available to DGA on technical problems that may arise during sub-project design or construction. The DGI has the requisite physical, financial and human resources to support this Project, as necessary, at critical points. Out of a total complement of 336 employees, 83 are professionals in the following specialities: civil engineering (45), agronomy (8), geology (5), agricultural engineering (4), and economics (4).

DGI's current biennial budget totals \$48.9 million, of which \$9.3 million represents the current operational budget, the remainder being allocated to investments in new irrigation projects, including the IDB credit under the "Linea Global".

c) DGFF (General Directorate of Forestry and Wildlife)

The major objective of the DGFF is to assure a substantial contribution by the forestry and wildlife sector to the regional and national economies of Peru.

Its functions to 1) integrate forestry into the overall pattern of development; 2) establish an adequate marketing system for domestic and export uses; 3) rationalize exploitation and conservation of forestry and wildlife resources; 4) propose sales prices for forestry products; 5) formulate and execute long-term forestry development and evaluation plans; 6) participate in the establishment and operation of wood processing plants; and 7) prepare production, marketing, and processing policy guidelines for the forestry sector.

With respect to investment and operating capital resources, the table below shows significant increases which should permit the forestry sector to develop as planned. The current biennial budget is double that of the previous period.

ORGANIGRAM OF THE GENERAL DIRECTORATE OF FORESTRY AND WILD LIFE RESOURCES (1975)

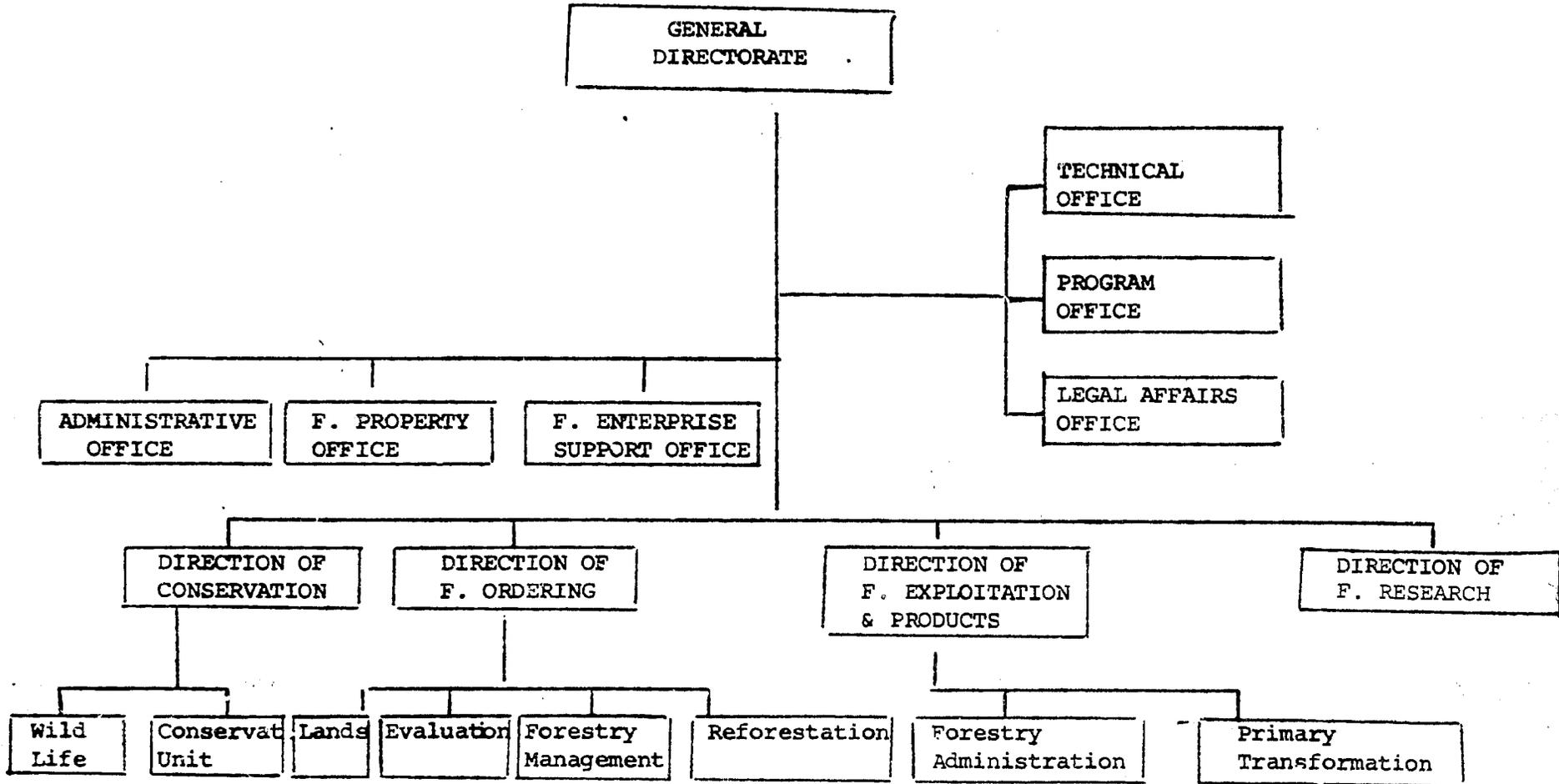


TABLE II

<u>Budget Category</u>	<u>DGFF BUDGETS 1971-76</u> (\$000)		
	<u>1971-72</u>	<u>1973-74</u>	<u>1975-76</u>
Investment	1,091	2,213	4,631
Operational	<u>2,573</u>	<u>2,342</u>	<u>4,502</u>
Totals:	\$3,664 =====	\$4,555 =====	\$9,133 =====

This General Directorate is organized as appears in Chart B. Its total staff is composed of 112 professionals, 48 non-degree technicians and 513 administrative employees.

The function of DGFF in this Project will be to evaluate the needs of each sub-project with respect to the conservation or afforestation requirements for protection of dams, dikes, and canals, and the conservation of watersheds and drainage areas. The DGFF will also evaluate the compatibility of proposed small irrigation systems with the environment to reduce the risks of negative environmental consequences.

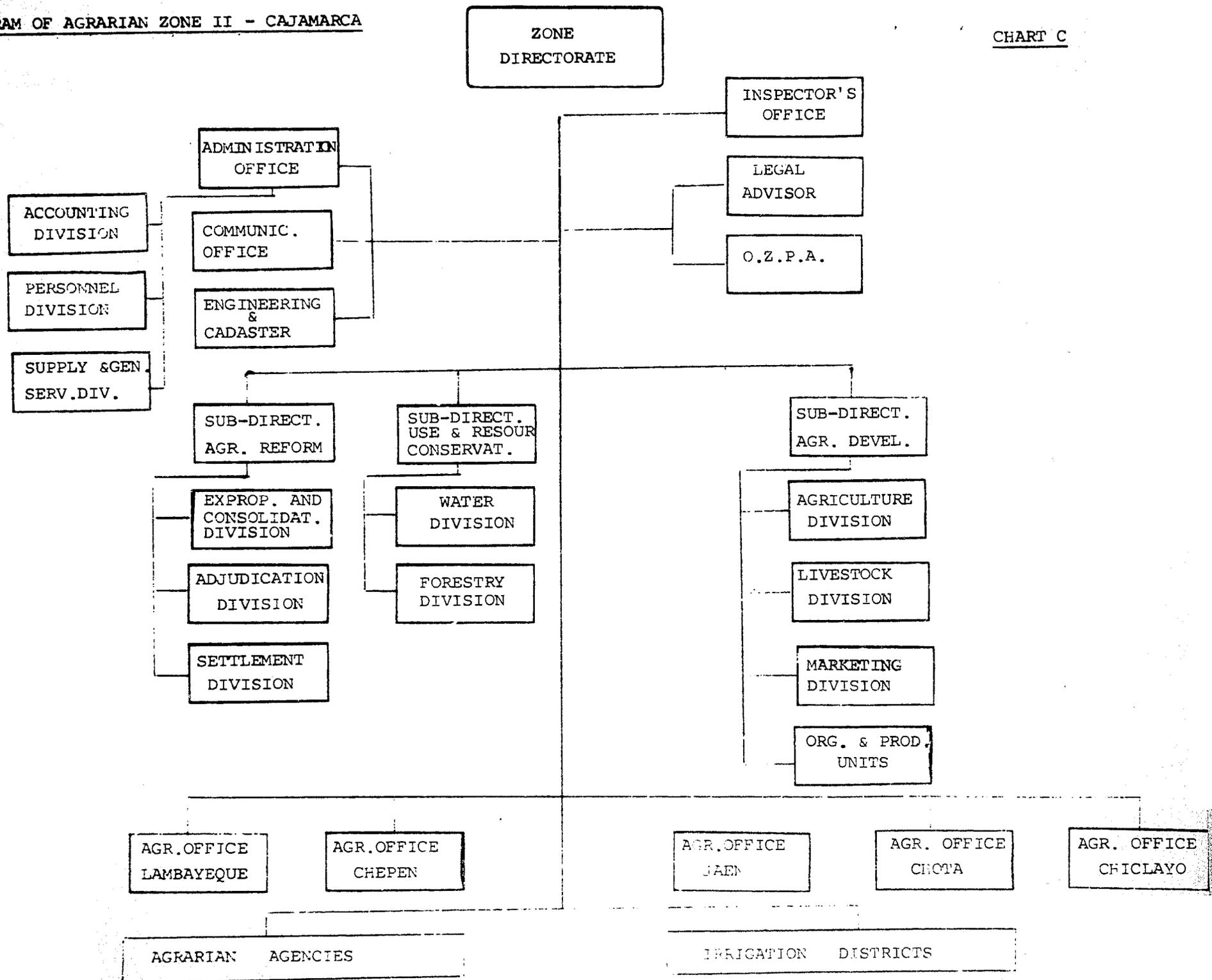
d) The Agrarian Zone II of Cajamarca

This Project involves 2 of 13 Agrarian Zones: Zone II headquartered in Cajamarca and Zone X in Huancayo. The major responsibility of the Zonal Offices is to implement MOA programs at the field level, principally those related to Agrarian Reform, water and irrigation resources, forestry, rural enterprise promotion and development, and rural cadaster. To this end, Zone organization roughly parallels that of the MOA national office as shown in Chart C. All MOA Directorates except Research and Engineering are represented in the Zonal Office. Most Project implementation activities will involve the Sub-Directorate of Resource Use and Conservation in the Agrarian Zones.

Zones are further sub-divided into Agrarian Offices which serve smaller areas. In Zone II, for example, the sub-project areas of Porcon and Negritos-Tual fall within the jurisdiction of the Agrarian Office of Cajamarca, and the Chingol sub-project falls within the Agrarian Office of Condebamba.

Approximately 870 MOA employees are assigned to Zone II. Of these 8% are professional employees and the rest are

118.-



non-degree specialists, administrative workers, and medium-level technicians working mostly in outlying areas.

The 1973-74 and 1975-76 investment and operational budgets of Zone II follow:

TABLE III

AGRARIAN ZONE II BUDGET  
(\$000)

<u>Budget Category</u>	<u>1973-74</u>	<u>1975-76</u>
Operational	4,892	7,064
Investment	<u>4,199</u>	<u>1,821</u>
Totals:	\$9,091 =====	\$8,885 =====

Source: Program Office of the DGA

Approximately 27% and 62% of the 1973-74 Zone II operational and investment budgets, respectively, were allocated exclusively to the Department of Cajamarca.\* Although there are no similar figures available for the 1975-76 budget, the same proportions may be assumed for the current operational and investment budgets. The sharp drop shown for investment budgets indicates infrastructural investments completed, not a lower priority for activity in the Zone.

Zone II has permanent contact and is closely coordinated with other GOP agencies in Cajamarca. This characteristic, particularly strong in this Zone, is advantageous to implementation of this Project which will necessarily engage the Zone, AgBank, INP, ENCI, and other agencies in the area.

e) Agrarian Zone X - Huancayo

This Zone has the same basic organization and functions as Zone II. Almost all sub-projects in this Zone will fall within the jurisdiction of Agrarian Office of Mantaro. This Agrarian

---

\* The rest of the budget was allocated to segments of other neighboring Departments falling within the jurisdiction of Zone II. See Maps in Annex X.

Office covers a total area of 1.7 million hectares with 8 sub-offices. The Agrarian Office of La Concepción, which may also include sub-projects, covers an area of 111,320 hectares with 4 administrative sectors, each with one medium-level extension agent, called a "sectorista".

Total Zone personnel amounts to approximately 900 employees, organized as shown in Chart D. It is estimated that 9% of these are professionals. The rest are non-degree, administrative, and medium-level employees.

The 1973-74 budgets are disaggregated as shown below:

TABLE IV

AGRARIAN ZONE X BUDGET  
((\$000))

<u>Budget Category</u>	<u>1973-74</u>	<u>1975-76</u>
Operational	4,991	5,118
Investment	<u>1,406</u>	<u>415</u>
Totals:	\$6,397 =====	\$5,533 =====

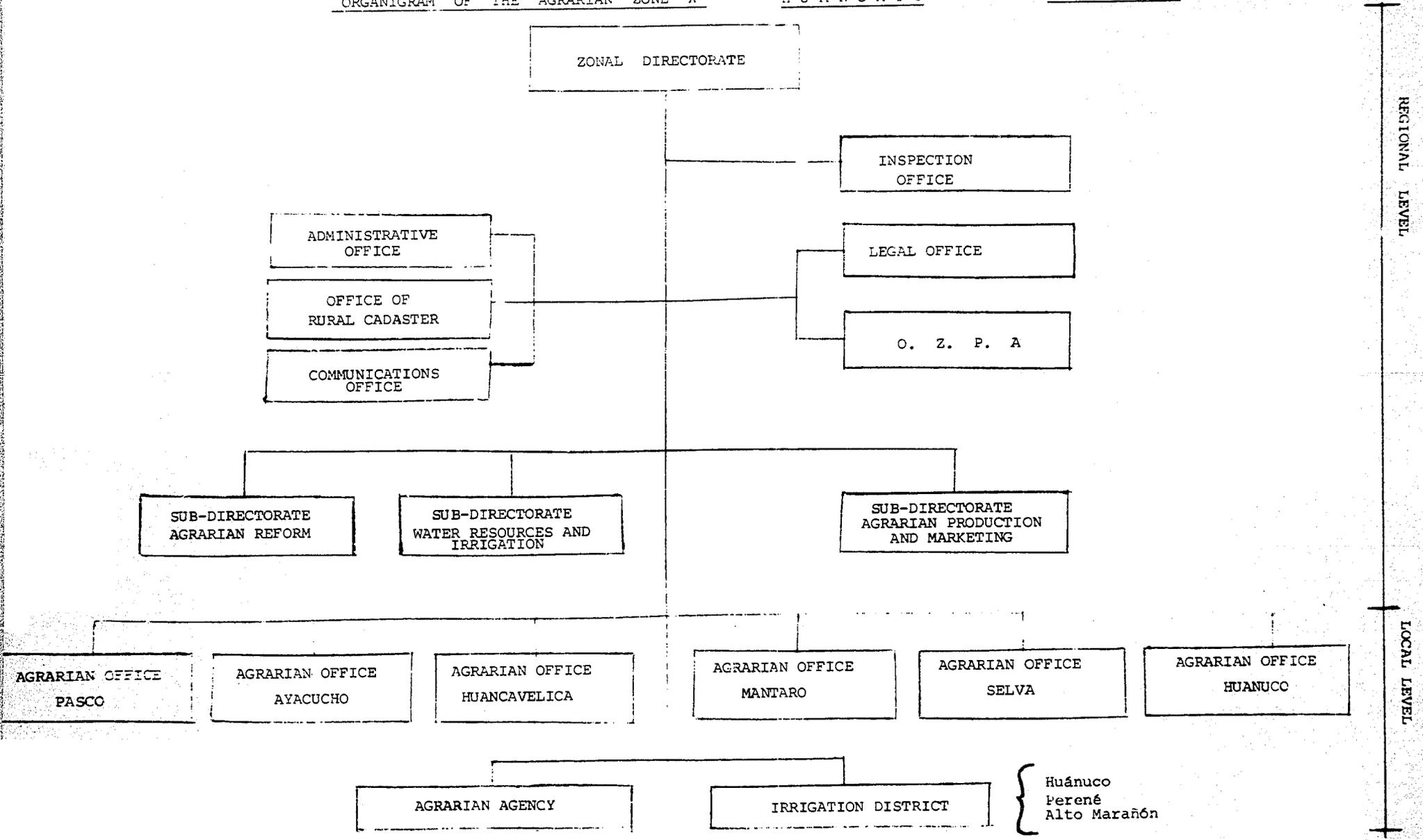
Source: Program Office of the DGA

Approximately 65% and 76% of the 1973-74 operational and investment budgets respectively were allocated exclusively to the Department of Junín which includes the Mantaro Valley where much of the activity will take place under this Project. As in Zone II, budgetary reductions are shown in the investment category and increases are registered for operational purposes, indicating that investments related to the establishment of administrative infrastructure have been completed. Similar proportions are likely to apply to the next biennial budget, now in the formulation process at the zone level.

All of the foregoing MOA Directorates and Zonal Units have 4 years of experience in budgeting, planning, execution, and evaluation of projects at the field level. Soon after the decentralization began in 1971, procedural and management problems with the decentralization became evident. These were related primarily to the large number of projects being developed by the Zones and the bottlenecks that arose in gaining approval at the national level. Moreover, since MOA Zones did not conform to traditional politico-jurisdictional divisions,

ORGANIGRAM OF THE AGRARIAN ZONE X - HUANCA Y O

CHART D



REGIONAL LEVEL

LOCAL LEVEL

Huancayo  
Perené  
Alto Marañón

coordination with agencies outside the MOA was a serious problem. In addition, field personnel were administratively less sophisticated than national office officials. At the outset, they were not fully aware of the types of information needed to gain project approval and funding.

Most observers agree that the MOA and its dependencies have adjusted to the problems of decentralization through periodic training of field staff, experience gained in actual project development and management in the field, and closer, more frequent contacts between the field and national Directorates.

The DIPRECO groups to be assigned to the Zones affected by this Project will integrate easily into field organizations already functioning and able to provide support and coordination services.

## 2) Agrarian Bank (AgBank)

The AgBank is responsible for promoting the development of agricultural production by providing agricultural credit to individual and associative farm units. It has an authorized capital of S/.15 million (\$345.7 million). A discount facility with the Central Bank supports short-term production lending.

The AgBank offers short-and long-term credit, generally with preferential rates of interest for activities producing priority foods including meats, milk, and other products. It also offers credits for food marketing activities and, to a limited extent, for the purchase or improvement of on-farm infrastructure such as silos and fences. Furthermore the new organic law of the AgBank (Decree Law 21227 dated 7/24/75\*) expands its authority to provide credit for food industries in coordination with the Industrial Bank and for Agricultural Social Property Enterprises. The law also enables the AgBank to participate as a share-holder in associative farm enterprises.

Under the current GOP Agrarian Reform policy, the AgBank orients its financial resources toward serving the associative enterprises, such as agricultural cooperatives, indigenous communities, and SAIS\*\*. At least 60% of the AgBank's short-term credits are presently provided to these groups. It is also expected that the Agrarian Reform process will expedite the flow of credit to larger number of producers.

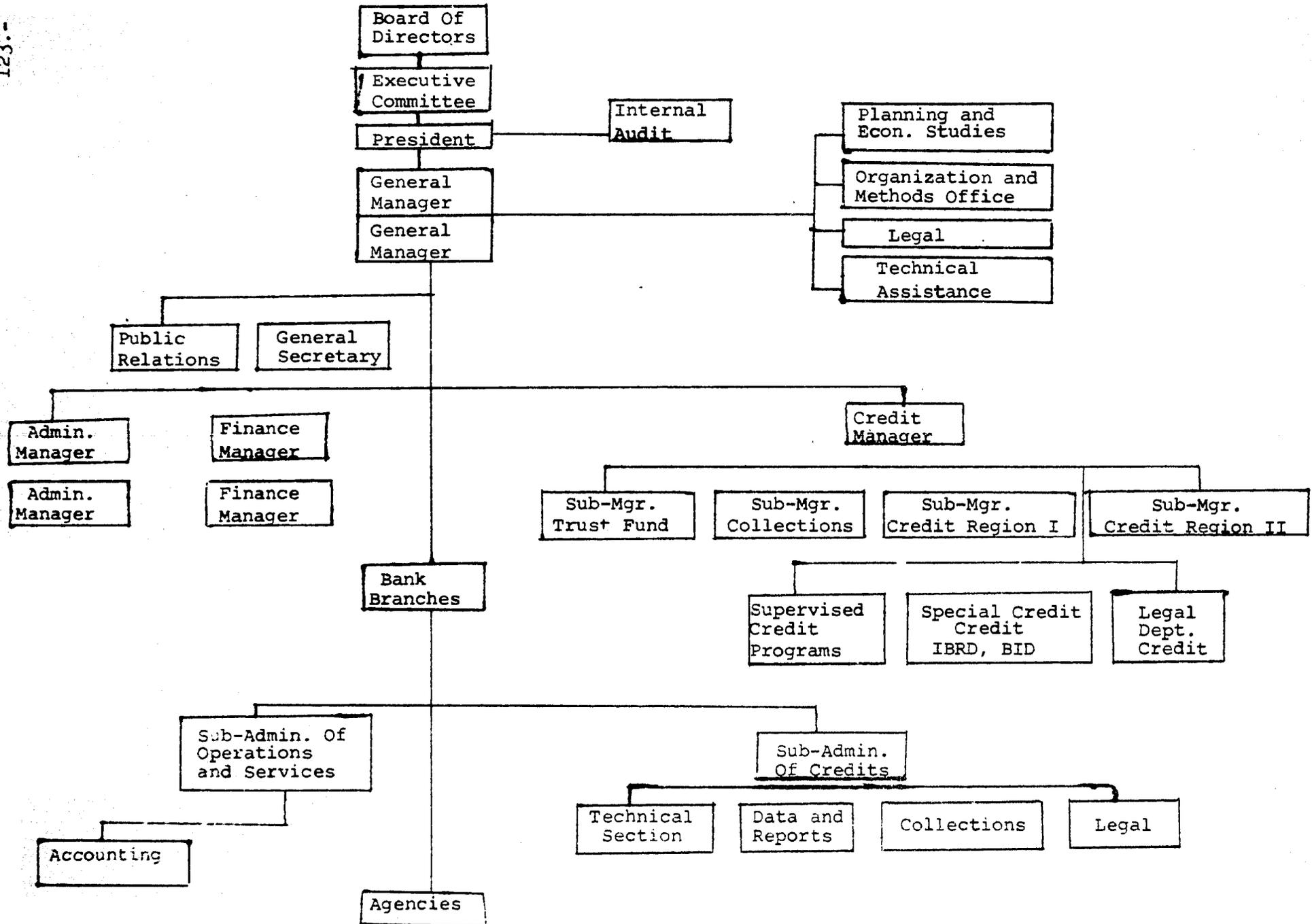
---

\* See Part III D 2 and Annex VIII.

\*\* Farmers organized into Water User Associations are similarly eligible for similar preferential treatment by the AgBank.

ORGANIGRAM : AGRICULTURAL DEVELOPMENT BANK

123.-



The Planning and Economic Studies Division of the AgBank (See Chart E), coordinates with the Planning Office of the Ministry of Food to allocate production credit resources in accordance with the requirements determined in biennial food production plans on a priority basis. This same Division also coordinates with the Planning Office of MOA on matters relating to irrigation.

The AgBank has 17 regional branches, including branches in the cities of Cajamarca and Huancayo, and 45 field agencies. Each regional branch can approve loans of up to S/.3 million (\$69,156) and field agencies can approve loans up to S/.600,000 (\$13,831). The AgBank plans to increase progressively the financial autonomy of its regional branches and field agencies to permit a wider and quicker utilization of farm credit resources. The Cajamarca valley has one regional branch in the city of Cajamarca and one field agency in Chota. The Mantaro valley has one regional branch in Huancayo and one field agency in Tarma.

The autonomous lending authority of AgBank branches, their location in the Project area, and the Bank's newly acquired authority to lend greater amounts for capital improvement, place it in an ideal position to support this Project. By providing administrative channels for annual production credit and the Project-financed credit for on-farm investments related to newly established irrigation networks, the Bank's role will be a key one in assuring a maximum return on irrigation investments.

Lending to associative enterprises or cooperative farm groups has enabled the Bank to increase rapidly the number of farmers it serves. Since commercial lending activity in the agricultural sector has been curtailed due to the uncertainties produced by the Agrarian Reform, the AgBank is virtually the only remaining source of bank credit needed by farmers in addition to being the only available source of concessional credit. Traditionally the Bank has supplied most of the production credit, even though only about 10% of the nearly 500,000 potentially credit-worthy Peruvian farmers received loans in any given year.

Unfortunately this expanded lending activity places a strain on the Bank's reserves and forces a greater reliance on discounting facilities for financing sub-loans. The annual rate of growth in the loan portfolio has been over 11% since 1970 and reserves have been reduced as the total demand has remained virtually steady. Under these circumstances, with a rapidly expanding number of cooperative groups and communities making demands for institutional credit, the Bank's resources will be thinly spread for some time to come, even when the full authorized capitalization is achieved.

To date the major credit demand has been for production; however, with new production units being formed, infrastructural investments are needed to adapt and modernize the resulting economic structures. New laws permit the AgBank more latitude in lending for capital improvements, establishing a Special Operations Fund with a capitalization of \$103.7 million over 6 years beginning in January 1976. Eligible uses of credits from this Fund include investments in irrigation, forestry, land rehabilitation, and colonization. These credits will be made on concessional terms and will be available to sub-borrowers in both the coast and the sierra.

Available capital will not be sufficient, however, to meet total credit needs for production and on-farm investments among the rapidly expanding Bank clientele. To augment the existing supply, and to assure that credit is made available specifically for investments in land development for increased efficiency of water distribution and application under this Project, up to \$4 million will be provided to the AgBank to create a Project fund for sub-lending to participating farmers and Water User Associations.

3) SINAMOS

SINAMOS operates under broad grants of authority in a quasi-ministerial status to aid in the formation of agricultural cooperatives and similar organizations. Its role is to oversee and audit these entities and to assist in their management.

Traditionally SINAMOS has allocated 10% of its budget to infrastructure construction in support of agriculture, such as irrigation canals. Its undertakings are of a community development nature and a pattern of cooperation with MOA has developed whereby SINAMOS provides tools and managerial direction, the community provides manpower for labor, and MOA furnishes technical direction. Under this Project SINAMOS may be called upon to assist in preparing and organizing communities to undertake and contribute to sub-project construction.

4) ONERN

An autonomous agency attached to the office of the Presidency, ONERN provides valuable data for agricultural planning in soils, hydrology, and economic evaluations of crop production potentials. ONERN, while not as directly concerned with this project as the other entities, may be asked to provide studies for DGA's analysis of sub-projects.

## B. Implementation Plan

### 1. Schedule of Project Activities

As shown in Charts F and G, identification, study, and construction of sub-projects will be carried on simultaneously, and Project funds will finance these 3 phases of sub-project implementation. This implementation procedure was adopted for 2 reasons.

First, one of the objectives of the Project is to strengthen the institutional capacity of the DGA to identify, study, and execute sub-projects of the type to be financed. The Project Development Committee, as noted throughout this document, is confident that existing professional capacity is adequate to perform these functions, but require<sup>s</sup> additional technical assistance to improve efficiency of operation and depth of project analysis. This latter area demands particular attention, especially in economic/financial analysis, development and application of investment decision criteria, and examination of social feasibility. These objectives can only be met by actual study of potential sub-projects, which will be an activity supported by Project TA funds.

Second, current operational programming of the DGA calls for simultaneous study and execution of sub-projects. This maximizes efficient use of staff personnel, which is divided into teams of technicians for each of these distinct activities, and which can be working full-time throughout the Project on their respective jobs. In this way, moreover, staff experience in a specific technical activity can be intensified and subsequently exploited.

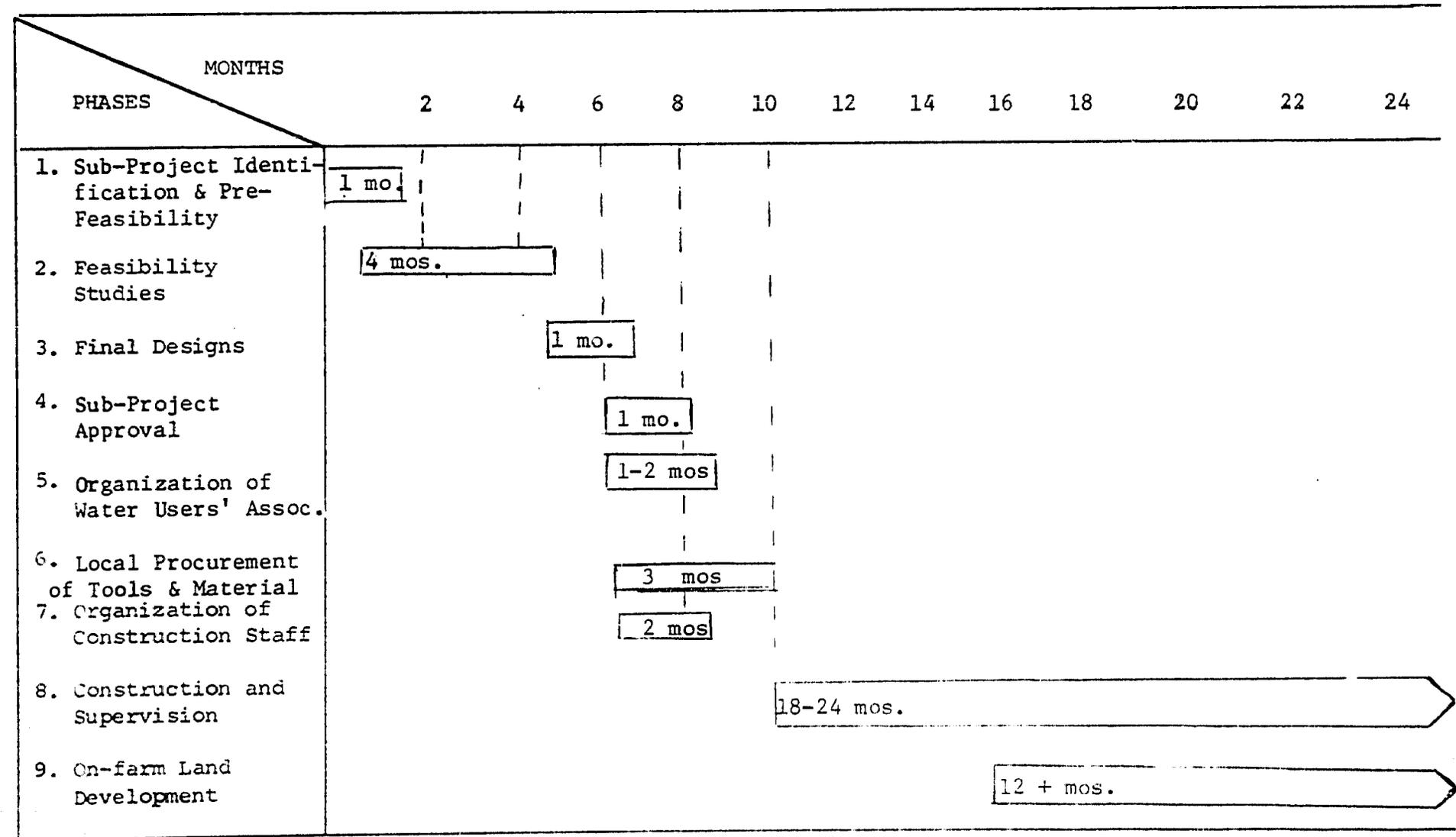
Project implementation, then, will proceed with the simultaneous programming of sub-project study and implementation. Sub-projects will be grouped in 3 stages, each comprising at least 5 sub-projects, and will be studied and executed in these stages.

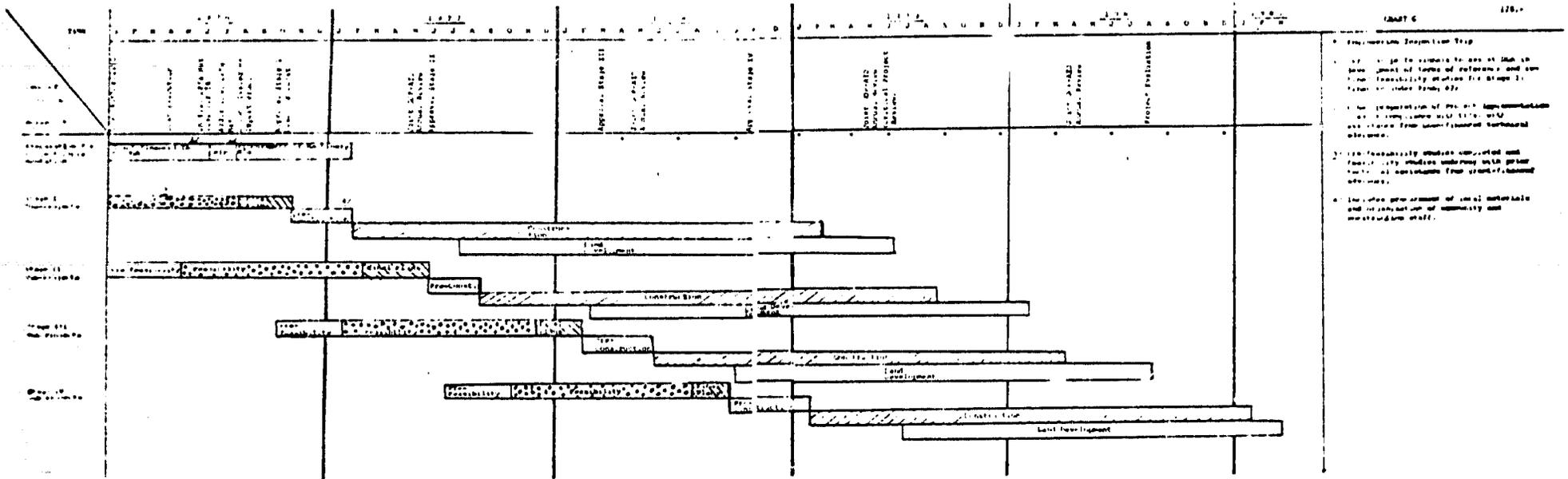
The study, analysis and final design of each sub-project will be done by teams comprising an agriculture or agronomic engineer, a civil engineer, and a topographer, all with experience in irrigation works, plus a draftsman. An agricultural economist and a social scientist will be shared among several individual teams. These teams will be based in the Regional Project Office (please see Chart H), supported and guided by mobile technical advisors of DIPRECO's Lima staff, who will consult with the other participating offices of the DGA and the DGFF on matters relating

CHART F

ILLUSTRATIVE IMPLEMENTATION PLAN

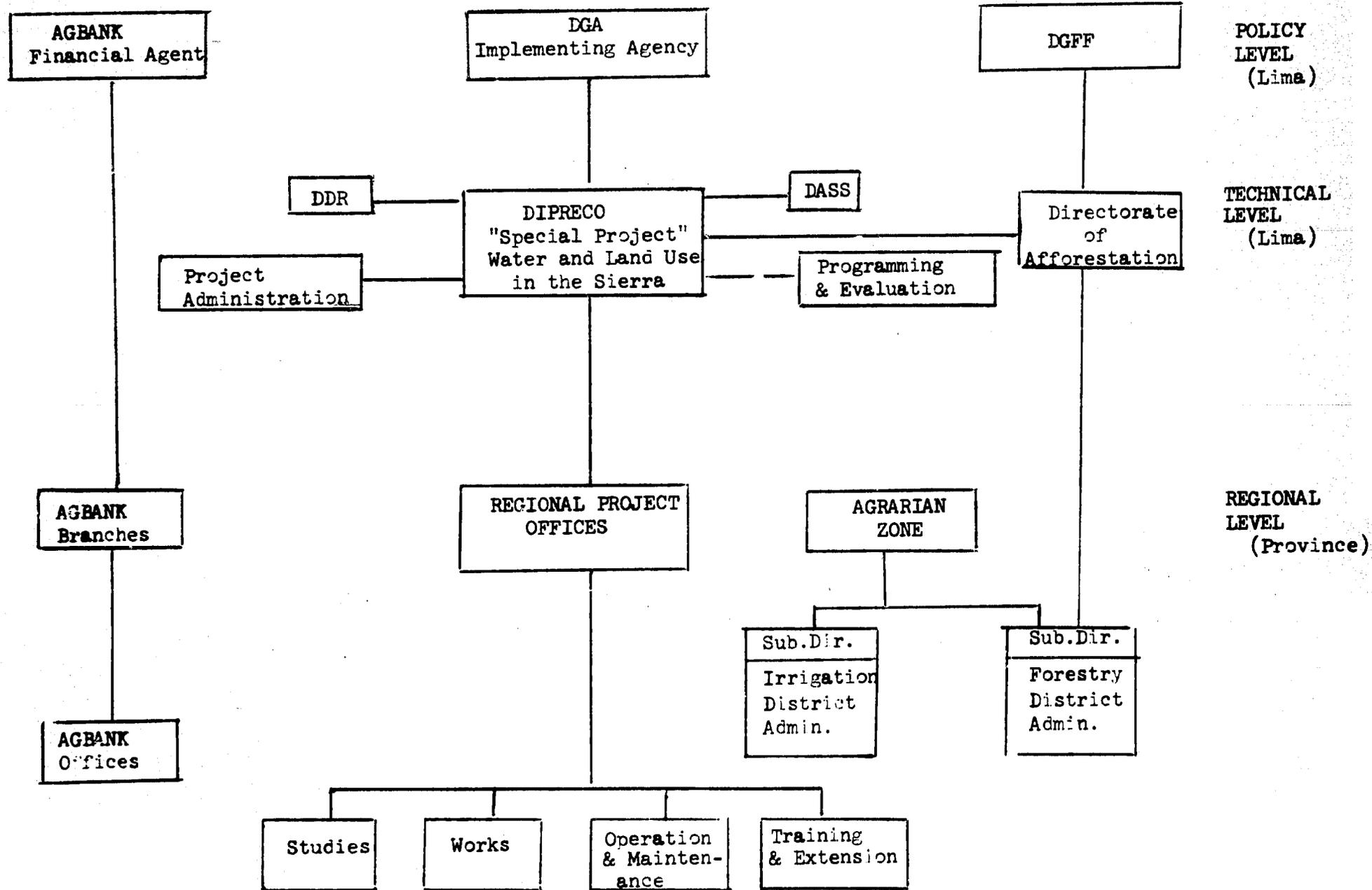
FOR AN INDIVIDUAL SUB-PROJECT





1. The mission inspection trip
- 1.1. To go to various places in the area (part of tasks of reference 1) to the feasibility studies for stage II. Total number of days: 27.
  - 1.2. Preparation of the final report on the feasibility study (stage II) and the final report on the feasibility study (stage III).
  - 1.3. The feasibility studies conducted in the area include working with the local authorities from administrative and technical aspects.
  - 1.4. The preparation of final reports and the preparation of summary for the management staff.

CHART H ORGANIZATIONAL CHART OF PROJECT ADMINISTRATION



129.-

to their respective technical expertise.\*

This phase of study and design will include 3 steps: 1) identification of potential sub-projects, which will include site visits and preliminary review of topography, required structures, and water sources; 2) pre-feasibility and feasibility analysis, including an examination of the land use and settlement patterns, availability of water and appropriate water balance, engineering and environmental aspects, social feasibility, and economic/financial returns; 3) final design of structures and preparation of plans and specifications. DIPRECO estimates that the total time required for the completion of these 3 steps is 4 months for a single sub-project, assuming that a single team of 4, as described above, is assigned to each sub-project.

At the completion of this phase, documentation on each sub-project will be submitted first to the DGA and then to USAID for review and approval, and the Regional Project Office staff will prepare for sub-project construction. This will include, as shown in Chart F (illustrative implementation plan for an individual sub-project), organization of the local farmers into a Water User Association and/or a Local Irrigators' Commission (which will in some cases, be already underway with the assistance of the Technical Office of the Water District), procurement of equipment and materials required for the sub-project, and organization of a construction staff, including the development of a viable work schedule for local labor.

Once these steps have been accomplished, sub-project construction, land development, and supervision will begin under DGA force account, with the direction of Resident Engineers attached to each Regional Project Office. Land development activities will begin approximately 6 months after sub-project construction has begun, and will include land-levelling and protective afforestation. The afforestation activities will be planned and supervised by the Technical Office of the Forestry District in the Agrarian Zone, with technical guidance as required from the Directorate of Forestry Ordering in Lima.

Force account land development will be supplemented by additional on-farm land development financed by under the AgBank

---

\* These will include the Directorate of Surface and Subterranean Water and the Directorate of Forestry Ordering.

program of sub-lending to farmers. Farmers, as members of a Water User Association, will receive technical guidance from the Regional Project Office staff in the identification and planning of on-farm investments to complement the constructed sub-projects, and will work with AgBank Branch Office and Field Agency staff in the preparation of sub-loan applications. The AgBank local staff will supervise use of sub-loan credits and will administer the collection of sub-loan repayments.

Extension and training functions under the Project will be assumed primarily by the Regional Project Office. Extension specialists in water use and irrigated agriculture will conduct informal on-farm demonstration plot programs with participating farmers, and will simultaneously train Agrarian Zone extension workers in more effective extension techniques and in technical aspects of water use efficiency.

On-going operation, maintenance, and administrative functions will continue to be provided by the Zone's Technical Office of the Water District, the current capacity of which is limited. The Regional Project Office will provide support staff and technical guidance in these functions and will informally train Water District Office staff to up-grade their technical and administrative capacity.

As shown in Chart G, the schedule of the implementation of Project activities covers a period of five years. This schedule has been designed to permit the concentration of available technical personnel on the planning and supervision of a limited number of sub-projects at a single time. Implementation of Project activities will be ordered in four separate stages, each stage comprising approximately eight individual sub-projects. Phasing these four stages over a five-year period reduces the number of sub-projects under a particular phase of study or construction at any one time, permitting greater concentration of specialized skills in feasibility analysis and infrastructure construction than could be provided over a shorter time period. This concentration of skills is essential in this Project owing to its innovative elements of comprehensive sub-project feasibility study and participation of local labor in infrastructure construction. Indeed, difficulties which may result in delays in introducing new methodologies for sub-project feasibility study and problems in sub-project construction could lead to scheduling slippages at the various states of sub-project execution or from two to six months.

## 2. Supervision and Monitoring

Daily supervision and monitoring of sub-project force account construction will be the responsibility of the Supervisor engineer attached to each sub-project. The Supervisor will oversee daily construction activities to assure that sound construction practices are followed, and that all work performed conforms to specifications. Routine monitoring will also be done periodically by the Resident Engineers from the Regional Project Office, who will have monitoring responsibilities for all sub-projects in construction in their Office's jurisdiction.

The USAID role in the Project will be limited strictly to monitoring responsibilities, shared by the Engineering and Agricultural Offices. The Engineering Office will review final sub-project plans and specifications for technical feasibility, and will monitor construction progress by making field inspection trips approximately every 3 months, or as required if technical problems arise. The Agriculture Office will be the Project Implementation Office, which will review sub-project studies for economic/social feasibility, coordinate all planning and contracting under the Technical Assistance Program and will handle all routine implementation matters. The Controller and Capital Development Offices and the Regional Legal Advisor will contribute, as required, to the identification and resolution of any implementation or policy questions which might arise.

Routine monitoring of Project activities will be supplemented by a critical review of construction and disbursement progress after three years of Project implementation. A joint USAID/GOP review will be made early in year four of the Project to measure actual progress against implementation targets established in the Project Implementation Plan submitted in compliance with a Condition Precedent. This critical review will permit the Mission to make a judgment as to whether the loan funds which remain uncommitted or undisbursed at that time can reasonably be expected to be utilized under the Project within the time period then remaining, and what actions, including reduction of the Loan balance or a reprogramming of Project funds, might be warranted to assure the best utilization of remaining funds.

### 3. Procurement

Goods and services procured under the Loan will have their source and origin in Peru and in countries included in Code 941 of the A.I.D. Geographic Code Book. An estimated \$ 3.12 million of Loan funds might be used for procurement of imported goods and services, of which approximately \$2.5 million might be used for the purchase of U.S. construction equipment, machinery, and vehicles. The procurement of these goods is expected to be pursuant to Letters of Commitment procedures, and will comply with A.I.D.'s 50/50 shipping requirements. The remainder, of estimated input costs, approximately \$620,000, will be used to procure professional services from U.S. or other Code 941 countries and to finance short-and long-term training outside Peru.

The remainder of Loan funds will be applied to local currency costs of Peruvian or off-the-shelf goods and services required to implement the Project. It is expected that some locally-available construction equipment and materials will be procured, and Peruvian technical and professional services will be financed.

### 4. Disbursement Procedures

While most aspects of Project implementation have been carefully reviewed and agreed upon by DGA and USAID technicians in the preparation of this document, that relating to disbursement procedures remains to be negotiated. Pursuant to A.I.D. and Mission preferences to encourage quality construction and to assure completion of sub-projects, the Project Development Committee considered the desirability of a fixed amount reimbursement method for local cost financing of sub-project construction. Given, however, the innovative nature of the Project, which entails greater foreseen and unforeseen risks than the continuation of a program of construction which has been standardized over years of actual experience, the Committee rejected the fixed amount provision.

Instead, the Committee proposed to the DGA the use of a modification of a fixed amount reimbursement method of local cost financing. The proposed disbursement procedure includes an advance of Loan funds to purchase locally-available equipment and tools required to get Stage I sub-project construction underway.

Such an advance would be required given the current budgetary constraint on the DGA owing to the biennial budgeting process.\* With an advance of Loan funds for the purchase of a minimum of local equipment and tools, Stage I sub-project construction could be begun, as other local costs in the construction phase -- wages to labor, salaries, construction materials -- would be paid from GOP counterpart funds.

The Project Committee's proposal further provided that subsequent disbursement of Loan funds for sub-project implementation would only be made on a cost-reimbursement basis once each individual sub-project was completed. This provision was judged by the DGA staff to be infeasible owing to the length of sub-project construction periods and to the tight programming of budgeted GOP funds; such a procedure would also pose a very real **danger** of delay in payment for wages and salaries, which may seriously undermine the sub-project construction work schedule.

The Project Development Committee recognizes and is sympathetic to these perennial problems of the GOP budgeting cycle and funding process. Moreover, the Committee is anxious to avoid any potentiality of the Project facing a cash-flow problem, which could result in a dangerous loss of momentum under an already tightly-scheduled 4-year disbursement period. As a new program of activities, such difficulties could significantly undermine the possibility of its expansion into other sierra regions. Therefore, the Committee proposes a procedure of periodic reimbursement for actual sub-project expenditures.\*\* As noted above, all reimbursements will be made on an actual-cost, rather than fixed-cost basis, owing to the risk-ridden conditions of infrastructure construction in the sierra.

Other local currency disbursements of Loan funds, such as those made to the DGA for contracting Peruvian personnel for sub-project studies under the Project's technical assistance program and for local-cost support of U.S. contractors will be made according to normal USAID procedures. All U.S. dollar loan disbursements for the purchase of U.S. equipment for sub-project implementation and for TA programs will be made pursuant to Letter of Commitment procedures. Other dollar costs will be those applied against personal service contracts for professional services.

---

\* The Project would be initiated in mid-1976, in the final 6 months of the fiscal biennium; new GOP budgetary resources may not be available for support of the Project until January 1977.

\*\* For example, reimbursement of a percentage of actual costs when construction of an individual sub-project has been 50% completed, with the remainder to be paid upon completion.

### C. Evaluation Plan

As this Project represents an initial response to a complex of long neglected problems of sierra agriculture, and its success or failure may determine in great part future GOP commitment to and budgetary support of expanded activities in the sierra, periodic evaluation of the Project is most essential. Project evaluation in this instance has two critical objectives: one, to provide information on the key aspects of Project administration so that inefficiencies, bottlenecks, and unnecessary delays can be progressively reduced or removed as the Project continues; and second, to analyze the success of the Project in the achievement of its purposes and in its contribution to the sector goals, in order to provide the GOP and AID with a measurement of the socio-economic impact of the Project on the lives and productivity of sierra farm families. To fulfill these two distinct yet equally important evaluation needs --those of continually improving Project administration and of providing the GOP with some measure of the effect of the Project on priority sector goals-- the Project will include two discrete evaluation components.

First, to meet the need of continually up-grading Project administration, monitoring and evaluation of on-going Project implementation activities will be performed by the DGA's Office of Programming and Evaluation, in collaboration with the Sectoral Office of Agricultural Planning (OSPA) of the MOA. These offices will have the responsibility of periodically compiling information on such aspects of Project administration as the performance of local unskilled labor, the quality of technical support provided by each of the participating agencies, adequacy of engineering design and construction, the timeliness of agricultural and water extension services, and the efficiency with which required equipment and materials are procured. These data may be compiled through periodic reporting by the Zonal Offices and the Agrarian Bank, through field monitoring by on-site sub-project supervisors, and/or through interview surveys and will serve as a basis for annual evaluation reviews to be held between AID and representatives from the DGA, DGFE, the Agrarian Bank, OSPA, and other relevant agencies as the GOP may identify.

Second, to provide the GOP with a measure of the effect of the Project on the priority sector goals of increasing employment, income, and food production, the Loan will finance with technical assistance funds for watershed planning studies consulting services from Peru, the US, eligible 3rd countries with experience in similar water and land-use practices (such as Mexico), or international agencies.\*

\* FAO recently conducted a comprehensive evaluation of irrigation projects in Peru, Chile and Argentina, which was presented in Washington, D.C., in mid-1975. The Programming and Evaluation Office of the DGA has indicated a strong interest in following that example for evaluation of this Project.

Such services will be contracted to conduct a comprehensive analysis of the socio-economic impact of the Project. This evaluation should be conducted in mid-1980, at least one full year after the completion of Stages I and II (or approximately 50%) of sub-project construction in each Project area.

The socio-economic impact of the Project will be examined in terms of the following:\*

1. Production effects; i.e., changes in:
  - average yields per crop per hectare
  - percentage of land area under production (crop and pasture land)
  - length of growing season
  - crop diversity
  - crop losses
  - soil loss
2. Income effects; i.e., changes in:
  - farm-generated cash income
  - food consumption/nutritional level
  - quantity and value of marketed production
  - household expenditure patterns
  - credit rating/borrowing behavior
3. Employment effects; i.e., changes in:
  - number of required man-days of on-farm labor
  - employment index (see Table XI, Part III B)
  - utilization of non-family labor
  - percentage of cash income earned from seasonal off-farm employment

These illustrative indicators of socio-economic impact will be supplemented by indicators selected to provide a basis for a GOP decision whether to expand the Project throughout the sierra. Such indicators would provide measures of: (1) cost-effectiveness (e.g., total Project cost per hectare affected or per farm family benefitted); (2) the replicability of the Project in other sierra regions (e.g., comparative analyses of production patterns, soil and water resources, marketing patterns, physical and administrative infrastructure, social organization, and data availability in Project areas and in other major sierra watersheds); (3) administrative feasibility (e.g., demonstrated progress in achieving Project purpose pursuant to logical framework indicators, and availability of minimum required budgetary and staff resources).

---

\*The indicators given here are only illustrative of those which will be used; given limited data sources and the high costs of collecting some kinds of socio-economic data in the sierra, surrogate indicators may have to be developed in some cases.

The collection of all these data will necessarily include extensive interviewing of participating farmers themselves to solicit their perceptions of the conduct and impact of Project activities, and to evaluate their participation in these activities.

These indicators will be further refined and specified in terms of reference for the Project evaluation, to be drafted by Loan-financed advisors (see Part II B 3(2)) and DGA technicians, and reviewed by USAID. Supplemental assistance in drafting the terms of reference may be required from a social scientist for which USAID may have to depend on its own or AID/W's staff or contracted personnel. Close collaboration with GOP officials in the development of these terms of reference will be maintained to assure that the evaluation will provide the GOP planning agencies with the data appropriate for a review of the desirability of expanding Project activities into other sierra regions.

Evaluation of socio-economic impact will measure levels of production, income, and employment in approximately half of the sub-projects in both Project areas at least one growing season after the completion of infrastructure construction. These levels will be measured against the estimated production, income, and employment levels used in the economic/financial analyses performed as part of the feasibility study for each sub-project. The estimates used in the sub-project feasibility studies, then, will constitute the baseline data for the evaluation study, and will be readily available from the computer print-outs for each sub-project analysis.

The DGA has expressed its strong support of Project evaluation, particularly that of socio-economic impact, and has indicated its willingness to contribute to local cost support of contracted services. USAID will coordinate closely with the DGA in designing appropriate terms of reference for such evaluation and maximum participation of GOP agencies and Peruvian professional personnel will be strongly encouraged.

#### D. Conditions and Covenants; Negotiating Status

The Project Development Committee has held initial discussions with the DGA to review the conditions and covenants which are routinely required in AID Loan Agreements and those which may be specifically required in implementation of this Loan Project. In principle, agreement has been reached on the following proposed Conditions Precedent:

##### I. CP's to initial disbursement

- Legal opinion of the Borrower
- Designation of Borrower representatives
- Evidence of Borrower contribution

It is expected that upon Borrower compliance with these initial CP's, which should be met within 120 days after the execution of the Loan Agreement, Loan disbursements will be made to finance technical assistance in planning and project analysis (See Part II B(2)) to assist the DGA in the preparation of a Project Implementation Plan and with the on-going analysis of sub-projects to be financed.

II. CP's to disbursements for other than technical assistance

- Project Implementation Plan to include: (1) a time-phased implementation plan of sub-project investments in works, afforestation, land development, and personnel; (2) an outline of the terms of reference and procedures to be used to determine sub-project feasibility; and (3) a plan for the technical assistance program.
- List of equipment and machinery requirements.

Compliance with these CP's will permit the DGA and AID to initiate procurement of heavy equipment representing core requirements for the equipment pools for each Project area so that deliveries of imported goods can be made by the time USAID has approved Stage I sub-projects, and the DGA is ready to begin construction.

III. CP's to disbursements for construction of any individual sub-project

- An economic and technical feasibility study, including an assessment of the environmental effect and projected socio-economic impact of the sub-project to be financed, which meet the sub-project selection criteria agreed upon by AID and the GOP.
- Final engineering plans, specifications, and cost estimates.
- Time-phased plan of sub-project construction and supervision.

Prior to the disbursement of Loan funds for any construction of any individual sub-project USAID will review the above documentation to determine socio-economic and technical feasibility of the sub-project and in order to approve the sub-project for Project financing.

IV. CP's to disbursement to the Agarian Bank credit fund

- Evidence of the establishment of a Fund in the Ag Bank for sub-lending for on-farm land development and improvements, including an outline of procedures, designation of administrative responsibilities, eligibility criteria, and sub-lending terms and conditions.

Compliance with this CP is not expected until well into Year 1 of the Project, when sub-loan investments will have been identified by the DGA engineers and the respective Water User Associations.

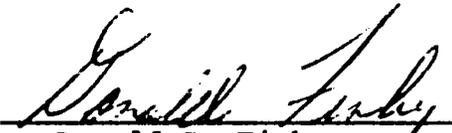
In addition to these Conditions Precedent, a covenant, to be negotiated with the GOP and included in the Loan Agreement or Annex to the Loan Agreement, will require joint USAID-GOP annual reviews of the progress of the Project. Such a covenant will additionally require that three years after the execution of the Loan, a review will be held to measure Project progress against implementation targets established in the Project Implementation Plan with a view to determining whether the Project funds (including those under the Loan) remaining uncommitted or undisbursed at that time could reasonably be expected to be utilized within the remainder of the disbursement period. This will provide the Mission an opportunity to make a judgment as to the best allocation of Loan funds for the remainder of the disbursement period, including the options of reprogramming of Project funds and/or partial deobligation.

Given the DGA's strong interest in the Project, the enthusiastic support it has received in OSPA and the INP, and the reasonably advanced state of USAID-DGA conversations relating to the details of Project Implementation, the Project Development Committee believes that the Loan Agreement can be negotiated promptly and smoothly. All participating GOP agencies are anxious to begin implementation as soon as possible, and some Project activities are already underway or in preparation.

CERTIFICATION PURSUANT TO SECTION 611 (e) OF THE

FOREIGN ASSISTANCE ACT OF 1961, AS AMENDED

I, Donald R. Finberg, the principal officer of the Agency for International Development in Peru, having taken into account among other factors the maintenance and utilization of projects in Peru previously financed or assisted by the United States, do hereby certify that in my judgment Peru has both the financial capability and the human resources capability to effectively maintain and utilize the capital assistance project: PROGRAM FOR IMPROVED WATER AND LAND USE IN THE SIERRA.

  
Donald R. Finberg  
Director, USAID/Peru

DRAFT LOAN AUTHORIZATION

Provided from: FAA Section 103 ("Food and Nutrition")

Peru: Sierra Water and Land Use Improvement

Pursuant to the authority vested in the Administrator, by the Foreign Assistance Act of 1961, as amended, ("the Act") and the delegations of authority issued thereunder, I hereby authorize the establishment of a loan ("Loan") pursuant to Section 103 of the Act, and in furtherance of the Alliance for Progress, to the Government of Peru ("Borrower") of not to exceed eleven million United States dollars (\$11,000,000) to assist the Borrower in financing United States dollar and local currency costs of a project to improve water and land use in the Sierra of Peru ("Project").

The Loan shall be subject to the following terms and conditions:

I. Interest and Terms of Repayment

Borrower shall repay the Loan to A.I.D. in United States dollars within forty (40) years from the date of the first disbursement under the Loan, including a grace period of not to exceed ten (10) years. Borrower shall pay to A.I.D. in United States dollars interest at the rate of two percent (2%) per annum during the grace period and three percent (3%) per annum thereafter on the outstanding disbursed balance of the Loan and on unpaid interest.

II. Other Terms and Conditions

- A. Goods and services, except for ocean shipping, financed under the Loan shall have their source and origin in Peru or countries included in A.I.D. Geographic Code 941, provided, however, that marine insurance may be financed under the Loan only if it is obtained on a competitive basis and any claims thereunder are payable in freely convertible currencies. Ocean shipping financed under the Loan shall be procured in any country included in A.I.D. Geographic Code 941, not including Peru.
- B. United States dollars utilized under the Loan to finance local currency costs shall be made avail pursuant to procedures satisfactory to A.I.D.
- C. Prior to any disbursement or the issuance of any commitment documents under the Loan, Borrower shall submit to A.I.D., in form and substance satisfactory to A.I.D., evidence that the Borrower's contribution to the Project will be available in a timely manner.

- D. Prior to any disbursement or the issuance of any commitment documents under the Loan other than to finance technical assistance, the Borrower shall submit to A.I.D., in form and substance satisfactory to A.I.D.:
1. A Project Implementation Plan containing, inter alia, a delineation of respective governmental agencies' responsibilities, provisions for adequate staffing, a description of procedures for approving sub-projects, and a plan for monitoring sub-project construction;
  2. A list of equipment and machinery required to implement sub-project construction.
- E. Prior to any disbursement or the issuance of any commitment documents under the Loan for sub-lending, the Borrower shall submit to A.I.D., in form and substance satisfactory to A.I.D., evidence of the establishment of a fund for sub-lending for on-farm improvements.
- F. Borrower shall covenant to review with A.I.D. annually the progress of the Project; approximately three years from the date of the Loan Agreement a review shall be held to measure such progress against the targets established in the Project Implementation Plan with a view to determining whether funds remaining uncommitted or undisbursed under the Loan at the time could reasonably be expected to be utilized within the remainder of the disbursement period.
- G. The loan shall be subject to such other terms and conditions as A.I.D. may deem advisable.



Department of State

TELEGRAM

LA  
D-8

UNCLASSIFIED 8464

GP/P

PAGE 01 LIMA 10351 152058Z

64  
ACTION AID-59

INFO OCT-01 EB-07 L-03 IGA-02 SSU-00 /072 W  
----- 043940

O 152025Z DEC 75  
FM AMEMBASSY LIMA  
TO SFCSTATE WASHDC IMMEDIATE 003R

UNCLAS LIMA 10351

AIDAC

EO 11952: NA  
SUBJ: GOP LOAN APPLICATION LETTER: IMPROVED WATER AND LAND  
USE IN THE SIERRA OF PERU

1. MISSION HAS RECEIVED SUBJECT LETTER FROM MINISTER OF  
ECONOMY AND FINANCE DATED DECEMBER 15, 1975. TEXT FOLLOWS:

"...I AM PLEASED TO WRITE TO YOU REGARDING THE PROJECT "IMPROVED  
WATER AND LAND USE IN THE SIERRA OF PERU" PREPARED BY THE TECH-  
NICAL OFFICES OF THE MINISTRY OF AGRICULTURE WITH THE SUPPORT  
OF A.I.D.

"THE ABOVE PROJECT HAS THE NECESSARY PRIORITY FALLING WITHIN THE  
NATIONAL DEVELOPMENT PLAN, AND FOR THIS REASON MY GOVERNMENT  
OFFICIALLY REQUESTS OF THE AGENCY FOR INTERNATIONAL DEVELOPMENT  
(AID) OF THE UNITED STATES OF AMERICA ITS PARTICIPATION IN THE  
IMPLEMENTATION OF THE PROJECT BY GRANTING FINANCIAL ASSISTANCE  
ESTIMATED IN THE AMOUNT OF \$11,000,000.00 UNDER THE MOST CON-  
CESSIONAL TERMS AVAILABLE FROM .I.D.

"REGARDING THE NATIONAL CONTRIBUTION REQUIRED FOR THE EXECUTION  
OF THE PROJECT, MY GOVERNMENT WILL ARRANGE FOR THE NECESSARY  
BUDGETARY RESOURCES TO BE PROVIDED FOR THE COMPLETE IMPLEMENTA-  
TION PLAN, BUDGETARY RESOURCES IN AN ESTIMATED AMOUNT OF  
\$10,000,000 WILL BE ALLOCATED IN THE BUDGETARY BIENNIUMS 1975-76  
AND 1977-78.

"TO CARRY OUT THE PROJECT, THE GENERAL DIRECTORATE OF WATERS OF

UNCLASSIFIED



Department of State

TELEGRAM

UNCLASSIFIED

PAGE 02 LIMA 10351 152058Z

THE MINISTRY OF AGRICULTURE HAS BEEN DESIGNATED AS THE EXECUTING AGENCY WHICH WILL HAVE PRINCIPAL RESPONSIBILITY FOR THE IMPLEMENTATION OF THE PROJECT. IN ADDITION, A SPECIAL FUND WILL BE ESTABLISHED IN A SPECIAL ACCOUNT AT THE AGRARIAN BANK WITH A PORTION OF AID LOAN FUNDS AND NATIONAL COUNTERPART. THIS FUND WILL BE USED FOR THE IMPROVEMENT OF LAND IN THE AREAS AFFECTED BY THE PROGRAM AND WILL BE ADMINISTERED BY THE BANK IN COORDINATION WITH THE GENERAL DIRECTORATE OF WATERS.

"HEREFORE, ON BEHALF OF MY GOVERNMENT, I REQUEST THE COOPERATION OF THE AGENCY FOR INTERNATIONAL DEVELOPMENT IN THE FINANCING AND DEVELOPMENT OF THE ABOVE PROJECT. PLEASE ACCEPT THE ASSURANCES OF MY HIGHEST CONSIDERATION."  
SIGNED BY MINISTER OF ECONOMY FINANCE  
LOIS MARIA CASTANEDA

2. BASED ON THE ABOVE, REQUEST AID/W PROCEED WITH DLSC  
REVIEW OF PP.  
DEAN

1975 DEC 15 AM 8 28

UNCLASSIFIED