

# CORECA

REGIONAL COUNCIL FOR  
AGRICULTURAL COOPERATION



# GISA

INTER-INSTITUTIONAL GROUP  
OF THE AGRICULTURAL SECTOR

FIRST AGRICULTURAL SECTOR MEETING OF THE CENTRAL AMERICAN  
GOVERNMENTS WITH COOPERATING GOVERNMENTS AND INSTITUTIONS

# 4

REGIONAL PROGRAM ON  
IRRIGATION, DRAINAGE AND  
LAND LEVELING

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PEC/AS/91/4  
PROJECT CAM/90/002  
SPECIAL PLAN OF ECONOMIC COOPERATION  
FOR CENTRAL AMERICA

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The technical information for the First Agricultural Sector Meeting is presented in ten documents to facilitate cooperation by cooperating governments and institutions. The documents are:

- 1: Executive Summary
- 2: Importance of the Agricultural Sector. Technical and Financial Assistance. Summary of Project Profiles.

Documents 3 to 10 describe the eight regional programs on topics selected as being of priority by the Central American governments. The Programs are:

- PEC/AS/91/3: Regional Agro-alimentary Program.
- PEC/AS/91/4: Program on Irrigation, Drainage and Land Leveling.
- PEC/AS/91/5: Program on the Development of Biotechnology.
- PEC/AS/91/6: Program on Intra-regional Trade and Exports to Third Countries.
- PEC/AS/91/7: Program on Agroindustrial Development.
- PEC/AS/91/8: Program to Strengthen Plant and Animal Health Services.
- PEC/AS/91/9: Program on the Development of Border Areas.
- PEC/AS/91/10: Program to Strengthen Rural Enterprises.

Each Program consists of two components: one of regional scope and the other of national scope. The regional component involves cooperative projects and actions among the countries of the Isthmus, while the national component is made up of the investment projects to be carried out in individual countries.

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IRRIGATION, DRAINAGE AND  
LAND LEVELING

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PROJECT CAM/90/002  
SPECIAL PLAN OF ECONOMIC COOPERATION  
FOR CENTRAL AMERICA

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## DOCUMENT CONTENTS

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### **REGIONAL PROGRAM**

IRRIGATION, DRAINAGE AND LAND LEVELING..... 5

### **PROJECTS :**

#### **COSTA RICA**

DESIGN AND CONSTRUCTION OF IRRIGATION INFRASTRUCTURE  
IN THE REGION OF BARRANCA, PROVINCE OF PUNTARENAS ..... 47

#### **HONDURAS**

AGRICULTURAL DEVELOPMENT IN THE COMAYAGUA VALLEY  
REHABILITATION AND IMPROVEMENT OF THE IRRIGATION SYSTEM OF THE LAS FLORES DISTRICT... 65

#### **NICARAGUA**

REHABILITATION AND IMPROVEMENT OF IRRIGATED  
AGRICULTURE IN THE SEBACO VALLEY ..... 85

#### **PANAMA**

REHABILITATION OF THE EL CANO, GUARARE AND LA  
HERRADURA IRRIGATION SYSTEMS..... 99



**REGIONAL PROGRAM  
ON IRRIGATION, DRAINAGE  
AND LAND LEVELING**

1991

PROJECT CAM-90-002 UNDP/PAHO/PEC

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## TABLE OF CONTENTS

---

INTRODUCTION .....	7
I. FRAME OF REFERENCE.....	7
1. Macroeconomic Setting and Its Impact on the Regional Program	
2. Analysis of Production Options and of the Technical Environment	
3. Socioeconomic Situation of Potential Beneficiaries	
4. Institutional Conditions	
5. Legal Framework	
6. The Program in the Context of Regional Integration	
II. REGIONAL PROGRAM DESCRIPTION.....	11
1. Justification	
2. Objectives	
3. Strategy	
4. Projects and Components	
5. Goals	
6. Regional Program Beneficiaries	
7. Support Services for Production	
III. ORGANIZATIONAL STRUCTURE .....	17
1. Executing Unit	
2. Plan of Action	
4. Participating Institutions	
IV. COSTS AND FINANCING .....	
1. Costs	
2. Financing	
V. ANALYSIS .....	20
1. Technical Analysis	
2. Institutional Analysis	
3. Legal Analysis	
4. Financial and Economic Feasibility	
5. Regional Program Impact	
APPENDIX. Summaries of component profiles for pre- investment and technical cooperation .....	24



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## INTRODUCTION

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The development of irrigation infrastructure and the rehabilitation of existing irrigation systems are important elements of the agricultural development strategy of the Central American countries. The use of modern irrigation technology and the upgrading of agricultural infrastructure in existence, will make it possible to stabilize agricultural production and productivity increases in Central America in the short and medium terms.

The use of modern irrigation technology will make it possible to increase agricultural production and productivity in the region.

Such modernization will, in turn, improve trade opportunities for farmers and encourage them to diversify crops, boost food production for local markets, and maintain and further expand new export crops.

The best trade opportunities for marketing fresh agricultural produce occur from December to April, which is winter time in the countries of the northern hemisphere (the United States, Canada, Europe). This period coincides with the dry season in Central America, when there is a low availability of water.

It is essential to develop irrigated agriculture in order to profit from comparative advantages offered by the seasons when northern markets are in short supply. The Central American region has a high agricultural potential which can be tapped in the short term, provided the current irrigation infrastructure is expanded and rehabilitated.

The Regional Program consists of two components, the first containing the profiles of the national investment projects for expanding and rehabilitating irrigation systems. The second consists of technical cooperation and pre-investment projects that will serve to complement the national efforts.

The national investment projects aim to provide for the expansion and rehabilitation of irrigation systems. The Regional Program components will complement efforts made by the countries.

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## I. FRAME OF REFERENCE

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### **1. Macroeconomic Setting and Its Impact on the Regional Program**

The area of potential farm lands in Central America amounts to 7.75 million hectares, of which, that suitable for irrigation consists of

2,496,900 hectares; at present, land under irrigation totals 363,700 hectares or 15 percent of the total land area suitable for irrigation.

In this five-year period, the Central American governments are investing US\$225.1 million in 25 irrigation and drainage projects, and nearly US\$2.5 million in three technical cooperation projects with the same objective.

In addition, 33 investment projects have been identified and are at different stages of preparation and negotiation, representing a total estimated investment of US\$322.3 million. Two investment lines are being followed: one valued at US\$144.1 million and aimed at large and medium-scale projects, and the other, valued at US\$122.7 million, for small projects. A region-wide irrigation project, valued at US\$52 million, is being negotiated with the Central American Bank for Economic Integration (CABEI).

## **2. Analysis of Production Options and of the Technical Environment**

Through better management and a master plan to govern the exploitation of water resources, training and technical assistance, it will be possible to give new vitality to irrigation in the six countries of the Isthmus

The following are the main problems hindering development of irrigation, drainage and soil conservation in Central America: lack of organizational and management skills in the irrigation projects; lack of a master plan for the exploitation of water resources; lack of training, extension and technical assistance programs; inadequate legislation governing the use of the water; lack of irrigation supplies and equipment; financial constraints; and shortage of qualified technical personnel.

The irrigation systems established throughout the region use mainly surface water, and their potential for expansion depends on the availability of these waters, mainly from the low water flow of rivers. Nicaragua uses its underground water sources for developing the Pacific seaboard flatlands, and also has plans to use the water from Lake Nicaragua.

The largest investments made by the Central American governments in irrigation and drainage have been oriented towards large and medium-scale projects, which require sizable initial investments and complex legal and administrative operations.

One successful method has been to introduce small-scale irrigation works financed with private investments

An important mode of operation used recently in some countries of Central America has been to encourage investments by private enterprise in small- and medium-scale irrigation infrastructure. Experience has shown that the investments are more profitable if they are accompanied by technical assistance related to production and crop management. Medium- and small-scale projects are less complicated in terms of implementation and maintenance.

Options for irrigation in the Central American countries are the following:

- Maintain the status quo, making little use of the irrigation potential
- Use temporary irrigation systems
- Operate irrigation systems that do not have proper drainage and land leveling
- Install permanent irrigation systems, including land-leveling, drainage, sectioning into plots and internal roads

Of these options, the least productive is to maintain the status quo. The selection of any other option will depend upon each particular case; for greatest efficiency, it is recommended that complete irrigation systems be installed with all supplementary works.

### **3. Socioeconomic Situation of Potential Beneficiaries**

The land tenure system consists of a small property/large-holding structure, in which more than 60 percent of the holdings are in the medium and large farm category. In general, small farmers produce staple grains; because of their low income levels, they are obliged to work as salaried labor during some periods of the year.

Some 60 percent of the arable land corresponds to medium- and large-scale holdings.

### **4. Institutional Conditions**

The governments of the Central American isthmus have expressed their interest in irrigation projects financed with the participation of the Central American Bank for Economic Integration (CABEI). In 1987, the CABEI produced a report on a Central American irrigation, drainage, and soil conservation program, which recommended that the CABEI participate in the financing of small- and medium-scale irrigation projects at the pre-investment and investment levels.

CABEI requested technical assistance from the FAO Investments Center for an exploratory mission, whose purpose would be to study the documentation available at the Bank, and in the countries of the region, on irrigation and drainage projects.

CABEI has requested technical assistance from FAO, consisting of an exploratory mission which will study the documentation available in Central America on irrigation projects.

The Central American countries, through bilateral agreements with friendly nations, have implemented small irrigation projects with technical advice from international consultants, with infrastructure investments being channeled through private banks.

### **5. Legal Framework**

The legal framework relative to irrigation in the Central American countries is inconsistent and, in some cases, obsolete. Some changes will have to be made, in order to establish a legal framework compatible with present-day needs.

*Costa Rica.* In 1942 a water law was enacted. This law gives priority to the multi-sectoral use of water resources. There are several bills before congress for reforming the Water Law.

*El Salvador.* In 1970 the Irrigation and Drainage Law was passed with the purpose of regulating the conservation of water resources. Later, general regulations were issued to develop and enforce the provisions of that Law, which also includes specific provisions for the operation and maintenance of irrigation districts.

*Guatemala.* A specific legal framework is not in place. There are general laws, such as the 1982 Basic Statute of the Government, the 1963 Civil Code, and the 1962 Agrarian Transformation Law, which discuss the multi-sectoral use of water resources. There are a number of legislative decrees and governmental resolutions in existence that regulate the operation and maintenance of irrigation districts.

*Honduras.* In 1927, the General Water Law was enacted, regulations for the application of which have never been established. The Law regulates the use of water on banana plantations and the use of railroads. There are regulations for the operation of the irrigation districts. The Directorate of Water Resources has a new Water Code, whose administrative regulations have been submitted to Congress for approval.

*Nicaragua.* There are no laws governing the use and exploitation of water, and there are no regulations for the operation and maintenance of the areas under irrigation.

*Panama.* The 1966 Law-Decree on Water Use is the legal instrument governing the multi-sectoral use and exploitation of water resources. Although it establishes the basis for developing areas under irrigation, administrative regulations have not been issued for the operation and maintenance of irrigation projects in existence. At present, draft regulations exist which must be approved by the President of the Republic.

## **6. The Program in the Context of Regional Integration**

The Regional Program responds to the need to boost integration efforts by putting into place mechanisms that will complement investments made at the national level to develop irrigation infrastructure.

Program actions will be executed with the support of international technical cooperation, and will seek:

- to ensure the successful development of national projects in each country;

In general, the legislation applicable to irrigation in the six countries of the region is inconsistent and needs to be updated.

International technical cooperation will provide support to the proposed activities, as irrigation has a dynamic impact on agriculture and will contribute to reviving it.

- to expand the models that can be used in each country for irrigation, land leveling and drainage; and
- to make available to the countries of the region the experience gained through the implementation of the national projects.

The coordination of Regional Program activities through a regional organization will enable the countries to benefit from the successful experiences gained on the matter throughout Central America.

## II. PROJECT DESCRIPTION

### 1. Justification

The Regional Program on Irrigation, Drainage and Land Leveling is justified for the following reasons:

- There is a need to incorporate new irrigated areas into the production process in the Central American countries.
- There is a high irrigation potential in Central America, which could be used and exploited at a relatively low cost.
- The topography in most of the countries of Central America makes it necessary to prepare the land in such a way as to facilitate the modernization of agriculture which makes as efficient a use as possible of the soil, through good irrigation management and suitable leveling and drainage works.
- The positive results and efficiency achieved with small-scale irrigation systems are encouraging, and can serve as models for similar works.

A number of successful irrigation works are in existence, especially small-scale projects.

### 2. Objectives

#### *General*

- To increase agricultural production and productivity by expanding the cultivated area under irrigation, through the construction of small- and medium-scale irrigation projects, is the main objective.
- To diversify crops, which will contribute to supplying the local food market and to boosting the export of nontraditional products
- To update and harmonize water-related legislation in the countries of Central America, in order to ensure a rational use of irrigation water

The proposed irrigation projects will help expand the agricultural frontier.

### *Specific*

An expeditious and effective information system will be used in the control and evaluation of the works.

- To study the technical documentation available at the Central American Bank for Economic Integration (CABEI), and in the countries, relative to small- and medium-scale irrigation projects
- To evaluate the small- and medium-scale irrigation projects being implemented in the Central American region, with a view to taking advantage of the positive experience acquired when formulating and designing similar projects
- To design a monitoring, evaluation and control system for irrigation projects, which will be updated on an ongoing basis with with information generated at the national institutions
- To prepare an inventory of irrigation projects, with the purpose of establishing priorities and determining which are eligible to be advanced to the pre-investment and investment phases
- To train the national personnel that will be in charge of implementing the projects of the Regional Program
- To conduct four feasibility studies and produce the final design for the small- and medium-scale projects requested by the countries of the CABEI
- To train national personnel responsible for maintaining the irrigation works
- To train farmers benefitting from small- and medium-scale irrigation projects
- To prepare the documentation necessary for updating water-related legislation in the countries of Central America

### **3. Strategy**

Program duration: three years

The Regional Program has a three-year duration, and its strategy for implementation includes the following:

- Creation of the regional executing unit at the CABEI
- Coordination with the national technical personnel responsible for implementing the irrigation projects
- Hiring of consultants for the preparation of the inventory of small- and medium-scale irrigation projects
- Hiring of consultants for creating the technical units to conduct the feasibility studies of the small- and medium-scale irrigation projects requested by the countries of the CABEI

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In addition to the Regional Program, an Irrigation, Land Levelling and Soil Conservation Project is submitted in a document prepared by the CABEI; it covers the additional technical cooperation needs, which amount to US\$2 million.

- Preparation of technical documentation for the inventory of irrigation projects
- Preparation of the reports, with recommendations for the draft laws and/or bills relative to water legislation in the countries of the region
- Determining the training needs of professionals, technical personnel and farmers, with the purpose of scheduling the courses and other activities
- Submission of the documentation on the inventory of irrigation projects to the countries
- Designing and operation of the information system on irrigation projects in the Central American countries

The training of professionals, technicians and farmers will ensure the success of the projects to be implemented.

#### 4. Projects and Components

The projects and components are the following:

##### *A. Four National Projects submitted by the countries to the Regional Program*

National Projects	Area (ha)	Cost (US\$ X 000)
Design and Construction of Irrigation Infrastructure in the Region of Barranca, Province of Puntarenas (Costa Rica)	1 943	9 733.4
Agricultural Development in the Comayagua Valley: Rehabilitation and Improvement of the Irrigation System of the Las Flores District (Comayagua, Honduras)	4 400	8 090.0
Rehabilitation and Improvement of Irrigated Agriculture in the Sebaco Valley (Sebaco Valley, Nicaragua)	1 608	4 070.7
Rehabilitation of the El Cano, Guarare and La Herradura Irrigation Systems (Panama)	726	1 296.8
<b>Total</b>		<b>23 190.9</b>

Implementation of the four national projects of the Regional Program will have a multiplier effect in the region.

##### *B. Components of the Regional Program*

- Inventory of small- and medium-scale irrigation works
- Feasibility studies and final design of small- and medium-scale irrigation projects
- Legislation and norms for irrigation
- Training of technical personnel and producers
- Information system on Irrigation

The FAO Investments Center mission will visit the main irrigation projects, with a view to gaining a comprehensive and direct understanding of the entire situation.

Following is a brief description of each of the components:

##### *Component 1. Inventory of small- and medium-scale irrigation works*

This component will involve the study of the technical documentation available at the CABEL and at the organizations responsible for irrigation in the countries, relative to small- and medium-scale land leveling, irrigation, drainage, and soil conservation projects.

The CABEI requested the FAO Investments Center to send an exploratory mission to study that documentation, and to visit the small- and medium-scale projects under way.

In the course of this work, the main small- and medium-scale irrigation project sites in Central America will be visited, with the purpose of gathering information on the experience gained; this will contribute to designing and preparing better feasibility studies for submission to the CABEI for funding.

*Component 2. Feasibility studies of small- and medium-scale irrigation projects*

The feasibility studies of the four projects will include all the studies, up to the final designs

This component will involve preparation of four irrigation projects requested by the Central American countries for funding by the CABEI. These studies will cover the following:

- Topography
- Soil studies and crop patterns
- General design
- Maps and plans
- Detailed design of water-works infrastructure, drainage systems and roads
- Technical records
- Economic studies
- Cost of irrigation infrastructure
- Budgets
- Economic and financial indicators
- Socioeconomic study of beneficiaries
- Characterization of the socioeconomic status of the population in the Project's area of influence
- Social and economic indicators

Irrigation projects which will be advanced to the feasibility study level are the following:

- Small- and medium-scale irrigation projects for an area of 12,000 hectares, submitted by Guatemala
- Small- and medium-scale irrigation projects for an area of 5,491 hectares, submitted by El Salvador
- Small- and medium-scale irrigation projects for an area of 5,000 hectares, submitted by Honduras
- Small- and medium-scale irrigation projects for an area of 7,800 hectares, submitted by Costa Rica



### *Component 3. Legislation and norms for irrigation*

This component will involve producing the reports necessary to provide the Central American countries with a legal framework on which to base their legislation and regulations governing the use of water resources by means of licenses, concessions and permits.

The countries of the region do not have updated legislation on water use and management, although three countries do have bills which require adjustment and regulation.

These countries are Honduras, Costa Rica and Nicaragua. In the case of El Salvador, irrigation legislation was adopted more recently, in 1970.

The proposals for draft bills to update and harmonize irrigation regulations will be discussed in a regional forum which could, in the future, also serve as a forum for discussion of complementary matters related to the development and modernization of irrigated agriculture in the region.

### *Component 4. Training*

The training component will seek to enhance the technical capabilities of those responsible for implementing the irrigation projects in the different countries, and for managing and maintaining the existing irrigation works.

Training activities will include four short region-wide courses for professional and technical personnel, and 18 national events for farmers with leadership capabilities, ensuring the transfer of irrigation technology.

The regional courses for professional and technical personnel will cover the following:

- Design, construction and supervision of irrigation projects
- Water management at the farm level
- Organization for the administration and maintenance of the irrigation systems
- Crop management

The national courses for farmers (three per country) will cover the following:

- Operation and conservation of irrigation systems
- Crop diversification
- Crop management

A regional forum will be used to harmonize legal and administrative regulations applying to irrigation.

Four regional courses will be organized for professionals and technicians; 18 national events will be set up to train farmers with leadership capabilities.

### Component 5. Information system on irrigation projects

The information system on irrigation projects will be used to establish an up-to-date data bank on legal, technical and financial matters.

This component will maintain and make available an updated information system concerning irrigation projects at different stages of negotiation (pre-investment, investment), sources of funding, interest rates, payment terms, priorities for implementation, channeling of resources, financing alternatives, and other information of interest to financing and executing organizations.

The first source of information for this system will be the inventory of projects and pre-investment studies included in the Regional Program reports. The information system will collect data from the national institutions in charge of irrigation and drainage systems, and from the national and international financial institutions providing funds for the irrigation projects. Information system activities will be carried out by the executing unit, which will be headquartered at the CABEL.

#### 5. Goals

Program goals: inventory of projects, four feasibility studies requested of CABEL, recommendations for updating legislation, training, design and installation of an information system

The goals of the Regional Program are described below:

- To prepare an updated report on the inventory of irrigation, drainage and land leveling projects at CABEL, and ensure that the information is consistent with that in the countries. To make recommendations based on successful experiences gained in implementing similar projects
- Four feasibility studies requested of the Central American Bank for Economic Integration, as specified below:

Irrigation project by country	Hectares
Guatemala	12 000
El Salvador	5 491
Honduras	5 000
Costa Rica	7 800

- Recommendations for amending and regulating laws governing the use of the water (Honduras, Nicaragua and Costa Rica)
- Recommendations for updating three draft bills to regulate water use (Panama, Guatemala, El Salvador)
- Four training events for 48 technicians and professionals, and 18 events for 360 farmers, over a period of three years
- Design and installation of an information system on small- and medium-scale irrigation projects, which will contain sufficient technical, financial and economic information to be able to determine which are the most profitable.

## 6. Regional Program Beneficiaries

The Regional Program identifies five types of beneficiary:

A total of 2,529 farmers, under the national projects (Honduras, Nicaragua, Costa Rica and Panama)

Farmers benefiting from the feasibility projects requested by the Central American countries of the CABEI (Guatemala, El Salvador, Honduras and Costa Rica)

Technicians and professionals (48) from the institutions involved in implementing the national projects

Some 360 farmers with leadership roles in existing projects, to equip them to transfer the skills they acquired through training to other irrigation systems

Users of the irrigation systems in Central America who will profit from updated and amended legislation on the use of water for irrigation

Direct beneficiaries: more than 2,500 farmers in the four countries where national projects will be implemented

## 7. Support Services for Production

Support services for production required by the national projects will be provided by the public and private institutions of the agricultural sector in each country.

Broad support is forthcoming from official specialized organizations, regional organizations and the private sector.

Support services for the Regional Program will be provided by the national institutions in charge of managing water resources, and by the international technical cooperation organizations participating in the training of national technicians and in preparing the feasibility studies for the projects.

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# III. ORGANIZATIONAL STRUCTURE

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## 1. Executing Unit

The executing unit will be established at the Central American Economic Integration Bank (CABEI), under the supervision of a general coordinator (irrigation specialist), with the support of a secretary.

The executing unit will be headquartered at the Central American Bank for Economic Integration (CABEI). It will enjoy the support of several private associations and enterprises.

The functions of the executing unit are described below:

- Provide technical advice to national technicians concerning the implementation of the irrigation projects under the Regional Program
- Plan and organize training activities for national technicians responsible for the implementation of each project

Of particular importance is the regional forum on proposals for updating and harmonizing irrigation regulations.

- Coordinate the undertaking of feasibility studies with the CABEI and the international technical cooperation organizations
- Coordinate the work to update existing legal instruments with the respective Institutions and the designated experts, and provide advisory services for amending current legislation in the remaining countries
- Coordinate the organization of a regional forum for discussing proposals for updating and harmonizing irrigation laws and norms, with the respective national institutions
- Coordinate the information system on irrigation projects with the CABEI, in order to ensure a steady flow of technical information to be used for setting priorities related to the funding of irrigation works

## 2. Plan of Action

Following are the most important actions of the Regional Program:

Activities	1	2	3
-Establish executing unit at the CABEI	x		
-Coordination and hiring of an expert to review the documentation on irrigation projects	x		
-Visits to small- and medium-scale irrigation projects in operation	x		
-Hiring of consultants to advise the countries on irrigation legislation and norms	x		
-Updating of legislation on water exploitation and use (Costa Rica, Honduras and Nicaragua)	x		
-Recommendations for formulating legislation on water exploitation and use (Guatemala, Panama and El Salvador)	x		
-Advisory services to national institutions on the implementation of irrigation projects	x	x	x
-Hiring of consultants for preparation of the feasibility studies	x		
-Preparation of feasibility studies	x	x	
-Submission of the final reports of the feasibility studies		x	
-Supervision of projects under construction	x	x	x
-Design of information system	x		
-Agreement with national institutions on the exchange of information for the system	x		
<b>Training events for technical personnel</b>			
Course on the design, construction and supervision of irrigation projects		x	
Course on organization for the operation and maintenance of irrigation systems		x	
Course on water management at the farm level		x	
Course on crop management			x
<b>Training events for farmers</b>			
Management and conservation of irrigation systems		x	
Crop diversification		x	
Crop management		x	

By the end of year one, the Regional Program will have accomplished certain tasks of vital importance.

During year two, emphasis will be placed on the feasibility studies and training activities.

## 3. Participating Institutions

The following institutions will participate in the implementation of the Regional Program:

The Central American Bank for Economic Integration Bank (CABEI), through the executing unit

The Tropical Agriculture Research and Training Center (CATIE), which will participate in the organization of training events

CATIE will participate in the training courses and seminars.

The FAO Investments Center, which will participate in updating the inventory and in studying the documentation relative to existing irrigation projects, at the CABI and in the countries

Participating at the country level as institutional counterparts in the Regional Program will be the ministries of agriculture, the irrigation and drainage directorates, and/or the institutions responsible for irrigation.

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## IV. COSTS AND FINANCING

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### 1. Costs

A detailed breakdown of the cost of the four national projects can be found in each profile; the total amounts to US\$23.19 million. The cost of the five regional components comes to US\$8,073,100.

The total cost of the four national projects included in the Regional Program is US\$23.19 million. More detailed information on each project can be found in the profiles.

The cost of the Regional Program's components is US\$8,073,100, broken down as follows:

Component	Amount (US\$ X 000)
<b>Component 1</b>	
Inventory and study of documentation on irrigation projects	50.0
<b>Component 2</b>	
Feasibility studies and final design of irrigation projects	7 500.2
2.1 Irrigation project of Costa Rica	2 000.0
2.2 Irrigation project of El Salvador	1 100.2
2.3 Irrigation project of Honduras	1 400.0
2.4 Irrigation project of Guatemala	3 000.0
<b>Component 3</b>	
Irrigation legislation and norms	61.5
<b>Component 4</b>	
Training	268.9
<b>Component 5</b>	
Information system (executing unit)	192.5
<b>Total</b>	<b>8 073.1</b>

NOTE: The mean unit cost of the feasibility studies is US\$247.0/hectare.

*Cost of the executing unit**(US\$ X 000)*

No.	Description	Duration (years)	Cost
1	Coordination	3	108.0
1	Secretary	3	18.0
1	Computer		5.0
1	Office equipment		2.0
	-Supplies	3	5.0
18	Missions	3	5.4
18	Travel expenditures	3	1.8
	-Administrative expenses	3	7.2
	-Installation, furniture and premises	3	40.0
<b>Total</b>			<b>192.5</b>

The cost of the executing unit during the three years of the Regional Program is US\$192,500.

**2. Financing**

The Regional Program shall be financed through nonreimbursable technical cooperation funds, contributions by the countries, and the CABEI. The amounts and sources of funding are listed below:

Item	Component		Total
	Local	US\$ X 000 External	
Component 1			
Inventory and study of documents on irrigation projects	25.0*	25.0	50.0
Component 2			
Project feasibility studies			
2.1 Irrigation project of Costa Rica	200.0	1 800.0	2 000.0
2.2 Irrigation project of El Salvador	110.0	990.2	1 100.2
2.3 Irrigation project of Honduras	140.0	1 260.0	1 400.0
2.4 Irrigation project of Guatemala	300.0	2 700.0	3 000.0
Component 3			
Irrigation legislation and norms		61.5	61.5
Component 4			
Training		268.9	268.9
Component 5			
Information System (executing unit)	40.0	152.5	192.5
<b>Total</b>	<b>815.0</b>	<b>7 258.1</b>	<b>8 073.1</b>

The Regional Program will be financed with nonreimbursable technical cooperation funds, as well as contributions from the countries and from CABEI.

\* CABEI

CABEI will participate in financing the component to conduct the inventory and study the documentation related to irrigation projects, with a contribution of US\$25,000. The FAO Investments Center will contribute the remaining US\$25,000.

CABEI will also participate in financing the executing unit, through the contribution of office space, other installation-related items, and technical assistance, for an estimated cost of US\$40,000.

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## V. ANALYSIS

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### 1. Technical Analysis

The irrigation potential of the region, combined with the successful experience gained with small- and medium-scale irrigation systems, highlight the Regional Program's technical feasibility.

The Regional Program's activities are technically sound, given that they will contribute to making effective use of irrigation infrastructure in the region, will establish priorities for pre-investment and investments in new projects, and will provide for the training of national technicians in different aspects of irrigation and drainage activities.

The region has accumulated successful experiences with small- and medium-scale irrigation projects, which can be used for expanding the frontier of irrigated agriculture.

### 2. Institutional Analysis

The organization proposed for executing the Regional Program enjoys the support of the CABEL, which is an institution with broad experience financing similar projects in the Central American region.

Regional and national institutions of the Central American isthmus have broad and recognized experience in both technical and financial matters.

Participating Central American countries have the required organizational structure and experience, which will facilitate the development of activities in coordination with the executing unit.

### 3. Legal Analysis

Regional Program does not face any legal difficulties for its implementation, as it fits in with the framework of the development plans of the participating countries. The Regional Program's proposal to adjust and update the water laws has already been initiated by some countries.

### 4. Financial and Economic Feasibility

The financial analyses of the four national projects demonstrate that the proposed activities are feasible.

The financial analysis of each of the four national projects making up the Regional Program can be found in the investment profiles submitted by the countries (Costa Rica, Nicaragua, Panama and Honduras). It is in the countries' interest that the Regional Program be funded, since it will contribute to securing investments for projects of priority in the region, which have been delayed because of the shortage of funds.

### 5. Project Impact

The feasibility studies of small- and medium-scale irrigation projects will facilitate negotiations aimed at making agricultural production more modern and efficient.



The implementation of the four irrigation projects will contribute to expanding the amount of land under irrigation in Central America.

The monitoring and evaluation system for small- and medium-scale irrigation projects will help set priorities for investments that can have great economic and social impact.

The training of professionals, technicians and farmers will contribute to the success of the national projects, and will provide for a more efficient use and conservation of existing and future irrigation infrastructure.

The modernization of legislation on water resources will give protection and security to the investments made in irrigation infrastructure, by bringing water resources into the domain of the State.

The irrigation works proposed for four countries of the region will have a considerable multiplier effect in the target areas, and will serve as models for similar efforts in other areas.

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**APPENDIX**  
**SUMMARIES OF PROFILES OF COMPONENTS FOR**  
**PREINVESTMENT AND TECHNICAL COOPERATION**

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**1. NAME OF THE COMPONENT**

Inventories of Irrigation, Drainage and Land-Leveling Projects

**2. GEOGRAPHIC SCOPE**

Central America

**3. TYPE OF PROJECT**

Technical Cooperation

**4. COST**

*Cost of the component* (US\$ X 000)

Description	Cost
1 External consultant	25.2
International travel	2.5
Per diem	15.7
Supplies	0.6
Work meetings	2.4
7.2% contingency	3.6
<b>Total</b>	<b>US\$ 50.0</b>

*Financing* (US\$ X 000)

CABEI contribution	25.0
External contribution	25.0
<b>Total</b>	<b>50.0</b>

**5. DURATION**

126 days

**6. JUSTIFICATION**

In spite of the importance of irrigation for the Central American region, updated information is not yet available on the progress of ongoing projects. The CABEI requested the FAO Investments Center to send an exploratory mission to study related documentation, and to visit the small- and medium-scale irrigation projects currently un-

der way. The result will be an inventory which can be used for establishing priorities for the region's investments in irrigation.

## **7. OBJECTIVES**

### *General*

The main objective of this component of the Regional Program is to study the documentation on small- and medium-scale irrigation projects available at the CABEI, and at the institutions in the countries, and to gather information on similar projects in progress. This information will serve to improve the feasibility studies and the projects submitted to the CABEI for financing.

### *Specific*

-To make an inventory of irrigation projects and to study the technical documentation available at the CABEI

-To evaluate the small- and medium-scale irrigation systems under way in Central America, with a view to making use of successful experiences gained in the formulation and design of such projects

-To design a monitoring, evaluation and control system for irrigation projects, which will provide ongoing information to be used to determine the profitability of projects

-To make an inventory of irrigation projects and determine which are eligible to be processed at the pre-investment and investment levels

## **8. GOALS**

To prepare an updated report on the inventory of irrigation, drainage and land-leveling projects at the CABEI, which matches information from the countries, with recommendations for the implementation of similar projects

## **9. BENEFICIARIES**

*Direct:* Ministries of Agriculture of Central America

*Indirect:* Farmers using irrigation

## **10. MAIN ACTIVITIES**

-Review the files on irrigation projects at the CABEI and in the countries, in order to update and harmonize them

-Visit small- and medium-scale irrigation systems under construction

## **11. FINAL PRODUCT**

Two documents: Report I will consist of the updated inventory of irrigation project files at the CABEI, which will provide short- and medium-term alternatives for negotiations on pre-investment and in-

vestment projects. Report II will consist of an inventory of small- and medium-scale irrigation projects in operation in Central America, and will highlight the experience gained through their execution.

## **12. EXECUTING ORGANIZATION**

The executing organization will be the Central American Bank of Economic Integration, with the cooperation of the FAO Investments Center. The countries will provide institutional support, under the coordination of the executing unit of the Regional Program.

## 1. NAME OF THE COMPONENT

Training for irrigation

## 2. GEOGRAPHIC SCOPE

Central America

## 3. TYPE OF PROJECT

Technical cooperation

## 4. COST

*Cost of regional courses*

*A. Training for professional and technical personnel (US\$ X 000)*

<b>Description</b>	<b>Duration in days</b>	<b>Cost</b>
Consultants, course on project design, construction and supervision	30	12.0
Consultants, course on water management at the farm level	21	8.0
Consultants, course on organization for the operation and maintenance of irrigation systems	21	8.0
Consultants, course on crop management	15	6.0
Travel expenses of consultants		16.0
Travel expenses of technicians		12.0
Per diem for participants and consultants	87	31.8
Lodging for participants	87	20.9
Teaching materials		5.0
Field trip	8	0.9
Contingencies (10%)		12.0
<b>Subtotal</b>		<b>132.0</b>

*B. Cost of the national courses for farmers**(US\$ X 000)*

<b>Description</b>	<b>Duration in days</b>	<b>Cost</b>
Consultants, courses on management and conservation of irrigation systems	15	18.0
Consultants, courses on agricultural diversification	15	18.0
Consultants, courses on irrigated agriculture	15	18.0
Travel expenses, consultants		10.8
Travel expenses, farmers		3.6
Per diem, consultants		10.8
Per diem, farmers		54.0
Supplies		3.6
Field trips		0.2
Subtotal		<b>136.9</b>
<b>TOTAL ( A + B)</b>		<b>268.9</b>

*Financing**(US\$ X 000)*

<b>Description</b>	<b>External contribution</b>
Person/months E.C.	60.9
Person/months N.C.	75.8
Meetings	1.1
Training	99.4
Missions	12.0
Equipment and supplies	8.7
Contingencies (4%)	11.0
<b>TOTAL</b>	<b>268.9</b>

**5. DURATION**

Three years (22 events)

**6. OBJECTIVES***General*

The main objective of this component is to enhance the technical capabilities of professionals in charge of implementing the new irrigation projects, and of leading farmers in projects under way, with a view to facilitating the horizontal transfer of technology among farmers

*Specific*

-To upgrade the capabilities and skills of technicians and professionals involved in the implementation of irrigation projects

-To ensure that professionals, technicians and farmers who have received training apply the new technology in order to boost the production of traditional and nontraditional crops

-To encourage technicians and farmers to work together in diagnosing problems related to irrigation and production

## **7. BENEFICIARIES**

*Direct:* 48 technicians/professionals, and 360 farmers in the Central American region

## **8. MAIN ACTIVITIES**

-Four training events for 48 professionals and technicians on project design, construction and supervision, water management at the farm level, organization for operation and maintenance, and crop management in irrigated agriculture

-Eighteen events in the countries for 360 farmers, pertinent to the operation and maintenance of irrigation systems, agricultural diversification and crop management

## **9. FINAL PRODUCTS**

-Comprehensive training of 48 professionals and technicians, and 360 farmers of the Central American region, in different topics related to irrigated agriculture, over a period of three years

-Strengthening of the institutional capacity of national organizations to execute activities, provide technical assistance and transfer technology to the farmers

## **10. CURRENT STATUS OF THE COMPONENT (Study Level)**

-Profile

## **11. EXECUTING ORGANIZATION**

The executing organization is the Central American Bank for Economic Integration (CABEI), which, with the cooperation of the Tropical Agriculture Research and Training Center (CATIE), will hire two consultants per course. It will also coordinate each event with the national institutions of the countries, and help select participants.

The international events will be held at the CATIE headquarters and the national events will be held in the individual countries.

## **12. DISTRIBUTION OF TRAINING EVENTS**

-Over a period of three years, three training events will be held for farmers in each Central American country, with each course attended by up to 20 farmers. This represents a total of 18 events and 360 farmers, trained in the following areas: a) operation and main-

tenance of irrigation systems; b) agricultural diversification and crop management.

-For professionals and technicians, there will be one event in the first year, two in the second year, and one in the third year. Each course will have a maximum of 12 participants. This represents a total of four international training events, and 48 persons trained in the following matters: a) project design, construction and supervision; b) organization for the operation and maintenance of irrigation systems; c) water management at the farm level; d) crop management.



## 1. NAME OF THE COMPONENT

Updating of water legislation

## 2. GEOGRAPHIC SCOPE

Central America

## 3. TYPE OF PROJECT

Technical cooperation

## 4. COST

*Cost of the component*

*(US\$ X 000)*

Description	Cost
International travel	2.5
Per diem	22.5
Supplies	0.5
<b>TOTAL</b>	<b>61.5</b>

*Financing*

*(US\$ X 000)*

Description	External contribution
Person/months, E.C.	58.5
Person/months, N.C.	
Meetings	
Training	
Missions	2.5
Equipment and supplies	0.5
Other expenditures	0.0
<b>TOTAL</b>	<b>61.5</b>

## 5. DURATION

Six months

## 6. JUSTIFICATION

In the Central American countries, preferential arrangements for the granting of licenses, concessions or permits for water use, are inadequate; irrigation generally receives a low priority. With the exception of El Salvador, the water legislation of the Central American countries is obsolete. This Regional Program will support the Central American countries' preliminary efforts to draft updated legislation on water use and regulations to govern irrigation.

## **7. OBJECTIVES**

### *General*

The main objective is to provide the Central American countries with a legal framework for establishing legislation and regulations that promote a balanced use of water resources, through preferential arrangements for granting concessions or water use permits.

### *Specific*

- To design a flexible preferential scheme for water use
- To amend the legislation, with a view to providing protection and security to investments made in irrigation infrastructure
- To grant legal concessions to irrigated agriculture for water use
- To bring all sources of water under State domain

## **8. GOALS**

- One document of recommendations to be used in formulating three bills to govern water use
- One document of recommendations for updating three bills to govern and regulate water use

## **9. BENEFICIARIES**

*Direct:* Ministries of agriculture, and the directorates of irrigation and drainage in the Central American countries

*Indirect:* Current and potential irrigation users

## **10. MAIN ACTIVITIES**

- Exhaustive review of the legislation currently in force, and of bills in preparation, in the countries
- Formulation of pertinent recommendations on how to make water concessions more flexible, in accordance with the priorities established in each of the countries of the region

## **11. FINAL PRODUCT**

One final report on the various ways water is used, with an analysis of the current status of related national laws. Additionally, recommendations for preferential arrangements relative to water use will be included in the bills.

## **12. CURRENT STATUS OF THE COMPONENT (Study Level)**

-Profile

## **13. EXECUTING ORGANIZATION**

The executing organization will be the Central American Bank for Economic Integration (CABEI), which will hire a consultant specializing in water legislation, under the coordination of the Regional Program's executing unit.

## 1. NAME OF THE COMPONENT

Small-scale irrigation

## 2. GEOGRAPHIC SCOPE

Costa Rica. Several regions of the country

## 3. TYPE OF PROJECT

Technical cooperation; pre-investment

## 4. COST

*Cost of the project* (US\$ X 000)

Technical cooperation	Total	Years	
		1	2
Project chief	168.0	84.0	84.0
Civil engineers (5)	144.0	72.0	72.0
Agricultural engineers (3)	72.0	36.0	36.0
Agronomists (3)	72.0	36.0	36.0
External consultants (3)	216.0	108.0	108.0
Secretaries (2)	24.0	12.0	12.0
Drivers (5)	28.0	14.0	14.0
Draftspersons (5)	42.0	21.0	21.0
Topographers (5 teams)	168.0	84.0	84.0
Programmer	24.0	12.0	12.0
Economists (2)	48.0	24.0	24.0
Per diem and supplies	500.0	250.0	250.0
Vehicles and parts	375.0	262.5	112.5
Fuel and lubricants	45.0	22.5	22.5
Topography equipment	20.0	20.0	-
Office equipment	30.0	22.0	8.0
Overhead	24.0	12.0	12.0
<b>TOTAL</b>	<b>2 000.0</b>	<b>1 092.0</b>	<b>908.0</b>

*Financing* (US\$ X 000)

Description	Country contribution	External contribution
Person/months E.C.		384.0
Person/months N.C.	200.0	160.0
Meetings		
Training		
Missions		500.0
Equipment and supplies		425.0
Other (fuel, lubricants, support personnel, and overhead)		331.0
<b>TOTAL</b>	<b>200.0</b>	<b>1800.0</b>

## **5. DURATION**

Two years

## **6. OBJECTIVES**

### *General*

The main objective is to expand the irrigation agriculture frontier, and improve crop production and productivity through a more efficient use of the water and soil resources, and to set into motion techniques and methods for agricultural diversification and increasing nontraditional exports.

### *Specific*

- To prepare a feasibility study, including the technical design of an irrigation and drainage system
- To schedule crop diversification in the irrigated area, with a view to generating employment
- To use production methods and techniques to schedule increases in the supply of foodstuffs for domestic consumption and of nontraditional products for export

## **7. GOALS**

To prepare a document containing the feasibility study and final design for an irrigation project involving 7,800 hectares, for implementation in several regions of the country. This document is to contain the agrological study, a socioeconomic evaluation of beneficiaries, engineering designs, plans for internal roads and technical reports.

## **8. BENEFICIARIES**

*Direct:* Subterranean Water, Irrigation and Drainage Service (SENARA)

*Indirect:* Medium-scale farmers from seven irrigation projects

## **9. MAIN ACTIVITIES**

- Overall Identification of the Project's areas of influence
- Socioeconomic study of Project beneficiaries
- Selection of the Project's crop plans
- Economic feasibility study
- Detailed final design
- Preparation of technical reports

## **10. FINAL PRODUCT**

One document containing the feasibility study and the design for seven medium-scale irrigation and drainage systems covering an area of 7,800 hectares. It is to describe all matters relative to hydrological engineering, drainage and internal roads.

## **11. CURRENT STATUS OF THE PROJECT (Study Level)**

-Profile

## NAME OF THE PROJECT

Small-scale irrigation

## 2. GEOGRAPHIC SCOPE

Honduras (several regions)

## 3. TYPE OF PROJECT

Technical cooperation; pre-investment

## 4. COST

*Cost of the project*

*(US\$ X 000)*

Technical cooperation	Total	Years	
		1	2
Project chief	168.0	84.0	84.0
Civil engineers (5)	120.0	60.0	60.0
Agricultural engineers (2)	24.0	12.0	12.0
Agronomist (1)	24.0	12.0	12.0
External consultants (2)	288.0	144.0	144.0
Secretary	12.0	6.0	6.0
Drivers	21.6	10.8	10.8
Draftspersons	25.2	12.6	12.6
Topographers (3 teams)	86.4	43.2	43.2
Programmer (1)	24.0	12.0	12.0
Economist (1)	24.0	12.0	12.0
Per diem and supplies	170.0	85.0	85.0
Vehicles and spare parts (9)	339.0	231.0	108.0
Fuel and lubricants	25.2	12.6	12.6
Topography equipment	12.0	12.0	--
Office equipment	12.6	8.0	4.6
Overhead	24.0	12.0	12.0
<b>TOTAL</b>	<b>1 400.0</b>	<b>769.2</b>	<b>630.8</b>

*Financing*

*(US\$ X 000)*

Description	Country contribution	External contribution
Person/months E.C.		456.0
Person/months N.C.	140.0	76.0
Meetings		
Training		
Missions		170.0
Equipment and supplies		339.0
Other (fuel, lubricants, support personnel and overhead)		219.0
<b>TOTAL</b>	<b>140.0</b>	<b>1.260.0</b>

## **5. DURATION**

Two years

## **6. OBJECTIVES**

### *General*

The main objective is to expand the irrigated agriculture frontier, and to improve crop production and productivity through a more efficient use of water and soil resources, the use of techniques and methods to boost agricultural diversification, and a greater emphasis on nontraditional products.

### *Specific*

- To prepare a feasibility study that includes the technical design of the irrigation and drainage system
- To schedule crop diversification in the irrigated areas, with a view to generating more employment
- To plan increases in the supply of foodstuffs for domestic consumption, and of nontraditional products for export

## **7. GOALS**

To prepare a document containing the feasibility study and final design for a project involving 5,000 hectares, distributed over several regions of the country. This document is to detail all aspects related to hydrological engineering and internal roads.

## **8. BENEFICIARIES**

*Direct:* Ministry of Natural Resources (General Directorate of Water Resources)

*Indirect:* Small- and medium-scale farmers in the Project's area of influence

## **9. MAIN ACTIVITIES**

- General identification of the Project's areas of influence
- Socioeconomic study of Project beneficiaries
- Selection of Project's crop plan
- Final design of the Project
- Preparation of the technical reports



## **10. FINAL PRODUCT**

One document containing the feasibility study and the design of small- and medium-scale irrigation projects for 5,000 hectares, distributed over several regions of the country. This document is to detail the aspects related to hydrological engineering, drainage and internal roads.

## **11. CURRENT STATUS OF THE PROJECT (Study Level)**

-Profile

## 1. NAME OF THE PROJECT

Small-scale irrigation

## 2. GEOGRAPHIC SCOPE

Guatemala (several regions)

## 3. TYPE OF PROJECT

Technical cooperation; feasibility studies

## 4. COST

<i>Cost of Project</i>	<i>(US\$ X 000)</i>			
		<b>Technical cooperation</b>	<b>Total</b>	<b>Years</b>
		1	2	2.5
Project chief	210.0	84.0	84.0	42.0
Civil engineers (8)	240.0	96.0	96.0	48.0
Agricultural engineers (4)	120.0	48.0	48.0	24.0
Agronomists (4)	90.0	36.0	36.0	18.0
External consultants (3)	270.0	108.0	108.0	54.0
Secretaries (2)	45.0	18.0	18.0	9.0
Drivers (5)	45.0	18.0	18.0	9.0
Draftspersons (4)	52.5	21.0	21.0	10.5
Topographers (5 teams)	288.0	115.2	115.2	57.6
Programmer	30.0	12.0	12.0	6.0
Economists (2)	30.0	12.0	12.0	6.0
Per diem and supplies (20)	856.0	346.2	346.2	163.6
Vehicles and spare parts (18)	600.0	500.0	75.0	25.0
Fuel and lubricants	54.7	22.0	22.0	10.5
Topography equipment	32.0	32.0	--	--
Office equipment	12.7	10.0	1.5	1.2
Overhead	24.0	10.0	10.0	4.0
<b>TOTAL</b>	<b>3 000.0</b>	<b>1 488.4</b>	<b>1 022.9</b>	<b>488.7</b>

<i>Financing</i>	<i>(US\$ X 000)</i>	
	<b>Description</b>	<b>External contribution</b>
Person/months E.C.		480.0
Person/months N.C.	300.0	210.0
Meetings		
Training		
Missions		856.0
Equipment and supplies		600.0
Other (fuel, lubricants, support personnel and overhead)		554.0
<b>TOTAL</b>	<b>300.0</b>	<b>2 700.0</b>

## **5. DURATION**

Two and a half years

## **6. OBJECTIVES**

### *General*

The main objective is to extend the irrigation agriculture frontier for increasing crop production and productivity, promote agricultural diversification and boost the export of nontraditional products.

### *Specific*

-To prepare a feasibility study which includes the design of an irrigation and drainage system

-To schedule crop diversification in the irrigated area, with a view to generating more employment

-To boost food supply for domestic consumption and the production of nontraditional products for export, using production methods and techniques

## **7. GOALS**

To prepare a document containing the feasibility study and final design for a project involving 12,000 hectares, distributed over several regions of the country. This document is to contain all the details relative to the hydrological engineering component.

## **8. BENEFICIARIES**

*Direct:* Ministry of Agriculture

*Indirect:* Small- and medium-scale farmers in the Project area (12,000 hectares)

## **9. MAIN ACTIVITIES**

-General identification of the Project's areas of influence

-Socioeconomic study of Project beneficiaries

-Final design, including full details related to hydrological engineering, drainage and internal roads

-Preparation of technical reports

## **10. FINAL PRODUCT**

One document containing the feasibility study and the design for small- and medium-scale irrigation and drainage systems, for an

area of 12,000 hectares, spread over several regions of the country. This document is to contain all details relative to hydrological engineering and internal roads.

## **11. CURRENT STATUS OF THE PROJECT (Study Level)**

-Profile

## 1. NAME OF THE PROJECT

Small-scale irrigation

## 2. GEOGRAPHIC SCOPE

El Salvador (several regions)

## 3. TYPE OF PROJECT

Technical cooperation; pre-investment

## 4. COST AND FINANCING

*Cost of project*

*(US\$ X 000)*

Technical cooperation	Total	Años	
		1	2
Project chief	168.0	84.0	84.0
Civil engineers	72.0	36.0	36.0
Agricultural engineer	48.0	24.0	24.0
Agronomist	48.0	24.0	24.0
Consultants	144.0	72.0	72.0
Secretary	24.0	12.0	12.0
Driver	21.6	10.8	10.8
Draftspersons	28.8	14.4	14.4
Topographers	96.4	48.2	48.2
Programmer	24.0	12.0	12.0
Economist	24.0	12.0	12.0
Per diem and supplies	151.0	80.0	71.0
Vehicles and spare parts	180.0	140.0	40.0
Fuel and lubricants	20.0	10.0	10.0
Office supplies	9.0	7.0	2.0
Office equipment	17.3	10.0	7.3
Overhead	24.0	12.0	12.0
<b>TOTAL</b>	<b>1 100.0</b>	<b>608.4</b>	<b>491.7</b>

*Financing*

*(US\$ X 000)*

Description	Country contribution	External contribution
Person/months N.C.	110.0	106.0
Meetings		
Training		
Missions		151.0
Equipment and supplies		202.3
Other (secretarial support personnel, other administrative expenses)		218.9
<b>TOTAL</b>	<b>110.0</b>	<b>990.2</b>

## **5. DURATION**

Two years

## **6. OBJECTIVES**

### *General*

The main objective is to expand the irrigated agriculture frontier, to improve crop production and productivity through a more efficient use of water and soil resources, promote agricultural diversification using specialized techniques and methods, and boost nontraditional exports.

### *Specific*

- To prepare a feasibility study which includes the technical design of the irrigation and drainage system
- To schedule crop diversification in the irrigated area, with a view to generating employment
- To plan increases in food production for domestic consumption and in nontraditional products for export, using special production methods and techniques

## **7. GOALS**

To prepare a document containing the feasibility study and final design for a project involving 5,491 hectares, distributed over several regions of the country. This document is to detail the hydrological engineering, drainage and internal roads components.

## **8. BENEFICIARIES**

*Direct:* Ministry of Agriculture (General Directorate for Irrigation and Drainage)

*Indirect:* Small- and medium-scale farmers in the irrigated areas

## **9. MAIN ACTIVITIES**

- General identification of the Project's areas of influence
- Socioeconomic study of Project beneficiaries
- Selection of the Project's crop plan
- Preparation of the Project's feasibility study
- Final design of the Project
- Preparation of the technical reports

## **10. FINAL PRODUCT**

One document containing the feasibility study and the designs for small- and medium-scale irrigation projects covering 5,491 hectares, distributed over several regions of the country. This document will detail the hydrological engineering, drainage and internal roads components.

## **11. CURRENT STATUS OF THE PROJECT (Study Level)**

-Profile





# **COSTA RICA**

**DESIGN AND CONSTRUCTION OF IRRIGATION  
INFRASTRUCTURE IN THE REGION OF BARRANCA,  
PROVINCE OF PUNTARENAS**

(Project)

1991

PROJECT CAM-90-002 UNDP/PAHO/PEC

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## TABLE OF CONTENTS

---

INTRODUCTION .....	87
I. FRAME OF REFERENCE.....	87
1. Macroeconomic Setting and Its Impact on the Project	
2. Analysis of Production Options and of the Technical Environment	
3. Socioeconomic Situation of Potential Beneficiaries	
4. Institutional and Financial Conditions	
5. Legal Framework	
6. The Project in the Context of Regional Integration	
II. PROJECT DESCRIPTION .....	90
1. Justification	
2. Objectives	
3. Strategy	
4. Subprojects and Components	
5. Goals	
6. Project Beneficiaries	
7. Support Services for Production	
III. ORGANIZATIONAL STRUCTURE .....	94
1. Executing Unit	
2. Plan of Action	
3. Resources	
4. Participating Institutions	
IV. COSTS AND FINANCING .....	96
1. Costs	
2. Financing	
V. ANALYSIS.....	97
1. Technical Analysis	
2. Institutional Analysis	
3. Legal Analysis	
4. Financial and Economic Feasibility	
5. Project Impact	

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## INTRODUCTION

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During the 1950s, the irrigation systems of the Las Flores, Selguapa, and San Sebastian districts were built in the Valley of Comayagua, including the El Coyolar dam on the San Jose River, and the water diversion works of El Taladro on the Selguapa River. During the 1960s, FAO prepared a study in order to determine the potential use of the soils of the Comayagua Valley.

The Project for the Development of the Comayagua Valley, which recommends the intensive use of some 5,600 hectares for agriculture under irrigation, was drawn up between 1972 and 1973. The Las Flores district is one of the most important systems in the Valley, its water source being the El Coyolar dam, which was built between 1956 and 1957. It is currently in very poor condition because of its age (it is over 30 years old), which reduces the regular supply of water for crops.

During the 1970s and 1980s, the government of Honduras concentrated its efforts for the agricultural development of the Comayagua Valley on the improvement of its irrigation infrastructure. The purpose was to solve problems related to the irregularity and instability of yields and production, caused by insufficient and inadequate irrigation infrastructure in most of this valley.

An Agricultural Development Center was installed in the Comayagua Valley in 1986, for the purpose of training technicians and farmers in irrigation technology. Efforts continue to promote programs and studies with the governments of Japan and the United States, and with international financial organizations.

The improvement of the irrigation system would make it possible to supply a cultivated area of 4,400 hectares during both seasons (rainy and dry) in the Las Flores district, beginning in the fifth year of the Project. During the rainy season, 100 percent of the potentially irrigable area would be used, whereas during the dry season, 90 percent would be used.

The Project will last three years, and will involve the participation of the National Directorate of Water Resources of the Secretariat of Natural Resources (SRN). Also foreseen is the creation and development of a private technology transfer and agricultural development enterprise. This enterprise would have full autonomy, and could be comprised of farmers, the Board of Users and agricultural enterprises in the Project's area of service.

The zone selected includes one of the most important irrigation systems of the Comayagua Valley. Experience in this technology has been gained over several decades

The Project proposes the creation of a private enterprise specializing in technology transfer and agricultural development

Returns on investments are guaranteed in this rehabilitation project

Rehabilitation of the irrigation systems will focus on the immediate needs of the agricultural sector. During the study made on the need to rehabilitate irrigation infrastructure, priority was given to the three systems selected for this Project. Irrigation canals are for the most part obstructed, making it impossible to use them at full capacity. This was caused by poor maintenance of the irrigation systems, resulting in the destruction of most of the water intakes, excessive sedimentation along the canals, the loss of water at dam intakes and deterioration of pumps.

The rehabilitation of irrigation infrastructure, combined with appropriate crop selection, will produce, in the short term, greater profitability and improve the success of efforts to place products on the market.

To this end, the new policy guidelines included in the Agricultural Development Plan give priority to the use of irrigated agriculture.

## **2. Analysis of Production Options and of the Technical Environment**

Panamanian engineering capabilities will be improved through participation in these works.

The proposed options aim to rehabilitate existing engineering works, collect larger amounts of water, and improve both the irrigation distribution network and the hydraulic structures. Similarly, the improvement of the road network and the adoption of new, more efficient irrigation methods are being proposed.

The technical component will be complemented by an administrative component seeking to ensure appropriate administration of the water in the irrigation districts, with the purpose of ensuring greater efficiency in operations and better management of irrigation systems.

The El Cano irrigation system is located in the province of Coclé, Nata district. It covers a surface area of 637 hectares, distributed into 54 parcels. Of the total, 551 hectares will benefit from the rehabilitation. In accordance with the soil studies and ecological conditions, the potential crops for agricultural development are: staple grains (rice, maize, beans, sorghum, soybeans); fruits (mango, cashew, papaya, citrus trees); vegetables (tomatoes, red peppers, onions, melons, squashes); and other crops (sugar cane, forages). Rice is the predominant crop.

The Guarare irrigation system is one kilometer northwest of the township of Guarare, in the Los Santos province. The total surface area covered by this system is 238 hectares, of which 81 hectares will benefit from the rehabilitation works. The parcels are used for the following purposes: 38 percent of the farms are devoted to cattle raising; 37 percent to agricultural activities; and 25 percent of the land is not used. The predominant crops are, rice and maize during the rainy season, and industrial tomatoes, export melons, red peppers and maize during the dry season.

The La Herradura irrigation system is located approximately one kilometer southwest of the township of Rio Grande, Penonome district, Cocolé province. It covers 115 hectares, distributed into 75 parcels. Of this total, 94.5 hectares will benefit from the rehabilitation of the irrigation system. The predominant crop is rice.

The level of technology is high; agricultural machinery, inputs and labor are available. The level of technology in Guarare is low for the production of industrial tomatoes, melons, red peppers and sweet corn; this contrasts with the high level of technology used for rice and maize cultivation during the rainy season.

The country's technological level is high: the necessary agricultural machinery and inputs, as well as manpower, are available

### 3. Socioeconomic Situation of the Potential Beneficiaries

It has been estimated that some 660 farmers will benefit directly from the rehabilitation of the three irrigation systems. Most of them live in concrete houses with galvanized iron (zinc) roofs, although there are local-style houses with tile roofs in fair condition, as well as others that are deteriorated and poor. Most of these homes have drinking water and electricity.

The economic situation of the beneficiaries is as follows:

Project	Source of Income	Income (balboas)	
		Monthly	Annual
Guarare	Salary, retirement pension, sale of agricultural products, family support	65.40	784
La Herradura	Salary, retirement pension, other pension benefits, sale of the products, family support	98.37	1 180
El Cano	Salary, retirement pension, other pension benefits, sale of the products, family support	87.36	1 048

### 4. Institutional Conditions

The management and maintenance of irrigation systems are the responsibility of the Ministry of Agricultural Development (MIDA). The National Directorate of Rural Engineering, as a technical agency of the MIDA, must, among other things, establish rules, conduct technical studies and design irrigation and drainage systems as required by the sector. Furthermore, it provides specialized technical assistance to the producers, with the purpose of increasing productivity. Farmers file formal requests with the institution for service of the irrigation systems.

The Ministry of Agricultural Development manages and provides maintenance for the irrigation systems. This situation will continue under the Project, with greater participation, however, from the private sector.

The human resources of this National Directorate consist of seven professional agriculturalists, 24 individuals trained in civil engineering, one architect, six individuals trained in hydraulic engineering, and 22 employees who support the technical work.

Financial limitations have seriously affected the state's capacity to provide maintenance of the irrigation systems; efforts will be made to turn this situation around

One of the main problems limiting the provision of services by this institution is the lack of logistic support (particularly fuel and vehicles). These shortcomings result in poor attention to the country's irrigation systems.

## **5. Legal Framework**

The legal framework in force concerning the administration of irrigation systems and the supervision of the use of the water for irrigation consists of the following:

- Decree Law N° 35 on the use of waters (22 September 1966)
- Law N° 12. This creates the Ministry of Agricultural Development, and specifies its functions and authority (25 January 1973).
- Executive Decree N° 55, of 13 June 1973, which stipulates the regulation of water rights
- Executive Decree N° 70, of 27 July 1973, whereby regulations are established for granting permits or concessions for the use of water, and for creating and operating the Water Resources Advisory Council
- Law N° 21, of 16 December 1986, establishing the Renewable Natural Resources Institute
- Resolution ALP-53-ADM, of 13 October 1986, creating the National Rural Engineering Directorate

## **6. The Project in the Context of Regional Integration**

Technological modernization of the agricultural sector in the countries of Central America must start with the improvement of existing irrigation infrastructure. In the short term, the rehabilitation of irrigation systems will substantially increase production and productivity in farming and livestock activities.

Irrigation equipment manufacturing companies in other countries of the Isthmus will participate in the Project.

National efforts will be boosted by a process of regional integration which facilitates and supports, in a sustained manner, the introduction of new, more efficient irrigation systems. Industries established in the region which manufacture and distribute irrigation equipment will be called upon to complement government efforts.

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## II. PROJECT DESCRIPTION

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### 1. Justification

The El Cano, Guarare, and La Herradura irrigation systems were built with public funds. At present, farming area under irrigation is small in comparison with the maximum capacity of the installed infrastructure.

The rehabilitation of these systems would restore irrigation for agricultural exploitation in production areas affected by drought, specifically the so-called Dry Arch of the Republic of Panama (provinces of Cocolé and Los Santos).

Other sections of this Project emphasize the dynamic impact of the proposed works on both the development of local civil engineering capabilities and on crop productivity.

Drought-related problems in the so-called Dry Arch (Cocolé and Los Santos provinces) will be solved

### 2. Objectives

#### *General*

- To increase agricultural productivity, and intensify land use by providing more water for irrigation
- To generate permanent and productive employment opportunities on farms
- To increase incomes and improve the nutrition levels of the population in the area of influence of the irrigation systems

Main objectives: To increase productivity, intensify land use, create jobs, increase income levels, improve the nutritional levels

#### *Specific*

- To rehabilitate the El Cano, Guarare and La Herradura irrigation systems
- To install modern micro-irrigation equipment
- To provide training to producers with a view to improving irrigation efficiency on their parcels

### 3. Strategy

The strategy to be used for accomplishing the proposed objectives consists of three stages:

### ***Stage 1. Contracting, implementation of the irrigation and drainage works, and leveling of lands***

The first stage would include the following: selection of the contractor; rehabilitation of canals, structures and roads; reconstruction of water intakes; installation of pumping station; leveling of lands; and drainage cleaning.

### ***Stage 2. Organization of the beneficiary farmers***

This stage would include the following:

The two existing production organizations are registered as legal entities. The Board of Irrigation Users is in the process of becoming legally registered

**Guarare.** Efforts will focus on helping to better organize the three types of entities in existence (two production organizations and one irrigation users' organization). The two production organizations are legally registered; the Board of Irrigation Users is in the process of becoming legally registered. The support of these organizations is important for maintaining a rehabilitated system.

**La Herradura.** The La Herradura irrigation system has a users association, founded in 1986, which is not yet legally registered, since the formalization of its by-laws is still pending. The Project will help the association complete its legal arrangements, whereupon a process of intensive training of users would start.

**El Cano.** The El Cano irrigation system has an active users' board, and it is the country's most dynamic organization of this type. It has 35 members, and has established water usage rules, which are in the process of becoming legalized. This is the most organized and most productive group of farmers. The Project would provide them with training in the use of more efficient irrigation equipment.

### ***Stage 3. Organizing the marketing of agricultural products***

The rehabilitation of the irrigation systems, combined with intensive soil use, will make the crops highly profitable

Because rehabilitated irrigation systems permit an intensive use of the soils, high profit margins have been registered for production, such as in the case of rice and maize during the rainy season, and vegetables during the dry season. The Project will provide support to the domestic marketing of staple grains. In addition, it will provide support for export marketing of dry season crops, such as squash and melon, which become highly profitable with the use of irrigation systems.

## **4. Subprojects and Components**

The Project consists of three subprojects: El Cano, La Herradura and Guarare.



### *Subproject 1. Rehabilitation of the El Cano irrigation system*

The implementation of this subproject will involve the following components: rehabilitation of canals, structures and roads; rehabilitation of water intakes; leveling of lands; cleaning of canals and drains.

The rehabilitation process will improve the canals, structures and roads, promoting further growth in the selected areas

### *Subproject 2. Rehabilitation of the Guarare irrigation system*

Works relative to this subproject include the following: rehabilitation of dams and roads; installation of the pumping station; installation of the fixed distribution network; a portable network for sprinkler irrigation; cleaning and testing of the rehabilitated irrigation system.

### *Subproject 3. Rehabilitation of the La Herradura irrigation system*

This subproject involves the following actions: rehabilitation of canals, structures and roads; rehabilitation of water intakes; leveling of lands; cleaning of canals and drains.

## **5. Goals**

In its third year, the Project will be in full development. The Project's goals are:

<b>Description</b>	<b>Goals</b>
Rehabilitation of irrigation systems	
1. El Cano	551 ha
2. Guarare	81 ha
3. La Herradura	94.5 ha
Installation of the portable sprinkler irrigation network	1
Installation of pumping station	2
Training in irrigation (farmers)	153

## **6. Project Beneficiaries**

Some 660 people will directly benefit from the rehabilitation project. These persons were selected by means of special surveys and will exploit the production area in each of the parcels of the system.

## **7. Support Services for Production**

Support services for production in the rehabilitated systems will be the responsibility of the following:

- Agricultural research services. The Agricultural Research Institute of Panama (IDIAP) is the agency in charge of regulating and providing orientation in all of the Project's research activities.
- Agricultural extension services. Assistance shall be provided by the Ministry of Agricultural Development through the National Rural Engineering Directorate, which will assist in the

Production in the Project's area of influence is marketed by private enterprise. Formerly, the Agricultural Marketing Institute performed this function

design of the subprojects, the operation of the irrigation system, and the exploitation plans.

- Credit services. This will be provided through a specialized organization comprised of the Agricultural Development Bank, private banks, commercial mills and input companies, and non-governmental organizations.
- Harvest and marketing services. Marketing services will be improved. In general, farms sell their output directly to private mills. Before this, and in certain small-scale operations, it was sold to the State-owned Agricultural Marketing Institute.

As a complement to the provision of technological services, education and health services will be provided at the places citizens usually go to receive such services (schools and health centers).

At present, the farmers of the areas covered by the three irrigation systems benefit from pioneer roads and electric works built by the government.

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### III. ORGANIZATIONAL STRUCTURE

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#### 1. Executing Unit

Executing unit: the National Rural Engineering Directorate

MIDA's National Rural Engineering Directorate will be the Project's executing unit. This Directorate has participated in the different coordination and supervision phases of similar construction works, including small irrigation projects mostly subcontracted out to private construction companies.

A series of actions has been scheduled for the rehabilitation of the three systems, to wit:

- Awarding the construction project by means of bids, by invitation or through direct selection of the beneficiaries
- Selecting the organization offering the best technical and financial guarantees
- Supervising the construction works through the National Rural Engineering Directorate

The Project will serve as a Pilot Model for the rehabilitation and development of Panama's irrigation systems

In view of the new guidelines adopted by the agricultural public sector, and since the systems are state-owned, this Project will serve as a pilot model for the rehabilitation and development of the irrigation systems in Panama.

These actions have already begun in El Cano, yielding a better administration of the irrigation system. The administrative irrigation unit has been established, which will regulate the usufruct of the rehabilitated system.

## 2. Plan of Action

The Plan of Action for the implementation of the Project is the following:

Subprojects	Months					
	1	2	3	4	5	6
<b>Subproject 1. El Cano</b>						
1. Rehabilitation of canals, structures and roads	▲	▲	▲			
2. Rehabilitation of water intakes		▲				
3. Land leveling			▲	▲	▲	▲
4. Cleaning of canals and drains				▲	▲	▲
<b>Subproject 2. Guarare</b>						
1. Rehabilitation of dam and roads	▲	▲	▲	▲		
2. Pumping station		▲				
3. Fixed distribution network			▲	▲	▲	
4. Portable sprinkler irrigation network				▲	▲	▲
5. Cleaning and testing						▲
<b>Subproject 3. La Herradura</b>						
1. Rehabilitation of canals, structures and roads	▲	▲				
2. Rehabilitation of water intakes		▲	▲			
3. Land leveling			▲	▲	▲	
4. Cleaning of canals and drains				▲	▲	▲

Works must be completed in no more than 180 days

The subcontractor will hire and provide the personnel required to comply with the contract within the specified terms; the duration of the contract must not exceed 180 days.

## 3. Resources

The human resources needed to implement and extend this Pilot Model and to organize and supervise the rehabilitation of the existing irrigation systems, consist of the following:

- seven professional agriculturalists
- six hydraulic engineers
- 24 civil engineers
- one architect
- 22 employees who will support the technical tasks

Agriculturalists, hydraulic engineers and civil engineers, among others, will participate in the Project

Together, these professionals and employees will coordinate, supervise, provide maintenance for vehicles, follow up and evaluate the work in progress, among other responsibilities.

Projects of this nature contribute to upgrading the technical capabilities of personnel at all levels

The resources needed to improve the administration of the country's irrigation systems are estimated as follows:

- Per diem for supervisory personnel. Ten employees in the field per day at the rate of B5 per day each, for 180 calendar days
- Vehicles (6) for transporting personnel in charge of supervision and/or involved in rehabilitation efforts
- Fuel (5,400 gallons of diesel). Five gallons per day, per vehicle, for 180 calendar days
- Lubricants for the maintenance of the vehicles
- Replacement parts for maintaining the vehicles in good condition
- Stationery, office equipment and supplies for submitting documents relative to the projects in progress
- Others (contingency) five percent

Resources will be equitably distributed over the six months estimated for the rehabilitation of the irrigation works.

#### **4. Participating Institutions**

A Plan of Operational Organization will make it possible to overcome or correct errors and shortcomings.

A Plan of Operational Organization was formulated, based on the evaluation and diagnosis of the current situation of the irrigation systems under the rehabilitation program; the evaluation of the MIDA's organizational structure and of the services provided by state-owned support organizations; and information obtained on the administration of the irrigation systems and districts in other countries. The Plan covers both the Project's institutional needs vis-a-vis the three irrigation systems to be rehabilitated, and sectoral activities, with a view to surmounting or correcting current errors and/or shortcomings.

In order to set the Plan in motion, an organizational proposal must be designed, based on the experience gained. It should show the place of agencies responsible for execution at both the department or irrigation users' association levels, and of the sectoral institutions responsible for agricultural credit, marketing and research. The organizational chart for the Plan should reflect the work to be carried out in the three irrigation systems of the Project, also indicating the relationship between MIDA, the farmers, users, and public and private sector institutions that participate in some way in agricultural development in general, and irrigation systems in particular.

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## IV. COSTS AND FINANCING

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### 1. Costs

The estimated total investment needed for the Project is US\$1,296,840.

The total cost of the Project is US\$1.3 million

Items	(US\$) Amount
<b>Cost of rehabilitation</b>	
Subproject 1. Guarare	291 924
Subproject 2. La Herradura	210 581
Subproject 3. El Caño	504 000
<b>Subtotal</b>	<b>1 006 505</b>
Executing unit	290 335
<b>Total for the Project</b>	<b>1 296 840</b>

The executing unit allotment corresponds to the cost of supervising the works.

The cost of rehabilitation covers the hiring of the construction firm, plus the materials required for rehabilitating the three irrigation systems.

### 2. Financing

Estimated costs for the rehabilitation of the systems, to be funded both with local and external resources, are summarized below. The external contribution to the Project amounts to US\$1,006,505, and is itemized by subproject.

A total of US\$1 million will be sought from external donors

#### *External support for rehabilitation*

Subproject	External support (US\$)
Guarare	291 924
La Herradura	210 581
El Caño	504 000
<b>Total required</b>	<b>1 006 505</b>

The local scheduled contribution will cover the cost of supervision by the executing unit.

The local contribution of US\$300,000 will cover the cost of supervision by the executing unit

Item of expenditure	Local contribution (US\$)
Technicians	166 260
Per diem	9 000
Vehicles	90 000
Fuel	6 750
Lubricants	500
Replacement parts	2 000
Stationery, office equipment and supplies	2 000
<b>Subtotal</b>	<b>276 510</b>
Five-percent contingency	13 825
<b>Total local contribution</b>	<b>290 335</b>

## V. ANALYSIS

### 1. Technical Analysis

The technical soundness of the subprojects is clear

Rehabilitation of the three irrigation systems will increase the efficiency of the use of soil resources by farmers. This, combined with potential crops selected on the basis of special studies, local experience gained, and the information generated by the agricultural survey, ensures the technical soundness of the subprojects, because yields will increase considerably. Viability will also be enhanced by the use of appropriate technology, zoning practices, crop rotation and diversification, all of which will benefit from the increased water availability.

### 2. Institutional Analysis

MIDA's National Rural Engineering Directorate will make possible the successful implementation of the Project, which will serve as a pilot model in the new organization proposed for the MIDA. Thus, an adequate institutional framework for governing the different actions is in place. The MIDA will be strengthened through Project actions, especially its organizational structure at the local executive level, and the mechanisms to be used for coordinating and integrating the actions of the institutions with the administrators of the irrigation systems.

The Project envisages integrated management of the rehabilitation of the production infrastructure by beneficiaries, as well as the strengthening of agricultural services agencies related directly to agricultural production. At the local level, MIDA works with farmers through its field activities. It can appropriately undertake the responsibilities of managing the rehabilitated irrigation systems.

### 3. Legal Analysis

Legislation currently in force is favorable to the implementation of the Project. The legal framework governing the use and management of irrigation water includes specific provisions allowing for the introduction of modern irrigation techniques. This will contribute to increasing the efficient use of existing infrastructure.

The Ministry of Agricultural Development plays a key role in the Project, as the promoter and coordinator of agricultural development in Panama

The MIDA is empowered to coordinate all public and private, local and external organizations for purposes of developing the technical and production aspects of agriculture. It thus serves as the promoter and leader of all of the country's agricultural development activities.

### 4. Financial and Economic Feasibility

In accordance with the assessments made, the financial and economic viability is reflected in a very high internal rate of return; the updated value of the profit expected is seven-times greater than the value of the initial investment.

The Project is clearly profitable. The updated value of gains is equivalent to seven times the initial investment

#### *Subproject 1. El Cano*

The total value of production will increase annually from B187,880 under current circumstances to B565,249 under the rehabilitation project. Other indicators are the following:

- The net income per family will rise to B16,660.
- The financial internal rate of return (FIRR) was estimated at 150 percent and the economic internal rate of return (EIRR) at 122 percent

#### *Subproject 2. La Herradura*

The value of production will increase from B71,533 to B463,925. Other indicators are the following:

- The net income per family will amount to B4,924.
- The FIRR is 180 percent and the EIRR is 157 percent.

#### *Subproject 3. Guarare*

The value of production will increase from B136,778 to B474,600 per year. Other indicators are the following:

- The net income per family will rise to B8,895 in the Project area.
- The FIRR is 65 percent and the EIRR 84 percent.

Results: more jobs, better farmer organization, stabilization of crops in areas under irrigation, better incomes, and improving environmental conditions in the selected areas

## **5. Project Impact**

### **The Project will:**

- **Generate more year-round jobs within the areas of influence of the three irrigation systems**
- **Contribute to better preparing producers to maintain the rehabilitated infrastructure**
- **Stabilize production volumes in the areas under irrigation**
- **Improve income levels of direct beneficiaries by increasing production and productivity**
- **Contribute to conserving the environment in the selected areas**









