UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D. C. 20523

ECUADOR

PROJECT PAPER

FORESTRY SECTOR DEVELOPMENT

AID/LAC/P-097

Loan Number: 518-T-042
Project Number: 518-0023

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

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

DOCUMENT CODE: 3

2. COUNTRY/ENTITY: ECUADOR

3. PROJECT NUMBER: 518-0023

4. BUREAU/OFFICE: LAC — 05

5. PROJECT TITLE (maximum 40 characters): FORESTRY SECTOR DEVELOPMENT

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 03 DD 31 YY 88

7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4)
A. Initial FY 82 B. Quarter 4 C. Final FY 85

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

A. FUNDING SOURCE	FIRST FY 82 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	700	650	1350	2300	5800	8100
(Grant)	(400)	(100)	(500)	(1300)	(300)	(1600)
(Loan)	(300)	(550)	(850)	(1000)	(5500)	(6500)
Other U.S. 1.						
Other U.S. 2.						
Host Country		350	350		7500	7500
Other Donor(s)						
TOTALS	700	1000	1700	2300	13300	15600

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) ARDN	233	160	160			1600	6500	1600	6500
(2)									
(3)									
(4)									
TOTALS									

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 067 | 096 | 079 | 054 | 721 | 968

11. SECONDARY PURPOSE CODE

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

A. Code	ENV	R/AC	LAB	PART	LAB	COOP	BS
B. Amount	8100	7600	3000	3000	3000	1000	3000

13. PROJECT PURPOSE (maximum 480 characters)

To strengthen the capacity of Ecuadorian Forestry Sector Institutions to undertake afforestation/reforestation activities and to manage productive and protective forests.

14. SCHEDULED EVALUATIONS
Interim MM 12 YY 84 | MM YY | Final MM 06 YY 86

15. SOURCE/ORIGIN OF GOODS AND SERVICES
☐ 000 ☒ 941 ☐ Local ☐ Other (Specify)

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

17. APPROVED BY
Signature: John A. Sanbrailo
Title: Director USAID/ECUADOR
Date Signed: MM 06 DD 15 YY 82

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

AID 1330-4 (8-79)

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON D C 20523

PROJECT AUTHORIZATION

Name of Country:	Ecuador
Name of Project:	Forestry Sector Development
Number of Project:	518-0023
Number of Loan:	518-T-042

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Forestry Sector Development project for Ecuador involving planned obligations of not to exceed Six Million Five Hundred Thousand United States Dollars ($6,500,000) in loan funds ("Loan") and One Million Six Hundred Thousand United States Dollars ($1,600,000) in grant funds ("Grant") over a five (5) year period from date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the project.

2. The project ("Project") consists of cooperation with the Government of Ecuador ("GOE") in improving the Ecuadorean public and private sector institutional and technical capability to efficiently develop and utilize Ecuador's forest resources by: (i) strengthening the National Forestry Program's ("PNF") capacity to mobilize, coordinate and provide technical assistance in support of other forest sector institutions; (ii) implementing a program of productive forestry field demonstrations and applied research; and (iii) developing the GOE's capacity to develop and implement protective forest delimitation and management plans for critical watersheds.

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

a. Interest Rate and Terms of Repayment

The GOE shall repay the Loan to A.I.D. in U.S. Dollars within twenty-five (25) years from the date of first disbursement of the Loan, including a grace period of not to exceed ten (10) years. The GOE shall pay to A.I.D. in U.S. Dollars interest from the date of first disbursement of the Loan at the rate of (i) two percent (2%) per annum during the first ten (10) years, and (ii) three percent (3%) per annum thereafter, on the outstanding disbursed balance of the Loan and on any due and unpaid interest accrued thereon.

b. Source and Origin of Goods and Services (Loan)

Goods and services, except for ocean shipping, financed by A.I.D. under the Loan shall have their source and origin in Ecuador or in countries included in A.I.D. Geographic Code 941, except as A.I.D. may otherwise agree in writing.

Ocean shipping financed by A.I.D. under the Loan shall be financed only on flag vessels of Ecuador or countries included in A.I.D. Geographic Code 941, except as A.I.D. may otherwise agree in writing.

c. Source and Origin of Goods and Services (Grant)

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

d. Condition Precedent to Disbursement

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement, to finance any individual field demonstration activity, except for the procurement of vehicles and imported equipment, the GOE shall, except as A.I.D. may otherwise agree in writing, furnish, in form and substance satisfactory to A.I.D., a plan which details how the field demonstration activity will be implemented, and an agreement between the PNF and each implementing institution, group and community participating in such activity.

e. Covenants

The GOE shall covenant that, unless A.I.D. otherwise agrees in writing, it will:

(1) cause the PNF and the Agrarian Reform and Colonization Institute to expedite the titling of land which will be utilized for productive or protective forestry field demonstrations under the Project;

(2) cause the PNF to increase its central office staff by at least six professional permanent positions, including a full-time training coordinator, by the end of the first Project year and its field staff by two professional and seven technical permanent positions by the end of the second Project year and maintain such permanent staff levels after the end of the Project; and

(3) prepare a plan by December 1984 which will detail an appropriate organizational structure for implementing watershed management in Ecuador.

f. Financing of Commodities Normally Ineligible

The financing of seeds and seedlings, necessary for the successful completion of the Project, is hereby authorized.

Otto J. Reich
Assistant Administrator
Bureau for Latin America
and the Caribbean

3

July 12, 1982
Date

Clearances:

GC/LAC:BVeret: date 7/2/82
LAC/SA:RLindsay: date
LAC/DR:DJohnson: date 7/2/82

GC/LAC:GMWinterbkg:6/28/82:x23272

FORESTRY SECTOR DEVELOPMENT PROJECT

PROJECT PAPER

TABLE OF CONTENTS

		Page
SUMMARY AND RECOMMENDATIONS		
A.	Introduction and Overview	i
B.	Background and Conceptual Framework	ii
C.	Project Description	iii
D.	Ecuadorean Coordinating and Implementing Institutions	v
E.	Summary Financial Plan	vi
F.	Issues	vi
G.	Project Development Committee	xi
H.	Recommendation	xii
I.	BACKGROUND AND JUSTIFICATION	
A.	Analytical Framework	1
B.	Statement of the Problem	3
	1. Status of Forestry and Forest Resource Development in Ecuador	3
	2. Opportunities for Development of Ecuador's Forest Sector	5
	3. Constraints on Solving Forestry Sector Problems	6
C.	GOE and Ecuadorean Private Sector Policies and Programs	10
	1. GOE Policies and Programs	11
	2. Private Sector Initiatives	12
D.	Other Donor Activities	13
	1. International Donors	13
	2. Other Bilateral Donors	14
	3. Other U.S. Government Efforts	15
E.	USAID Country Development Strategy	15
F.	Project Model	19

II. DETAILED PROJECT DESCRIPTION

A. Project Goal, Purpose and Strategy 22
B. Description of Project Activities 22
1. Institutional Development of the National Forestry Program and Other Forestry Institutions 22
2. Productive Forestry Demonstration Activities 28
3. Watershed and Protective Forest Management 36

III. PROJECT ANALYSES

A. Technical Analysis Summary 42
B. Economic Analysis Summary 43
C. Social Soundness Analysis Summary 46
D. Administrative Feasibility Summary 50
E. Environmental Concerns 53
F. Financial Analysis 55

IV. IMPLEMENTATION ARRANGEMENTS

A. Implementation Planning 59
1. Project Timetable 59
2. GOE Administrative Responsibilities 60
3. Procurement 61
4. USAID Monitoring Arrangements 62
B. Evaluation Plan 63
C. Conditions and Covenants 64

FORESTRY PROJECT PAPER ANNEXES

I. Standard Exhibits

- A. Letters of Application
- B DAEC Guidance Cable
- C. Statutory Checklist
- D. Draft Loan Authorization

II. Logical Framework

III. Project Design Exhibits

- A. Productive Forestry Demonstration Activities
- B. Watershed and Protective Forest Management Activities

IV. Economic Analysis

- A. Sector Analysis
- B. Benefit-Cost Analysis

V. Social Soundness Analysis

VI. Technical Analysis

- A. Productive Forest Demonstration Activities
- B. Watershed and Protective Forest Activities

VII. Financial Exhibits and Cost Analyses for Major Project Activities

VIII. Time-Phased Implementation Plan

IX. Institutional Analysis

X. Initial Environmental Examination.

SUMMARY AND RECOMMENDATIONS

A. Introduction and Overview

The Republic of Ecuador will be confronted by serious economic and social problems during the decade of the 1980's. After growing rapidly during the 1970's because of the petroleum boom and extensive foreign borrowing by Ecuador's private and public sectors, the nation is faced with a situation in which economic growth is likely to be slow or non-existent. Oil production is unlikely to expand significantly in the medium term; oil prices, at least in the short run, are falling; and the ability to significantly increase its net foreign borrowing is minimal, given Ecuador's large amount of outstanding debt at high, commercial interest rates. According to recent IBRD and USAID macroeconomic studies, the country's medium term economic prospects, therefore, are not promising.

At the same time, the Government of Ecuador (GOE) fully recognizes the pressing social needs of the country, particularly in rural areas. Despite increasingly severe economic constraints it remains committed to a serious development effort which focuses on assistance to the rural low income families. The 1980-1984 National Development Plan identified 43 priority development projects to be implemented during the quinquenium of which the majority directly benefit the rural sector. Despite severe budgetary constraints, it is making a significant effort to implement the Plan. Implementation of the Integrated Rural Development program, partially financed by A.I.D., IBRD and IDB, continues to have a high priority in the GOE's plans.

A gradual change in perception of appropriate development is taking place in a growing number of GOE decision-makers and others who influence policy making. It is increasingly being recognized that a stronger emphasis must be directed of the promotion of productive activities that can generate the additional revenues required to carry out priority social programs. There is also a concomitant recognition that the private sector, rather than the public sector, must provide the impetus to generate the economic growth which is a prerequisite to the improved well-being of Ecuador's poor majority.

Within this context, the forest sector offers significant opportunities for an expansion of a productive activity which can generate a substantial amount of employment for Ecuador's low income rural families and substantially add to Ecuador's GNP. This contribution can come both from increased wood production in the humid tropics and in the Sierra for export (e.g., plywood veneer, balsa) and for internal consumption (e.g., fuel- wood, sawnwood), and from the protection of major hydroelectric, irrigation and potable water investments.

Forest production is primarily a private sector activity while forest protection is largely a responsibility of the public sector. However, before the forest resource can be utilized rationally from an economic perspective, the public and private sector institutions related to this sector must be strengthened and the technologies employed by these institutions must be improved. Accordingly, institution building and technology transfer are the focus of the A.I.D. project proposed herein.

B. Background and Conceptual Framework.

Ecuador's forest resource has been poorly managed for decades. In the early years of the twentieth century the Amazonian tropical forest was a major source of natural rubber. During the 1930's and 1940's the country became the leading producer of balsa wood. By the 1960's major exploitation of high value tropical hardwoods had become an important economic activity, especially in the northwest coast. This forest resource has been exploited rather than managed. As a result, significant depletion of the resource is occurring with little or no effort to utilize the resource rationally. Because of very great population pressures in the highlands, native tree species have been significantly depleted. They have been for all intents replaced by eucalyptus introduced from Australia during the 19th century. While eucalyptus grow extremely rapidly and have an important economic value as fuelwood and for construction, they are often inappropriate for controlling soil erosion. Ecuador's humid tropical forests have to some extent been deforested by selective logging operations but more so by the extensive colonization which has occurred both in coastal Ecuador and in the Amazonian region since the 1950's. Until recently, Ecuadoreans paid little attention to the need for effective use of its forest resources. Indeed, the Ecuadorean Agrarian Reform and Colonization Institute (IERAC) has in the past maintained a policy that 50 percent of a colonist's holding has to be cleared of forest and put into "productive" use before IERAC will award him title to the land. Consequently, extensive deforestation has occurred during the past three decades both on the coast and in the Oriente, totaling over 800,000 hectares. In most instances little benefit from the utilization of forest resources has been obtained.

The productive management of the forest resource in Ecuador during the coming decades represents a significant challenge which must begin to be confronted immediately if substantial future economic benefits are to be realized. Because vast areas of the most accessible forests have been destroyed, it is important not only to begin to develop ways to utilize Ecuador's remaining natural forests better, but also to initiate an active and wide-spread reforestation program. Given the nature of Ecuador's geography, such a program must be located in the Sierra, the humid tropics and arid lowlands, and must be technically, economically, ecologically and socially sound in these regions. In order to accomplish this objective, an improved

institutional and technical base must first be developed. To date, there has been little experience in Ecuador with regard to the management of the forest resource. Although there have been some reforestation efforts carried out in the Sierra using pine, these have been small in scale compared to the magnitude of effort which will be required in the future. In addition, these efforts have often been deficient in their implementation from a technical, economic and/or social standpoint.

A prerequisite to any large scale, effective forest management/reforestation program in Ecuador is the development of the knowledge base about forest management/reforestation in Ecuador's varied geographic/climatic/cultural conditions. Applied silvicutural research must be initiated to provide the long-term foundation for the program. Also, an extensive range of commercial scale pilot forest management/reforestation activities should be undertaken. These efforts include, in addition to plantation establishment, on-farm tree planting and agro-forestry systems. Because the private sector will necessarily have to undertake the major portion of any large scale forest management/reforestation effort, private sector as well as public sector institutions should participate in the research and pilot activities. These pilot activities should be undertaken where future forestry activities could be appropriately implemented and should involve the socio-cultural groups who are likely to be direct or indirect participants. Finally, an initial experience in developing and implementing protective forest management plans in Ecuador must be obtained.

The activities proposed in this project are designed to establish an institutional framework adequate for the future implementation of large scale forest management/reforestation activities in Ecuador. Moreover, the project will promote the participation of Ecuador's private sector in these activities to the maximum extent practicable.

C. Project Description

The future expansion of forest sector activities in Ecuador requires the creation of a more appropriate and capable institutional structure and a greatly expanded body of knowledge about the country's forest resources. The purpose of the project is to strengthen Ecuadorean public and private sector institutional capacity to develop and utilize Ecuador's forest resources rationally. The project will enhance the GOE's capacity to assist and support private and public sector initiatives in the development and management of production forests and on-farm forestry, and it will initiate development of a public sector capacity to manage protective forests effectively. The project's three interrelated components are:

1. Institutional Development of the National Forestry Program and Other Forestry Institutions. This component will help reorient priorities in the National Forestry Program (PNF) so it may more effectively support other forest sector institutions which will implement forest management/reforestation activities. Through technical assistance, training and material support, this component will strengthen the PNF's capacity for forestry planning and programming, research coordination, information dissemination and technical services outreach.

2. Productive Forestry Research and Field Demonstrations. This is the principal component of the project, accounting for two thirds of project resources. Forest (primarily silvicultural) applied research and field demonstration activities will be coordinated by the PNF and carried out in collaboration with the communities, groups, and private and public sector institutions which are the end users of the information in order to increase basic knowledge about native and promising exotic species, control of tree diseases, nursery and planting practices, etc. Such knowledge generation is essential to maximizing the long-term productive returns from Ecuador's forest resources. The activities will be carried out in each of Ecuador's major ecological zones related to forest resources: Sierra highlands; arid coast; and humid tropics. The individual demonstrations will be of a large enough scale to prove commercial feasibility while simultaneously contributing to Ecuador's afforestation/reforestation needs. Some 10,000 hectares will be involved.

3. Protective Forest and Watershed Management. A large part of Ecuador's remaining forest resource can provide maximum economic benefits by remaining in a protected state and serving to protect major infrastructural investments in hydroelectricity, irrigation and potable water. In order for this to occur, this component will develop a capacity to delimit protective forests in critical areas and to implement management plans for such protective forests in key watersheds.

This project represents a continuation of the Mission's longer term strategy (as outlined in its approved CDSS) to support improved development and protection of Ecuador's forestry and other natural resources. The strategy began in FY 1980 with USAID's environmental conservation project with the Ecuadorean PVO Fundacion Natura which is focussed on educating the Ecuadorean public about the country's growing environmental degradation such as deforestation. In accordance with this strategy, a soil conservation subproject is also included in the Rural Technology Transfer (Title XII) Project approved in FY 1980. This Forestry Sector Development Project is designed to strengthen institutional and technical capacity so that Ecuador can absorb an increasing volume of resources and direct them to forestry development activities. The project will lay the institutional and technological base necessary for the generation of follow-on projects later in

the 1980's (from A.I.D. or other donors) to support private sector industrialization and development of export markets for Ecuadorean forest products.

D. Ecuadorean Coordinating and Implementing Institutions.

The National Forestry Program (PNF) of the Ministry of Agriculture will be responsible for coordinating most project activities. Under Ecuador's recently promulgated Foresty Law, the PNF is mandated to serve as the agency responsible for administering Ecuador's forest patrimony. By law, it is responsible for: (1) the delimitation and development of management plans for protective forests; (2) the development of a national forestry plan to be implemented in coordination with interested public and private sector institutions; (3) the authorization of the right to utilize productive forest lands owned by the State to public, mixed or private institutions; and (4) the promotion, coordination and implementation of research related to the conservation, administration, utilization and development of forest resources and to the natural areas within Ecuador's forest patrimony. Thus, the PNF has a clear responsibility related to the development of Ecuador's forest resource potential and must necessarily play a key role in this regard. The PNF's capacity to carry out its clearly defined legal responsibilities will be enhanced by its coordinating/implementing role.

The PNF, however, is an institution which for the foreseeable future will have limited human and financial resources and which, therefore, is not in a position to undertake primary responsibility for implementation of many of the activities included in this project. Nor is it likely that the PNF would ever be able to undertake by itself truly large-scale forest management or reforestation programs unless the institutional structure of the forestry sector were to undergo drastic changes. Therefore, project activities will be implemented to a very large degree in conjunction with those forest sector institutions (private and public) which are likely to play important roles in the implementation of forest sector activities.

Specifically, project activities will be implemented with the participation of several of the more important private sector forest industries which are members of the Asociacion Ecuatoriana de Industriales de la Madera, as well as through mixed forest enterprises (the Empresa de Desarrollo Forestal, EMDEFOR and the Industria Forestal Cayapas) and a number of public sector institutions (e.g., Integrated Rural Development Projects in Salcedo and Jipijapa, regional development organizations, and the Ecuadorean Electrification Institute INECEL).

E. Summary Financial Plan (US$ 000)

Project Components	A.I.D. Loan	A.I.D. Grant	Host Country	Total
I. Institutional Development	900	900	800	2,600
II. Productive Forest Research and Field Demonstrations	4,500	450	5,500	10,450
III. Protective Forest Management	800	250	900	1,950
Sub-Total	6,200	1,600	7,200	15,000
Contingencies	300		300	600
TOTAL	6,500	1,600	7,500	15,600

F. Issues

1. The Role of the National Forestry Program and its Relationship with other Forest Sector Institutions.

In the past, the National Forestry Program utilized most of its human and financial resources to directly implement reforestation activities. Fifty-six percent of the PNF's budget for FY 1982 is allocated for reforestation programs implemented by the PNF. In addition, a large percentage of its staff has been assigned to carry out regulatory functions, particularly efforts to control the harvesting of tropical hardwoods. Neither of these activities are being effectively or efficiently carried out. Nevertheless, they absorb a very large percentage of the PNF's available resources. Should these circumstances continue, the PNF would not be in a position to carry out the important coordinating and support role assigned to it by the new Forestry Law. Not only would insufficient resources be available to carry out these other responsibilities, but also the competitive and even adversary relationships which the PNF currently has with other private and public forestry sector institutions that engage in reforestation activities and/or are exploiting existing forest resources would continue. Such a situation would very likely severely constrain the future development of Ecuador's forestry sector.

The project design addresses this problem by actively promoting the PNF's coordination role while encouraging other forestry sector institutions to undertake a major part of the responsibility for implementing project activities. The project strengthens relationships between the PNF and the other forestry sector institutions which are cooperative rather than competitive or adversarial in nature. This approach

is based on the premises that PNF alone, because of its human and financial constraints as well as its location in the Ministry of Agriculture, cannot have a field level capacity with the depth and breadth necessary to confront all of Ecuador's forestry sector problems. Assistance and participation of other entities is necessary. This premise is accepted by the PNF's executive and technical directors.

While a substantive change will be required in PNF's operating approach, the change will be gradual and consistent with PNF's legal basis set forth in the new Forestry Law. The change will be implemented through the positive incentive provided by project funding for inter-institutional agreements with public and private sector forestry entities. These agreements will permit PNF to influence field activities of these other forestry entities and to obtain important feedback on the results of the field demonstrations. At the same time, PNF will be developing a clientel or constituency that will build the basis for future support. Thus, USAID concludes that the change in the institutional role of PNF being sought under the project is appropriate and feasible.

2. Financing of Project Activities.

Because of the severe difficulties which are currently confronting the Ecuadorean economy, the GOE is making every effort to limit public sector expenditures. Consequently, the PNF will not receive the full 250 million sucres mandated by law in 1982. Under these circumstances the PNF's ability to utilize A.I.D. support effectively and to meet its counterpart contribution must be carefully scrutinized.

The project design has dealt with this issue by proposing that PNF resources (human and financial) be reallocated rather than expanded. Only a very minimal expansion of the PNF's staff and budget is required during the life of the project in order to carry out the proposed project activities effectively. Instead, other public and private sector resources will be mobilized to implement project activities. Many of these institutions, particularly those in the private sector, do not face the very severe budgetary constraint faced by the PNF. Other public sector institutions often have more budgetary resources available for forestry than does the PNF. By combining the resources of the PNF with those of other participating institutions, the resource constraint will be overcome.

In fact, half of the host country contribution will come from public and private sector entities other than PNF. These resources will be mobilized through inter-institutional agreements in which PNF will use A.I.D. funds to partially finance field demonstrations. During project development USAID critically reviewed the degree of interest of potential participating entities. All indicated a serious willingness to enter into co-financing agreements for the proposed field demonstrations.

3. GOE Commitment.

Forestry is a sector in which the returns on investments made today are generally realized after many years (15, 20, or more). Given this fact and considering the budgetary constraints identified in Issue 2, does the GOE have a sufficient degree of commitment to the forestry sector to warrant financing this project?

The GOE has demonstrated a very high degree of commitment to the forestry sector during the Presidencies of Roldos and Hurtado. This commitment can be traced back to proposals and strategies outlined during the election campaign. Forestry is one of the elements set forth in the 1978-79 so-called "21 points" of their very effective campaign literature. Specifically, it said that the Roldos-Hurtado administration:

> "will place special emphasis on the development of forestry which, apart from being essential for the construction industry and vital for the preservation of ecological equilibrium, can be one of the country's most important sources of foreign exchange."

The need to expedite reforestation/afforestation efforts was highlighted further in working documents elaborated shortly after the August 1979 elections. The 1980-84 National Development Plan counts on a growth rate in the forestry sector that exceeds other components of the primary sector, i.e., agriculture, livestock and industry. Two of the Plan's 41 priority projects are in the forestry sector. While a number of projects included in the Plan have been postponed indefinitely, the forestry projects will apparently be implemented although their size may be reduced.

In 1981, the GOE implemented two extremely important legislative/administrative reforms. A new Forest Law which substantially strengthens the GOE's mandate to develop the forestry sector was proposed by the executive and passed by the Ecuadorean legislature. In addition, the Forestry Department of the Ministry of Agriculture was upgraded to the status of a Program which gives it significantly more administrative flexibility. Furthermore, although the PNF will not receive its full 1982 budgetary resources, its budget has been greatly increased in recent years and it will receive more resources in 1982 than any other Ministry of Agriculture Program with the single exception of the National Coffee Program.

4. Scope of the Project Activities

The project has three components, with the second component, Productive Forestry Demonstrations, by far the largest in terms of funding allocation. The appropriateness of the project scope with respect to the need for all three components and their scale was reviewed by USAID as a potential issue.

The first component, PNF Institutional Development, is a fundamental element of the project. USAID considers current institutional weaknesses as a major constraint to expediting the productive utilization of Ecuador's forestry resources. In order for USAID to be able to influence and shape PNF's future institutional role and capacities, it must be able to offer a critical mass of technical assistance and training resources. The level of technical assistance and training envisaged under this component is concentrated during the first four years of the project and represent the minimum necessary to achieve this critical mass.

The Watershed and Protective Forest Management component constitutes a limited, but catalytic, effort to improve Ecuador's institutional capability to protect a crucial resource that is rapidly deteriorating, i.e., its watersheds. As described in the Project Paper, the institutional responsibility for watershed management in Ecuador is,by necessity,divided. The small amount of project resources allocated to this third component (approximately 12.5 percent of the total) represents an opportunity to consolidate somewhat the institutional responsibilities for this type of activity and to improve the response effectiveness of individual institutions. Given the substantial economic returns just from one aspect of improved watershed management--extended operational life of major hydroelectric investments--the project would be remiss in not responding to this need.

The Productive Forestry Demonstration component accounts for 70 percent of total A.I.D. financing. It is an essential complement to the institutional development component which will rely to a large degree on a process learning approach involving field demonstrations to achieve "learning-by-doing". In addition to having a training impact on the staff of PNF and other forestry sector entities, the field demonstrations will permit applied research to be carried out in an effective and meaningful manner.

The relatively large number of demonstrations planned under the project is inescapable, largely because of Ecuador's varied geography. Reforestation/afforestation techniques and approaches must be demonstrated in Ecuador's highland Sierra, humid tropics (on both sides of the Andes) and dry coastal areas if PNF is to truly have national coverage. Each of these areas requires not only technologies appropriate to the region, but also institutional approaches specific to the varying socio-cultural characteristics of campesinos and Indians.

At the same time, the scale of individual demonstrations should be large enough to present definitive findings and, where possible, to contribute towards resolving Ecuador's deforestation problem. Experimental plot size trials are not necessarily conclusive particularly if they do not represent the operational conditions faced by those expected to carry out reforestation/afforestation. Moreover, PNF is at an institutional stage where it must move

away from an emphasis on studies and report preparation and towards the achievement of more significant field level accomplishments. The scale of field demonstrations is designed to help PNF mature as an institution. Neither the number nor the scale of field demonstrations can be reduced.

In sum, each of the projects components are needed. Significant interrelationships exist between the institutional development component and the two field level components. The level of effort of each component represents the minimum amount necessary to assure achievement of project objectives.

5. Relation of the Forestry Project with the Rural Technology Transfer System.

A.I.D. is financing a major GOE effort to establish a Rural Technology Transfer System which is designed to promote, coordinate, and disseminate research related to Ecuador's rural sector. The forestry project is to a very great degree an applied research project. As such it could very well be included as a subproject within the RTTS system. Certain advantages, particularly with regard to the procurement mechanism for obtaining technical assistance are evident. Also, linkages with other RTTS subprojects have been clearly identified. (See Section I.E.)

During the intensive review of the project USAID carefully evaluated the possibility of including this project as a subproject under the RTTS. USAID concluded, however, that it would be preferable not to include it for two major reasons. First and foremost, the institution-building strategy of the forestry project which emphasizes the establishment of an on-going cooperative relationship between the National Forestry Program and other private and public forestry sector institutions would be more difficult to implement. There would be a strong likelihood that all parties would view the cooperative agreements as temporary, "life-of-project" arrangements if they were administered though a third party rather than directly by the PNF. Secondly, the RTTS is a new institutional structure, and, although it is functioning with sufficient success to fully merit an additional increment of A.I.D. funding of $5.0 million (an increase of 100 percent in terms of A.I.D's contribution), an additional project which would add an even greater increase and require the administration of a large number of agreements would add an overly heavy burden to an RTTS management structure.

Moreover, it should be emphasized that the linkages with the RTTS project are at the subproject level. PNF will directly draw on the results and resources available from RTTS subproject implementing entities such as INIAP, Ecuador's agricultural research institute. The establishment and encouragement of such inter-institutional relationships are a part of the project's objectives.

G. Project Development Committee

1. The principal author of the Project Paper was Dr. Robert Jordan. The Project Development Committee, co-chaired by Dr. Fausto Maldonado and Dr. Jordan, was composed of the following USAID Officers who were responsible for project design and contributing to the Project Paper:

Dr. Robert Jordan,	Project Development Officer
Dr. Fausto Maldonado,	Agricultural Development Officer
Mr. Paul Fritz,	Project Design and Implementation Officer
Dr. Vincent Cusumano,	Rural Development Officer
Mr. Carlos Luzuriaga,	Program Economist
Mr. Richard McClure	Controller
Mr. Patricio Maldonado,	Program Officer

2. The following GOE personnel participated in the development of the project:

Ing. Carlos Aguirre,	Executive Director, National Forestry Program (PNF)
Ing. Juan Salinas,	Technical Director, PNF
Ing. Oswaldo Vivanco,	Chief, Forest Management, PNF
Ing. Jorge Montesdeoca,	Planning and Evaluation, PNF
Ing. Arturo Ponce,	Chief, Natural Areas and Wildlife, PNF
Ing. Segundo Jadan,	Chief, Research and Training, PNF
Ing. Oswaldo Mantilla,	Forest Management, PNF
Ing. Victor Alomoto,	Chief, Planning and Evaluation, PNF

3. The following persons contributed to the formulation of the project:

Ing. Enrique Laso,	General Manager, Empresa de Desarrollo Forestal (EMDEFOR)
Ing. Gustavo Cortaire,	Private Consultant

4. The following consultants and TDY personnel assisted in design studies or in preparation of the Project Paper:

Dr. Joshua Dickinson,	Private Consultant, Project Design Consulting Team Coordinator and Ecologist
Mr. William McCredie,	American Forest Products Association, Forest Industries Expert
Mr. Bruce Burwell,	Private Consultant, Forest Plantations and Nurseries Expert

Dr. Theodore MacDonald,	Cultural Survival, Harvard University, Anthropologist
Ing. Leonidas Vega,	Private Consultant, Tropical Forestry Expert
Dr. Patrice Harou,	University of Massachusetts, Amherst, Forestry Economist
Dr. William Fleming	State of New Mexico, Watershed Management Expert
Mr. Anthony Ormasa,	Private Consultant, Institutional Analyst
Mr. Gary Wetterberg,	United States National Park Service, Parks and Wildlands Expert
Mr. David Joslyn,	S&T,FNR, Forestry Division Chief

5. This project was reviewed and approved by the following officers:

Mr. John A. Sanbrailo, Director, USAID/Ecuador
Ms. Annette Adams, Regional Legal Advisor

H. Recommendation

The project proposed in this Project Paper was designed by a team composed of professionals from GOE institutions, USAID/Ecuador, and AID/W. Substantial design input was received from a number of private consultants who are highly qualified experts in their respective fields. The project design was carefully worked out with the National Forestry Program and was fully discussed with a large number of private and public forest sector institutions.

USAID has received strong support for the project design from the great majority of the Ecuadorean private and public sector institutions which were consulted during the design of the project. The project was reviewed and approved by the USAID project review committee which has concluded that the project and its components are technically, economically, socially, administratively, environmentally and financially sound. The committee noted that the project is consistent with key guidance contained in Section 103(b)(3) 118 of the Foreign Assistance Act which deals with Forestry and with the Environment and Natural Resources. It also reflects the A.I.D. policy on Natural Resource Conservation as formulated in Administrator McPherson's recent testimony to the Congress, which stresses the importance of well managed tropical forests and the need to implement programs which result in the more rational use of forest resources. The project review committee recommends that the project be approved by AID/W and that an A.I.D. loan for $6.5 million and a grant for $1.6 million be authorized.

I. BACKGROUND AND JUSTIFICATION

A. Analytical Framework

1. Studies and Technical Data

The status and characteristics of Ecuador's forestry sector have been analyzed in a wide variety of studies, including 11 reports prepared specifically for USAID by consultants or AID/W personnel.[1/] The consultants' reports and a large number of studies, reports, and articles prepared by various GOE entities, international organizations and private consultants were extensively used by the project design team to develop the project. The breadth and depth of the consultants' reports and other literature underscore that there is ample knowledge of the problems confronting the development of the forestry sector. Further, a number of concrete recommendations and suggestions on how to proceed in resolving these problems are available. Field testing and research trials on a realistic scale have been identified as elements which are of key importance for the future development of the sector.

The nature of Ecuador's reforestation problem is amply documented in the Environmental Assessment recently prepared by Fundacion Natura with USAID financing as well as a "Preliminary Environmental Sector Analysis for Ecuador" by CHEMONICS and "Draft Environmental Report on Ecuador" prepared by the Library of Congress. Also, much has been written on the socio-cultural aspects of the man/land relationships that contribute to the deforestation problem. The documents include case studies proposed by Ecuadorean Social Scientists, dissertations of U.S. Ph.D. candidates, as well as books and journal articles.

1/ The consultants' reports (available in USAID and LAC/DR files) include: (1) Vega, Leonidas, "Assessment of Possibilities for the Management of the Tropical Rainforests of Ecuador," March, 1982; (2) Harou, Patrice, "Forestry Sector Analysis and Forestry Economic Analysis", March, 1982; (3) MacDonald, Theodore, "Development of Ecuador's Forestry Resources and Institutions: Social Considerations", February, 1982; (4) Burwell, Bruce, "Highland and Arid Lowland Forest Plantations in Ecuador, "April, 1982; (5) McCredie, William, "The Forest Industries in Ecuador", February, 1982; (6) Maldonado Fausto, "Forest and Soil Conservation in Ecuador", April, 1980; (7) Ormasa, Anthony, "Institutional Development of the National Forestry Program", March, 1982; (8) Fleming William "Forestry Sector Development: Watershed Management Consideration", February, 1982; (9) Deely, Dan, and George Guess, "A Public/Mixed Enterprise Approach to Forestry-National Resource Management for Integrated Rural Development in Ecuador", 1980; and (10) Wetterberg, Gary, "Ecuador -- "Wildlands and Wildlife", February 1982.

A number of reports that provide an overview of institutional and technical aspects of Ecuador's forestry sector have been prepared by FAO experts and IDB missions, as well as by technical experts provided by other organizations such as the Overseas Development Administration and the Commonwealth Development Corporation. These include: (1) a 1974 UNDP/FAO Working Document prepared by F. Arboleda and A. Anderson entitled "Situacion Forestal en el Ecuador"; (2) a 1981 IDB document (10571) prepared by M. Steward entitled "Asesoramiento para la Identificacion de Oportunidades de Inversion en el Sector Forestal"; (3) the 1981 final report of Robert Dixon, an FAO advisor entitled "Ecuador-Desarrollo Forestal"; (4) a 1977 UNDP/FAO study prepared by A. Putney, entitled "Estrategia Preliminar para la Conservaci¢n de Areas Silvestres Sobresalientes del Ecuador"; (5) a 1976 UNDP/FAO Working Document prepared by W. Beattie, entitled "Analisis de los Recursos Forestales del Nororiente del Ecuador y su Papel Actual y Potencial en el Desarrollo de la Regi¢n"; (6) Hans Peter Spier and Christian Brederbick "Arboles Lejosos para Reforestar las Tierras Altas de la Regi¢n Interandina del Ecuador"; (7) an ODA report by D.B. Webb "Arid Zone Forestry Project - Ecuador, 1974-1979"; and (8) R. Dixon, "Proyecto para la Conservaci¢n de Recursos Naturales, Suelos, Hidrolog§a, y Bosques en la Cuenca del R§o Paute", 1981.

GOE and other Ecuadorean entities have generated forestry development plans and strategies as well as a wide variety of technical and geographic studies that were heavily drawn on during project design. These include (1) MAG/PNF "Situacion Actual y Plan de Desarrollo 1980-1984, Subsector Forestal"; (2) MAG/PNF "Plan Operativo, 1982"; (3) Carlos Aguirre, "El Sector Forestal en el Ecuador", June 1982; (4) Enrique Laso, "Estudio de la Empresa de Desarrollo Forestal", May, 1980; (5) Oswaldo Mantilla, "Zonificaci¢n Potencial Forestal con Recomendaciones de Especies, Sierra"; (6) John Bishop, "Agroforestry Systems for the Humid Tropics of the Andes"; (7) Julio Rosero, "Informacion sobre la Silvicultura de Balsa y Pechaco en Santo Domingo.

In addition to the studies and reports mentioned above, the team had access to a significant amount of pertinent information on forestry activities provided by the PNF, EMDEFOR (the Empresa de Desarrollo Forestal) and private enterprises. Thus, the final project design is based on a more than ample amount of relevant information.

2. Setting

Over one-half of Ecuador's land surface is or should be dedicated to forest activities. Some 12,000,000 hectares are most appropriately used for forestry purposes. Currently, however, the forest resource is not being used rationally. Very great opportunities exist to increase the productivity of this resource and, consequently, to increase forestry's contribution to Ecuador's Gross National Product. At present forestry's contribution to the GNP is relatively small, approximately four percent, according to the official accounts. Nevertheless, when the tremendous volume of wood used for fuel and rustic construction and the contribution of forested watersheds to the quality and quantity of water available for irrigation, hydroelectricity, and domestic uses, which are unaccounted for in the official statistics, are considered, the importance of the forest resource is significantly greater.

The forest resource serves two major functions, productive and protective, both of which are essential to the development of Ecuador.

Productive functions of the forest resource include:

- o Production of plywood, particle board and high value woods such as balsa for export and internal consumption.
- o Import substitution in pulp and paper production and in natural rubber.
- o Production for internal consumption of sawnwood, poles and, particularly, fuelwood to serve as a substitute for petroleum derivatives which will become increasingly expensive.

Protective functions include:

- o Protection of major infrastructural investments in hydroelectric generation, water supply and irrigation through management of protective forests.
- o Maintenance of coastal fisheries and shrimp farm production through protection of coastal mangroves.

Forest production is primarily a private enterprise activity which can be enhanced by support from public institutions. Management of the protective forest resource is largely a function of the public sector. Although development of both the productive and protective functions can make substantial contributions to Ecuador's economy, a significant amount of institutional strengthening and technology transfer is required in order to establish a sound basis for the development of Ecuador's forest resources.

B. Statement of the Problem.

1. Status of Forestry and Forest Resource Development in Ecuador.

Most economic activity related to forestry in Ecuador, except for large amounts of eucalyptus planting in the highlands, has involved the exploitation of natural forests. Although the current contribution of forestry activities to Ecuador's GNP is low, the sector offers a relatively untapped potential for contributing to Ecuador's economic development. The total production value of forest industries has increased from 2.2 percent in 1970 to 4.6 percent in 1978 as a share of total manufacturing. Total employment in forestry related activities is estimated to be the fulltime equivalent of 30,000 persons, excluding the substantial amount of human effort devoted to gathering fuelwood. Despite Ecuador's hitherto abundant supplies of wood, the country has historically run a net trade deficit in forest products. In 1978, the latest year for which statistics are available, Ecuador imported approximately $50 million of forest products, primarily pulp and paper products, while in the same year it exported approximately $17 million of forest products.

Rather than being rationally developed to take full advantage of current and future opportunities for their economic utilization, Ecuador's valuable forest resources are being inefficiently and often uneconomically used. In the Sierra, strong population pressures combined with an extremely inequitable land tenure system has meant that the natural forests have long been cleared for fuelwood and to cultivate land which should be in forests . This cultivation is often carried out on steep slopes with loose soils which, when combined with inappropriate tillage and irrigation practices, has resulted in serious soil erosion problems. In many areas of the Sierra, wind erosion is also a problem where fine sandy soils are found. Some trees have been planted to serve as wind breaks and for erosion control purposes -- but not nearly enough.

In the Oriente colonization and petroleum exploration are combining to cause extensive deforestation. The GOE's policy, recently changed, of offering settlers 50 hectares of land with the provision that at least half the land be cleared within five years, combined with the extreme fragility of a very large percentage of the tropical soils in the region and the consequent depletion of its fertility in two or three years, has resulted in massive deforestation with very little of the timber resource even utilized.

Although parts of the coast have always been arid with sparse tree cover, the more humid Province of Esmeraldas is still largely in natural forest. These natural forests are now being threatened by both settlers and by a burgeoning timber industry which, to date, has paid scant attention to the need to develop sustained yield forestry in order to assure an adequate future supply of tropical hardwoods. Often the settlers who are moving into the area occupy land assigned to timber concessionaires who, as a result, feel no responsibility toward the fulfillment of their legal obligation to replant cleared lands.

Should these trends continue, it is likely that Ecuador's seemingly vast forest resource will be effectively depleted within 15-20 years. Further, the clearing of Ecuador's forests, in addition to bringing about the destruction of a valuable resource, exacerbates other serious environmental problems such as soil erosion and, ultimately, desertification. This phenomenon, which is the end product of deforestion and soil erosion, is taking place at an alarming rate in many areas of the coast and highlands. It is estimated that within the past 25 years arid land in Ecuador has increased by 31.5 percent with 10,000 km^2 now estimated to be arid. One recent study estimates a progressive rate of desertification of approximately 5,000 hectares per year.

Clearly, Ecuador's forest resource contributes relatively little to the nation's economy in comparison with the potential contribution it could make. This potential can be attained only if the private and public sector institutions which deal with forestry are more adequately developed so that an economically, socially and ecologically rational utilization could take place.

2. Opportunities for the Development of Ecuador's Forest Sector

a. The Future Demand for Wood Products

The major internal demand for forest products is for fuel wood, construction and industrial uses. (See Annex IV.A - Forestry Sector Supply and Demand Analysis). Total roundwood equivalent requirements for these purposes averaged 210,000 cubic meters between 1975 and 1980. By 1990 consumption is projected to be between 8,200,000 and 10,200,000 cubic meters. Further rapid growth of demand is projected for the following decade as well. By the year 2000 demand for roundwood will have more than doubled from current consumption levels.

A significant amount of current consumption of roundwood (approximately 80 percent) is used for fuel. This use is likely to continue for the indefinite future -- as long as supplies of fuelwood are available -- since the relative price of the major petroleum derivative fuels, kerosene and gasoline, which are currently subsidized, will undoubtedly increase during the next several years. Internal demand for sawnwood, wood-based panel and pulp and paper products will also grow very rapidly during the current decade. In addition, there is a significant internal demand for other forest products, in particular, natural rubber used for tire manufacturing. Currently, Ecuador produces about twenty percent of its natural rubber requirements while it imports the rest. The annual value of imported rubber is $3.9 million.

The future export market for forest products is also very promising, although it is more subject to international economic cycles and to changes in relative prices of exported products with possible substitute products. Ecuador has been the world's leading exporter of balsa wood for the past forty years. In 1980, it exported $9.5 million of balsa and, while the international market price fluctuates substantially from year to year, it is probable that the volume consumed for industrial uses will increase significantly during the coming two decades. The export market for high value decorative veneer plywood panels made from tropical hardwoods has developed rapidly during recent years. Ecuador currently exports panels to Colombia and Venezuela but has not yet tapped potentially very lucrative markets in the United States and Europe. The future export possibilities for these panels are very great compared to current production levels.

b. Need for Protective Forests

The massive deforestation which is taking place in Ecuador has a number of deleterious impacts. In many circumstances the clearing of forests combined with inappropriate land uses or land use technologies results in a significant degradation of the soil resource. This has several consequences. First, soil productivity is often irreversibly degraded. Second, increased erosion rates often jeopardize major downstream investments in hydroelectricity, irrigation and/or potable water. In addition, the desertification process which is occurring in parts of Ecuador is undoubtedly exacerbated. In other circumstances unique and valuable plant or animal genetic

pools may be jeopardized. A major example is the destruction of the mangrove forests which serve as the breeding grounds for much of Ecuador's coastal fish and shellfish population -- including shrimp, the export value of which exceeded $80 million in 1981 and will surpass $100 million in 1982.

In these circumstances the most valuable economic use for much of Ecuador's land surface may be as protective forest, subjected only to controlled or non-extractive land uses. A particularly critical function of the protective forest is its watershed management function. During the decade of the 1980's Ecuador will complete or initiate several major hydroelectric and multipurpose water projects which will require an investment of over $2,500,000,000. A key variable in the economic soundness of these projects is the length of their useful life. Other benefits include the regulation of seasonal water flows and reduced eutrophication and suspended sediment load which affects turbine operation.

Although Ecuador has in the past undertaken relatively few large scale water utilization projects, a recent study for one relatively small multipurpose project on the Ecuadorean coast (Poza Honda) found that the reservoir was being filled with sediment at the rate of four percent per year and that the useful life of the reservoir will be 25 rather than 50 years as estimated in the original design studies for the project. Currently, the GOE and IDB are investing over a billion dollars in a massive hydroelectric project in the Paute river basin. While estimates of the useful life of this project differ substantially -- no data base adequate to make reliable projections exists -- one study has estimated that, using present low energy prices (less than one sucre per kwh), an extension of the useful life of the Paute project by one year would have a present value of $4.5 million. While other measures will be required to rationally manage most of Ecuador's most critical watersheds, the establishment and management of protective forests is a feasible, least cost alternative for the upper parts of almost all of these watersheds.

3. Constraints on Solving Forestry Sector Problems

a. Technical

A major constraint to the rational development of Ecuador's forest sector is the lack of knowledge about the tropical forest resource. Although two Ecuadorean universities (Loja and Esmeraldas) offer degree programs in forestry and the PNF has conducted several two year programs to train forest technicians, there are obvious deficiencies in the quantity and quality of the human resource base at both the professional and technical levels. The qualitative deficiency is caused in great part by a lack of information about the forest resource in Ecuador. Most of the limited research conducted in the tropics has been highly academic in nature with few linkages to the practical implementation of forestry programs. The practical work that has been done in Costa Rica, Surinam, and Brazil has been limited and none has been replicated in Ecuador.

In the Ecuadorean highlands Monterrey pine and eucalyptus are being planted; however, the planting is generally done with little technical knowledge about either nursery or plantation management (See Annex IV.B). Further, the Monterrey pine and the species of eucalyptus which are usually planted (E. globulus) are subject to diseases for which no cure is known. Only one other pine species, (Pinus patula) has been tested sufficiently to permit consideration of its use for large scale reforestation programs. There is limited knowledge about other native or exotic species which could be used in highland reforestation activities. Species elimination trials have been carried out but only on a very sporadic and limited basis with little generation of technical information about the behavior of species and with no dissemination of the limited information which has been gathered. Information related to growth responses of different species to varying altitude, moisture and soil conditions is scarcely available. Knowledge about fertility requirements and plant diseases, as well as about nursery and plantation management does not exist.

In the humid and dry tropical lowlands of Ecuador, the knowledge constraint is even greater since there is even less experience in forest management and reforestation than in the highlands. There is no body of knowledge about either the management of existing natural forests nor about the reforestation with tropical hardwood species, although there is private sector experience with balsa and rubber plantations. Other than one twenty year old plantation of laurel, currently being used for plywood manufacture, only recently have humid tropical species been planted even on a trial basis. Basic information about nursery and planting techniques is not available nor does basic information about fertility requirements and plant diseases exist. Although the PNF has carried out some species trials in both humid and dry coastal areas in Esmeraldas Province and in Manabi Province, little useful information has been obtained from these trials because of their lack of continuity.

b. Socio-Cultural

A major consideration in the development of any large scale forest management/forestation activities is the relationship between the forest resource and the rural population in the Sierra, coastal, and Amazonian regions.

The Sierra population pressures combined with inequitable land distribution mean that land areas which, by their physical characteristics (soils, slope, altitude) should be classified as suitable only for forests, are being cultivated or used as pasture. In addition, the major use of the forest resource in the Sierra is as fuelwood. The rural highland population therefore does not appreciate future potential benefits from, for example, industrial utilization of pine trees. Consequently, there are limitations imposed by socio-cultural factors on the type of reforestation which is carried out as well as on how it is carried out. The recent tendency by the Ecuadorean forest sector agencies active in the highlands to promote the development of pine plantations presents several dangers over the long run.

First, massive plantings of pines are very likely to impinge upon land which has alternative uses within a campesino economy which already faces a severe land constraint. In particular, plantations are likely to be located on land which currently serves for pasture. Thus, even though the economic returns may be higher if the land is used for forestry rather than pasture, such a use may lead to social conflict. Also, the very large demand for firewood and resulting increasing scarcity means that from the campesino's perspective, eucalyptus may be a more attractive species to plant than pine -- for which no current use exists in the highland campesino economy. A related socio-cultural issue is that of incentives which may be required to stimulate campesino participation in reforestation activities. Because there is little understanding of future economic benefits which may be obtained from reforestation activities and because of economic pressures which tend to encourage productive activities which have quick returns, incentives, additional to future returns from reforestation, are likely to be required.

In the humid tropical areas of Esmeraldas and the Amazonian region population pressures are not as great as in the highlands. Nevertheless, significant colonization is occurring in these areas -- including areas of Esmeraldas which have been assigned as concessions to forest industries. The colonists are interested in exploiting the land, not the forest, resource. They are interested in generating cash incomes but since they are often unfamiliar with the nature of the environment which they are exploiting, they usually (1) do not make much money and (2) poorly manage the land which they put into cultivation so that its fertility is quickly lost. Colonists will often harvest the more valuable trees found on their exploitations. In addition they often let laurel, a valuable secondary growth species, naturally regenerate in plots in which they are planting pasture. Nevertheless, they do not manifest great interest in actively reforesting their plots. Although Amazonian Indian groups generally are better adapted to their environment than are colonists, their cultures are evolving, as a result of increased contact with the "national" culture, and they are as a general rule interested in participating in a cash economy. Consequently, they are seeking new ways to exploit their environment without, however, having an adequate knowledge of how to do so. Neither colonist nor Indian has a clear understanding of the fragility of the humid tropical environment and how to rationally exploit it so that it can be utilized on a continuous basis.

c. Institutional

The major limitation on the rational development of Ecuador's forest resources is institutional. The public and private sector organizations which work in the forest sector: (1) lack the institutional capacity to effectively address the issues and problems of the sector; and (2) do not adequately coordinate efforts to make optimal use of the human and financial resources which are available to them.

The Ministry of Agriculture's National Forestry Program (PNF) by law is responsible for establishing forest sector policies and for coordinating with other forest institutions to develop the sector. It is the

only institution with functions relating to all aspects of forestry including national parks, protective forests and matters related to natural areas and flora and fauna as well as to management of productive forests and to reforestation. The PNF has a staff of 68 professionals and 104 technical personnel. It has a budget of approximately $8.0 million per year. Although its current organizational structure is theoretically adequate to permit the implementation of its mandated responsibilities, the assignment of its staff must be rationalized and the quality of its human resource base upgraded before it can carry out its reponsibilities effectively.

Currently, the PNF devotes a major part of its resources to the execution of rather minimal reforestation activities. In 1981 it reforested 3,600 hectares, or 35 percent of the acreage which it had programmed. Twenty of the PNF'S 68 professionals and 38 of its 104 peritos (forestry technicians) work in this program while 57 percent of its 1982 budget is dedicated directly or indirectly to reforestation activities. Another significant portion of its resources is devoted to forest management. Approximately 14 professionals and 41 technicans are involved in forest management activities. In addition, 34 professionals and 21 technicians are assigned to such functions as training, research, and management of natural areas including protective forests and national parks.

In addition to the PNF a number of other institutions work in the forest sector. However, none has a broad-based approach with respect to the development of the forest sector. Several regional development institutions and one specialized forestry institution are implementing reforestion activities in the highlands. They have little or no technical capacity in reforestation. The PNF provides them some technical expertise on an intermittent basis. Only EMDEFOR (Empresa de Desarrollo Forestal), a mixed enterprise, has an adequate in-house technical capability in reforestation matters. Only one private sector institution, Aglomerados Cotopaxi, a particle board manufacturer, has initiated reforestation activities (on a small scale) in the Sierra.

In the humid tropics, the only forest management/reforestation accomplished to date, except for small acreages in balsa and rubber plantations, has been on a very small-scale experimental basis with tropical hardwoods such as laurel and cedar. These activities have been carried out entirely by private enterprises. Firms which utilize balsa and rubber as raw material provide some technical assistance to small commercial farmers to grow these trees on a plantation basis. The tropical hardwood trials are being carried out by wood industries on their own land or in conjunction with colonists. These enterprises, which have an enlightened self-interest to assure future supply of raw material for their industrial requirements and/or for export, nevertheless lack technical expertise in forest management and reforestation. To date, no public sector institution other than the PNF has attempted to implement these types of activities in the humid tropics, although a number of regional institutions have demonstrated a strong interest in promoting the rational utilization of the forest resource in the humid tropics.

The PNF shares responsibility of the watershed management function of protective forests with the Ministry of Agriculture's Soil Conservation and Regionalization Programs (PRONACOS and PRONAREG) and with the Ecuadorean Hydraulic Resources Institute (INERHI). Although all of these agencies have a demonstrated interest in and certain legally mandated responsibilities for the management of watershed, none presently has an institutional capacity to implement field activities in this area. The National Forestry Program has two professionals who are responsible for protective forest-watershed management activities. The Soil Conservation Program was established in 1981 and is only now becoming operational. INERHI's small watershed management unit has to date not yet demonstrated an effective watershed management planning capacity. That is, none of the institutions responsible for aspects of watershed management (protective forests, soil, water) has an operational capacity to plan or implement such activities.

Despite the proliferation of public and private sector entities which currently or potentially have a role to play in the productive or protective functions of forestry, the institutional capacity to plan and implement forest sector programs is very weak. Further, there has been relatively little inter-institutional coordination in either forest production or forest protection. The PNF's implementation of highland reforestation activities in the past have often placed it in competition with the regional and specialized forestry institutions. In the management of humid tropical forests the PNF has tended to assume an adversary relationship with the private sector enterprises involved in the exploitation of the timber resource. In the case of the protective forest/watershed management activities, only recently have there been manifestations of a desire to cooperate and to pool the very limited resources currently available for this purpose.

The relationships between the PNF and the other forest sector institutions results in a highly inefficient utilization of the private and public human and financial resources which could be devoted to programs of reforestation and of productive and protective forest management. That is, the lack of coordination has not only resulted in inefficiencies because of duplication of efforts and a failure to share information, but also has impeded the forestry development because the dispersion of resources has prohibited the establishment of the required critical mass of effort.

C. GOE and Ecuadorean Private Sector Policies and Programs.

Both public and private entities are involved in the development of Ecuador's forestry sector. The GOE has undertaken several policy and programatic initiatives within recent months which contribute significantly to the future rational development of the forest resource. Private sector initiatives, primarily by wood product industries interested in assuring future timber supplies, have also begun to demonstrate their real concern for the development of the forest sector by initiating promising reforestation experiments.

1. GOE Policies and Programs

Both the late President Roldos and President Hurtado made the promotion of forestry programs an issue in the 1978-79 presidental campaign. The Government of Ecuador, through a series of actions, implemented in 1981, has clearly reaffirmed its strong interest in developing the forestry sector.

a. Creation of the National Forestry Program

In May, 1981 the Direccion de Desarrollo Forestal (DDF) of the Ministry of Agriculture was upgraded to the status of a Program. Within the MAG'S structure the new Programa Nacional Forestal (PNF) not only has substantially increased responsibilities for guiding the development of the forestry sector but also has an increased budget and expanded administrative autonomy. The PNF's budget for 1982 of 208 million sucres represents a 25 percent increase over the amount budgeted for the DDF in 1981. Administrative, financial and legal departments have been created or strengthened within the PNF since its transformation from a Directorate to a Program. The PNF now has an administrative structure which will permit it to carry out its new legislative mandate. However, personnel reassignments and training must occur before this structure becomes fully functional (See Annex IX for an institutional analysis of the National Forestry Program).

b. Promulgation of a Comprehensive Forest Law

A comprehensive Forestry Law was passed by the Ecuadorean Congress and signed by President Hurtado in August 1981. The law not only provides significant tax incentives for afforestation/reforestation activities, but also provides the legal base for a rational use of the forest resource. It specifically deals with the following topics -- National Forest Patrimony, Protective Forests and Vegetation, Private Forest Lands and Forests, Forest Plantations, Forest Management and Utilization, Control and Transport of Forest Products, Training and Forestry Research, Incentives (for the Private Sector), Forest Industries, Administration of the Patrimony of Natural Areas, Conservation of Wild Flora and Fauna, and Financing. It sets broad policies, authorities and responsibilities in the subject areas and grants to the Ministry of Agriculture (and, consequently, to the National Forestry Program), a most adequate charter for coordinating the development of Ecuador's forest sector.

c. Creation of EMDEFOR

The Empresa de Desarrollo Forestal (EMDEFOR) was legally established in 1981 (although it had begun operations in 1980). It was created through the efforts and financial backing of the Banco Nacional de Fomento, Ecuador's agricultural development bank. EMDEFOR is now completing its second forest planting season and has reforested approximately 2,800 hectares in highland Ecuador, principally in Chimborazo Province. There is a question of EMDEFOR's financial viability since it will have no assured, continuous

income until its initial plantations begin to be harvested. Never- theless, it has demonstrated a substantial (and flexible) operational capacity and has been able to jointly implement afforestation/reforestation activities with 12 highland communities and cooperatives during the past two years. EMDEFOR has demonstrated a potential for becoming a significant lead institution for the implementation of effective afforestation/reforestation activities in highland Ecuador.

d. Inclusion of Forestry Activities in the 1980-1984 National Development Plan

The National Development Plan gives high priority to rural development. With regard to forestry, the Plan identifies environmental degradation, particularly deforestation, as a major problem which must be confronted in the near term. Six afforestation/reforestation projects, valued at 1,777 million sucres, are included in the Plan while 142 million sucres are included for the protection of natural areas. Without question the objectives of the Plan related to forestry as well as to the other programs delineated in the Plan will only be partially fulfilled during the quinquenium. Nevertheless, the primary significance of the Plan is that it has investment priorities which are the result of a conscious planning process and which, to a great degree, are being maintained.

e. Other Public Sector Institutions

A number of semi-autonomous regional governmental units are engaged in the development of Ecuador's forest sector. Several of these institutions -- the Pichincha Provincial Council and regional development agencies such as CREA and PREDESUR operate without significant coordination with the National Forestry Program. Others, specifically the Integrated Rural Development (IRD) projects, rely directly on the PNF to provide specialized technical inputs to carry out programmed activities. Regardless of the current degree of coordination or collaboration between the PNF and the other institutions, they represent a significant potential source of additional financial resources and, often, human resources that contribute to the development of Ecuador's forest sector.

2. Private Sector Initiatives

A number of private sector institutions have demonstrated their interest in the rational development of the forest sector. For the most part these are wood products industries which have realized that their long term economic interest is in the implementation of a sustained yield management approach with regard to the forest resource. (While the bio-mass which remains in the humid tropics of Esmeraldas Province and, especially, in Ecuador's amazonian region is tremendously large in volume, the economically utilizable volume of quality tropical hardwoods is much more limited and, by some projections, will be exhausted before the year 2000.) These industries have begun small-scale experimental activities in order to begin to develop an adequate future supply of roundwood. ENDESA, a plywood manufacturer, has

established a nursery and has begun to reforest an area of 600 hectares in the humid tropics of northwestern Ecuador with high value tropical hardwoods. CODESA, another plywood manufacturer, has made an initial attempt to implement an agro-forestry program on 320 hectares of its forest concession which have been invaded by colonos. In both instances the experiments have suffered from a lack of adequate technical knowledge about the species which are being utilized. In an effort to overcome this lack of technical knowledge, several of the private sector forest products industries have recently joined together to establish the Corporacion Forestal Juan Manuel Durini, a non-profit organization which will be dedicated to silvicultural research and reforestation activities. However, it has not yet initiated any significant research activity.

The Fundacion Natura (Nature Foundation), a non-profit environmental organization founded in 1978 has, with support from A.I.D., been involved in a number of forestry-related activities. It has done an environmental profile of Ecuador which contains an extensive analysis of Ecuador's forest resources. In addition, it has utilized a small amount of A.I.D. funding to initiate forestry activities with two Indian communities in Imbabura and Chimborazo provinces and has just signed a grant agreement with the Inter-American Foundation to expand this activity to 25 additional communities. Finally, the Fundacion Natura has implemented an important consciousness-raising campaign with regard to the need for environmental conservation in Ecuador. This campaign, which has been supported through an OPG, has focussed on issues such as deforestation. This Foundation is well-positioned to play a key role in mobilizing support for the rational development of Ecuador's forest resources and has demonstrated a strong interest in doing so.

D. Other Donor Activities

1. International Donors

International donors have been working on Ecuador's forestry sector for approximately 25 years. The bulk of other donors' past activities has consisted of forest inventory and forest use studies. These studies, however, have generally not been followed up by actions which were recommended in the studies because of the lack of adequate human and financial resources and of an appropriate institutional structure which would permit such actions. The major international donor has been the United Nations Food and Agriculture Organization (FAO) which has assisted the PNF's predecessor agencies in sever- al forestry related projects. It has provided technical and other assistance to establish a forest sector training and research center at Conocoto in the highlands near Quito and a humid tropical forest experimental station at La Chiquita in Esmeraldas Province. Although these institution building activi- ties have made a positive contribution to human resource development to meet forest sector needs, their impact has been hampered by their limited funding. They have been unable to achieve a "critical mass". Specifically, FAO tech- nical assistance has lacked complementary funds to carry out research and field demonstration activities. FAO is not currently providing assistance to the forestry sector nor does it plan to provide assistance in the near term.

The Inter-American Institute of Cooperation for Agriculture (IICA) has been providing technical assistance to the National Forestry Program through its land and water use unit. Recently, this assistance has been focussed on the elaboration of Ecuador's new forest legislation and its regulation. IICA has also provided training to Ecuadorean foresters at CATIE in Turrialba, Costa Rica.

The Inter-American Development Bank (IDB) and the World Bank (IBRD) have actively supported Ecuador's recent development efforts, through financing of hydroelectricity projects such as the Paute watershed, a multi-purpose river basin development project, and Integrated Rural Development projects. Neither the IDB nor the IBRD has allocated funds adequate to address the negative environment- al factors which affect these projects. Although Integrated Rural Devel- opment projects financed by these institutions occasionally contain forestry components, these have been limited in scope. Neither institution has directly financed forestry projects. The IDB is considering a proposal from EMDEFOR to finance a forestry program in highland Ecuador which would focus on pine plantations which could be utilized for industrial purposes (primarily pulp and paper). Nevertheless, a minimum of two years will be required to develop, approve and finance this project. The IBRD's Forestry Sector Policy Paper is consistent with the type of forestry development which is proposed as an outcome of this project and future assistance in forestry could be forth-coming once Ecuador has established an appropriate policy and institutional framework.

The OAS has conducted a number of regional planning studies based on a multi-purpose river basin development methodology. It is currently providing an expert in this field to the Ecuadorean Hydraulic Resources Institute (INERHI).

2. Other Bilateral Donors

The Belgian Government has received a request for technical and financial assistance for an afforestation project in the highland paramos of the Palmira area in Chimborazo Province. The purpose of this project, which is not yet being implemented in the field, is to control wind erosion and prevent desertification in this area. This activity would be carried out in conjunction with the Guamote IRD project.

The National Forestry Program has requested assistance from the Federal Republic of Germany for improving tree harvesting and small sawmill operating methods in Esmeraldas Province. The project is not yet being implemented. The Federal Republic of Germany also provided forest technicians who conducted species trials in highland Ecuador between 1976 and 1980.

Although it is not currently providing assistance to the forest sector, Great Britain provided a substantial amount of technical assistance and equipment to carry out a large number of species trials in the highland and dry coastal regions of Ecuador during the 1970's.

A common characteristic of these bilateral assistance efforts is that they are conducted on a short-term basis in isolation from the intended beneficiaries and outside of the existing institutional framework. As a consequence, little reliable information has been generated because of the short project life and the preliminary information which may be generated as a result of these efforts is not disseminated to forestry sector technicians or to beneficiary groups.

3. Other U.S. Government Efforts

In 1961 an A.I.D. loan program helped establish the Ecuadorean Military Geographic Institute (IGM) through the provision of a building, equipment and other support to prepare aerial maps and natural resources surveys. This was followed by a 1963-1966 technical assistance program of the Inter-American Geodetic Survey (IAGS) funded by A.I.D. to help establish a Natural Resource Division in IGM for undertaking land use and land capability surveys, cataloging natural resources data, mineral surveys, and carrying out natural resources studies in areas such as the Guayas River Basin. After 1966, advisors from IAGS and OAS continued much of this work and in 1978 the GOE created a Remote Sensing Unit (CLIRSEN) as an autonomous agency of IGM to expand the natural resource inventory work initiated with A.I.D. funding in the 1960s.

In addition to A.I.D., two other U.S. governmental institutions are currently supporting the development of Ecuador's forest sector. The Peace Corps has been providing volunteers to work in forestry for more than ten years. These volunteers work with the National Forestry Program. There are currently 16 volunteers working in such activities as nursery development, watershed management and plantations. An additional 20 volunteers are scheduled to begin working in forestry activities in December, 1982. The Peace Corps Volunteers will play an important role in carrying out many of the field demonstration activities. Because of the effective manner in which the PNF has utilized PCV's, USAID and Peace Corps/Ecuador have agreed that the PNF will coordinate the activities of the PCV's with project activities; a formal agreement between A.I.D. and Peace Corps on this matter is unnecessary. The Inter-American Foundation (IAF) has recently signed an agreement with the Fundacion Natura to expand its community forestry promotional activity which it began with assistance from USAID's Special Development Activity Fund. The IAF will provide $225,850 to finance projects in 25 indigenous highland communities.

E. USAID Country Development Strategy.

The A.I.D. program in Ecuador is designed to assist the country to promote economic growth with equity and to address some of its highest priority develoment problems: extensive rural and urban poverty, stagnating agricultural production, rapid population growth, growing environmental degradation, and the need to rationalize use and increase availability of energy resources. Forestry is an approved sector within USAID's CDSS.

As indicated in the CDSS, institutional, technological, and human resources constraints most often limit Ecuador's ability to solve these problems. USAID's strategy is to strengthen Ecuadorean institutional and technical capacity so that the country can mobilize its own resources and direct them over an extended period of time towards solving its own problems.

In accordance with this strategy, USAID seeks to: (1) encourage changes in policies and resource allocation by assisting Ecuadorean institutions to better analyze complex policy and planning issues; (2) support technologies to increase Ecuador's capacity to meet the needs of its low income families; (3) strengthen the institutional capacity of Ecuadorean institutions to implement development programs; and (4) strengthen progressive elements of the public and private sectors so that they can address better the country's critical development problems. Several priority areas for USAID support have emerged and evolved within this framework, beginning with conversations with late President Roldos in Washington shortly after his election and supplemented by a continuing dialogue with key GOE officials, including President Hurtado both in his current capacity and in his former role as Vice-President and head of CONADE. These priority areas are reflected in USAID's project portfolio.

USAID's project portfolio may be divided into two distinct stages. The first stage involves the resumption of the A.I.D. program in Ecuador in FY 1980 after a seven year phase-out period. The major focus of this first phase has been institution building and technology transfer related to the GOE's rural development efforts. To date, some five projects, with total LOP A.I.D. funding of $29.3 million, have been approved. The activities being financed involve agricultural development and health delivery services to support the GOE's Integrated Rural Development program; a Title XII program to assist with the transfer and adaptation of rural technologies key to the improvement of agricultural production and productivity; improvement of the Ministry of Agriculture's capacity to carry out a campesino training program; and development and promotion of low cost renewable energy technologies suitable for replication in the rural sector, together with development of an institutional capacity to promote energy conservation and improved energy sector policies. In addition to these activities, a $5.0 million loan add-on to the Title XII program and a $25 million HG to extend low cost housing programs to secondary cities are being developed in FY 1982. Finally, a number of OPG's to PVO's have been financed in the USAID's start up program, including an environmental conservation activity being implemented by Fundacion Natura.

Stage two of USAID's program will involve promotion of revenue generation and private sector development programs. USAID is carrying out a study of private sector development problems and opportunities. The study will form the basis for a CDSS update that is scheduled for the end of CY 1982. Simultaneously, USAID is developing two projects for which needs have already been identified. A small grant has been awarded to finance the study of management training needs in the private sector. Depending on the outcome of the study, a PID is tentatively scheduled to be submitted in the first quarter of FY

1983. Also, USAID is working on a PID for an FY 1983 revenue generation project aimed at improving the GOE's capacity to develop its oil resources, improve tax and customs administration, and upgrade municipal finance administration and planning.

The Forestry Sector Development project is a logical transition between the first and second stages of USAID's country development strategy. The project represents an important initial step in the implementation of the second phase of USAID's country development strategy. An explicit and important part of the project's strategy is to (1) encourage expanded private sector involvement in forest management and reforestation activities in Ecuador and (2) to promote development of an enhanced public sector capacity to support private sector initiatives in these fields. Accordingly, the project will provide a model for the development of future collaboration between Ecuador's public and private sectors. It will also be an excellent point of departure for USAID's new emphasis on private sector development.

Moreover, the project directly complements a number of activities that are being carried out under phase one of USAID's strategy. A major ele- ment of the first phase is to assist the GOE make operational its integrated rural development mechanism. The Integrated Rural Development Secretariat, an office within the Presidency of the Republic, is responsible for designing and implementing some 17 IRD projects located in different areas of the country. The GOE's strategy is based on its conviction that carefully selected resources and services must be concentrated in specific geographic areas in order to break up Ecuador's centuries old patterns of rural poverty. In supporting this strategy, USAID's approach is to strengthen GOE institutional capacity as well as to provide for the investment requirements of specifically selected IRD projects. Under already approved loans and grants, A.I.D. is financing:

- Technical assistance for the GOE's Integrated Rural Development Secretariat;

- Financial and technical assistance for implementing agricultural production and primary health care delivery in two IRD subprojects located in the Central Sierra (Salcedo in Cotopaxi Province and Quimiag-Penipe in Chimborazo Province) and one IRD subproject (Jipijapa in Manabi Province) in coastal Ecuador; and

- Campesino training in the above three IRD projects as well as in other GOE IRD projects.

The Forestry Sector Development project will provide the resources necessary to redefine and to carry out appropriate reforestation activities in each of the three IRD projects being supported by USAID. It will also strengthen the GOE's capacity to plan and support forestry components of IRD and other rural development activities in general. Equally important, the project will build a PNF that will encourage and foster a private sector capacity to contribute to rural development through productive forestry activities.

The Rural Technology Transfer System project is assisting the Ecuadorean Government to address two major constraints of the rural sector: institutional weaknesses and the lack of technology appropriate for small farmers. By the end of the project, the RTTS is expected to be capable of: (1) identifying rural development problems and determining rural development priorities, (2) providing top-level support for and coordinating subprojects aimed at finding solutions to priority agricultural/rural development bottlenecks, (3) identifying appropriate sources of external and internal technical expertise for the subprojects and channelling such expertise to participating Ecuadorean rural development institutions, and (4) identifying, mobilizing, and financing sources of technical training, both within country and external, to support the subprojects. The RTTS project is managed by the National Council on Science and Technology (CONACYT), and the project is currently being implemented through an A.I.D. $5.3 million grant. Although no specific forestry subproject is included in the project, the Small Farmer Research and Adaptive Development subproject (IDAPA) will have a direct linkage to the forestry project through its agro-forestry activity which will be implemented in the humid tropics and the Soil Conservation and Management subproject (COMSA) will be closely related to the environmental protection (watershed management) component of the forestry project. An add-on loan for $5.0 million was authorized in FY 1982 to expand the activities of the RTTS. The increase includes, along with the expansion in soil conservation activities, other environmental protection subprojects such as integrated plant protection and support for a national resources planning unit to be established in CONADE.

The Alternative Energy Development project has as main goals: (1) to encourage more rational use for energy resources in order to improve Ecuador's ability to meet the energy needs of its population, and (2) to address better the energy needs of low income Ecuadorean families, particularly those in rural areas. To contribute to these goals, the project is strengthening the National Energy Institute's capacity to conduct and influence overall GOE energy planning and to promote the development and dissemination of non-conventional energy technologies appropriate to Ecuador. The demonstration of non-conventional energy technologies will include small mini-hydroelectric facilities, more efficient wood-burning stoves, solar water heaters biomass generators and other technologies. Some of these activities will influence the use of firewood and the making of charcoal. At the same time, the proposed forestry project will encourage the rational use of forest resources and watershed protection and management which means an adequate provision of fuelwood and charcoal without depleting the resource.

Fundacion Natura's environmental conservation project has three major components: (1) research and field surveys concerning environmental deterioration in selected areas of Ecuador; (2) dissemination of the results of such research through the different media--the press, film presentations, etc.--to sensitize the public opinion on environmental issues; and (3) lecture presentations and roundtable discussions with key opinion leaders to influence the formation of environmental public policy. Fundacion Natura has also prepared an Environmental Profile of Ecuador and has issued many press releases. As a consequence, a public awareness of environmental matters is starting to emerge.

Thus, while the Forestry Sector Development project proposed herein represents a logical transition towards a strategy that will focus increasingly on private sector involvement in the development process, it also relates directly to and supports existing and ongoing USAID projects in Ecuador.

F. Project Model

There is a lack of technical knowledge about proper species development and forest management practices appropriate for Ecuador. This information is needed if the country is to increase the benefits that can be generated from this resource. There is a lack of experience in dealing successfully with the socio-cultural factors that often impede reforestation. Yet, these factors must be considered in the design of forestation technologies suitable for massive replication throughout Ecuador.

Rather than supporting large scale forestation activities at this time, USAID has opted for an institutional strengthening project, consistent with its overall program strategy. The project will upgrade Ecuador's capability to develop and manage its forest resources. It will develop and disseminate technologies which are appropriate to the requirements of Ecuador's forest sector, including the needs of private enterprises in the sector. These technologies necessarily must correspond to Ecuador's geographic, climatic and geological conditions. They must also be compatible with Ecuadorean social, economic, and institutional realities. Thus, the project will help provide the basis for more massive resource transfers from domestic or external sources for future major forestation activities.

Because there is a severe lack of technical knowledge and practical field experience in most aspects of afforestation/reforestation, a major element in the institutional development model of this project is the implementation of a process learning approach with regard to the development of the forest sector. This learning process or learning by doing approach relies to a certain extent upon trial and error in order to develop both the technologies and the institutional mechanisms will permit the effective development of Ecuador's forest sector.

The institutional development of the Ministry of Agriculture's National Forestry Program (PNF) through the process learning approach is crucial, given the PNF's central role in the sector. The structure and functions of the National Forestry Program, established in 1981, will be modified to strengthen its role as a coordinating/support institution that can act as a catalyst for the efforts of private and public sector institutions which implement forestry projects. Its planning, project design, research, information, dissemination, and technical assistance functions will be emphasized. Direct involvement in planting will be gradually deemphasized. Personnel reassignments within the PNF will occur to implement this change in function.

These changes in functions will mean that the PNF will become more of a service organization which provides technical information and support services to those institutions interested in carrying out reforestation and/or forest management activities (regional development organizations, Integrated Rural Development projects, private enterprises, cooperatives, community organizations, etc.) The participation of a wide variety of private and public institutions to implement forestry programs will mobilize substantial in-place resources. In particular, the involvement of private forest product industries in reforestation to produce future supplies of roundwood for their enterprises will be encouraged provided they are able to work within the existing social framework of the areas in which reforestation activities are implemented.

An essential feature of this project's institutional development model is the encouragement of effective collaborative working relationships between the PNF and other institutions involved in forestry related activities. The project will provide ample opportunities for PNF to work with these institutions in the planning and implementation of project activities. The long range benefits of forestry sector institutions learning that they can work together rather than at cross purposes is a necessary prerequisite in order for the sector to be developed rationally. If the PNF can effectively provide the necessary technical support to these institutions, these resources will be utilized in a more efficient, effective manner. The forestry sector's absorptive capacity should be substantially increased and resources should be mobilized from other donors which until now have been hindered in their resource transfer efforts by the weak institutional and technical bases of Ecuadorean forestry entities.

The process learning approach to the institutional development of PNF will require that a number of field level activities be carried out. Such activities will provide practical "hands-on" type of experience not only to test or demonstrate appropriate technologies, but also to demonstrate the benefits of inter-institutional cooperation and coordination. When carried out at an appropriate scale, these activities also will bring about concrete accomplishments and responses to serious needs. In turn, such accomplishments will promote an institutional self-confidence and a maturity among the forestry sector institutions.

Thus, the proposed institutional development model includes a series of carefully designed subprojects for field level implementation which are themselves part of the learning process. The detailed project description of Section II below categorizes and identifies specific subprojects. Moreover the project has the flexibility to adjust and revise specific subprojects and add new ones as experience is gained thereby reinforcing the institution building process. Similarly, the institutional capacities developed under this project must be able to deal effectively with Ecuador's three distinct geographic/climatic regions with respect to forestry: the highlands (Sierra), the arid coast; and the humid tropics, including the northwestern coast and the Amazonian basin (Oriente). These regions present significantly different social as well as natural environments. Accordingly, the field activities planned under the project will necessarily vary from one region to another.

Under the new Forestry Law, the PNF is mandated to work with and through other public entities and private organizations. Therefore, the project's institutional development model is akin to an Intermediate Credit Institution (ICI) approach. In effect, the project will provide: (a) technical assistance, training and other support to improve PNF's institutional capacities; and (b) a technical/financial mechanism within PNF for identifying, developing, and implementing or arranging for the implementation of forestry activities.

The project's model is similar to an ICI approach in another respect as well. The resources being provided under this project should be considered as an initial tranche. With improved institutional capabilities, PNF will be able to mobilize other external assistance. A future follow-on tranche of financing, as with ICI's, is also tentatively planned as part of USAID's long term strategy.

As indicated in Section E above, USAID intends to increase its direct activities with the private sector. Private sector initiatives, with emphasis on export promotion and diversification, will be encouraged and stimulated under these future projects. Potentially large and lucrative export markets exist or can be developed for products made from Ecuador's fine tropical hardwoods. Internal efficiency of wood utilization can also be improved.

The project being proposed herein will initiate linkages between public and private sector forestry institutions. The development of a mature, self-confident PNF will further enhance positive public sector attitudes regarding private sector forestry activities. USAID envisages that a future follow-on tranche may be appropriate to: (a) consolidate the progress of the institutional development expected under this project; and (b) promote private sector forestry initiatives which will be generated by this project as well as those related to the industrialization and export marketing of wood and wood-based products.

II. PROJECT DESCRIPTION

A. Project Goal and Purpose

As described in the Logical Framework included as Annex II, the goal of the project is to increase the productive use of Ecuador's forest resources.

The purpose of the project is to strengthen the capacity of Ecuadorean forest sector institutions to undertake afforestation/reforestation activities and to manage productive and protective forests. This purpose will be achieved by: (1) strengthening the National Forestry Program's capacity to mobilize, coordinate, and provide technical assistance in support of other private and public sector institutions engaged in forestry activities; (2) implementing a program of productive forestry field demonstrations which includes a significant amount of applied research; and (3) developing the GOE's capacity to develop and implement management plans for critical watersheds which are important for the protection of major economic resources.

The project addresses major U.S. Congressional and A.I.D. policy concerns related to the development of forestry activities, deforestation of humid tropical forests and environmental conservation. These concerns are highlighted in Sections 103(b)(3) and 118 of the Foreign Assistance Act. Section 103(b)(3) authorizes assistance for forestry activities with emphasis on agro-forestry, reforestation, protection of watershed forests, and more effective forest management. Section 118 emphasizes the importance of properly managing tropical forests to provide a sustained source of files while reducing their destruction. Activities included in the project will strengthen the technical and institutional capacity of Ecuadorean institutions to implement forestry programs of the type indicated in the Foreign Assistance Act.

The project also implements recent policy guidance provided by Administrator McPherson in March 1982 testimony to the Congress on the natural resources problems in developing countries. This testimony stresses the importance of building the institutional capacity within the LDCs to solve their critical environmental and natural resource problems, particularly tropical forest cover, soil erosion and the extention of crop lands.

B. Description of Project Activities

1. Institutional Development of the National Forestry Program (PNF)

a. Introduction

The National Forestry Program (PNF) is the national level entity responsible for developing forest sector policies as well as for planning and programming forest sector activities. It is the only institution with functions relating to all aspects of the forestry sector including national parks and protective forests as well as afforestation/reforestation and management of productive forests. It is in charge of administering Ecuador's public forests which cover more than eighty percent of all forest land in the country.

Because of this wide range of responsibilities and geographic diversity, the PNF can best use its limited human and financial resources by playing a coordinating, support, and technical assistance role rather than attempting to implement a wide variety of forest sector related activities. This project will provide resources which are channelled to or through the PNF to help develop its capacity to mobilize resources of other institutions. Specifically, the project will strengthen the PNF's capabilities in: (i) the planning and programming of productive and protective forest activities; (ii) coordinating research; (iii) the dissemination of technical information; and (iv) the provision of technical support for forestation and for productive and protective forest management activities.

b. Outputs

(1) Enhanced Planning and Programming Capability - The PNF's planning and programming capability will be strengthened. Currently, the PNF lacks the capability to carry out indicative planning functions crucial to the rational development of the forestry sector. For example, there is no mechanism to estimate supply and demand for roundwood and other forest sector products. Yet, this function is key to the establishment of overall priorities which must be based on reasonably good estimates of future demand and supply. The PNF is not an omniscient, centralized forestry planning and implementation institution. It has little authority and no budget control over the national and regional institutions which engage in forestry activities. Given this reality, the most efficient way to influence forest sector activities is for the PNF to sponsor studies that provide the information necessary for forest sector institutions to plan their activities and to assist other private or public sector entities to design good projects. In this manner, the PNF can orient and, by participating positively in the design of specific activities, prioritize actions and programs executed by other entities.

Through technical assistance and training, a modest macro-planning capability will be established within the PNF to facilitate indicative planning and project design. The personnel of the PNF's Planning and Evaluation Department will be trained in macro-planning and, particularly, in project design techniques. Practical training courses in project design will be conducted for the chiefs of the PNF's district offices. The project will finance the installation of a micro-computer to enable the PNF to improve its data analysis and management capability for the planning and programming of forest sector activities. In addition, the project will finance a series of studies in which PNF personnel will collaborate with contracted consultants or other specialized personnel. Specific studies to be financed include, an updated and revision of an existing study on Ecuador's forest industries' potential and an evaluation of Ecuador's existing forest plantations.

(2) Research Coordination Capability - A capability to coordinate forestry research will be developed within the PNF's Research and Training Department. Although the PNF cannot by itself undertake all the silvicultural research necessary for the sector, it can play a catalytic role in mobilizing such research and in disseminating the results. Specifically,

the PNF will enter into cooperative agreements with other public and private Ecuadorean institutions to implement research activities which have been identified either by the PNF or by the cooperating institution.[1/] The PNF will share in the costs, monitor the research, provide specialized research assistance and facilities, compile research results, and disseminate the research findings. To carry out such a role, the PNF's own institutional capacities must be strengthened through the provision of training, technical assistance and necessary equipment.

Two PNF professionals will be trained in forest pathology and forest entomology, respectively. Laboratory equipment for these specialties will be installed in existing facilities at the PNF's Conocoto research station located 14 kilometers from Quito. In addition, PNF personnel will be given short-term training in forestry field research techniques. A seed bank will be established in existing facilities at Conocoto to allow the PNF to coordinate the acquisition and distribution of native and imported tree seeds for research purposes as well as for general planting requirements.

(3) Information Dissemination - The project will establish an information dissemination capacity within the PNF Research Department's documentation center. Research findings, statistical information and other data relevant to the improved planning and implementation of forest sector activities will be gathered and disseminated. The center will collect information relevant to the development of Ecuador's forest sector and will publish it in appropriate forms, including a periodic bulletin for forestry sector professionals and technicians and simple "how to" guides for non-professionals engaged in forestry activities. Much of the necessary information will be obtained from the results of the productive forestry field demonstrations and the protective forest/watershed management activities included in this project. The center will sponsor ten two-day technical and informational workshops to promote information exchange among forestry sector personnel in which an average of forty professionals and technicians will attend. These workshops will, when feasible, be based on the field demonstration activities described in project components two and three below.

(4) Strengthened Technical Assistance/Outreach Capability - The final major institution-building output is the strengthening of the technical assistance/outreach capacity of the PNF's twenty district offices. Both the professionals (ingenieros forestales) and the technicians (peritos) who are assigned to district offices will be given the task of providing technical assistance to groups and institutions who wish to undertake forestry activities as a primary responsibility. Job descriptions will be revised to reflect this new duty. In some cases, personnel will be reassigned within the district

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1/ These applied research activities generally will be incorporated as an element of the productive forestry field demonstrations financed under Project component described in Section II-B-2 of the Project Paper.

offices. A program of on-going, in-service training for the district office personnel will be developed and implemented to familiarize them with PNF's new focus. In addition, six district offices will double their nursery capacity in order to meet an increasing demand for tree seedlings.

The reassignment of functions and personnel will occur gradually. It will be done concurrently with the implementation of training and other activities designed to facilitate the transition and with the growth in demand for technical and support services from communities and other groups interested in reforestion activities. Generally, the small size of the district offices--there are currently 38 professionals and 104 technicians assigned to 20 offices--precludes a high degree of specialization among their personnel. Consequently, the reassignment of functions will consist of a shift in emphasis and allocation of time by the district office personnel who have a number of responsibilities, rather than the implementation of a highly specialized technical assistance/support function.

Training will focus not only on the upgrading of technical knowledge in such fields as nursery and plantation management, species selection, disease identification, and protective forest management, but also in such important topics as social relations and project design. Training will generally consist of short courses prepared by the line staff of the PNF with the assistance of the long and short term technical experts provided by the project. The training methodology will emphasize the active participation and "hands-on" field practice by the personnel who are receiving the training. Training courses will be open to personnel from other public or private entities which are involved in forestry, including members of campesino or Indian communities, cooperatives or associations as appropriate. Approximately 25 short courses will be implemented during the project. Course size will generally range from 20 to 30 students.

The operation of tree nurseries is a key support function of the district offices which will become increasingly important in the future. Currently, seedling production is often a constraint to carrying out reforestation activities. As demand for seedlings by communities and groups interested in reforestation expands, the operational capacity of PNF nurseries must be increased. This will be accomplished through nursery management training for the personnel in charge of nurseries, through applied investigation in nursery management technologies, and through an expanded nursery infrastructure.

c. Inputs

(1) Technical Assistance - A major input into the institutional strengthening process is the provision of a long term (48 pm) contractor or PASA advisor who will advise the PNF on aspects of its reorganization. The advisor will assist USAID with the technical monitoring of the project and serve as a liaison with USAID. Other technical assistance will be provided as follows:

- management assistance (5 pm) to assist the PNF in its transition toward a support role;

- planning assistance (12 pm) to assist the PNF's planning, programming, and evaluation unit in macro-planning and project design and evaluation;

- a nursery management specialist (12 pm) to help the PNF upgrade its nursery facilities;

- a forest pathologist and a forest entomologist (8 pm each) to set up specialized laboratories and provide on the job training to PNF personnel working in these fields;

- an information specialist (5 pm) to assist the PNF establish an information/data bank and an information dissemination mechanism.

Also, the services of an Ecuadorean anthropologist (15 pm) will be provided on a part time basis to advise the district office personnel on how best to interact with groups or institutions which are participants in forestry activities as well as to provide training to PNF personnel and to advise the PNF on social aspects of specific forestry activities in which it may collaborate.

Technical assistance for this component will be financed with grant funds and will amount to $900,000. (Annex VIII contains a detailed presentation of technical assistance requirements.) Of the amount budgeted for technical assistance, $440,000 will be used to finance the services of the long term contractor or U. S. Forest Service PASA advisor. Because the advisor will assist USAID with technical monitoring, funding will not be included in the Project Agreement, but will be obligated separately.

(2) Training - The major training focus will be in-service training primarily for technical personnel located in the district offices. When possible, the training will be carried out by professionals from the various technical offices of the PNF's headquarters. The in-service training courses will be developed with the assistance of the external and local technical experts financed by the project. The A.I.D. loan will help finance local costs of the in-service training as well as of the technical/informational workshops. Representatives of other public and private sector groups and organizations will also be candidates for training if they require technical training or additional knowledge in forestry to more adequately carry out their responsibilities. Items eligible for financing include the salaries of trainers, materials costs, and per diem costs for trainers and participants.

Other training requirements include: (a) Long-term (one year) training in forest sector planning for the head of the PNF's Planning and Evaluation Department with a concentration in the design and evaluation of forestry projects; (b) short-term training for 10 members of the PNF's central and district office staff in forestry field research techniques;

(c) short-term training in project design for five other members of the PNF's central staff, including members of technical departments; (d) short-term training in forestry statistical analysis for the Department's statistician; and (e) master's degree training in forest pathology and entomology for two members of the PNF staff in the U.S. or at a specialized third country institution such as CATIE.

Training will be loan funded in the amount of $400,000 while the GOE will provide $150,000 in counterpart. See Annex VII for details.

(3) Equipment and Materials - Loan funds will finance basic equipment and materials needs, including:

- A small micro-computer/word processing system and duplication equipment and supplies to assist in the development of the information data bank and dissemination activities;

- Laboratory equipment for the forest pathology and entomology laboratories;

- Equipment for the seed bank and a small fund to purchase seed for research and demonstration purposes;

- Equipment and materials for nursery expansion and improvement.

A list of estimated equipment and materials requirements is provided in Annex VII. Loan funding for equipment and materials will amount to $200,000. In addition, $200,000 of GOE counterpart financing will be provided for materials and supplies.

(4) Additional Staff and Studies - The expansion of the PNF's promotional, technical assistance and coordination roles can in large part be achieved through the judicious reassignment of its current staff. Nevertheless, specialized functions in research, training and information systems will require new personnel. The PNF will add two professionals to its research staff, as well as a training coordinator and an information management specialist in order to cover these needs. The GOE counterpart contribution to cover the additional personnel amounts to $150,000. Also, $100,000 of loan funds will be used to finance contracts and short term consultants to carry out studies in collaboration with members of the PNF's Planning and Evaluation Department. Approximately 50 percent of the loan funds will be used to finance project evaluation activities. Ecuadorean institutions will provide counterpart funding of $100,000 for local contractors, data processing, staff salaries and materials.

d. Budget Summary for Component 1

The total A.I.D. contribution to this component is $1,750,000 of which the major part is grant funded technical assistance ($850,000) and loan funded training ($400,000). In addition, $200,000 in loan funds will be used for equipment and supplies to implement the PNF's information dissemination,

planning and nursery support functions. The GOE counterpart will total $800,000 of which $300,000 will be for salaries of trainees and new counterpart staff and $300,000 will be allocated for local supplies and support services. The summary budget analysis for this component is shown in table I below. A more detailed budget is presented in Annex VII.

TABLE I

INSTITUTIONAL DEVELOPMENT OF PNF
(U.S. $000's)

Item	A.I.D. Loan	A.I.D. Grant	GOE	Total
Technical Assistance	-	900		900
Training	400	-	150	550
Equipment and Materials	200	-	200	400
Studies and Evaluations	100	-	100	200
Additional Staff			150	150
Inflation	200	-	200	400
TOTAL	900	900	800	2,600

2. Productive Forestry Applied Research and Pilot Demonstrations.

a. Introduction

This component is the major focus of the project, accounting for about 70 percent of the total funding. Annex III describes these field activities in detail. The magnitude of funding for this component is essential to fully implement the process learning approach of the project. First, a wide variety of research needs exist. These include species elimination trials, plantation establishment and management techniques, disease and insect problems and nursery practices. At the same time, it is equally important to field test a variety of:

- reforestation alternatives (e.g., agro-forestry and on farm forestation);

- institutional arrangements for carrying out needed reforestation; and,

- extension techniques that permit foresters to successfully relate to individual farmers, communities, and Indians who will carry out reforestation.

Second, given Ecuador's myriad socio-cultural, economic, climatic, topographic, geographic and land-tenure conditions, there must be a relatively large number of research and demonstration activities. Third, the field pilots planned under this component are intended to be of a scale that will clearly demonstrate commercial viability. Some 10,000 hectares will be planted or managed in these activities.

In the humid tropics, highlands, and arid coastal areas, commercial sized plantations will serve as pilot demonstrations of planting and management technologies, while contributing to the production of wood products and assisting with soil and water regime stabilization. In conjunction with these demonstrations, applied research will be carried out to generate technical information about native and exotic species. The results of the applied research will then be transmitted to forest industries, farmers, development institutions and communities through the information dissemination mechanisms which will have been strengthened as a result of the activities implemented in the project's institutional development component.

The productive forestry field demonstrations and applied forestry research activities will be coordinated by the PNF. Although the PNF will directly carry out some of the research and demonstration activities, as a general procedure, it will enter into cooperative agreements with other public sector agencies, private industries and/or other interested groups to conduct a significant portion of the field demonstration and applied research activities. These cooperative agreements will be designed to meet the specific inter-institutional circumstances which will apply. They will involve a joint contribution of resources and the research results will be part of the public domain and will be widely disseminated by the PNF.

Three basic categories of productive forestry field demonstration activities will be implemented in the highlands, arid coast and humid tropics. These basic categories are plantations, natural regeneration, and on-farm and agro-forestry. Plantation forestry involves tree planting on significant parcels of land (ranging from five to several hundred hectares). Plantation forestry is afforestation/reforestation where forestry is the principal use of the land. Enrichment plantations in the humid tropics are plantations of valuable species within existing remnant forests. Natural regeneration is the management of the natural regrowth of native species. On farm forestry (or agro-forestry) involves tree planting as an activity which is undertaken on a complementary basis with agricultural and/or livestock activities. Species trials are field research trials which test the suitability of different species to specific climatic and soil conditions.

In the Sierra and arid coastal areas commercial-scale models for integrating multipurpose forestry within a framework of overall community development will be demonstrated. In addition to increasing the wood supply for industrial purposes this activity would promote afforestation to produce

fuelwood, aid soil conservation/recovery, and serve as windbreaks. The demonstration will include pine and eucalyptus but will not be limited to these species. Participating institutions, in addition to community groups, will include private industry and mixed sector forestry institutions (the Empresa de Desarrollo Forestal - EMDEFOR), Integrated Rural Development projects and regional or provincial institutions.

In the humid tropical lowlands three types of scale experimental production models will be demonstrated: natural forest management, enrichment of natural forests and agro-forestry. They will integrate the inhabitants of the the humid tropics, whether natives or colonos into an ecologically and socially sound as well as economically beneficial system of sustained yield management of the tropical forest resource base. Indian associations and cooperatives formed by colonos as well as private and mixed-capital enterprises and regional development organizations will participate in carrying out these experimental activities.

b. Outputs.

The specific outputs of this component of the project are pilot activities of commercial scale that test various institutional and silvicultural schemes for reforestation in the four distinct regions of Ecuador, and that serve as demonstrations of replicable forest management systems. Applied research and training activities will be carried out to address the major technical and institutional constraints to increased reforestation. As a result, the project will provide a series of proven technologies and tested institutional arrangements between PNF and executing agencies cooperating in reforestation projects. The detailed description of this component is contained in Annex III. A. and is summarized by geographic area below.

(1) Sierra. - The following reforestation schemes will be tested in the Sierra:

(a) Plantation Demonstration Activities - In the Sierra three types of plantation demonstrations will be tested. These include pine plantations with inter-cropping, new species of pine, and eucalyptus with varied planting techniques. They will demonstrate methods and techniques to increase production of wood and non-wood forestry products, to decrease plantation establishment costs, and to match appropriate tree species with site characteristics. Approximately 4,000 hectares will be planted under the project.

(b) On-Farm Demonstration Activities - Seventy-five farmers will be chosen to participate in a program of on-farm tree planting for the production of food, fuel, shade, fodder, and construction wood. Trees will be planted for wind rows, boundaries and live fences. Where appropriate, linear plantings across slopes will be established with grasses (e.g., penco) and fruit trees (e.g., capuli) to retard soil erosion and produce fodder and food. The farms will be from one to five hectares in size. Species of Eucalyptus, Cupressus, Casuarina, Acacia, Juglans, Salix, Alnus, Populus, Prosopis, and native fruit bearing trees will be considered. This is the largest single activity within the project. Because previous forestry development has previously focussed on the Sierra, the PNF has a human resource base in place which will facilitate this level of activity. In addition, other existing

institutional mechanisms, e.g., EMDEFOR and IRD projects, will increase the effectiveness and impact of the Sierra plantation demonstrations.

(c) Natural Regeneration - The PNF will enter into 25 agreements with individual landowners or communities to protect selected areas from fire and grazing for a period of five years. The PNF will provide fencing and data collection, and the landowner will contribute the land and protection. These demonstrations will be on very eroded steeply sloping lands, and generally will not exceed five hectares. The importance of these trials will be to record the type and value of the natural vegetation that grows, and to demonstrate the potential productivity of apparently unproductive land.

(2) Arid Coast. - The following reforestation schemes will be demonstrated in the arid coast:

(a) Plantation Forestry - A total of 500 hectares, in plots of at least 10 hectares, will be established with as many as 20 communities, using tree species which provide fuelwood (e.g., E. camaldulensis), fodder (e.g., Prosopis juliflora) and fruit (e.g., tamarindo).

(b) Natural Regeneration - Three plots of 25 hectares each of community-owned land will be fenced and protected from grazing in the Santa Elena Peninsula. These plots will be studied for five years to collect data on natural revegetation. The same will be done in the Jipijapa IRD project area, in conjunction with reforestation efforts. The pilot areas will be systematically opened up for grazing, and protected again after animals have grazed for a prudent (as yet undetermined) period of time.

(c) On-Farm Forestry - On farm forestry in the arid coast will concentrate on shade trees for coffee plantations in Jipijapa. Approximately 600 hectares will be planted in widely spaced shade trees such as Leucaena and Guaba.

(3) Humid tropics. Humid tropical lowland demonstration activities include:

(a) Humid Tropical Lowland Enrichment Plantations - A series of four enrichment plantations of about 250 hectares each will be demonstrated in remnant forests where concessions have already depleted the most valuable species. These will be highly controlled, regularly spaced plantations using species characterized by local high value, rapid growth and relative insensitivity to competition by other species. These activities are designed for relatively large-scale industrial plantations, because of the management needs and long-term nature of anticipated returns. The project will establish demonstration plots testing four different fast growing species, Laurel, Cedro, Pachaco, and Mascaray, initially on 25 hectare plots, which will be expanded over five years to 250 hectares per species (total of 1,000 hectares).

(b) Humid Lowland Agro-Forestry - A program of combined agricultural and forestry management will be demonstrated to encourage forest production on small and medium sized rural holdings. The agro-forestry combination balances the delayed return on investment in forestry by more immediate returns from agricultural activities. Agro-forestry pilot projects will be conducted on 600 hectares in the northwest coastal area, and on 400 hectares in the Oriente. Agro-forestry plots will combine trees with permanent cash crops, temporary cash crops, and subsistence crops. Each plot will consist of 10 hectares dedicated to subsistence crops, with the remaining 40 hectares used for market-oriented agroforestry activities. For both the northwest and Oriente the following systems will be used: Laurel or Cedro with bananas or coffee; Pachaco with rice, hard corn and pasture; Teak with rice, corn, and beans; and Balsa with rice and corn.

(c) Humid Lowland Natural Forest Management - The project will establish four plots of 400 hectares each in the northwest and in the Oriente to demonstrate natural regeneration of valuable species in relatively unmodified humid tropical forest through a process of selective cropping and subsequent assistance in regrowth of these species.

(4) Species Trials - A series of species trials will be conducted in conjunction with the field demonstration activities in each of the different climatic environments. Approximately 20 trials will be established each year.

(5) Other Demonstration Activities

The above pilot activities constitute the major elements of the project. However, as the forestry sector in Ecuador develops, various other demonstration activities will be considered for funding. These include:

(a) Lowland long-fiber plantations - The utilization of Caribbean pine, which is suited for areas of Ecuador's coastal region, is a possible alternative to growing pine pulpwood in the Sierra. In the lowlands climatic and soil conditions are more favorable for faster growth of trees, but insect, disease, and management problems are apt to be great. A series of species trials is warranted in the coastal area to determine the technical feasibility of lowland Caribbean pine plantations.

(b) Walnut Plantings in San Antonio de Ibarra - Estimates have been made that the supply of wood (Juglans sp.), which is the basis for the large artisan woodworking community of San Antonio de Ibarra in the northern Sierra, will be depleted within the decade. Limited planting of Juglans sp. as well as other species which can be used by the wood carving industry should be undertaken.

(c) Plantations of Balsa and Rubber - Balsa (Ochroma lapogus) and rubber (Hevea sp.) are grown in Ecuador in the area between Santo Domingo de los Colorados and Quininde. Both are commercial species which are appropriate for cultivation on small land holdings and for which there is an existing internal or export market. Field demonstrations of both species in agro-forestry systems will be considered as the project progresses. In addi-

tion, applied research should be carried out on balsa which appears to be frequently attacked by insects and diseases which, if not brought under control, can greatly decrease the amount and value of the exported balsa wood.

(d) Model Small-Scale Sawmill Demonstrations - Portable, low cost, small-scale sawmill, chipping, and woodworking machines should be demonstrated in areas where pine and eucalypt plantations are reaching maturity. Such demonstrations would serve to determine which machinery are most appropriate for the Sierra. They would also serve as an incentive to communities which are potential tree planters since working processing units will demonstrate the potential market for the roundwood to be produced in plantations.

The following field demonstrations will be conducted:

Sierra Plantations (at an average cost of $500/hectare)	4,000 hectares
Arid Coast Plantations(at $500/hectare)	500 hectares
Humid Tropical Enrichment Plantations (at $500/hectare)	1,000 hectares
Sierra Natural Regeneration (25 five hectare plots at $100/hectare)	125 hectares
Arid Coast Natural Regeneration (Twelve 25 hectare plots at $100/hectare)	300 hectares
Humid Tropical Natural Forest Management (four 400 hectare plots at $500/hectare)	1,600 hectares
Sierra On Farm Tree Planting (75 three hectare plots at $100/hectare)	225 hectares
Arid Coast On Farm Forestry (at $100/hectare)	600 hectares
Humid Tropical Agro-Forestry (at $1,500/hectare)	1,000 hectares
Species Trials (all areas - twenty 1/4 hectare trials per year for five years)	25 hectares
Other Demonstrations (at $1,500/hectare)	625 hectares
Total	10,000 hectares

c. Inputs

Inputs for this component include technical assistance, equipment and materials, some additional staff for the PNF and financing for field demonstration/applied research activities which will be carried out in cooperation with other groups and institutions. Training necessary to carry

out this component is included in the institution-building component. Annex VII contains details on cost estimates.

(1) Technical Assistance - Long-term technical assistance will be provided in:

- Tropical Forestry Management (36 pm) to supervise overall implementation of the agro-forestry, enrichment plantation and natural forest management demonstrations in the humid tropics.

- Plantation Management (36 pm) to supervise implementation of highland and dry coastal field demonstrations and to provide specialized assistance in nursery and plantation management.

Short term assistance is required as follows:

- Applied Forestry Field Research Design (9 pm) to assist the PNF establish its field research methodology;

- Forestry Extension (7 pm) to advise on extension techniques appropriate for Ecuador;

- Agro-forestry (6 pm) to advise on technical aspects of agriculture-forestry and livestock-forestry systems;

- Dryland Tree Species (4 pm) to advise on species appropriate for Ecuador's dry coastal areas.

In addition, the forest economist, the applied forestry field research design expert, the forest entomologist, and forest pathologist included under the institution-building component will devote significant amounts of their time and effort to the applied research and field demonstrations financed under this component. The short-term technical assistance will be provided on a periodic basis throughout the life of the project. Technical assistance requirements for this component will be financed with both loan funds ($450,000) and grant funds ($450,000).

(2) Equipment and Materials Total A.I.D. funding for equipment and materials for this component is $150,000 for the following:

(a) Vehicles - Six pick-up trucks will be purchased for areas which have major project activities, i.e., Chimborazo, Cotopaxi, Esmeraldas, and Napo provinces as well as the arid coast. These pick-ups will be adapted to carry tree seedlings as well as tools and fencing materials.

(b) Tools and Implements - Small tools and implements, e.g., hand-driven tillers and chain-saws, will be purchased for use in the field demonstration activities. Large equipment which may be required (e.g., tractors for use in terracing) will be rented.

(3) Local Staff - Reforestation activities in the Sierra and dry coast can be primarily carried out using the permanent staff and contracting mechanisms already being used in each of the collaborating institutions.

However, the PNF will assign the following additional staff to the project as part of its contribution:

(a) Two forest engineers to coordinate field demonstration activities in Esmeraldas and Napo provinces.

(b) Seven forest technicians to assure that the necessary field work is being carried out according to design, that tree seedlings are available for demonstration activites, and that data is collected on the demonstrations.

Additionally, teams of data collectors will be needed to record information relevant to the objectives of each reforestation activity. Two methods will be used to carry out this function: The first is to use local community members who, by gathering data, can be informed of the objectives and progress of the project and, consequently, have more interest in its outcome, and ultimately relate the outcome of the demonstrations to other community members. The second is to provide a small allowance to cover subsistence and thesis costs for university forestry students who have an interest in these activities and will undertake practical, problem-oriented thesis topics related to the applied research and field demonstration in which they will gather data for this project. Both methods will provide the opportunity for wider dissemination of project results. These costs, which amount to $50,000, are included in the cost of the field demonstrations.

(4) Field Demonstration Activities - Loan funds will finance 50 percent of the costs of all field demonstration activities, including applied research, which are carried out under the project. The remaining costs will be financed by the collaborating institutions, participating communities, and individual landowners. This is the average for the entire component and will vary among the field demonstrations because of the the diverse operating mechanisms and budgetary possibilities of the different groups and institutions which will collaborate with the PNF in the implementation of the productive forestry field demonstrations. The amount of loan funds used for a field demonstration will vary from 20 to 80 percent of the cost of the demonstration. When the PNF collaborates with private enterprise, PNF contribution will be approximately 20 percent. Demonstrations established in collaboration with other governmental institutions will involve approximately equal cost sharing. Reforestation for demonstration purposes carried out in collaboration with mixed enterprises or with associations of participants will have loan financing which approaches 80 percent.

The total cost of demonstration plantations, on-farm tree planting, natural regeneration and management, species trials and other demonstrations is $5,800,000. A.I.D. loan funds will finance $2,600,000 while Ecuadorean institutions and participants will contribute the remainder.

In addition to the plantation, natural regeneration, and on-farm/agro-forestry field demonstration activities specifically identified for financing in the outputs section, a number of other possible field demonstration activities have been identified. Additional activities, particularly those involving private sector entities, undoubtedly will be identified as

project implementation progresses. In order to facilitate a positive response as new needs materialize, $200,000 of loan funds are allocated as a reserve for unprogrammed field demonstrations. The counterpart contribution for these demonstrations is estimated at $800,000 given the expectation that they will involve support primarily to private enterprise activities.

d. Budget Summary for Component II

The A.I.D. contribution to this component amounts to $4,950,000 including $4,500,000 of loan funds and $450,000 of grant funds. The Ecuadorean counterpart contribution amounts to $5,500,000. Costs for this component are shown in Table II below. A more detailed budget is presented in Annex VII.

TABLE II

PRODUCTIVE FORESTRY RESEARCH AND PILOT DEMONSTRATIONS
(U.S. $000's)

Item	A.I.D. Loan	A.I.D. Grant	GOE	Total
Technical Assistance	450	450		900
Equipment and Materials	150	-	325	475
Field Demonstration Activities	2,800	-	3,400	6,200
Additional Staff			275	275
Inflation	1,100	-	1,500	2,600
TOTAL	4,500	450	5,500	10,450

3. Watershed and Protective Forest Management

The effective protection of economically important watersheds requires the delimitation of protective forests as well as a series of other measures related to land and water use as well as soil conservation.

The PNF is responsible for delimiting and managing protective forests. While it has some capacity to delimit and develop management plans for protective forests, it is unlikely that the PNF ever would be in a position to implement protective forest management plans on a large scale because of budgetary reasons. Therefore, it is important that the direct beneficiaries of protective forest management, e.g., the National Electricity Institute (INECEL) or the Regional Development Commission of Guayas (CEDEGE), assume responsibility for management of protective forests.

The related land and water uses, and soil conservation measures are the responsibility of the Ecuadorean Hydraulic Resources Institute (INERHI), the National Soil Conservation Program (PRONACOS) and, to a lesser degree, Ecuador's regional development organizations. An effective program of watershed management requires that protective forest delimitation and management planning activities be closely coordinated with actions for which other agencies are responsible. In December 1981, the PNF, INERHI, PRONACOS, and INECEL, together with a number of other institutions such as the Integrated Rural Development Secretariat and CREA, joined together to establish an Inter-Institutional Watershed Management Commission to coordinate watershed management activities in Ecuador.

Although the Commission is a coordination mechanism, with no staff of its own, rather than an implementing entity, the fact that the Commission includes the major potential beneficiary from watershed management planning activities (INECEL) as well as the agencies which must implement such activities, (PNF, PRONACOS, INERHI) is important. This will significantly increase the possibility that economically important watershed management activities are financed, either through revenues generated by the Institute or with funding from international banking institutions which finance hydroelectric projects. It will also help the implementing agencies to establish priorities.

The project will support the efforts of the Inter-Institutional Commission to develop Ecuador's capacity to implement watershed management programs by:

(1) improving the PNF's Department of Natural Areas and Wildlife capability to delimit and develop management plans for protective forests in economically important watersheds and other natural areas;

(2) helping finance a pilot watershed management field activity which will be implemented with the joint participation of the PNF and other institutions in the Paute watershed; and,

(3) strengthening INECEL's capacity to act as the lead institution in the Inter-Institutional Watershed Management Commission. Selection of INECEL as the lead institution is based on the following factors: (a) it is currently exercising such a role; (b) it is the Ecuadorean institution which has the largest direct financial benefit or loss from the implementation or non-implementation of adequate watershed management measures in watersheds where major infrastructure investments are being or will be made; and, (c) it is the institution most capable of financing such activities in those watersheds.

These three activities constitute a modest effort to develop an institutional and technical capability to carry out watershed management activities in Ecuador. However, they will be complemented a number of other small, on-going efforts including A.I.D. support to PRONACOS and INIAP through the RTTS project and OAS technical assistance to INERHI in river basin planning. When combined, these activities will be sufficient to establish an adequate institutional and technical basis for planning and implementing watershed management activities.

b. Outputs

(1) A Strengthened PNF Capacity to Delimit, Classify, and Develop Protective Forest Management Plans for Economically Important Natural Areas

This activity will strengthen the capability of the PNF's Department of Natural Areas and Wildlife to delimit and develop management plans for areas classified as protective forest within the context of the criteria established in the Forest Law.

In order to delimit and develop management plans for these areas, the PNF personnel must be able to map land capability according to its geomorphic characteristics, hydrologic conditions, slopes, soils, and Holdridge life zone association using available aerial photographs, maps, and field verification. The project will provide technical assistance, training, equipment and materials, and additional professional staff in order to upgrade the PNF's capability to carry out these tasks.

The process learning approach will be employed to achieve this increased capability. To gain necessary experience the PNF will carry out a number of protective forest delimitation/management planning efforts under the project. Specifically, the PNF will carry out an interdisciplinary assessment and delimitation effort in a 60,000 hectare sub-watershed of the Paute river watershed. This effort, which will be conducted with the assistance of a team of contracted technical experts, will allow the delimitation and management planning of protective forests.

Using the general criteria developed for the Paute watershed, the PNF will carry out protective forest assessment, delimitation and protective forest management planning in other watersheds where major infrastructure investments exist or are planned. The management plans will detail the optimal means of implementing protective forest management, including a determination of the combination of incentives and enforcement measures which would be required to implement the plans. Possible locations for these activities include parts of the Jubones and Daule-Peripa watersheds as well as coastal mangrove areas. Efforts covering approximately 500,000 hectares will be undertaken. This work will be carried out by PNF personnel, complemented by contracted personnel and the GOE's Center for Remote Sensing (CLIRSEN) and National Regionalization Program (PRONAREG). The participation of CLIRSEN and PRONAREC will be arranged through inter-agency agreements.

(2) Watershed Management and Rehabilitation Field Demonstration

In order to provide the institutions which comprise the Inter-Institutional Watershed Management Commission with an opportunity to obtain experience in the technical aspects of developing and jointly implementing watershed management plans, a field demonstration of watershed management practices will be conducted on a micro-watershed scale. Because the Paute watershed is the number one priority for Ecuador, and because a special sub-commission has been established for the Paute, the demonstration will be conducted within this watershed.

The site for demonstrations and controls to be chosen will represent the most prevalent degraded land conditions and will be located when possible for easy accessibility for visits by decision makers and will be chosen, field courses. Costs and measures of sedimentation control achieved will be extrapolated to the scale of major watershed units to determine the economic benefit derived from protection and rehabilitation in terms of extended useful life of infrastructural projects.

The control or treatments which will be demonstrated include: (a) protection with natural vegetation; (b) revegetation; (c) soil conservation measures; and (d) check dams. These treatments are described in Annex III. B. The first two treatments will be financed under this project while the other two investments will be financed by the PRONACOS sub-project of A.I.D.'s Rural Technology Transfer System Project.

(3) Technical Support to INECEL's Watershed Management Unit

The project will help INECEL to establish a small Watershed Management Unit within its operations department which will permit the institution to play a lead role in the Inter-Institutional Watershed Management Commission and to coordinate watershed management efforts where it is implementing hydroelectric projects. The role of this unit will be to evaluate the watershed management concerns in its projects, to supervise the preparation of watershed management plans and to elicit and obtain assistance from the institutions responsible for implementing specific watershed management activities.

A.I.D. will provide eighteen person-months of long-term technical assistance in watershed management to INECEL to help the institution establish this unit. This assistance will be provided in a limited scope grant agreement apart from the Project Agreement to facilitate project implementation. While there is a relationship between protective forest and watershed management activities, there is no benefit to be obtained by channeling institution-building assistance through the PNF to INECEL, which is an autonomous institution belonging to the energy and natural resources sector.

c. Inputs

(1) Technical Assistance: A team of experts will provide twelve months of technical assistance in land capability assessment and protective forest delimitation. The team, which will include a forester experienced in land use management planning for natural areas, an agro-ecologist, and a geo-morphologist, will provide on-the-job training to PNF professionals as well as personnel from other institutions in the delimitation and management planning of critical natural areas as well as advising in the selection, design and monitoring of management demonstrations. In addition, local expertise in civil engineering and economics will be tapped for design of small control structures and to conduct cost-benefit analyses. A.I.D. will also provide eighteen person-months of long-term technical assistance in watershed management to INECEL to help the institution establish its Watershed Management Unit.

The total cost of grant-financed technical assistance for this component amounts to $250,000.

(2) Training: Training will be provided to create an interdisciplinary group of professionals within the PNF which is capable of delimiting protective forests in accordance with the Forest and Water Laws, classifying those areas in terms of management requirements and developing management planning activities for the same areas.

Significant on-the-job training will be provided by carrying out the delimitation and classification activities in close collaboration with the technical assistance team in the case study area. Complementing the intensive work in the case study area will be a series of field workshops related to the protective forest/watershed management planning of major infrastructure projects. The purpose of these workshops will be to sharpen the technical competence of Ecuadorean professionals under diverse environmental conditions and to establish a data base and reconnaissance level knowledge of where protective forests are and how each watershed should be managed. Financing for these workshops is included under the first component of the project.

Long term training will be financed from loan funds in the amount of $80,000 for two PNF professionals at the masters level or equivalent in disciplines relevant to protective forest management.

(3) Equipment and Materials: Protective forest delimitation activities will require additional equipment for aerial photograph interpretation and mapping. The estimated cost of this equipment, as detailed in Annex VII, is $70,000.

(4) Protective Forest Delimitation and Field Demonstration Activities: Loan funding amounts to $450,000. Of this, $200,000 will finance field demonstration activities in the Paute river watershed and $250,000 will be provided to delimit and develop management plans for protective forests in other economically important natural areas in Ecuador. These funds will finance expenditures, primarily for specialized work which must be contracted out, e.g., field surveys, or accomplished through coopertive agreements with other GOE institutions such as CLIRSEN and PRONAREG under which the PNF would provide funds so that these institutions can carry out specialized studies. A total of $350,000 in counterpart funding will be provided of which $150,000 will finance field demonstrations and $200,000 will be allocated for delimitation activities.

A detailed cost breakdown of these activities is included in Annex VII.

(5) Additional Staff: The PNF will add two additional professionals to its Natural Areas and Wildlife Department who will devote full time to delimitation and management planning for protective forests. Counterpart funding of $60,000 will be provided. INECEL's Watershed Management Unit will consist of the unit director and two other professional staff

members. Three professionals, concluding a civil engineer, an agronomist with training in ecology and an economist will be hired. Counterpart funding for this Unit will amount to $210,000 for salaries and operating expenses.

d. Project Costs

The A.I.D. contribution consists of $800,000 in loan funding and $250,000 in grant financing. INECEL will receive $150,000 of these grant funds through a separate project agreement.

GOE counterpart amounts to $900,000 of which $200,000 will be provided by INECEL.

TABLE III

PROTECTIVE FORESTS AND WATERSHED MANAGEMENT
(U.S. $1,000's)

Item	A.I.D. Loan	A.I.D. Grant	GOE	Total
Technical Assistance	-	250		250
Training	80	-	40	120
Equipment and Materials	70	-	40	110
Protective Forest Delimitation and Field Demonstration Activities	450	-	350	800
Additional Staff			270	270
Inflation	200	-	200	400
TOTAL	800	250	900	1,950

III. PROJECT ANALYSES

Parts A, B, C, and D below are summaries of more detailed analyses presented in Annexes IV, V, VI and IX of this Project Paper. Additionally, Annex VII contins a number of financial exhibits which support the financial analyses of part F.

A. Technical Analysis Summary (See Annex VI)

1. Productive Forestry Applied Research and Pilot Field Demonstrations.

The detailed technical analysis contained in Annex VI supports the conclusion that the productive forestry applied research and pilot field demonstrations are technically feasible. Of the systems proposed, highland plantation forestry has been carried out in Ecuador while highland on-farm forestry and humid tropical agro-forestry and enrichment plantations have been tested elsewhere in Latin America. Although there is relatively less experience with arid zone forestry and with management of the humid tropical natural forest, the technical elements are not complicated and can be implemented without difficulty under Ecuadorean conditions.

There are, nevertheless, a number of technical (as well as economic, institutional, and social) issues with regard to productive forestry activities in Ecuador. For this reason the forestry production activities financed under the project will have applied research elements in their design and will be demonstrative in nature. By implementing a program of diverse field demonstrations combined with applied research the PNF will generate the information needed to determine whether specific forestry activities that may be proposed in the future are technically feasible. The technical knowledge which is generated as a result of the project will enable the PNF and other Ecuadorean institutions involved in forestry activities to better identify the most appropriate types of forestry under a wide variety of geographic and climatic situations.

Major technical questions which will be addressed by the applied research/field demonstration activities include:

- The feasibility of using native species in highland and dry coastal forestry programs;
- The feasibility of inter-cropping in highland pine plantations;
- The feasibility of natural forest management in the humid tropics;
- The feasibility of natural regeneration in the highlands and dry coastal zone;

o The feasibility of using exotic species other than P. radiatus and E. globulus in highland forestry.

The precise definition and adequate design of these demonstrations will be assured through the provision of technical assistance and training in field research design methodologies and a wide variety of other technical assistance relevant to the specific demonstrations.

2. Protective Forest Delimitation and Management

The protective forest delimitation and management activity focuses on the delimitation and management planning of protective forests and on the implementation of a watershed management field demonstration in the Paute river watershed. The delimitation and management planning is technically feasible. The major technical constraint--the lack of good land use maps--is being gradually resolved through the activities of the National Regionalization Program (PRONAREG) and CLIRSEN. To the extent that good maps are not available, they can be constructed from aerial photographs provided by CLIRSEN which are verified by site visits. Although the PNF does not currently have an adequate capacity to implement a large-scale protective forest delimitation and management planning program, the project provides for additional staff trained in this function.

The watershed management field demonstration activity will implement a series of erosion control activities which have been demonstrated to be technically feasible in other Latin American countries. These include: natural regeneration of vegetative cover, planting vegetative cover, check dams, and other soil conservation measures such as contour plowing and grass waterways. While the technical appropriateness of specific measures must be determined by site surveys, the major function of the field demonstration will be to test their social acceptance and economic feasibility, rather than technical feasibility.

3. Construction and Engineering Considerations

No major construction or engineering activities are planned under the project. The physical structures which will be built in conjunction with the Paute watershed management demonstration activity are small structures which will be financed through the PRONACOS and/or COMSA subprojects under the Rural Tecnology Transfer System Project.

B. Economic Analysis Summary (See Annex IV)

As indicated in Section 1.B. of this Project Paper and Annex IV-A, the economic prospects for substantial improvement in the development of Ecuador's forestry sector are promising. Internal demand for wood products will continue to grow rapidly through the remainder of this century. Opportunities

to decrease pulp and paper imports will exist as Ecuador increases its forestry plantations. Significant possibilities for expanded exports of wood products also exist. It is expected that increased investments in forestry and wood products will have high financial and economic pay-off.

Table IV summarizes the economic analysis conducted on selected project activities. It should be remembered, however, that given the emphasis of this project on institutional development and technology generation and diffusion, most of the proposed project activities do not lend themselves to ex-ante B/C analysis. Economic appraisals conducted ex-post of similar types of projects suggest that the continued investments of both financial and human resources in research and institutional strengthening are having a high return to such investments. For example, recent review of the literature by the World Bank on the economic returns of such investments reveals a consistent story: realized rates of return on agricultural research investments are generally two or three times greater than alternative investment opportunities. High rates of return are also expected as a result of the project elements proposed in this paper.

The economic feasibility of specific types of forestry activities included as major field demonstrations is detailed in Annex IV. B. Although the analysis which has been carried out for this project is indicative of the proposed activities, it is important to note that one of the major objectives of the field demonstrations is to more carefully measure costs and benefits of the different types of forestry activities in the various geographic areas of Ecuador, prior to making large scale investments in such activities. A number of the field demonstrations are specifically aimed at testing the feasibility of systems and techniques, e.g., agro-forestry, which can generate increased returns to forestry investments.

The results of the analysis show, under the assumption that the opportunity cost of capital in Ecuador is in the 10-15 percent range, that underinvestment in forestry sector activities exists. The measures of economic feasibility exceed alternative investment opportunities and, indeed, confirms the underinvestment in the forestry sector. For example, in the case of pine and eucalypt plantations, under average conditions, the economic IRR exceeds 13 percent, and when inter-cropped with a short-cycle food crop like potatoes, the financial indicators of viability increase significantly.

For activities in the humid tropics, financial rates of return are higher because of the higher value of much of the wood produced and in some instances the more rapid growth of certain tropical species. The analysis for enrichment plantations yields an internal rate of return of 13 percent while agro-forestry activities generate substantially higher returns, indicating that if the latter prove to be socially, administratively and technically feasible, future forestry efforts may be channelled more toward this type of activity.

TABLE IV

COMPARATIVE MEASURES OF FINANCIAL AND ECONOMIC FEASIBILITY OF SELECTED FIELD DEMONSTRATION ACTIVITIES

ACTIVITY	Financial Profitability Measures			Economic Appraisal 1/		
	NPW 2/ Sucres/hectare	IRR	B/C 2/	NPW 2/ Sucres/hectare	IRR	B/C
A. Pine Plantations in Highland Ecuador						
1. Normal Soil Conditions	4,547	12.4	1.38	11,765	13.0	
2. Cangahua Soils	7,880	6.7	.61			-
B. Pine Plantations Inter-cropped with Potatoes	58,972	50.0+	1.92			
Sensitivity to: increased production	7,132	13.7	1.60			
decreased production	386	10.2	1.04			
C. Eucalyptus Plantations in Highland Ecuador	606	10.4	1.05	20,646	20.0	-
D. Agroforestry Plantations in the Humid Tropics:						
- Laurel and bananas	36,595	-	1.62	58,963	(3)	2.13
- Laurel and coffee	28,595	-	1.54	47,968	(3)	2.04
- Pachaco with rice, corn and pastures	17,316	-	1.30	37,929	(3)	1.73
- Teak with rice, corn beans	22,033	-	1.29	69,650	(3)	2.03
- Balsa with corn and rice	58,699	-	1.96	89,155	(3)	2.64
E. Demonstration on Protected Enrichment Plantations in the Humid Tropics						
Pachaco without wood use	6,996	-	1.37	18,647	19.6%	2.7
Laurel with wood use	11,010		1.49	32,013	(3)	3.6

1/ See USAID/Ecuador, Forestry Sector Assessment.
2/ Assumes a discount rate of 10%
3/ An internal rate of return cannot be estimated, since the cash flow is such that unless discounted, even at the highest rates, cannot yield a negative NPW.

The economic feasibility of forestry activities is higher than their financial feasibility. When shadow prices are applied to important factors (labor, capital) and products (fuelwood), the return on forestry activities, particularly in the Sierra and dry coast, increases. Fuelwood, which currently competes with highly subsidized petroleum derivative fuels, has a shadow price of 500 sucres per cubic meter compared to the 150 sucre price used in the financial analysis. Although no shadow price for rural labor has been calculated for Ecuador, a shadow wage of 80 percent of the monetary remuneration has been assumed for analytical purposes. Since one half of wood which is harvested is used as fuel and since forestry is a highly labor intensive activity, the economic return can be substantially higher than the financial rate of return. Shadow prices for these items have been applied to the major productive forestry field demonstration activity, i.e., Sierra pine plantations. The economic internal rate of return to this activity is 13 percent. Similar increases in return are obtained for other forestry activities.

Yet, probably of greater importance, are mostly unquantifiable externalities. The project involves much more than field demonstration activities. For example, Ecuador will greatly profit from activities such as those which will be made to improve Ecuador's institutional capacity to define sector policies, to rationalize the use of the country's forestry resources, and to improve its research and training capacity.

In summary, the economic analysis is indicative of a project which is expected to have high economic payoff. In the past, Ecuador's forestry sector has not received the necessary economic investments needed for an efficient management of forestry resources. With this project, the institutional development, the technology generated and the improved human resources will provide Ecuador with the necessary base for meeting its wood products requirements and better managing this valuable renewable resource.

C. Social Soundness Summary (See Annex V)

1. Project Beneficiaries

The project will benefit a number of different segments of the Ecuadorean population. It will: (a) provide direct benefits to an estimated 5,000 campesino and Indian families who will participate in the project's field demonstration activities; benefit PNF and other forestry sector professional and technical personnel who will receive training under the project; benefit private and public forestry sector entities through the generation and dissemination of more cost-effective silvicutural techniques and methodologies; and it will establish a base for generating significant economic benefits in the form of increased useful life of major investments in infrastructure to Ecuadorean institutions such as INECEL and INHERI.

2. Socio-Cultural Feasibility

a. General Considerations

The Social Soundness Analysis, presented in Annex V, shows that Ecuador's new Ley Forestal, together with the implementation of forestry activities of the type proposed under this project, offers a variety of direct and indirect benefits to campesinos and Indians. Although the exact nature of these benefits varies widely due to the great social and ecological differences within Ecuador, the most direct benefit of the project will be through its support for sustained yield production systems and the resulting long term economic gains for the beneficiaries. Many of the activities will assist in reversing ecologically unsound and economically short-sighted land use patterns. Generally, however, benefits derived from forestry projects produce neither large nor immediate economic benefits. Thus, the socio-cultural feasibility of the project rests not on whether or not it will benefit the recipients, but on whether the intended beneficiaries can be sufficiently motivated to participate in the project.

An important indirect benefit of forestry programs is the fact that land owners who commit their property to reforestation or forestry related activities are not subject to expropriation under the Agrarian Reform Law. Consequently, colonists and Indian groups can be expected to participate fully in forestry projects if they can obtain title to their land. Support for protecting titled land and assisting in titling land is almost a prerequisite for the social success of potentially significant forestry programs. Recent experience by EMDEFOR in Chimborazo demonstrates that titling of community lands can be carried out quickly and at low cost. The project will provide land titling assistance to the communities and groups which participate in the project and which require such assistance. The PNF's legal department will play a key role in providing such assistance, particularly in dealing with the paperwork required by the Ecuadorean Agrarian Reform and Colonization Institute (IERAC) which is responsible for providing land titles. A small amount of project funding for field demonstration activities will be provided as needed to pay for expenditures necessary for titling such as land surveying.

The project is expected to have a favorable impact on women because substantial amount of the round wood produced in the Sierra and the dry coast will be allocated for fuelwood. This generally will reduce the difficulty and amount of time spent in gathering fuelwood, which is generally a woman's chore. The role of women in forestry activities per se will vary according to the specfic cultural and economic context of the forestry activities. In situations where on-farm forestry activities are implemented and where women are involved in agricultural tasks, they necessarily must be involved in the planting and maintenance of the trees. Where reforestation occurs on communal lands or is a wage labor activity, the participation of women will depend on the cultural norms of the community or group.

b. Regional Considerations

The detailed Social Soundness Analysis, included in Annex V , shows that significant social-cultural diversity exists among Ecuador's major geographic regions and therefore the benefits and social feasibility of specific activities vary from area to area.

(1) Sierra

Andean campesinos and Indians are primarily concerned with maintaining their subsistence security, however fragile that may be. Food production is therefore a primary concern and any forestry related activity must be undertaken with the understanding that, unless one approaches these communities with the idea of providing incentives without incurring risks to food production, the program could be met by either violence or apathy.

Tree plantations on community lands at altitudes above individual agricultural plots, (i.e., generally above 2,800 to 3,200 meters) offer excellent opportunities to utilize unused land, protect lower agricultural lands from erosion, provide long-term economic benefits, and secure presently underutilized land against the threat of capricious agrarian reform. Many communities are aware of these benefits and will undoubtedly seek assistance in implementing forestry programs. Others will need to be stimulated by promotional campaigns. Similarly, some communities will enthusiastically embrace forestry plantations while others will require incentives which produce immediate benefits. As such, contracts or agreements between communities and forestry institutions (private and public) which provide cash payment for planting and periodic maintenance of plantation will encourage communities to introduce and care for trees, which for them will always be less important than agricultural activities. Such benefits will be provided in activities financed by the project and have been included in project cost estimates. Communal plantations in which crops or pastures can be grown will also encourage participation in forestry activities. These are also contemplated in the project.

In addition to communal plantations on high grasslands, another component of Sierra forestry will be on-farm/agro-forestry programs. This will help trees to be perceived as something other than items which stand isolated from the rest of the agricultural complex. However, the feasibility of such activities lies in the ability of the project to produce successful demonstration plots and demonstrable direct or indirect economic benefits, e.g., soil conservation, fuelwood, etc.

(2) Northwestern Moist Tropical Lowlands

Anticipated forestry related activities for the northwestern sector are: 1) plantation development and forest enrichment; 2) experiments in natural regeneration; and 3) agro-forestry.

Plantations and forest enrichment present no social feasibility problems. Activities will be undertaken on state land during the initial period of the project and the major direct impact these activities will have on the local population is in terms of labor relations between the state enterprises and the local employees. Although the area has long been characterized by labor problems and relations with local employees must be managed carefully, PNF officials have an awareness and sensitivity to this situation.

The project's planned demonstration experiments in natural regeneration and agro-forestry offer excellent opportunities to reverse the currently uncontrolled, or minimally controlled, deforestation by both concessionaires and colonists in the area. The ability to implement the programs is directly related to the resolution of tensions between industry and colonists and the establishment of a firm land tenure system. No one will be willing to participate in programs, however beneficial they maybe, if their land tenure is precarious. The ultimate success of the sustained-yield, economically and ecologically sound land use programs which are being proposed rests on the resolution of severe social problems by providing land titles to natives and colonists who reside in the area. As in the Sierra, the PNF will assist beneficiary groups in obtaining their titles.

(3) Eastern Tropical Lowlands (Oriente)

By comparison to the western lowlands, forestry development in the Oriente is much less constrained by social tensions. The region is populated by native people and colonists, both of whom, in increasing numbers, are deforesting in order to prepare land for pasture. Many, particularly the Indians, recognize that this land use pattern is not the best possible but that it serves a significant function in that it demonstrates evidence of production and therefore provides a guarantee to their tenure and a means to obtaining title to land. As such the agro-forestry and natural regeneration aspects of the project which will be linked to land titling offer an excellent alternative and, if successful, a model for rational economic development and tropical forest management.

(4) Dry Coastal Areas

The social feasibility of forestry activities in this region is less tied to land titling. Rather, it is dependent primarily on selecting forestry activities which are perceived to provide direct economic benefits, e.g., natural regeneration of algarrobo for use in charcoal manufacture, and planting of trees which provide shade for other crops and/or food.

c. Conclusion

As indicated in Annex V, the project is feasible from the socio-cultural perspective. It provides sufficient incentives including immediate economic incentives and other tangible benefits such as land titling to assure a high degree of participation by campesino and Indian groups in project activities. The provision of 15 person-months of advisory services of an Ecuadorean anthropologist will also enable the PNF to properly implement field demonstration activities and, where necessary, make adjustments in operating procedures in order to deal more effectively with project beneficiaries.

D. Administrative and Institutional Feasibility (See Annex IX)

1. The PNF's Capability to Administer the Project.

Annex IX analyzes the structure of the PNF, its staffing, and its legal basis. Chart I on the next page depicts the organization and indicates the staffing levels of each department, including contract personnel. The organization shown in Chart I reflects changes made in anticipation of the new Forestry Law. See Annex IX for details.

The new Law provides the PNF with an ample mandate to carry out the promotional, programming, research, coordination, information dissemination, technical assistance and support activities which comprise the institutional development component of the project, as well as to enter into the inter-institutional agreements contemplated under the field activities. The PNF came into being with the issuance of its functional organizational regulation on March 31, 1981. This newness does not reflect its operational experience as an organization since its Executive Director and key staff worked together in the predecessor organization - a Directorate within the Ministry of Agriculture (MAG).

The upgrading to the level of a national Program within MAG provides the PNF with its own capability to manage procurement and disbursement matters. The project will strengthen this capacity by providing short term management consulting services at the onset of implementation. It is expected that these services will help the PNF become more agile in making funds available on a timely basis. In-service training programs will also be developed to improve the administrative capabilities of field personnel.

The PNF has adequate technical capability to carry out productive and protective forestry field demonstration activities provided that minimal staff increases are implemented in specific areas and some staff functions and responsibilities are reassigned. The specific technical assistance and support functions at the district office level must be strengthened. The PNF is committed to make these changes since, as a result of the new Forestry Law, it must assume responsibility for these functions. The project will support these changes through the provision of training, vehicles, nursery improvements and, where required, additional staff in the six district offices which will be required to assume a major part of the responsibility for providing the PNF's contribution to the field demonstration activities.

The changes to be introduced into the PNF program by the project principally address its role and administrative capacity, and not its organizational structure. As visualized, the PNF will assume a leadership role in the planning, coordination and evaluation of specific research projects which will involve the participation of other governmental or private institutions such as EMDEFOR. Broadening the number of participants in the field demonstrations in a coordinated manner will result in more personnel and financial resources being brought to bear than would result from research administered solely by the PNF. The introduction of the new mode and philosophy of administration has been discussed fully with the Executive Director and key PNF staff. They embrace the change and expect to be able to effect it with minimal difficulty.

2. Feasibility of Inter-Institutional Cooperative Agreements.

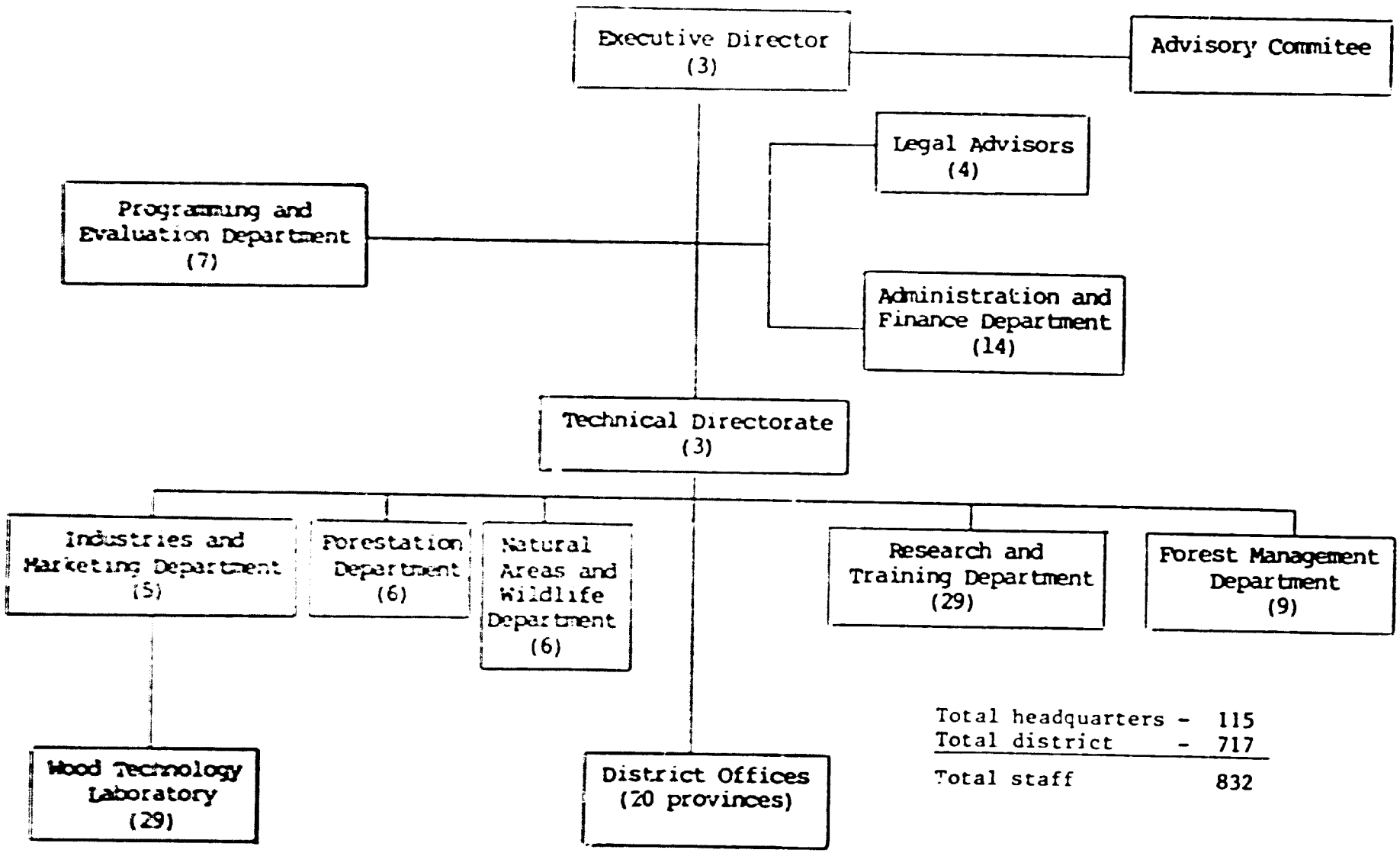
The project's administrative feasibility is also dependent on PNF's ability to enter into and implement cooperative agreements with other public and private sector entities. The PNF has used this cooperative agreement mechanism before and currently has agreements with PREDESUR, IRD projects, the Pichincha Provincial Council and EMDEFOR. Although it does not have cooperative agreements with private sector entities, the new Forestry Law facilitates such agreements and the PNF has expressed an interest in implementing agreements with private sector entities. During project design USAID explored this possibility with several private sector entities that would be likely candidates for a collaborative effort with PNF. Annex IX identifies and briefly describes potential private sector participants. All indicated a strong interest in signing cooperative agreements with PNF.

A fundamental issue with regard to these agreements is the way in which loan funds will be used. Since the field demonstration activities will involve communities or other groups, as well as public and private sector institutions, it may be more convenient in some cases for the PNF to make disbursements directly to communities, rather than through other public or private sector institutions which may be implementing the field demonstration activities. Alternative disbursement mechanisms will be tested and adjustments will be made in these mechanisms as necessary. The implementation of the cooperative agreements will require close monitoring by the PNF to ensure their proper execution. The principal long-term advisor will assist the PNF in this task.

USAID will undertake responsibility for project implementation in specific areas such as the procurement of dollar cost goods and services. It will be able to carry out these responsibilities provided that the long-term principle advisor will assume a key liaison role in assuring adequate coordination between the PNF and USAID. The procurement of technical assistance will require the assistance of the regional contracting officer and the A.I.D.- USDA Forestry Support Program.

CHART I

Organization of the National Forestry Program
(Numbers represent total staffing assigned to each unit)



Total headquarters	-	115
Total district	-	717
Total staff		832

3. USAID Conclusion

The project is administratively feasible and institutionally sound for several reasons.

First, although the track record of the PNF's predecessor agency is spotty, it has gained considerable experience and receiving substantial technical assistance principally from FAO during the past 25 years. Its self-identity as an institution has been strengthened by the new Forestry Law. In this context, the PNF's key staff are receptive to and looking for ways to improve PNF's performance and effectiveness. The project responds by positively approaching institutional development through incremental adjustments. No major reorganization and no major staff increases are required to implement the project.

Second, the project is a balanced approach. It will improve PNF's service delivery to decentralized institutions that work at the community level and PNF's own understanding of how to work with local communities. By improving PNF's capacity to provide services valued by its clients, its organizational legitimacy as a priority development institution within the GOE bureaucracy will be solidified. It will thus be better able to compete for limited central government finances and support.

Third, the project will help institutionalize a learning capacity within PNF, the learning-by-doing approach of major field demonstrations with applied research elements will not only generate specific technical information but should instill a more scientific or inquiring attitude among PNF staff. Similarly, the project's focus on in-country training and use of staff members for in-service training will help highlight the importance of the learning process. In this regard, the project financed information center will add further support to the knowledge generation/dissemination process.

The above three factors should have the combined effect of making the PNF a more dynamic institution. Moreover, the importance of sound forest- ry policy and programs will increase in the minds of the Ecuadorean public and opinion leaders as the conservation promotion efforts of organizations such as Fundacion Natura take effect. At the same time, PNF's field demonstrations and applied research will generate answers to some of the difficult questions concerning the use of an extremely important natural resource. These factors, together with the technical assistance, training, and other inputs furnished by the project, will help PNF rapidly develop into a mature, service oriented organization.

E. Environmental Concerns

An Initial Environmental Examination (IEE) was prepared on the Forestry/Natural Resource Management project on November 6, 1980. This IEE, based on a review of the Project Identification Document (PID), resulted in a Negative Determination and indicated that the project would have a positive effect on the quality of the human environment.

The Project Paper presents, in detailed form, substantially the same activities outlined in the PID insofar as activities in support of the forestry sector are concerned. Soil conservation will be supported through another current A.I.D. project. Cooperation in the execution of the two projects will constitute a substantial contribution to natural resource management. A careful review of the IEE indicates no significant change in ranking on any of the evaluation elements nor in the overall Negative Determination. The impact of the pertinent activities planned in the Project Paper can now be discussed with more precision than was possible when the original "Discussion of Environmental Impacts" was prepared.

1. Nursery Operations in Support of Forestry Activities - Nursery operations in support of forestry activities will use a variety of pesticides to protect concentrated seedling production. The pest problems to be encountered in producing various tree species cannot always be anticipated nor can the pesticides to be used always be identified. The Project will finance controlled experiments to ascertain appropriate pesticides for nursery use. The proper use and handling of pesticides will be included in the nursery management training sub-activity. Pesticides employed for general use in nurseries will be limited to those not banned or restricted by the EPA.

2. Humid Tropical Forestry - The activities proposed in agroforestry, enrichment of degraded forests and improved succession management all have in common the intensification of forest production on appropriate, accessible sites using a diverse range of native and exotic species. Success in these ecologically sound activities will tend to reduce pressure to convert isolated forests to marginal cattle pasture, prevalent destructive practice.

The demonstration to improve the sustained yield management of standing tropical forests for non-wood products by indigenous groups in the Oriente will have a net environmental benefit. This activity is designed to provide economic benefits to indigenous groups already participating in the na- tional economy while at the same time providing an alternative to the destruc- tive land use practices spreading into their territory. Herbicide use will occur in the forest enrichment demonstration. The herbicide(s) used will be limited to those not banned or restricted by the EPA and application will be done under the technical supervision of PNF technicians trained in pesticide handling.

3. Sierra and Dry Coastal Forestry - Activities include multipurpose on-farm forestry and large scale plantations on sites considered marginal for agriculture. On-farm forestry will use various species for planting of wind breaks, field borders, terrace edges and dooryards. The net effect will be a net increase in tree diversity and soil conservation while contributing to the availability of wood products for local use. That is, positive environmental benefits are expected from this activity.

4. Protective Forest and Watershed Management - Activities in this area will have a strong positive effect on environmental quality. All aspects of water quality will be enhanced and a significant contribution to soil conservation and recuperation will be made. Effective protection of upper watershed natural forests will enhance and maintain ecological stability. Demonstration activities proposed serve as models for actions on the scale of an entire watershed which would result in large net economic benefits in terms of the protection of major infrastruc- tural investments.

F. Financial Analysis

1. Project Costs and Disbursement Schedule

A summary budget for the project components is presented in Table V. Detailed cost estimates are presented in Annex VII. The total cost of the project is $15,600,000 of which A.I.D. will contribute 52 percent. The A.I.D. funding will consist of $6,500,000 in loan funds and $1,600,000 in grant funds. As explained in the project description, $600,000 of grant funds will be obligated outside of the main Project Agreement as follows: (a) $450,000 will be obligated through a direct A.I.D. contract or a PASA for a long-term principal advisor to the PNF; and (b) $150,000 will be obligated through a separate Grant Agreement with INECEL. The Host Country contribution will amount to 48 percent of the project. The Host Country counterpart contribution will consist of GOE budget expenditures, private sector expenditures and contributions of labor and land by the communities and groups which will benefit from the project.

If financing cannot be made available to USAID to fully fund this project in FY 1982, the A.I.D. contribution to the project will be provided incrementally as follows:

Fiscal Year	Loan	Grant
1982	$3,000,000	$200,000
1983	3,500,000	500,000
1984	--	650,000
1985	--	250,000

The cost estimates for the field demonstration activities are based on current forestry experience in Ecuador where applicable and on experience in other South American countries where there is no local experience, adjusted to Ecuadorean conditions, as in the case of humid tropical forestry. Cost estimates for each major type of field demonstration are presented in Annex VII. These costs are reasonably firm although because of the nature of the field demonstration activities some variations in costs for specific activities should be expected. Other costs, e.g., for operations, training,

technical assistance and equipment are based on recent experiences in other USAID projects. Project costs have been adjusted for inflation on the assumption of a 10 percent annual inflation rate which has been applied to the estimated schedule of accrued loan and counterpart financed expenditures for each component of the project. Grant funded technical assistance costs have a built-in inflation factor. In addition to the amount set aside for cost adjustments due to inflation, $600,000 has been reserved for contingencies of which $300,000 are loan funds, and $300,000 are counterpart. The amount set aside for contingencies amounts to 6.5 percent of total project costs. This level for contingencies is considered adequate since an inflation factor has also been included separately in the project cost estimates.

The contingency line item is an important element of the project since, as explained in Section I. F., Project Model, the process learning approach requires that substantial flexibility to adjust activities be built into the project. The contingency line item will provide the PNF with the flexibility to make necessary mid-course adjustments. Possible uses for contingency funds include additional loan financed technical assistance and loan funding of additional PNF staff on a declining scale. The technical assistance which has been programmed for the project is the minimum amount required to achieve project objectives; however, it is probable that the PNF will, in some cases, request that long term experts be extended or that additional short term technical assistance be provided. Also, while USAID does not foresee any fundamental problem in the limited increases of PNF staff anticipated as part of the GOE contribution, the GOE has recently initiated an austerity program which includes a temporary freeze on all new hiring and personal services contracts. Therefore, during project agreement negotiation, up to $100,000 of loan funds may be set aside for temporarily contracting professionals who will be incorporated into the PNF's permanent staff as soon as possible.

2. A.I.D. Disbursement Procedures.

The Project Assistance Completion Date is March 31, 1988, approximately five years from the date of fulfillment of the initial conditions precedent to disbursement. The bulk of disbursements will occur during the second, third and fourth years of the project. Direct foreign exchange costs amount to $2,300,000. These will be primarily for technical assistance, training outside Ecuador, and imported equipment. The major portion of expenditures will be in local currency, primarily for field demonstration activities. Imported vehicles and equipment will be paid for by means of the A.I.D. Letter of Commitment procedure. Expenditures for technical assistance will be paid directly by A.I.D. under A.I.D. contracts or through the U.S.D.A. - A.I.D. Forestry Support Program RSSA. Local currency disbursements will be disbursed through a revolving fund procedure in which the PNF will establish a separate account in the Central Bank. For some field activities disbursements may be made directly to other institutions upon approval of the PNF. For example, disbursements for activities in Integrated Rural Development projects will be made through FONADRI, the Integrated Rural Development Fund which is being utilized in the Integrated Rural Development and Integrated Health Services Delivery projects. Activities which involve EMDEFOR as the implementation agency are also likely to have disbursements made directly to that institution. Specific disbursement arrangements will be included in each cooperative agreement which PNF executes with another Ecuadorean public or private

sector institution. Since the prior approval of A.I.D. will be required for each cooperative agreement, USAID will approve the specific disbursement procedures established for each field demonstration activity.

3. Host Country Counterpart Contribution and Recurring Cost Analysis

Ecuadorean resources will contribute 48 percent of the total project cost and will be $7.5 million over the five year project life. Counterpart for institutional development activities will be financed from the GOE budget and will include staff salaries and other operating expenses related to the implementation of these activities. For the field demonstration activities the counterpart contribution will consist of GOE budgetary expenditures channelled primarily through the PNF but also through other public sector organizations such as the IRD Secretariat, INECEL, and INCRAE, investments by mixed and private enterprises, and labor and land contributions of the communities and groups which will participate in project activities. A major objective of the project is to more effectively mobilize public, private and community resources to implement forestry activities, rather than relying entirely on public sector resources to carry out forestry activities. Therefore, the cooperative agreements which are established to implement the field demonstration activities will require a tangible contribution of resources from each of the participating groups or institutions. As detailed in Annex VII the counterpart contribution will consist of $5.0 million of public sector resources, $1.1 million from private enterprises, and a community contribution of $1.4 million which represents the net value of the land and labor contribution after incentive payments to participants have been taken into account.

The institutional development of the PNF which will occur as a result of the project will mean that the PNF will have to bear certain recurring costs, particularly to maintain the research, coordination and information dissemination functions which will be developed as part of the project. Because these functions will be developed with minimal additional staff, recurring salary expenditures related to institutional development amount to $30,000 per year, i.e., an increase of one percent in the PNF's current operations budget. Materials and other costs related to the implementation of these functions will also be incurred but these will not exceed one percent of the current PNF budgetary allocation.

The productive forestry field demonstration activities will require additional counterpart expenditures after the PACD by public and private sector institutions as well as by the beneficiary groups which participate in the field demonstrations. These include plantation maintenance expenditures which will generally be borne by the participating communities and groups, and outlays for continued gathering of data related to the applied research and field demonstrations which must be assumed by the public and private institutions which participate in the cooperative agreements. The former expenditures will primarily consist of labor expenditures for pruning and thinning

while the latter will require cash payment for data gathering. In addition, the increase in forestry activities in the northwestern and Amazonian humid tropics will require additional PNF staff which must continue to work in those areas after the PACD date. The increased staff expenditures will amount to $65,000 annually, or 2.5 percent of the PNF's current annual operations budget.

The development of the PNF's protective forest delimitation and management planning capability also means additional recurring salary costs in the amount of $15,000 annually and related operating costs amounting to $30,000 annually.

The ability of the PNF and other institutions to absorb the recurring costs generated by the project is reasonably certain. Except in the case of the PNF these costs are minimal and are often of an "in-kind" nature. The total estimated additional annual cost which must be included in the PNF's budget as a result of the project amounts to five percent of its 1982 operations budget. The PNF should be able to maintain this level of increased funding without difficulty after project completion, particularly since a number of project activities, e.g., training in nursery and plantation management are likely to result in substantial efficiencies in operation over the medium term.

4. USAID Conclusions

Reasonably firm cost estimates for project activities exist. The costs to the U.S. Government have been clearly identified. The counterpart contribution required to carry out project activities as well as the recurring costs which will result from the project can reasonably be borne by the institutions and groups which are responsible for them. Therefore, USAID concludes that the project is financially feasible.

SUMMARY PROJECT BUDGET BY INPUT
($ 1,000's)

	A.I.D.		Host
	Loan	Grant	Country
Technical Assistance	635	1,600	65
Training	650		250
Equipment and Materials	550		770
Field Demonstration Activities	3,700		4,675
Protective Forest Activities	600		450
Additional Staff			925
Evaluation	65		65
Contingencies	300		300

IV. IMPLEMENTATION ARRANGEMENTS

A. Implementation Planning

1. Project Timetable

The project will be implemented over a period of approximately five and one-half years from the date of signature of the Project Agreement. The March 1988 PACD will allow the field demonstration activities to be programmed over a five year period. Annex IX contains a detailed time-phased implementation schedule for each of the project components. Assuming a July 1982 Project Authorization, the schedule for key project start up and implementation events will be:

Activity	Date
Project Agreement Signed	July, 1982
Initial C.P.s Met	October, 1982
Principal Advisor to PNF In-country	March, 1983
Management Specialist Contracted	March, 1983
First year Operating Plan Prepared	March, 1983
Initial Applied Research and Pilot Field Activity Agreements Signed	June, 1983
Additional PNF Staff On-board	June, 1983
Remaining Long Term Technical Assistance Contracted	September, 1983
Out-of-Country Training for PNF Personnel Initiated	September, 1983
All Short Term Technical Assistance Contracted	September, 1983
In-country training initiated	November, 1983
Productive Forestry Pilot Field Activities Initiated	November, 1983
Protective Forestry Field Activity Initiated	February, 1984
Mid-Project Process Evaluation Completed	December, 1984
In-depth Project Evaluation Completed	December, 1986
PACD	March, 1988

For the separate limited scope grant agreement which will be signed with INECEL, key start up and implementation events are as follows:

Grant Agreement Signed	September, 1982
Initial C.P.'s Met	December, 1982
INECEL Watershed Management Unit Staffed	May, 1983
Long-Term Technical Assistance On-board	June, 1983

2. GOE Adminstrative Responsibilities

The Project Agreement will be signed by both the Minister of Finance and the Minister of Foreign Relations, because both loan and grant funds are involved, as well as by the Minister of Agriculture who will be an authorized representative for the project. (A separate Grant Agreement which will finance technical assistance for INECEL will be signed by the Minister of Foreign Affairs and by the Executive Director of INECEL.) An additional authorized representative for the project will be the director of the National Forestry Program. The Project Agreement will provide that the National Forestry Program will coordinate project activities and that it shall enter into subagreements as may be necessary to implement project activities.

The inter-institutional cooperative agreements which will be executed by the PNF will be negotiated on a case by case basis although they will be substantially similar to each other. A model cooperative agreement will be required as a condition precedent to disbursement. PNF will enter into the cooperative agreements through direct negotiations with groups and institutions normally selected on a non-competitive basis taking into account technical and institutional considerations. The nature of the relationships established will be similar to A.I.D.'s Cooperative Agreements. There will be a direct transfer of resources to each selected entity to assist it to carry out a public purpose or to stimulate it to develop its programs in line with PNF priorities. Yet, the agreements will not be outright grants since substantial involvement is anticipated between PNF and the recipient during the execution or performance of each agreement.

Such inter-institutional agreements are common implementing mechanisms within the GOE. In fact, PNF has already executed similar agreements with organizations such as PREDESUR, the Provincial Council of Pichincha, and the IRD Secretariat. In keeping with one of the project's objectives, a substantial effort will be made to involve a number of private and public institutions which have an interest in forestry in the implementation of project activities. Approximately nine such agreements will be developed during the life of the project. Although the PNF may be considered as the primary implementing agency, project inputs which are included in the cooperative agreements, may, upon authorization by the PNF director, be directly procured by other agencies which are also involved in project implementation.

Also, upon authorization of the PNF director, USAID will make direct disbursements of loan and/or grant funds to public or private entities other than the PNF which may be involved in project implementation. These arrangements are intended to facilitate the PNF's coordination role without placing an overwhelming burden on its administrative and financial staff.

The PNF's district offices have an important implementation role in those areas where field demonstration activities will take place. They will provide the technical assistance and other support required to implement and monitor field activities under cooperative agreements. This will be a learning-by-doing process. They will be supported by the appropriate PNF technical department and by the project's technical advisors. In order to enable the regional offices to carry out their project responsibilities effectively, the project also provides for training, improved nursery facilities, vehicles, and in certain districts, increased staff.

3. Procurement

The procurement of goods and services to implement the field demonstration activities will be primarily the responsibility of the PNF. To the extent that other public or private sector entities procure goods and services with loan funds, the PNF will assure the entity doing the procurement complies with A.I.D. regulations and that it submits proper reimbursement documentation.

Much of the funding for the field demonstration activities will be local currency expenditures for economic incentives to the participant beneficiaries in reforestation activities. Other material inputs for field demonstration include seeds, seedlings, fencing material, and, in some activities, minor amounts of fertilizer and/or pesticides. These will be local or shelf item purchases except for the purchase of small quantities of imported seed.

Pesticides will be procured for the project only with the prior approval of USAID which will carefully monitor pesticide procurement to assure that it conforms to A.I.D. regulations. Limited quantities of pesticides will be used in tree nurseries and in the humid tropical forestry activities as well as for controlled experiments. The PNF will continue to purchase pesticides for nursery use, however loan funds will be used to purchase pesticides in the other situations. Loan financed pesticide purchases will not exceed $25,000 during the life of the project. Nevertheless, USAID, upon the advice of AID/W forestry specialists and consultants, has determined that it is impractical to attempt to identify the pesticides to be financed under the project at this point. It was observed that currently pesticides are simply purchased off the shelf without any established criteria or recommendations being considered. Therefore, this determination should be made after the long-term advisors as well as the entomologist and pathologist, who will have a good knowledge of pesticides and who can make appropriate recommendations, are onboard. USAID will require that these advisors participate in the selection of pesticides to be used under the project. A determination from the LAC Environmental Officer will then be obtained prior to purchase of the pesticides.

U.S. dollar procurements will constitute a relatively small percentage of the total procurements financed with loan and/or grant funds. Generally, these procurements will be made by USAID since the procurements are limited in number, negligible institution-building benefits would be obtained, and delays could be incurred because of the PNF's lack of experience with imported procurement.

The major category of dollar procurement will be for technical assistance. USAID, with the assistance of the A.I.D.- USDA Forestry Support Program and, as necessary, the regional contracting officer, intends to contract the services of the principal advisor and the two other long-term forestry advisors, either directly or through the Forestry Support Program RSSA. Procurement of the long-term technical assistance on a timely basis is critical to the rapid initiation of project activities. Therefore, USAID, with the concurrence of the PNF, will initiate the selection process for these advisors prior to signature of the Project Agreement. Because the principal advisor will be funded outside the project agreement, he/she may be contracted prior to the fulfillment of the initial conditions precedent to disbursement. Short-term technical assistance will also be procured directly by A.I.D. or through the Forestry Support Program. In either case, efforts will be made to encourage U.S. forestry industries to furnish short-term technical assistance for which they may be well-qualified, e.g., nursery management, forest pathology and entomology.

Procurements of imported equipment and vehicles will be very limited in number and will also be carried out by USAID upon request from the PNF. Prior to purchasing the micro-computer/word-processing equipment, USAID will require assistance from SER/DM to determine the most appropriate equipment considering the PNF's requirements and the availability of service in Ecuador. Long-term training will be provided by U.S. and/or Latin American universities and by training institutions such as CATIE.

4. USAID Monitoring

The Project Agreement will provide for USAID prior approval of all cooperative agreements. USAID's Rural Development Office will have project monitoring responsibility. This office is currently staffed by one U.S. and one Ecuadorean professional. Plans call for the addition of an U.S. direct hire deputy and, eventually, a joint career corps officer under the new program being developed between A.I.D. and the Title XII universities. The office also has monitoring responsibility for the Rural Technology Transfer System Project -- a major component of USAID's on-going program. The RDO professionals, however, will be supported by a project committee and by the principle advisor to the project who will provide the requisite technical expertise.

The project committee will review and advise the project offices on major implementation actions such as the approval of cooperative agreements. It will also assist the project officers in preparing Project Implementation Letters and other project documents as appropriate.

USAID monitoring will be enhanced by the placement of the principle advisor in the PNF who, in addition to his advisory responsibilities to the PNF in technical and program management matters, will assist with USAID's technical monitoring by serving as the principle liaison between the PNF and USAID. The advisor will also facilitate major implementation actions on matters such as procurement and disbursement. Finally, he will provide advice and recommendations to USAID with regard to the cooperative agreements which the PNF will negotiate with Ecuadorean public and private sector entities.

USAID will continue to monitor the project subsequent to the PACD in order to assure that the research and field demonstration activities initiated during the project are continued. In order to accomplish this monitoring USAID will request an annual report from the PNF.

B. Evaluation Plan

Major evaluations will be carried out during the second and the fourth years of the project.

The first evaluation will be a process evaluation which will focus on how the project is being implemented. In this evaluation, primary attention will be devoted to evaluating how the PNF is performing and, in particular, the manner in which the project is being implemented. This evaluation will be conducted jointly by the PNF, A.I.D. personnel, and the principle advisor. However, it will substantially rely on a prior analysis by the institutional consultant financed under the project's institutional development component. The major objective is to identify ways and means to improve implementation of activities.

The second evaluation will be a performance evaluation to assess what the project has accomplished. Preliminary results of applied research and field demonstrations will be evaluated as well as the degree to which institutional development objectives have been accomplished. The evaluation will serve as a major element in the decision process as to whether a second tranche in a long term forestry program should be financed by A.I.D.

This second evaluation will be carried out by a contractor with experience in evaluating forestry activities. It will be carried out just prior to the departure of the long-term technical experts in plantations and tropical forestry and during visits by the majority of the short term consultants. These consultants will be expected, as part of their scope of work, to spend several weeks working with the contractor to provide specialized information required for the evaluation. Thus, the contractor will have the benefit of specialists who are familiar with Ecuador's forestry sector as well as PNF and USAID personnel. Funding for the cost of the evaluation, including the outside contractor, is included in the institutional development component of the project.

The evaluation of the institutional development objectives of the project will focus on the following factors: (1) the extent to which the PNF has developed its indicative planning and project design capabilities, and the degree to which the enhancement of these capabilities may have influenced the choice of forestry activities implemented by other forestry sector institutions, (2) the way in which the PNF has assumed its research coordination

role, considering the type and amount of research as well as the research results obtained; (3) the usefulness of the technical information disseminated through the PNF; and (4) the degree and effectiveness with which the PNF has upgraded its technical assistance and support functions (e.g., nurseries) at the district office level. In addition, the effectiveness of the general model for inter-institutional working relationships under the cooperative agreements will be analyzed.

The productive and protective forestry field pilot demonstrations will be evaluated from two points of view. First, they will be assessed in terms of the amount, kind and utility of the technical information (including cost information), that they have generated. Second, the effectiveness of the various types of specific institutional arrangements will be assessed, focusing especially on the degree and kind of participation of the beneficiary groups or communities in each of the cooperative agreements.

C. Conditions and Covenants

1. Conditions Precedent to Disbursement

USAID recommends the inclusion of the following condition precedent in the Project Authorization.

Condition Precedent to Disbursement to Finance Individual Field Activities, except for the Procurement of Vehicles and Imported Equipment. Prior to any disbursement, or to the issuance of any commitment documents under the Project Agreement to an individual field activity, except for the procurement of vehicles and imported equipment, the Government of Ecuador shall, except as A.I.D. may otherwise agree in writing, furnish, in form and substance satisfactory to A.I.D., a plan which details how the field activity will be implemented and an agreement between the PNF and each implementing institution(s) and participating groups or communities.

This recurring condition requires that A.I.D. approve each cooperative agreement prior to its signature. USAID intends to use this condition as a monitoring tool, particularly during the intial phase of project implementation. However, to the extent that the PNF demonstrates a capability to effectively negotiate and implement such agreements, USAID may waive this condition for small value agreements which the PNF will negotiate and sign.

2. Covenants.

a. The GOE shall covenant that, unless A.I.D. otherwise agrees in writing, it will cause the PNF and IERAC to expedite the titling of land which will be utilized for productive or protective forestry pilot field demonstrations under the project.

b. The GOE shall covenant that, unless A.I.D. otherwise agrees in writing, it will cause the PNF to increase its central office staff by at least six professional permanent positions (including a full-time training coordinator) by the end of the first project year and its field staff by two professional and seven technical permanent positions by the end of the second project year and maintain such permanent staff levels after the end of the project.

c. The GOE shall covenant that unless A.I.D. otherwise agrees in writing by no later than December 1984, the GOE will have prepared a plan which details an appropriate organizational structure for implementing watershed management in Ecuador.

MINISTERIO DE FINANZAS
Subsecretaría de Presupuesto y Crédito Público

Oficio No. SP-82- 3047

Quito, a 25 MAYO 1982

Señor
John A. Sanbrailo
DIRECTOR DE LA MISION DE AID EN ECUADOR
Av. Colombia 1573 y Queseras del Medio
Quito.-

Señor Director:

A solicitud del Gobierno del Ecuador, durante los últimos meses, varios organismos y agencias gubernamentales han venido desarrollando con técnicos de la Agencia para el Desarrollo Internacional (AID) algunos proyectos ecuatorianos de desarrollo que requerirán de financiamiento mediante préstamos de la AID en el año de 1982. La presente tiene por objeto ratificar el interés del Gobierno Nacional en recibir préstamos blandos de la AID, tan pronto como sea posible para los siguientes proyectos:

- El Consejo Nacional de Ciencia y Tecnología (CONACYT) ha desarrollado un Proyecto de Transferencia de Tecnología Rural que requerirá un préstamo blando de la AID por el monto de 5.0 millones de dólares. Este préstamo contribuirá a fortalecer el CONACYT como institución y a financiar los proyectos que CONACYT llevará a cabo con entidades tales como el MAG, INIAP, INERHI, INEC, universidades ecuatorianas, etc. Tenemos entendido que los términos de estos préstamos para el Gobierno del Ecuador serán los siguientes: 25 años plazo; 10 años de período de gracia; y una tasa de interés del 2 por ciento durante el período de gracia y del 3 por ciento de ahí en adelante.

- El Programa Nacional de Forestación (PNF) del Ministerio de Agricultura ha diseñado un proyecto tendiente a incrementar las actividades del Gobierno del Ecuador en las áreas de forestación, de conservación y de recursos naturales, con especial énfasis en el desarrollo de recursos forestales productivos. Este proyecto requerirá un préstamo blando de la AID de 6.0 millones de dólares, más fondos no reembolsables en un monto de 1.0 millones de dólares. Este proyecto será implementado a través del PNF y de otras entidades ecuatorianas tales como EMDEFOR. Los términos del préstamo blando al Gobierno del Ecuador entendemos serán iguales a los del Proyecto con CONACYT.

- La Junta Nacional de la Vivienda (JNV) y el Banco Ecuatoriano de la Vivienda (BEV) han diseñado un proyecto para incrementar la disponibilidad de viviendas de interés social en

... 66

MINISTERIO DE FINANZAS
Subsecretaría de Presupuesto
y Crédito Público

Oficio No. SP-82- 3047

Quito, a 25 MAYO 1982

ciudades secundarias y en pueblos pequeños, fuera de Quito y Guayaquil. Este proyecto proveerá financiamiento para soluciones habitacionales tales como lotes y servicios, piso techo y vivienda mínima, para familias de bajos ingresos. Entendemos que este proyecto califica para el Programa de Garantías de Inversión para la vivienda de la AID, programa este mediante el cual la AID puede garantizar un préstamo de un inversionista privado de los Estados Unidos de hasta 25.0 millones de dólares, de modo que los términos y condiciones del préstamo puedan ser más beneficiosos para el Gobierno del Ecuador. Con las garantías de AID, entendemos que dichos términos y condiciones podrían ser los siguientes: 30 años de plazo con un período de gracia de 10 años; del mismo modo entendemos que la AID está buscando los medios para obtener fondos no reembolsables para complementar las actividades de est proyecto.

A fin de tener la seguridad de que los fondos de AID estarán disponibles para estos proyectos, entendemos que el Convenio para el Proyecto de CONACYT debería ser firmado hasta el 30 de junio de 1982, y el Convenio para el Proyecto de Forestación hasta el 30 de agosto de 1982. Del mismo modo sería conveniente finiquitar el convenio de instrumentación para el proyecto de garantía de inversión para vivienda de ciudades secundarias hasta el 30 de septiembre de 1982.

Atentamente,
DIOS, PATRIA Y LIBERTAD,

Jaime Morillo Carrillo,
MINISTRO DE FINANZAS Y CREDITO PUBLICO.

Ministerio de Agricultura y Ganadería
Quito - Ecuador

Oficio No. 000551 PNF

Quito, a 31 MAYO 1982

ACTION:	D/CAP.2
DIR	✓
A/DIR	✓
EXO	
D/CONT	
O/DP	✓
O/CAP	
GDO	
RDO	✓
U/H	
OPS	
FMD	
RF	✓
M&R	✓
EMD	
PHASE	

REPLY DUE 6/7/82
☐ NO REPLY NEEDED
☐ REPLIED BY
ON
Date Initials

Señor
John Sanbrailo
DIRECTOR DE AID
Ciudad

Señor Director:

El Ministerio de Agricultura y Ganadería del Ecuador, en concordancia con las políticas determinadas en el Plan Nacionaldo Desarrollo ha creido conveniente incremontar las actividades del sector forestal en el área rural, en cooordinación con los programas intersectoriales identificados en diversas regiones del país.

De la misma manera, el Gobierno Nacional, con el propósito de coordinar los esfuerzos de las instituciones que desarrollan programas forestales en el país y para un mejor aprovechamiento de esos recursos y una planificación mas acorde con los programas mencionados, está contemplando el fortalecimiento institucional del Programa Nacional Forestal.

Adicionalmente se reconoce la necesidad de buscar mecanismos adecuados para el manejo de cuencas hidrográficas y de otras áreas para proteger grandes inversiones en obras hidroeléctricas y en sistemas de riego.

En base a estas consideraciones, el Programa Nacional Forestal del Ministerio de Agricultura y Ganadería, ha elaborado un Proyecto de Asistencia Técnica y Financiera que contribuya a la efectivización de los planes de Desarrollo del Sector Forestal.

El Proyecto propone una serie de actividades prioritarias para llevar a cabo. Estas son:

1. Fortalecimiento del Programa Nacional Forestal para ejercer con más efectividad sus responsabilidades de promoción, planificación, coordinación y apoyo técnico en actividades forestales. Se contempla el reforzamiento de los departamentos de Programación e Investigación y Capacitación; el establecimiento de un sistema de estadísticas forestales para el sector y de manejo y

divulgación de información; un sistema contínuo de perfeccionamiento de los profesionales y técnicos del programa, lo cual enfoca prioritariamente al personal de los Distritos Forestales. Para lograr estos objetivos se contará con la cooperación técnica y el equipamiento de los Departamentos indicados del Programa Nacional Forestal.

2. Ejecutar actividades forestales en diferentes lugares del país, lo que tendría como finalidad seleccionar las especies apropiadas para la reforestación así como los mecanismos de forestación que sean adecuados desde el punto de vista social y al mismo tiempo productivo en términos económicos. Las actividades incluirán programas agroforestales y de manejo del bosque húmedo tropical en Esmeraldas y Napo, programas de forestación de propósito múltiple en la Sierra y la Costa árida, enfocando las necesidades del pueblo ecuatoriano tanto en madera como para forraje, leña y conservación del suelo, etc. En este sentido se buscarán mecanismos interinstitucionales con los cuales se pueda movilizar una cantidad mayor de recursos en forma mas eficiente. Para tal fin se considerarán acuerdos entre el PNF y entidades públicas, mixtas o privadas que lleven a cabo estas actividades. Se contará con la cooperación técnica y la provisión de financiamiento para las actividades de campo. Se llevará a cabo tanto el entrenamiento y perfeccionamiento del personal técnico de las instituciones colaboradoras como también actividades de investigación.

3. Aumentar la capacidad institucional para proteger las áreas naturales que tienen importancia económica significativa para el país. Se reforzará la capacidad del Programa Nacional Forestal para delimitar dichas áreas y desarrollar planes de manejo para bosques protectores; se financiará el costo de estas actividades en algunas áreas de importancia crítica desde el punto de vista económico. Además se colaborará con otras instituciones estatales para llevar a cabo un proyecto demostrativo de manejo racional en una de las subcuencas del río Paute. Se contará para el efecto con cooperación técnica, un pequeño equipamiento y un financiamiento de actividades de campo.

Con estos antecedentes, el Ministerio de Agricultura y Ganadería, por mi intermedio, solicita a la Agencia para el Desarrollo Internacional, del Gobierno de los Estados Unidos de Norteamérica, un financiamiento de aproximadamente seis millones de dólares de préstamos en los siguientes términos y plazos: veinticinco años de amor-

69

tización con diez años de gracia y con interés de dos por ciento durante el período de gracia y tres por ciento durante el período restante. Además, se prevé un aporte a un millón de dólares en fondos no reembolsables.

La participación nacional será equivalente a 230 millones de sucres que incluyen contribuciones en especies y otras por parte de las entidades como de las comunidades y empresas participantes en las actividades de forestación. Los aportes externos e internos serán entregados durante un plazo de cinco años.

Todas las actividades resumidas anteriormente requerirán de la asistencia técnica por parte de la AID, con el fin de reforzar el desarrollo del programa propuesto.

Debo manifestar a usted, señor Director, el alto interés que el Ministerio de Agricultura y Ganadería tiene por este programa, así como exponerle nuestro agradecimiento a usted y a sus distinguidos colaboradores por la cooperación brindada en la fase de preparación de esta solicitud.

Aprovecho la oportunidad para presentarle a usted, mis sentimientos de la más distinguida consideración.

Atentamente,

Carlos Vallejo L.
MINISTRO DE AGRICULTURA Y GANADERIA

MINISTERIO DE AGRICULTURA Y GANADERIA
PROGRAMA NACIONAL FORESTAL

ACTION/INFO
AID-1

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BT
UNCLAS STATE 337927

ACTION TAKEN
12/24/80
JNT DATE

AIDAC

E.O. 12065: N/A

AGS:

SUBJECT: DAEC REVIEW OF ECUADOR FORESTRY, SOIL AND NATURAL RESOURCES MANAGEMENT PID

1. SUBJECT PID WAS REVIEWED AND APPROVED ON DECEMBER 8, 1980. THE FOLLOWING GUIDANCE IS PROVIDED FOR PP PREPARATION.

2. INSTITUTIONAL ANALYSIS SECTION: THE PP SHOULD ANALYZE THE STRENGTHS AND WEAKNESSES OF THE INSTITUTIONS TO BE INVOLVED IN THE PROJECT. BASED ON THIS ANALYSIS, AREAS OF INSTITUTIONAL STRENGTHENING SHOULD BE IDENTIFIED, FUNCTIONAL RESPONSIBILITIES OF EACH INSTITUTION SHOULD BE OUTLINED, AND A STRATEGY OF INTER-INSTITUTIONAL COORDINATION SHOULD BE DEVELOPED. IN PARTICULAR, THIS SECTION SHOULD ADDRESS/INCLUDE:

--A. CONADE'S CAPABILITIES AND THE EXTENT OF ITS ROLE IN THE PROJECT.

--B. JUSTIFICATION FOR CLIRSEN TO BE THE LEAD AGENCY IN DATA SYSTEM MANAGEMENT.

--C. THE UNDERLYING CAUSES FOR FAILURE OF ODF TO ADDRESS SEVERE DEFORESTATION PROBLEMS.
--D. EXPLORATION OF POSSIBLE INVOLVEMENT OF THE INEC, PRESENTLY NOT INCLUDED IN THE PROJECT.

--E. THE RISKS ASSOCIATED WITH EMDEFOR WITH RESPECT TO ITS PROFIT-MAKING APPROACH, CAPITALIZATION OF THE INSTITUTION, AND TARGET GROUP ACCEPTANCE OF LONG-TERM INVESTMENT. ALSO, THE MISSION SHOULD RESEARCH EXPERIENCES OF SIMILAR INSTITUTIONS OPERATING ELSEWHERE IN LATIN AMERICA.

--F. HOW EMDEFOR'S AND NATURA'S ACTIVITIES COMPLEMENT AND REINFORCE EACH OTHER.

ACTION: ADVISE
AR
D/AR
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3. LEGAL CONCERNS: EXISTING LEGISLATION OR LAWS AFFECTING FORESTRY AND SOIL CONSERVATION PROGRAMS SHOULD BE CLARIFIED DURING THE INTENSIVE REVIEW AND BRIEFLY DISCUSSED IN PP. WHAT, IF ANY, LEGISLATIVE REFORMS WILL BE REQUIRED? IF LEGISLATIVE REFORMS ARE REQUIRED, HOW WILL PROJECT ACTIVITIES BE CONFORMED? TO WHAT EXTENT ARE CURRENT REGULATIONS ENFORCED? SHOULD LEGISLATIVE REFORM AND/OR ASSISTANCE FOR ENFORCEMENT AS A PROJECT COMPONENT BE A PRECONDITION TO PROJECT SIGNING?

4. SOCIAL SOUNDNESS ANALYSIS: FIELD WORK SHOULD BE CONDUCTED DURING THE INTENSIVE REVIEW TO BETTER UNDERSTAND FARMER ATTITUDES TOWARD CONSERVATION ACTIVITIES. WHAT ARE THE DIFFERENCES IN ATTITUDES WITHIN THE TARGET POPULATION IN DIFFERENT TARGET AREAS? HOW DOES PERCEPTION OF RISK VARY? THE MISSION IS URGED TO HIRE A HUMAN ECOLOGIST TO ADDRESS THESE QUESTIONS AND ASSIST IN DEVELOPING PILOT PROJECTS TO TEST VARIOUS INCENTIVES TO INVOLVE THE FARMER

Best Available Document

IN THE PROJECT.

5. COMMUNITY PARTICIPATION: RELATED TO ABOVE ISSUE, THE PP SHOULD ADDRESS STRATEGIES TO INCORPORATE, ON A CONTINUING BASIS, COMMUNITY PARTICIPATION AND COOPERATION IN SOIL CONSERVATION, FOREST MANAGEMENT, AND REFORESTATION ACTIVITIES. THE MISSION IS ADVISED TO REVIEW THE HONDURAS AND JAMAICA EXPERIENCES TO IMPLEMENT SOIL CONSERVATION EFFORTS.

6. GOE COMMITMENT: THE PP SHOULD PRESENT STRONGER EVIDENCE OF GOE COMMITMENT TO NATURAL RESOURCE MANAGEMENT, I.E., INSTITUTIONAL REFORMS, INCREASES IN BUDGET ALLOCATIONS TO REFORESTATION, FOREST MANAGEMENT, AND SOIL CONSERVATION EFFORTS, REOPENING OF FORESTRY SCHOOL, ETC.

7. THE MISSION IS REMINDED THAT SER/DM WILL NEED TO BE INVOLVED INTHE PROCUREMENT OF AUTOMATIC DATA PROCESSING (ADP) EQUIPMENT, INCLUDING SERVICES AND SOFTWARE.

8. THE BUREAU ENVIRONMENTAL OFFICE HAS REVIEWED THE IEE AND CONCURS IN MISSION THRESHOLD RECOMMENDATION. MISSION IS ADVISED THAT SHOULD PROJECT INCLUDE ASSISTANCE FOR PROCUREMENT AND/OR USE OF PESTICIDES, AN IEE AMENDMENT WILL BE REQUIRED AS PER A.I.D. REG. 16, ENVIRONMENTAL PROCEDURES. MUSKIE
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COUNTRY CHECKLIST

A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

1. FAA Sec. 481. Has it been determined that the Government of the recipient country has failed to take adequate steps to prevent narcotic drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the U.S. unlawfully?	It has not been so determined. The GOE has an active narcotics program with USG support.
2. FAA Sec. 620(c). If assistance is to a government, is the government liable as debtor or unconditional guarantor or any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) the debt is not denied or contested by such government?	No such case is known.
3. FAA Sec. 620(e)(1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities?	No.

4.	FAA Sec. 532(c), 620(a), 620(f), 620D; FY 1982 Appropriation Act Secs. 512 and 513. Is recipient country a communist country? Will assistance be provided to Angola, Cambodia, Cuba, Laos, Vietnam, Syria, Libya, Iraq, or South Yemen? Will assistance be provided to Afghanistan or Mozambique without a waiver?	No.
5.	ISDCA of 1981 Secs. 724, 727, 728 and 730. For specific restrictions on assistance to Nicaragua, see Sec. 724 of the ISDCA of 1981. For specific restrictions on assistance to El Salvador, see Secs. 727, 728 and 730 of the ISDCA of 1981.	Not applicable.
6.	FAA Sec. 620(j). Has the country permitted, or failed to take adequate measures to prevent the damage or destruction by mob action of U.S. property?	No.
7.	FAA Sec. 620(k). Does the program furnish assistance in excess of $100,000,000 for the construction of a productive enterprise, except for productive enterprises in Egypt that were described in the Congressional Presentation materials?	No.
8.	FAA Sec. 620(l). Has the country failed to enter into an agreement with OPIC?	Yes.

9. FAA Sec. 620(o); Fishermen's Protective Act of 1967, as amended, Sec. 5. (a) Has the country seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters?	Yes.
(b) If so, has any deduction required by the Fishermen's Protective Act been made?	No.
10. FAA Sec. 620(g); FY 1982 Appropriation Act Sec. 517. (a) Has the government of the recipient country been in default for more than six months on interest or principal of any AID loan to the country?	No.
(b) Has the country been in default for more than one year on interest or principal on any U.S. loan under a program for which the appropriation bill appropriates funds?	No.
11. FAA Sec. 620(s). If contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the amount of foreign exchange or other resources which the country has spent on military equipment? Reference may be made to the annual "Taking into Consideration" memo: "Yes, taken into account by the Administrator at time of approval of Agency OYB." This approval by the Administrator of the Operational Year Budget can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.	Yes.

75

12. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption?	No.
13. FAA Sec. 620(u). What is the payment status of the country's obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget?	Payment status is current.
14. FAA Sec. 620A; FY 1982 Appropriation Act Sec 520. Has the country aided or abetted, by granting sanctuary from prosecution to, any individual or group which has committed an act of international terrorism? Has the country aided or abetted, by granting sanctuary from prosecution to, any individual or group which has committed a war crime?	No.
15. FAA Sec. 666. Does the country object, on the basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. who is present in such country to carry out economic development programs under the FAA?	No.

16. FAA Sec. 669, 670. Has the country, after August 3, 1977, delivered or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards? Has it transferred a nuclear explosive device to a non-nuclear weapon state, or if such a state, either received or detonated a nuclear explosive device, after August 3, 1977? (FAA Sec. 620E permits a special waiver of Sec. 669 for Pakistan.)	No.
17. FAA Sec. 720. Was the country represented at the Meeting of Ministers of Foreign Affairs and Heads of Delegations of the Non-Aligned Countries to the 36th General Session of the U.N. of Sept. 25 and 28, 1981, and failed to disassociate itself from the communique issued? If so, has the President taken it into account?	Yes. Yes. Check
18. FAA Sec. 721. See special requirements for assistance to Haiti.	Not applicable.

B. FUNDING SOURCE CRITERIA FOR COUNTRY ELIGIBILITY

1. Development Assistance Country Criteria.

a. FAA Sec. 116. Has the Department of State determined that his government has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, can it be demonstrated that contemplated assistance will directly benefit the needy?	The Department of State has not determined that Ecuador is a violator of human rights.

2. Economic Support Fund Country Criteria.

a. FAA Sec. 502B. Has it been determined that the country has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, has the country made such significant improvements in its human rights record that furnishing such assistance is in the national interest?	Not applicable.
b. FAA Sec. 620B. If ESF is to be furnished to Argentina, has the President certified that (1) the Govt. of Argentina has made significant progress in human rights; and (2) that the provision of such assistance is in the national interest of the U.S.?	Not applicable.
c. ISDCA of 1981, Sec. 726(b). If ESF assistance is to be furnished to Chile, has the President certified that (1) the Govt. of Chile has made significant progress in human rights; (b) it is in the national interest of the U.S.; and (3) the Govt. of Chile is not aiding international terrorism and has taken steps to bring to justice those indicted in connection with the murder of Orlando Letelier?	Not applicable.

PROJECT CHECKLIST

A. GENERAL CRITERIA FOR PROJECT

1. FY 1982 Appropriation Act Sec. 523; FAA Sec. 634A; Sec. 653(b).

   (a) Describe how authorizing and appropriations committees of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that amount)?

   a. The Project was described in the FY 1982 Congressional Presentation.

   b. Yes.

2. FAA Sec. 611(a)(1). Prior to obligation in excess of $100,000, will there be (a) engineering, financial or other plans necessary to carry out the assistance and (b) a reasonable firm estimate of the cost to the U.S. of the assistance?

   a. Yes.

   b. Yes.

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

   No such action is required.

4. FAA Sec. 611(b); FY 1982 Appropriation Act Sec. 501. If for water or water-related land resource construction, has project met the standards and criteria as set forth in the Principles and Standards for Planning Water and Related Land Resources, dated October 25, 1973?

   Not applicable. The project has a small pilot demonstration watershed management-erosion control activity. However, this has as one of its objectives the generation of the type of information required to carry out the analyses required by Principles and Standards.

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?	The project is an institution-building and technology development and does not involve capital assistance. Therefore, no 611(e) certification is required.
6. FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	No. The Project has as its objectives institution-building and technology development which will permit the GOE to solicit follow-on funding for subsequents projects from multilateral organizations.
7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; and (c) encourage development and use of cooperatives, and credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.	The project will indirectly encourage the export of wood products. It will foster private initiative by supporting research and demonstration activities which will generate technical information directly utilizable by the private sector. A large number of field demonstrations will be conducted with the participation of cooperatives and pre-cooperatives. The major objective of the project is to generate ways to improve the technical efficiency of Ecuador's forestry sector.
8. FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	Most imported goods and technical services supplied under the project will be supplied from U.S. sources. A strong possibility exists that U.S. Forest industries will provide part of the services required for the Project.

9. FAA Sec. 612(b), 636(h); FY 1982 Appropriation Act Sec. 507. Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.	The Host Country Contribution to the Project represents approximately 50 percent of Project costs.
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?	No.
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?	Yes.
12. FY 1982 Appropriation Act. Sec. 521. If assistance is for the production of any commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?	No.
13. FAA 118(c) and (d). Does the project take into account the impact of the environment and natural resources? If the project or program will significantly affect the global commons or the U.S. environment, has an environmental impact statement been prepared? If the project or program will significantly affect the environment of a foreign country, has an environmental assessment been prepared? Does the project or program take into consideration the problem of the destruction of tropical forests?	Yes. The Project will not significantly affect the global commons, the U.S. environment, nor the environment of a foreign country. The Project is specifically designed to limit the on-going current destruction of Ecuador's tropical forests.

14. FAA 121(d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (dollars or local currency generated therefrom)?

Not applicable.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b), 111, 113, 281(a). Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

(a) The basic orientation of the project is to involve the rural poor a active participants and beneficiaries in forestry activities; activities will be carried out through local community and cooperative organizations using labor-intensive production methods. Wide participation of the poor will be assured since they will partially or wholly received the benefits of forestry production.
(b) technical assistance will be provided to cooperatives which participate in forestry activities.
(c) The project will contribute to the strengthening of Ecuadorean institutions which will be able to continue addressing rural development problems after the termination of AID assistance.
(d) Rural women will be encouraged to participate equitably in forestry activities.
(e) Regional cooperation will be encouraged through visits to research and educational facilities, and by making research results available to other countries in the region.

96

b. FAA Sec. 103, 103A, 104, 105, 106. Does the project fit the criteria for the type of funds (functional account) being used?	Yes.
c. FAA Sec. 107. Is emphasis on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small business, and small incomes of the poor)?	Yes. The project is designed to develop, demonstrate and disseminate forest methods and techniques which are appropriate to small farmers and poor rural communities. Labor-using techniques will be emphasized.
d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the cost of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)?	Yes.
e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?	No. The project does not provide grant capital assistance.
f. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?	Yes. The goal of the project is to rationally develop Ecuador's forestry resources.

g. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intelectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.	The Project fulfills an expressed GOE need. It provides training and assistance to strengthen institutions and human resources. Some training will involve management of GOE programs for the achievement of national development goals.
2. Development Assistance Project Criteria (Loans Only)	
a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, at a reasonable rate of interest.	USAID has reviewed the GOE's capacity to pay this and other development assistance loans and has concluded that the GOE is able to repay the loan.
b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?	Not applicable.
c. ISDCA of 1981, Sec. 724(c) and (d). If for Nicaragua, does the loan agreement require that the funds be used to the maximum extent possible for the private sector? Does the project provide for monitoring under FAA Sec. 624(g)?	Not applicable.
3. Project Criteria Solely for Economic Support Fund	
a. FAA Sec. 531(a). Will this assistance promote economic or political stability? To the extent possible, does it reflect the policy directions of FAA Section 102?	Not applicable.

b. FAA Sec. 531(c). Will assistance under this chapter be used for military, or paramilitary activities?	Not applicable.
c. FAA Sec. 534. Will ESF funds be used to finance the construction of the operation or maintenance of, or the supplying of fuel for, a nuclear facility? If so, has the President certified that such use of funds is indispensable to nonproliferation objectives?	Not applicable.
d. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?	Not applicable.

STANDARD ITEM LIST

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed?	Yes. All procurement advertized in the U.S. will be channelled through AID Office of Small and Disadvantaged Business.
2. FAA Sec. 604(a). Will all procurement be from the U.S. except as otherwise determined by the President or under delegation from him?	Yes.
3. FAA Sec. 604(d). If the cooperating country discriminates against marine insurance companies authorized to do business in the U.S., will commodities be insured in the United States against marine risk with such a company?	Ecuador does not discriminate against U.S. marine insurance companies in procurements financed with funds provided by AID.
4. FAA Sec. 604(e); ISDCA of 1980 Sec. 705(a). If off-shore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity? (Exception where commodity financed could not resonably be procured in U.S.)	Not applicable.
5. FAA Sec. 603. Is the shipping excluded from compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 percent of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S. flag commercial vessels to the extent that such vessels are available at fair and reasonable rates?	No.

6. FAA Sec 621. If technical assistance is financed, will such assistance be furnished by private enterprise on a contract basis to the fullest extent practicable? If the facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?	Yes.
7. International Air Transport. Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will U.S. carriers be used to the extent such service is available?	Yes, the Project Agreement will so state.
8. FY 1982 Appropriation Act Sec. 504. If the U.S. Government is a party to a contract for procurement, does the contract contain a provision authorizing termination of such contract for the convenience of the United States?	Yes.
B. Construction	Not applicable.
1. FAA Sec. 601(d). If capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interests?	
2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?	Not applicable.

3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed $100 million?	Not applicable.
C. Other Restrictions	
1. FAA Sec. 122(b). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter?	Yes.
2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an intenational organization, does Comptroller General have audit rights?	Not applicable.
3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries?	Yes. Arrangements preclude activities as stated.
4. Will arrangements preclude use of financing:	Yes.
a. FAA Sec.104(f); FY 1982 Appropriation Act. Sec. 525: (1) To pay for performance of abortions as a method of family planning or to motivate or coerce persons to practice abortions; (2) to pay for performance of involuntary sterilization as method of family planning, or to coerce or provide financial incentive to any person to undergo sterilization; (3) to pay for any biomedical research which relates, in whole or part, to methods or the performance of abortions or involuntary sterilizations as a means of family planning; (4) to lobby for abortion?	

b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property?

c. FAA Sec. 660. To provide training or advice or provide any financial support for police, prisons, or other law enforcement forces, except for narcotics programs?

d. FAA Sec. 662. For CIA activities?

e. FAA Sec. 636(i). For purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained?

f. FY 1982 Appropriation Act, Sec. 503. To pay pensions, annuities, retirement pay, or adjusted service compensation for military personnel?

g. FY 1982 Appropriation Act, Sec. 505. To pay U.N. assessments arrearages or dues?

h. FY 1982 Appropriation Act, Sec. 506. To carry out provisions of FAA section 209(d) (Transfer of FAA funds to multilateral organizations for lending)?

i. FY 1982 Appropriation Act, Sec. 510. To finance the export of nuclear equipment, fuel, or technology or to train foreign nationals in nuclear fields?

j. FY 1982 Appropriation Act, Sec. 511. Will assistance be provided for the purpose of aiding the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights.?

k. FY 1982 Appropriation Act, Sec. 515. To be used for publicity or propaganda purposes within U.S. not authorized by Congress?

DRAFT PROJECT AUTHORIZATION

Name of Country: Ecuador

Neme of Project: Forestry Sector Development

Number of Project: 518-0024

Loan Number: _____

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Forestry Sector Development project for Ecuador involving planned obligations of not to exceed Six Million Five Hundred Thousand United States Dollars ($6,500,000) in loan funds ("Loan") and One Million Six Hundred Thousand United States Dollars ($1,600,000) in grant funds ("Grant") over a five (5) year period from date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB/ allotment process, to help in financing foreign exchange and local currency costs for the project.

2. The project ("Project") consists of cooperation with the Government of Ecuador ("GOE") in improving the Ecuadorean public and private sector institutional and technical capability to efficiently develop and utilize Ecuador's forest resources by: (i) strengthening the National Forestry Program's ("PNF") capacity to mobilize, coordinate and provide technical assistance in support of other forest sector institutions, (ii) implementing a program of productive forestry field demonstrations and applied research, and (iii) developing the GOE's capacity to develop and implement management plans for critical watersheds.

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

a. Interest Rate and Terms of Repayment

The GOE shall repay the Loan to A.I.D. in U.S. Dollars within twenty-five (25) years from the date of first disbursement of the Loan, including a grace period of not to exceed ten (10) years. The GOE shall pay to A.I.D. in U.S. Dollars interest from the date of first disbursement of the Loan at the rate of (i) two percent (2%) per annum during the first ten (10) years, and (ii) three percent (3%) per annum thereafter, on the outstanding disbursed balance of the Loan and on any due and unpaid interest accrued thereon.

b. Source and Origin of Goods and Services (Loan)

Goods and services, except for ocean shipping, financed by A.I.D. under the Loan shall have their source and origin in Ecuador or in countries included in A.I.D. Geographic Code 941, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the Loan shall be financed only on flag vessels of Ecuador or countries included in A.I.D. Geographic Code 941, except as A.I.D. may otherwise agree in writing.

c. Source and Origin of Goods and Services (Grant)

Good and services, except for ocean shipping, financed by A.I.D. under the Grant shall have their source and origin in Ecuador or in the United States, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the Grant shall be financed only on flag vessels of the United States, except as A.I.D. may otherwise agree in writing.

d. Condition Precedent to Disbursement

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement, to finance any individual field demonstration activity, except for the procurement of vehicles and imported equipment, the GOE shall, except as A.I.D. may otherwise agree in writing, furnish, in form and substance satisfactory to A.I.D., a plan which details how the field demonstration activity will be implemented, and an agreement between the PNF and each implementing institution, group and community participating in such activity.

e. Covenants

The GOE shall covenant that, unless A.I.D. otherwise agrees in writing, it will:

(1) cause the PNF and the Agrarian Reform and Colonization Institute to expedite the titling of land which will be utilized for productive or protective forestry field demonstrations under the Project.

(2) cause the PNF to increase its professional and technical staff by at least eight professional and seven technical permanent positions and maintain such a permanent staff level after the end of the Project.

(3) prepare a plan by December 1984 which will detail an appropriate organizational structure for implementing watershed management in Ecuador.

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(4) cause the PNF to appoint a full-time training coordinator by the end of the first Project year.

_____
Assistant Administrator
Bureau for Latin America
and the Caribben

_____
Date

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: FORESTRY SECTOR DEVELOPMENT PROJECT - 518-0023

Life of Project:
From FY 1982 to FY 1987
Total U.S. Funding 8.1
Date Prepared: 6-9-82

PAGE 1

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: (A-1)	Measures of Goal Achievement: (A-2)	(A-3)	Assumptions for achieving goal targets: (A-4)
To increase the productive use of Ecuador's forest resources.	Statistically significant increase in forest products produced for export and domestic consumption.	GOE national production statistics.	GOE commitment to release budget funds for the National Forestry Program (PNF) as specified in the Forest Law.
	Measurable increase in multipurpose tree planting in Sierra communities and on lowland small farms reached by commercial scale demonstration projects.	Annual progress reports by PNF Forest Management Department.	Private sector will actively engage in forestry activities.
	Physically delimited and protected protective forests and national parks in the watersheds of major infrastructural projects, and other economically important natural areas.	Annual progress reports by PNF Parks and Wildlife Department.	Full costs of watershed management are internalized in the funding of hydroelectric, irrigation and water supply projects.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: FORESTRY SECTOR DEVELOPMENT PROJECT - 518-0023

Life of Project: From FY 1982 to FY 1987
Total U.S. Funding: 8.1
Date Prepared: 6-4-87

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Purpose: (B-1)	Conditions that will indicate purpose has been achieved: End-of-Project status. (B-2)	(B-3)	Assumptions for achieving purpose: (B-4)
To strengthen the capacity of Ecuadorean forest sector institutions to undertake afforestation/reforestation activities and to manage productive and protective forests.	(1) A functional planning, research coordination, training and information capacity established within the PNF.	1. PNF's Planning Department.	GOE provides sufficient budgetary resources to PNF.
	(2) An increased PNF capability to provide technical assistance and other support through its District offices.	2. PNF District Office records indicate increased technical assistance being provided to communities and individuals. Sales of seedlings increased by an average of 50 percent.	PNF will modify functions of District offices.
	(3) Effective working relationships established between the PNF and other public and private sector institutions.	3. Inter-institutional cooperative agreements continue in operation (5).	
	(4) Increased technical knowledge available on forestry activities.	4. Research results published and disseminated.	
	(5) Protective Forest delimitation and management planning occurring.	5. Protective forest being delimited (100,000 hectares per year).	Public and government support for protective forests is increased.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 1982 to FY 1987
Total U.S. Funding 8.1
Date Prepared: 6-9-87

Project Title & Number: FORESTRY SECTOR DEVELOPMENT PROJECT - 518-0023

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Outputs: (C-1)	Magnitude of Outputs: (C-2)	(C-3)	Assumptions for achieving outputs: (C-4)
I. Institutional Development			
A. Planning and Programming		PNF Records	
1. Project designed	5		
2. Studies implemented	5		
3. District chiefs trained in project design	15		
B. Research Coordination		PNF Records	
1. Research results from field demonstrations and applied research collected by PNF			
2. Trained professionals in forest entomology and pathologist on PNF staff	2		GOE allows PNF to increase staff
3. Seed Bank and specialized operational entomology and pathology laboratories	5		
C. Information dissemination			
1. Documentation center staffed with trained personnel and operational	1	USAID monitoring	
2. Research results and technical information disseminated		PNF records, publications	

96

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number:

Life of Project:
From FY 1982 to FY 1987
Total U.S. Funding 8.1
Date Prepared: 6-9-82

NARRATIVE SUMMARY Project Outputs: (C-1)	OBJECTIVELY VERIFIABLE INDICATORS Magnitude of Outputs: (C-2)	MEANS OF VERIFICATION (C-3)	IMPORTANT ASSUMPTIONS Assumptions for achieving outputs: (C-4)
D. Technical Assistance and Support.			
1. nurseries expanded and improved.	6	PNF records	
2. District engineers and technicians trained	40		
II. Productive Forestry Field Demonstrations			
1. Sierra Plantations	4,000 hectares	PNF records	
2. Sierra On-Farm Forestry.	225 hectares		
3. Sierra Natural Regeneration	125 hectares		PNF signs inter-institutional agreement with public and private sector organizations.
4. Arid Zone Plantations	500 hectares		
5. Arid Zone Natural Regeneration	300 hectares		
6. Arid Zone On-Farm Planting	640 hectares		
7. Humid Tropical Forest Management	1,600 hectares		
8. Humid Tropical Agro-Forestry	1,000 hectares		
9. Humid Tropical Enrichment Plantations.	1,000 hectares		
10. Species trials	100		
11. Other Demonstrations	585 hectares		

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: FORESTRY SECTOR DEVELOPMENT PROJECT - 518-0023

Life of Project: From FY 1982 to FY 1987
Total U.S. Funding 8.1
Date Prepared: 6-9-82

PAGE 3 - C

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Outputs: (C-1)	Magnitude of Outputs: (C-2)	(C-3)	Assumptions for achieving outputs: (C-4)
III. Protective Forestry and Watershed Management			
A. Paute Watershed Protective Forest Delimited and Management Plan Developed	60,000 hectares	PNP records	
B. Other critical watersheds and economically valuable areas delimited and management plan developed.	500,000 hectares		
C. Field Demonstrations Implemented in Paute Watershed		Site visits	
1. Revegetation			
2. Natural Regeneration			
D. INECEL Watershed Management Unit Established			

98

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: FORESTRY SECTOR DEVELOPMENT PROJECT - 518-0023

Life of Project: From FY 1982 to FY 1987
Total U.S. Funding 8.1
Date Prepared: 6-9-87

PAGE 4-a

NARRATIVE SUMMARY Project Inputs: (D-1)	OBJECTIVELY VERIFIABLE INDICATORS Implementation Target (Type and Quantity) (D-2)	MEANS OF VERIFICATION (D-3)	IMPORTANT ASSUMPTIONS Assumptions for providing inputs: (D-4)
I. Institutional Development			
A. Technical Assistance		USAID Records	
1. Principal Advisor	48 p-m		
2. Short-term	54 p-m		
B. Training			
1. In-service technical workshops	25 workshops	PNF Training Reports	
2. In-service project design training	15 professionals trained		
3. Applied Research Design	10 professionals and technicians trained		
4. Training in Information Management and Statistics	1 person trained		
C. Equipment and Materials		USAID Records	
1. Micro-computer/word-processor	1		
2. Pathology and Entomology Lab. Equipment			
3. Seed Bank			
4. Nursery Expansion Equipment	1		
D. Additional Staff	4 professionals	PNF Records	
E. Funding for Studies		USAID Records	

AID 1020-20 (5-73)
SUPPLEMENT 1

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: FORESTRY SECTOR DEVELOPMENT PROJECT - 518-0023

Life of Project:
From FY 1982 to FY 1987
Total U.S. Funding 8.1
Date Prepared: 6-9-87

NARRATIVE SUMMARY Project Inputs: (D-1)	OBJECTIVELY VERIFIABLE INDICATORS Implementation Target (Type and Quantity) (D-2)	MEANS OF VERIFICATION (D-3)	IMPORTANT ASSUMPTIONS Assumptions for providing inputs: (D-4)
II. Productive Forestry Pilot Field Demonstrations.			
1. Technical Assistance			
a. Long-term	72 p-m	USAID Records	
b. Short-term	26 p-m		
2. Equipment and Materials		USAID Records	
a. Vehicles	6		
b. Small tools			
3. Additional Staff	2 Forestry Engineers 7 Forest Technicians	PNF Records	
4. Funding for Field Demonstrations	$ 2,600,000	USAID Controller's Records	
III. Protective Forest Delimitation and Watershed Management Planning			
A. Technical Assistance		USAID Records	
1. To PNF	12 p-m		
2. To INECEL	18 p-m		
B. Training		PNF Records	
1. On-the-job training of PNF professionals			
2. Master's training of PNF professionals	2		
C. Equipment		USAID Records	
1. Aerial Photo-Interpretation			
2. Mapping			

100

AID 1020-25 (11-78)
SUPPLEMENT 1

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: FORESTRY SECTOR DEVELOPMENT PROJECT - 518-0023

Life of Project: From FY 1982 to FY 1987
Total U.S. Funding 8.1
Date Prepared: 6 9 82

NARRATIVE SUMMARY Project Inputs: (D-1)	OBJECTIVELY VERIFIABLE INDICATORS Implementation Target (Type and Quantity) (D-2)	MEANS OF VERIFICATION (D-3)	IMPORTANT ASSUMPTIONS Assumptions for providing inputs: (D-4)
D. Financing of Protective Forest delimination and field demonstration activities.	$ 450,000	USAID Controller's reports	
E. Additional Staff	2 professionals	PNF records	

SUMMARY PROJECT BUDGET BY INPUT
($ 1,000's)

	A.I.D. Loan	A.I.D. Grant	Host Country
Technical Assistance	635	1,600	65
Training	650		250
Equipment and Materials	550		770
Field Demonstration Activities	3,700		4,675
Protective Forest Activities	600		450
Additional Staff			925
Evaluation	65		65
Contingencies	300		300

101

PROJECT DESIGN EXHIBITS

A. Productive Forestry Applied Research and Pilot Demonstrations

1. Introduction

A primary requirement for the development of the forestry sector is adequate knowledge about how to implement afforestation/reforestation activities that are appropriate for Ecuador's myriad socio-cultural, economic, climatic, topographic, geographic and land-tenure conditions. Applied silvicultural research and field demonstrations of alternative forestry systems are needed in order to generate the technical information and demonstrate feasible options.

A wide variety of research needs exist, including: species elimination trials, plantation establishment and management techniques, disease and insect problems and nursery practices. At the same time, it is equally important to field test a variety of reforestation alternatives (e.g., agro-forestry, on-farm forestation), institutional arrangements for carrying out needed reforestation, and extension techniques which are needed if foresters are to successfully relate to individual farmers, communities, and Indians who will carry out reforestation.

In both the humid tropical and Sierra plantations, commercial sized plantations will serve as pilot demonstrations of planting and management technologies, while contributing to the production of wood products and assisting with soil and water regime stabilization.

A major objective of this component of the project is to provide forest industries, farmers, development institutions, and communities with technical information about native and exotic species which may be appropriate to use in afforestation/reforestation activities. This information will be generated through applied research activities carried out in conjunction with the field demonstrations of different forestry systems. The results of the applied research will then be transmitted through the information dissemination mechanisms which will have been strengthened as a result of the activities implemented in the first Project's component.

The productive forestry field demonstrations and applied forestry research activities will be coordinated by the PNF. Although the PNF will directly carry out some of the research and demonstration activities, as a general procedure, it will enter into cooperative agreements with other public sector (GOE) agencies, private industries and/or other interest groups to conduct a significant portion of the field demonstration and applied research activities in a collaborative manner. These cooperative agreements will be

designed to meet the specific inter-institutional circumstances which will apply. They will involve a joint contribution of resources and the research results will be part of the public domain and will be widely disseminated by the PNF.

Three basic categories of productive forestry field demonstration activities will be implemented in the highlands, the arid coast and the humid tropics. These basic categories are plantations, natural regeneration, and agro-forestry. Plantation forestry involves tree planting on significant parcels of land (ranging from five to several hundred hectares.) Plantation forestry is afforestation/reforestation which is the principle use of the land. Natural regeneration is the management of the natural regrowth of natural species. Agro-forestry involves tree planting as an activity which is undertaken on a complementary basis with agricultural and/or livestock activities. Enrichment plantations are plantations of highly valued species carried out on cut over forest land in the lowland humid tropics.

In the Sierra and dry coastal areas commercial-scale models for integrating multipurpose forestry within a framework of overall community development will be demonstrated. In addition to increasing the wood supply for industrial purposes this activity would promote afforestation to produce fuelwood, aid soil conservation/recovery, and serve as windbreaks as well as to provide a resource for use in small scale community industries. The demonstration will include pine and eucalyptus but will not be limited to these species. Participating institutions, in addition to community groups, will include private industry and public sector forestry institutions (the Empresa de Desarrollo Forestal - EMDEFOR), Integrated Rural Development Projects and Regional or Provincial institutions.

In the humid tropical lowlands three types of scale experimental production models will be demonstrated: natural forest management, enrichment of natural forests and agro-forestry. They will integrate the inhabitants of the the humid tropics, whether natives or colonos into an ecologically and socially sound as well as economically beneficial system of sustained yield management of the tropical forest resource base. Indian associations and cooperatives formed by colonos as well as private and mixed-capital enterprises and regional development organizations will participate in carrying out these experimental activities.

2. Regional Considerations

The institutional capacities developed under this project must be able to deal effectively with Ecuador's three distinct geographic/climatic regions with respect to forestry: the highlands (Sierra), the arid coast and the humid tropics, including the northwestern coast and the Amazonian basin

(Oriente). These regions present significantly different social as well as natural environments. Accordingly, the field activities planned under the project will necessarily vary from one region to another. Each of these regions is described below.

a. Sierra

The Sierra is part of the Andean mountain range and occupies a north-south section usually 50-75 km in width and about 150 km inland from the Pacific Ocean. It is bordered by humid lowlands in the upper Amazon basin to the east and the arid to humid coastal lowlands on the west. The Sierra is composed of two major ranges separated by a series of intermontane basins and ridges. These intermontane basins (Inter-Andean Zone) are usually at altitudes of 1500-3000 meters and contain the major population centers in the Sierra. The external slopes of the Sierra on the east and west fall off very steeply to the hot lowlands and, in general, have not been intensively settled due to the difficulty of access, steep slopes and less favorable climatic conditions.

Climate, vegetation, soil and land use in the Sierra is very strongly influenced by altitude. However, the relationship of altitude to precipitation and, to a lesser extent, temperature is greatly complicated by the orientation of mountain ranges and valleys with respect to moisture-bearings winds from the east and west. Few, if any, plants grow above approximately 4500 meters.

The original vegetation of the Inter-Andean zone below the p@ramo was probably forest, composed mainly of broadleaf evergreen species of neotropic origin. Some remnants of this forest persist in steeper and less accessible areas, but even these have probably been modified to a considerable degree by wood cutting, etc.

Soils of the valley floors are generally deep, dark-colored and developed from alluvium, volcanic ash and glacial outwash. Soils on slopes were developed from various volcanic materials. Generally, the soils of the southern region are older than those of the northern area because the period of volcanic activity. Soils of the higher altitudes are also deep, dark-colored with moderate and moderately fine textures. The youngest soils are stratified with pumice-like material. Soils of the west are more acid in nature than those of the eastern range due to the influence of different parent materials.

Erosion is a severe problem of the Ecuadorean highlands. Topsoil has been removed from large areas, particularly on the lower slopes, resulting in migration of population into higher areas of potentially lower productivity.

Although it is probable that a large portion of the better land in the temperate mountain zone was in cultivation before the Spanish arrived, the increasing population has resulted in repeated subdivision of property and the creation of minifundia which are cultivated on a subsistence basis. Essentially all suitable, and most unsuitable, land between about 2,000-3,000 meters is cultivated for production of wheat, barley, potatoes, oats, corn and other crops. Areas which cannot be cultivated due to poor drainage, erosion, or other factors are used for grazing.

Increasing demand for cultivable land has resulted in more land at higher altitudes being used for crop production so that increasing amounts of land between 3000 and 3500 meters are being cultivated. In many areas crop cultivation above about 3300-3400 meters is not feasible due to low temperatures and extended periods required for crop maturation.

Expanding the forest resource base in the sierra will require very close cooperation with communities and individual landowners. The area available for commercial plantations is limited by the extensive use of marginal lands for crop and livestock production, as well as climatic and soil characteristics in non-agriculture areas.

Much of the land in the sierra is held by individual farmers in plots ranging from one to five hectares. It is often in need of soil conservation, and the farmers and surrounding communities need increased supplies of fodder, fuelwood and wood for rustic construction, tools and artesanal goods. Multipurpose forestry can be undertaken with individual farmers to increase wood production. This, however, must be limited to the establishment of windbreaks, live fences, roadside and field border plantings, and occasional tree planting for shade, fodder and fuel which do not compete with crop production on agricultural land. These farmers are also interested in trees that produce edible fruit, so multipurpose tree species will be an important input in this type of forestry.

Forestry activity on community-owned land must address similar needs to those of individual farmers, and will require a variety of tree species, both native and exotic. Communities may need to develop local nurseries, and mechanisms for establishing and protecting plantations. Since open grazing is used over much of the area that could be dedicated to forestry on community-owned land, systems for more controlled grazing or even grazing in combination with trees must be tried.

b. Dry Coast

The arid lowlands in Ecuador are mainly in the provinces of El Oro, Manabí and Guayas. Most of the natural forest that once existed here has been destroyed, resulting in a great scarcity of wood for fuel and building materials. A local charcoal industry is exacerbating the problem by not only exploiting what vegetation is left on the flatlands, but also rapidly devegetating the remaining hill forests.

105

It is possible that the complete clearing of the natural vegetation cover in this area is at least partially responsible for the declining rainfall throughout the zone in recent years. Annual rainfall in the area is low (100-700 mm), inter-annual variation is high, and whatever rainfall that occurs is limited completely to a four-month period. These climatic characteristics greatly limit the possibilities for large-scale forestry production in the area.

In the lower, flatter areas of the arid coast, inhabitants will grow crops if and when the annual rains begin; land that otherwise lies idle immediately is cultivated by all members of the family. Wage laborers (mostly males) who might be working in neighboring towns or as far away as Quito and Guayaquil, return immediately to cultivate the land if it rains. Goats graze the entire area, leaving very little vegetation and presenting a significant problem for the initiation of any forestry activity.

Communal land holdings are the pattern, with families holding usufruct rights to certain plots and the rest used for communal activities. Reforestation efforts are most likely to be successful in the arid lowlands if they are implemented by well organized community organizations, and if they address the inhabitants' needs for fuelwood, shade, soil erosion control, and food. The forestry programs which succeed will be those that promote multipurpose tree species and/or forage for animals.

c. Humid Tropical Lowlands: Northwestern Coast

Ecuador's northwest sector has been an area of relatively sparse population and difficult access until quite recently. Even today, the far northern sector near San Lorenzo remains isolated. The southern part of Esmeraldas province is now connected to the rest of the country by a paved, all weather road which has permitted an influx of colonists.

Prior to the recent arrival of colonists in the area, the population consisted almost entirely of Afro-Americans and Indians (principally Cayapas). Economic patterns were largely subsistence horticulture, artesanal fishing, and shellfish gathering. All of these native inhabitants utilize forest resources, clear land for gardens and occassionally fell trees for sale. Colonists and industrial forest concessions, however, have exploited the existing forest resource to establish agricultural plots and to carry out logging operations in much of the northwestern area. To facilitate their extractive activities, the concessionaires have developed a network of roads throughout the area. Whenever a road penetrates the forest, colonists quickly follow and establish themselves along either side.

Both the colonists and the concessionaires are deforesting the region at a very rapid rate. The concessions, which operate in the area through formal contracts, are required to replant areas in which they work. The concessionaires claim, however, that such efforts are useless since

colonists have occupied the partially deforested areas and would destroy incipient forests. Most colonists, in turn, have no legal title to their land and are therefore hesitant to make any improvements on land where their tenure is precarious. A projection of current deforestation trends in this area results in complete timber resource depletion within 10-15 years.

Attempts to manage the existing forest resource or reforest after harvesting or other land clearing soon reveal the fact that very little silvicultural information and experience is available upon which to base management schemes. Management of the natural environment and any forestry development in the area will require acceptance and collaboration of local colonists, natives and private industry management. This will not occur spontaneously, and forestry projects must consider a series of social and institutional issues as important as the silvicultural constraints.

d. Humid Tropical Lowlands: Oriente

The Oriente comprises about one-half of Ecuador's national territory. At present the area contains approximately eight million hectares of modified and unmodified tropical forest. Despite its relatively large size, it is considered to be one of the most undeveloped regions of the country. The region is populated by Indian groups -- Shuar, Quichua, Cof@n, Siona-Secoya, Huaorani and Z@paros, presently numbering about 125,000, who live primarily by hunting, fishing, and practicing swidden horticulture.

However, as transportation has improved and population pressure in the highlands has increased, colonists have moved into the western foothills. The principle economic activities of the colonists consist of cattle raising, purchase of agricultural goods, and sale of manufactured goods. The infrastructural development which coincided with oil exploration and exploitation in the early 1970's has resulted in a quantum increase in the number of colonists, particularly in Napo province where the road paralleling the petroleum pipeline provided a vector for an influx of colonists who have now claimed and settled plots several rows deep on either side of the road. At present, it is estimated that about one-half of the Oriente's residents are colonists. The indigenous response to increased colonization has been to develop well-organized and, in many cases, highly sophisticated federations dedicated mainly to the protection of their land rights and the development of locally-controlled economic activities. The future development of the Oriente will probably be based on distinct but parallel programs involving Indians and colonists, between whom considerable social tension exists.

The forest resource in the Oriente is still abundant. However, it is of lower quality than in the humid tropics of Esmeraldas province. Also, although some projections indicate that this region can provide wood from natural forests for forty years at current extraction rates, there are many more transportation difficulties and future exploitation is likely to become an increasingly high cost and eventually uneconomical operation well before the timber resources are depleted.

3. Activities

The specific activities of the Productive Forestry Applied Research and Pilot Demonstrations component of the project are commercial scale pilot activities that test various institutional and silvicultural schemes for reforestation in the four distinct regions of Ecuador, and that serve as demonstrations of replicable forest management systems. Applied research and training activities will be carried out to address the major technological and institutional constraints to increased reforestation. As a result, the project will provide a series of proven technologies and tested institutional arrangements between PNF and executing agencies which cooperate on reforestation projects.

(1) Sierra

The following reforestation schemes will be tested in the Sierra:

(a) Plantation Demonstration Activities

In the Sierra three types of plantation demonstrations will be tested. They will demonstrate methods and techniques to: increase production of wood and non-wood forestry products; decrease plantation establishment costs; and match appropriate tree species with site characteristics.

The first type of plantation forestry demonstration will be to establish Pinus radiata plantations on commercial plots of private land (at altitudes between 2600 meters and 3200 meters) and manage the plantation for sawnwood, with thinnings, prunings, and wood residuals used in particle board production. Combinations of pasture and pine will be demonstrated. This can be done on a small part of a larger plantation. (E.g., 2-5 hectares of a 10-25 hectares plantation could be planted or thinned to a spacing which permits a cover of grass maintained underneath for grazing.) Also, intercropping of potatoes and other traditional Sierra crops during the first years will be tested as a demonstration of plantation cost reduction through food production. Finally, different methods of plantation establishment (e.g., use of hand dug canals or machine terracing) will be tested.

The second type of plantation demonstration is to plant experimental stands of other species of pines at altitudes similar to that of the Pinus radiata range and above. Preliminary indications show that P.patula should be planted where P. radiata exhibits signs of dieback and slower growth, especially above 3,200 meters. Other Mexican and Asian pines could prove productive on these sites, but will be tested in small plots before planting extensive areas.

The third type of field trial will be with eucalypt plantations. Site characteristics, more appropriate planting and management techniques, utilization of different species, closer spacing, shorter rotation time for fuelwood, and utilization of pasture as ground-cover will be tested.

The PNF will enter into cooperative agreements with executing institutions such as EMDEFOR in the Quimiag-Penipe IRD Project in Chimborazo, and the Corporacion Forestal Juan Manuel Durini in the Salcedo IRD Project in Cotopaxi province to establish approximately 4,000 hectares of pine plantations and eucalypt plantations for lumber, fuelwood and construction materials production. INIAP, Ecuador's Agricultural Research Institute will provide assistance to the participating entities in planning the agricultural and livestock grazing activities.

The plantations will be on communally owned land and private land with the owners providing land and paying plantation costs. PNF funds will be used to cofinance reforestation and establish species trials in conjunction with the plantations. PNF will provide technical assistance in plantation management techniques and the plantations will be used as demonstration areas for training purposes.

In conjunction with the plantation field demonstrations at least ten field species elimination trials of 1/4 hectare each will be established within plantations to test native and exotic species thought to be viable alternatives to the few species now being planted. Also, close attention will be paid to devising an arrangement between the executing institution and the community upon whose land the plantation will be established so that sufficient incentives are included to provide for continued management and protection after planting.

(b) On-Farm Demonstration Activities

Seventy-five farmers will be chosen to participate in a program of on-farm tree planting for the production of food, fuel, shade, fodder, and construction wood. The farms will be from one to five hectares in size, and the farmers will participate in the project after a series of meetings with extension agents of the executing agency to explain the project objectives and mutual responsibilities. Species of Eucalyptus, Cupressus, Casuarina, Acacia, Juglans, Salix, Alnus, Populus, Prosopis, and native fruit bearing trees will be considered. Farmers and extension agents together will determine the different multipurpose tree species to be planted for windrows, boundaries and live fences. Where appropriate, linear plantings across slopes will be established with grasses (e.g., penco) and fruit trees (e.g., capuli) to retard soil erosion and produce fodder and food.

(c) Natural Forest Management Demonstration

Cropland and pasture land expansion in the higher slopes of the Sierra has resulted in the deforestation of montane broadleaf evergreen forests in the lower p@ramo zone between 2,800 and 3,500 meters. Consequently, vegetation such as bunchgrass, forbs, and other low grasses, occurring previously only between 3,500 to 4,000 meter elevations, has already replaced the major part of the original broadleaf evergreen forest at elevations between 2,800 and 3,500 meters in response to ongoing grazing, fire, fuelwood and cultivation practices. Simple protection from fire and control of grazing on depleted p@ramo areas where seed sources still exist will permit substantial recovery of natural vegetation cover within just a few years. Natural regeneration of this type would be productive in terms of soil and water conservation, wildlife habitat, and fuelwood.

PNF will enter into twenty-five agreements with individual landowners or communities to protect selected areas from fire and grazing for a period of five years. The PNF will provide fencing and data collection, and the landowner will contribute the land and protection. These demonstrations will be on very eroded steeply sloping lands, and generally will not exceed five hectares. The importance of these trials will be to record the type and value of the natural vegetation that grows, and to demonstrate the potential productivity of apparently unproductive land.

(2) Arid Coast

The following reforestation schemes will be demonstrated in the arid Coast.

(a) Plantation Forestry

A total of 500 hectares, in plots of at least 10 hectares, will be established with as many as 20 communities, using a number of a tree species for fuelwood (e.g., Eucalyptus camaldulensis), fodder (e.g., Prosopis juliflora) and fruit (e.g., tamarindo, Tamarindus sp.)

Tree planting will be planned and established on community held land for the production of fodder and shade for animals, fruit for humans, and fuelwood. Also, trees that bear fruit and nuts for human consumption and that provide shade for gardens will be introduced where feasible. This latter activity should become more important in the future if greater supplies of water reach this area.

PNF will provide the trees and technical assistance. The Jipijapa IRD project will provide the extension agents and material inputs like fencing, and the community the land and labor. In the first and second year, small plots (one to two hectares) will be established. After the second year, plot size will be expanded in those communities where the community has protected the plot from goats and has cared for the seedlings. Species trial (1/4 hectare each) will be established on five plantations to test other promising species of multipurpose trees for this type of arid site.

110

(b) Natural Regeneration

Because of the relative lack of population pressure, the possibilities for controling grazing and allowing natural revegetation to occur in the arid lowlands are good. In order to test the feasibility of natural regeneration, twelve plots of twenty-five hectares each of community-owned land will be fenced and protected from grazing in the Santa Elena Peninsula and in Jipijapa. These plots will be studied for five years to collect data on natural revegetation. The pilot areas will be systematically opened up for grazing, and protected again after animals have grazed for a prudent (as yet undetermined) period of time.

(c) On-Farm Forestry

On-farm forestry in the arid coast will concentrate on shade trees for coffee plantations in Jipijapa. A large extension of coffee land exists in the higher, more humid regions of Jipijapa. Although some of this land has shade tree cover, many of the trees have died because of recent drought conditions. Elsewhere, coffee is being grown without proper shade. The project will finance demonstrations using different species of trees which may be appropriate for conditions in the region, e.g., leucaena and guaba (Inga sp.). A relatively small area of approximately 600 hectares will be forested. Approximately 120 small-holder coffee growers with average holdings of 5 hectares will participate in this activity.

(3) Humid tropics

Humid tropical lowland demonstration activities include:

(a) Lowland Humid Tropical Enrichment Plantations

Enrichment plantations provide the opportunity to effectively utilize remnant humid tropical forests to generate a significant economic return on a sustained yield basis. A series of four enrichment plantations of 250 hectares each will be demonstrated in remanent forests where concessions have already depleted the forest of most valuable species. These will be highly controlled, regularly spaced plantations using species characterized by high local value, rapid growth and relative insensitivity to competition by other species. These activities are designed for relatively large-scale industrial plantations, because of the man- agement needs and long-term nature of anticipated returns. They will be im- plemented on state lands assigned as forest concession in northwest Ecuador, particularly in the Industria Forestal Cayapas concession. However, small- scale enrichment plantations will also be tested in the same geographic area as a component of local community or cooperative forestry programs, in combi- nation with agro-forestry systems described below.

The establishment of enrichment plantations in the lowland humid areas of the northwest coast is an accepted option for sustained forest management in this type of environment. To demonstrate the effects of different silvicultural and management variables in plantations of this type, the project will establish experimental plots testing four different fast growing species, initially on 25 hectare plots which will be expanded over five years to include 250 hectares per species (total of 1000 hectares). The sequence of procedures to implement the enrichment plantations is as follows: (1) a forest inventory in remnant areas which may be suitable for enrichment plantations; (2) site selection followed by exploitation of remaining forest; (3) plantation establishment: (4) continuous observation, recording and evaluation of plantation progress including planting techniques, protection, refinement procedures, and spacing.

The four species which will be used in the humid tropical enrichment plantations -- Laurel (Cordia alliodora), Cedro (Cedrela sp.), Pachaco (Schizolobium parahybum), and Mascarey (Hyeronyma chocoensis) --have shown good growth characteristics in preliminary trials in northwestern coastal Ecuador and similar reforestation projects in Venezuela and Surinam.

The proposed planting program is as follows:

Species	hectares/year 1983	1984	1985	1986	1987	Total
Laurel (Cordia alliodora)	25	50	75	75	25	250
Cedar (Cedrela sp.)	25	50	75	75	25	250
Pachaco (Schizo lobium parahybum)	25	50	75	75	25	250
Mascarey (Hyeronima chocoensis)	25	50	75	75	25	250

(b) Lowland Humid Agro-Forestry

A program of combined agricultural and forestry management will be demonstrated to encourage forest production on small and medium sized rural holdings. The agro-forestry combination balances the delayed return on investment in forestry by more immediate returns from agricultural activities. Agroforestry pilot projects will be conducted on 600 hectares (twelve 50-hectare plots--the standard family plot assigned by IERAC in lowland tropical forest regions) in the Northwest coastal area, and on 400 hectares (eight 50-hectare plots) in the Oriente. Agroforestry plots will

combine trees with permanent cash crops, temporary cash crops, and subsistence crops. Each plot will consist of 10 hectares dedicated to subsistence crops, with the remaining 40 hectares used for market-oriented agroforestry activities. This activity will obtain assistance on agricultural matters from INIAP's small farm adaptive research project (IDAPA) which includes humid tropical agro-forestry as an activity area. Although the agro-forestry demonstrations are quite limited in number and are comparatively high cost alternatives when the cost of agricultural activities is included as it has been for analytical purposes in this paper, they are potentially extremely replicable provided that their technical and economic feasibility are demonstrated. Colonists who obtain land titles are much more likely to be able to obtain agricultural production credit long before credit for forestry activities is available. Under such circumstances they would be able to finance agroforestry activities without difficulty.

For both the northwest and Oriente rainforest the following systems will be tested:

1. Laurel in combination with permanent crops (banana/plantain, coffee or cacao);

2. Cedar in combination with permanent crops (banana/plantain, coffee or cacao);

3. Mascarey in combination with temporary crops (corn and rice);

4. Pachaco in combination with temporary crops (corn and rice).

(c) Lowland Humid Natural Regeneration

Natural regeneration of valuable species in relatively unmodified humid, tropical forest can be accomplished through a process of selective cropping and subsequent assistance in regrowth of valuable species. To demonstrate this reforestation technique, the project will establish one plot of 400 hectares in the northwest, and three plots of 400 hectares each in the Oriente.

Because of the need for relatively unmodified land and the long-term anticipated return, the various sites which are planned will all be located on sections of forest accessible only by either jeep or motorized canoe (to permit regular control and observation). However, these plots will also consist of land which is uncolonized and undisturbed. Moreover, the original 400 hectare pilot plots must be surrounded by similarly undisturbed forest which will permit progressive expansion of initial experiments. In order to insure their unmodified condition, these plots will be managed by those who are less concerned with intensive exploitation and immediate returns; colonists and other non-natives are unlikely to be enthusiastic

participants. By contrast, land claimed by Indians and the state will offer the best opportunities. Indians will interpret natural succession projects as ones which help to guarantee their tenure through participation in a general development program without disturbing the forest to an extent which will prohibit traditional subsistence activities. Furthermore, by implementing this activity with Indian groups there is a good possibility that CONFENAIE, a recently formed confederation of Amazonian Indian groups could eventually promote similar projects among its other member groups.

4. Institutional Arrangements.

a. Sierra activities.

The Sierra plantation, natural regeneration and on-farm forestry field demonstration activities will be implemented through a series of four cooperative agreements between the PNF and EMDEFOR, the Quimiag-Penipe IRD Project, the Salcedo IRD Project and the Corporacion Forestal Juan Manuel Durini. Details of the proposed agreements are presented below.

(1) PNF - EMDEFOR

A cooperative agreement will be established between the PNF and EMDEFOR to work with selected campesino communities in Chimborazo, Bolivar and Tungurahua provinces to implement the following activities:

- 1,500 hectares of pine and eucalyptus plantations
- 10 natural regeneration plots
- on-farm tree planting with 25 individual farmers

The plantation activities will be carried out in 13 communities and with two cooperative groups (with an average planting of 100 hectares per community).

The pine plantations will field test the following alternative planting systems and techniques: (a) inter-cropping with potatoes during years one and two of the plantation; inter-cropping with pasture grasses and alfalfa for silage during the first four years of the plantation and thereafter for grazing; (c) establishment of plantations with Pinus patula; and (d) eucalypt plantations which test high altitude provenances of E. globulus from Bolivia as well as other species of Eucalyptus. In most cases the plantations will also contain an average of 10 percent native species and acacias.

The natural regeneration will be carried out in conjunction with the plantations. It will be implemented on land which is unsuited for plantation establishment such as draws or gullies. Biology and agronomy students from the Chimborazo Politechnic Institute will measure the types and rates of revegetation which occur.

The on-farm forestry willl be carried out using native species such as aliso and capuli with individual farmers in communities where EMDEFOR has worked previously in reforestation activities on communal lands.

Species trials of other untested native and exotic species will be included as part of the plantation activities. Approximately three trials per year will be undertaken.

The PNF will contribute 50 percent of the plantation establishment and monitoring costs, including economic incentives to the participants for planting trees and seedlings. EMDEFOR will contribute 25 percent for technical management, including social promotion and technical assistance and project administration. The communities and individual farmers will contribute 25 percent in the form of land and labor.

(2) PNF - Quimiag-Penipe IRD Project.

A cooperative agreement will be entered into between the PNF and the Qu§miag-Penipe IRD Project to implement:

- 500 hectares of plantations (primarily eucalyptus), which will be planted on steep hillsides using narrow terraces in Penipe. Various provenances and species of eucalyptus will be selected for field demonstrations on the basis of species trials which are currently being conducted within the project area.

- On-farm tree planting will be carried out with 25 farmers using eucalypts as well as native species.

The PNF will provide 40 percent of the plantation establishment costs, including technical assistance, seedlings, and economic incentives to the participants. The IRD project will provide 40 percent and the communities 20 percent in the form of a land and labor contribution.

(3) PNF - Salcedo IRD Project

The cooperative agreement between the PNF and the Salcedo IRD Project will include the following activities:

- 1,000 hectares of pine and eucalypt plantations

- on-farm forestry activities with 25 farmers

- 15 natural regeneration plots

The plantations will be implemented by cooperatives and communities within the Salcedo project. These include the Cooperative Forestal El Triunfo (150 hectares), the Cooperativa Agricola San Fernando (200 hectares), the Cooperativa Agricola Consolación (100 hectares). the Comuna Llactahurco (300 hectares), the Comuna Compan§a Alta (100 hectares), Comuna Cumbijin - Sacha (150 hectares). The research and demonstration outputs will be demonstration of contour trenching techniques, spacing and rotation of eucalyptus, and intercropping of pine with legumes such as lentils, broad-beans and chocho, a native andean edible legume. In addition species trials of the following species will be undertaken: E. rostrara, Faique, Guarango (Tara spinosa), Retama, Sigse, Molle (Schinus molle), Aliso (Alnus jorullensis), and Chilca.

The PNF will provide the vegetative material from its Nagsiche nursery, technical assistance (an ingeniero forestal (1/2 time) and a full-time forest technician, and will finance economic incentives amounting to a total of 40 percent of the cost of the plantations, the IRD project will provide an additional 40 percent and the communities and cooperatives will provide 20 percent in the form of land and labor.

(4) PNF - Corporación Forestal Juan Manuel Durini

The PNF will provide support to the Corporacion Forestal Juan Manuel Durini to implement an experimental program of 500 hectares of pine plantations and associated species trials in which the Corporacion will work with communities in Cotopaxi province to implement pine plantations on community lands. Unlike plantations implemented under public sector and mixed enterprise programs, these plantations and the wood volume that they generate will belong entirely to the communities. They will be located near a particle board plant in Lasso in the same province. They will involve a joint effort by the PNF and the private sector to develop sources of raw material close to the utilization sites at a low initial investment cost. The PNF will provide seedlings and technical assistance in planting while the Corporación will provide incentive payments to the community based on the number of trees planted and, subsequently, upon their survival rate. The communities will make a significant contribution in terms of land and labor. This program will be undertaken in an area where pine plantations already exist and will be harvestable during the project life so that the participating communities will have a familiarity with the end use of the lumber and will appreciate the potential economic gain which they can eventually realize from forestry activities.

b. Arid Coastal Zone Activities

Arid coastal activities will be implemented in two areas: Jipijapa Canton in Manabi Province and the Santa Elena Peninsula in Guayas Province.

(1) PNF - Jipijapa IRD Project

Forestry activities in Jipijapa will be implemented by means of a cooperative agreement between the PNF and the Jipijapa IRD project. Sub-agreements will be executed with the Union de Productores Campesinos de Manab§ (UPOCAM), a cooperative federation which includes a number of cooperatives in the drier zone of Jipijapa, and with the Coffee Producer's Cooperative. The following activities will be undertaken:

- 300 hectares of small-scale plantations with approximately 12 communities which are members of UPOCAM. These communities will reforest approximately 5 hectares per year over a five year period. An agreement will be entered into by the Jipijapa IRD and established local campesino organizations such as UPOCAM (Provincial Union of Peasant Organizations of Manab§), supported by PNF on technical, research, and training activities. Under the agreement, the PNF will provide seedlings, technical assistance, and cover some of the plantation costs, e.g. for fencing. The IRD project will provide appropriate incentives to obtain community participation. UPOCAM will promote the forestry activity.

- 600 hectares of on-farm forestry on approximately 120 small-holder coffee farms whose owners are members of the Coffee Producers Cooperative. This will involve border planting and widely spaced shade plantings.

- natural regeneration field demonstrations on eight 25 hectare plots will be implemented in eight of the communities which are involved in the plantation forestry activities.

The PNF will provide the trees and technical assistance. The Jipijapa IRD project will provide the extension agents and material inputs such as fencing, and the community the land and labor. In the first and second years, small plots (one to two hectares) will be established. After the second year, plot size will be expanded in those communities where the community has protected the plot from goats and has cared for the seedlings. Species trials will be established on five plantations to test other promising species of multipurpose trees for this type of arid site.

(2) PNF - FODERUMA

The PNF will enter into an agreement with the Marginal Rural Development Fund (Foderuma) to implement arid zone afforestation/reforestation activities in the Santa Elena Peninsula in Guayas province. The following forestry activities will be implemented:

- 200 hectares of plantation forestry;

- four 25 hectare natural regeneration plots;

- species trials for dry land exotics.

The plantations will be established using native and exotic species of Algarrobo. Natural regeneration experiments will be conducted to evaluate the possibilities of the natural regeneration of Algarrobo and other native species when grazing is restricted. Species trials will be conducted on exotics such as Jojoba and Guayule.

These forestry activities will be carried out with eight communities in the El Progreso area of the Santa Elena Peninsula. FODERUMA will provide low cost financing of the plantation activities to the communities while the PNF will contribute technical assistance and vegetative material, and will finance the natural regeneration and species trials. The communities will provide land and labor. The Foderuma contribution will amount to 60 percent while the PNF and the communities will each contribute 20 percent of the total cost.

c. Humid Tropics

(1) PNF - Industria Forestal Cayapas

The PNF and the Industria Forestal Cayapas(IFC), a mixed enterprise which holds a large forest concession in Esmeraldas Province, will enter into an agreement in which the following activities will be undertaken:

- 600 hectares of enrichment plantations using Pachaco, Laurel, Cedar and Mascaray on lot No. 4 of the concession, which is close to industrial installations, has an adequate infrastructure and is close to the PNF's La Chiquita experiment station in San Lorenzo.;

- one 400 natural regeneration plot on land adjacent to the Cayapa river and within the Cayapa Indian land reserve;

- twelve 50 hectare agro-forestry plots to be implemented through a sub-agreement with the Consortium of Farmers Asociations of the Northwest which includes 13 associations and groups which are just being organized and represents the great majority of colonists (1200) in the area of the IFC concession. The PNF and the Industria Forestal Cayapas will work with the consortium to implement the forestry activities. The consortium, for example, will select the colonists to participate in the agroforestry demonstrations and will provide much of the social promotion. The

PNF will provide technical assistance and seedlings while the Industria Forestal Cayapas will provide access to the land and will assume a significant portion of the planting costs. It is expected that the A.I.D. financed pilot demonstrations in this area will generate a model which the Industria Forestal Cayapas and other forest concessions can utilize to undertake the reforestation for which they are responsible under the terms of their contracts.

(2) PNF - Corporacion Forestal Juan Manuel Durini

This agreement will focus on applied research and enrichment plantation activities in the northwestern coastal area near the town of Quinindé. The applied research activity will test the introduction of exotic species, study phito-sanitary measures for humid tropical plantations, and study and select fast-growing native species which are not currently being used for industrial purposes. It will expand and improve the quality of the recently initiated research activities of the Corporación. The enrichment plantation activity will include 400 hectares of fast growing humid tropical species in remnant forests unsuitable for agricultural activities. Species utilized in this activity will be species currently being tested by the Corporación in its research program.

The resources for this activity will be primarily provided by the Corporación. However, the PNF will provide technical assistance, including the long and short term external technical assistance financed under the project in such areas as tropical forest management, nursery management, and forest entomology and pathology. It will also publish and disseminate the results of the research activity. Students from the biology faculty from the Catholic University in Quito will participate in the research activity as part of their thesis work.

(3) PNF - INCRAE

This cooperative agreement will focus on humid tropical forestry field demonstrations in the Oriente (Napo Province). The following field demonstrations will be undertaken:

- three 400 hectare natural forest management activities;

- 400 hectares of agro-forestry activities.

The natural forest management activities will be carried out in the Comuna Sinague adjacent to the Cayambe-Coca ecological reserve, the Comuna Dureno, and the Comuna San Pablo adjacent to the Cuyabeno Faunal Reserve. Each of these comunas is an Indian community. In addition to the natural forest management and regeneration, the Indians will manage other species of flora and fauna found in the the areas which have been set aside

for this activity. This will permit the Indian groups to gradually become incorporated into the national economy without sacrificing their subsistence security. The PNF will assist not only in delimiting the project area but will also assist the Indian groups to finish demarcating their territoral boundaries. It will also provide technical assistance in the management of humid tropical forests. INCRAE will be responsible for maintaining a liaison with the Indian communities and will contribute to the territorial demarcation effort.

The agro-forestry activity will be similar to that implemented in the northwestern humid tropics. The eight 50 hectare plots will be located in three different communities: Shushufindi, San Miguel, the Comuna Rucullacta. Each is sufficiently organized to select the participants for the agro-forestry activities. The first two are settlements comprised of colonists while the latter is an Indian community which has begun to have significant interaction in the monetary economy. In this activity the PNF will provide tree seedlings and technical assistance in forestry. INCRAE would serve as the primary contact with the participants and would provide the day to day supervision of the agro-forestry activities. In addition, INIAP will be extensively involved through its IDAPA project. Its Payamino Experiment station will serve as the base of operations for the agro-forestry activities in the Oriente.

5. Other Demonstration Activities

The above mentioned pilot activities are assigned highest priority and will be the major focus of the project. However, as the forestry sector in Ecuador develops, various other demonstration activities will be considered for funding. These include:

a. Lowland Long-Fiber Plantations

An alternative to growing pine pulpwood in the Sierra is to establish plantations in the lowlands where climatic and soil conditions are more favorable to faster growth of trees, but where insect, disease, and management problems are apt to be great. A series of species trials is warranted in the coastal area that includes Santo Domingo de Los Colorados, Quevedo and Quininde (below 600 meters), to begin identification of long-fiber species (e.g., the Caribbean pines) for planting in that part of the country. An analysis of land available for plantations would have to be carried out prior to any activity of this nature. The contractual model used by EMDEFOR in the Sierra could very well be tried for this type of reforestation.

b. Walnut Plantings in San Antonio de Ibarra

Estimates have been made that the supply of wood (*Juglans sp.*) which is the basis for the large artesan woodworking community of San Antonio de Ibarra, in the northern Sierra, will be depleted within the decade.

A study should be commissioned to provide reliable supply and demand data, as well as a census of wood workers to determine the extent of this problem. If, in fact, the raw material supply for a significant part of the population is threatened, planting of Juglans sp, as well as other valuable species, can be organized between PNF and the community or artesan association.

c. Balsa and Rubber

Balsa (Ochroma lapogus) and rubber (Henea sp.) are grown in Ecuador in the area between Santo Domingo de los Colorados and Quininde. Both are commercial species which are appropriate for cultivation on small land holdings. Field demonstrations of both species will be considered as the project progresses.

Balsa is a fast growing pioneer tree species that is planted in plantations after clearing the land of all vegetative material. With a planting density of about 600 trees per hectare, and a rotation of four to six years, production for export can be expected to be between 120 and 160 cubic meters per hectare. A field demonstration activity will be carried out to test and demonstrate intercropping of peanuts, beans, or some other cash crop along with the balsa trees during the first months to offset the fairly high cost of plantation establishment. In addition, applied research should be carried out on this species which appears to be frequently attacked by insects and diseases which, if not brought under control, can greatly decrease the amount and value of the exported balsa wood.

In the case of rubber, the most urgent need is to test the feasibility of planting rubber in agro-forestry combinations. The technical aspects of growing and harvesting this valuable product are well known in Ecuador. Current production, which supplies 20-25 per cent of Ecuador's internal demand is carried out in small commercial plantations of individual farmers. These, however, have significant credit and wage labor requirements. Rubber cultivation within an agro-forestry system would reduce both requirements.

d. Model small-scale sawmill and wood industrialization demonstrations

Portable, low cost, small-scale sawmill, chipping, and woodworking machines should be demonstrated in areas where pine and eucalypt plantations are reaching maturity. Such demonstrations would serve to determine which machinery is most appropriate for the Sierra. They would also serve as an incentive to communities which are potential tree planters since working processing unit will demonstrate the potencial market for the roundwood to be produced in plantations. At present there are mature pine and eucalypt plantations in, or adjacent to, the areas to be reforested under this project, so immediate demonstrations of this type are possible. Various brands and sizes of small-scale machines are now on the market which should be adapted easily to conditions in the Sierra.

B. Protective Forestry Field Demonstration: Paute Case Study

The watershed of the Paute River has been chosen as the primary case study area for demonstration and training activities in protective forest and watershed management. This area was selected because of the high rate of sedimentation affecting the Paute hydroelectric project and the strong interest on the part of the concerned government agencies in solving the problem. This interest is reflected in the formation of the National Inter-Institutional Commission for Watershed Management with a special sub-commission established to deal with the Paute. The Commission is made up of the several institutions having legal or technical responsibilities in watershed management including PNF, INERHI, PRONACOS, INECEL and CREA. The data base for the area is relatively good and additional stations for measuring sediment load in rivers are being constructed.

1. Case study goals

Goals of the case study are:

(1) Quantify the technical and economic feasibility of controlling sedimentation.

(2) Apply economic feasibility data to a benefit/cost analysis for watershed management.

(3) Establish an efficient set of methodologies and techniques for determining management strategies and costs and for executing integral management of a watershed.

(4) Build into the structure of PNF, INERHI and PRONACOS a cadre of professionals capable of carrying out management activities within the cultural and environmental framework of any watershed in Ecuador. In the specific case of hydroelectric projects INECEL will be assisted in establishing an internal capability to assess needs in watershed management and evaluate the work of legally responsible institutions.

(5) Use feasibility data to build a precedent for internalizing the costs of watershed management in the financing of infrastructural projects by national and international funding institutions.

2. Scope of Activities

Within the Paute watershed above the proposed Mazar dam (area 4,540 km2) are two subwatersheds, the Jad@n (243 km2) and the Burgay (374 km2) which are the sources of a large, but unquantified, proportion of the sediments entering the Paute river. The classification of capability, delimitation of protective forest and establishment of management criteria will be

carried out for the entire area of the two subwatersheds. Evaluation of land use practices contributing to erosion will also be carried out at the scale of the two subwatersheds. The scope of the analysis of the underlying cultural, demographic, economic and political factors will be regional.

On the basis of the classification, microwatersheds will be chosen in which treatments will be tested. Pairs of microwatersheds will be chosen in order to have similar conditions for treated and control watersheds. Each pair of treated and control sites will be instrumented for comparison of sediment generation rates. Pairs with the greatest similarity will be chosen. One of the pairs will receive conservation treatment and the control will be left in its normal use. Differences in rates of sedimentation will be a measure of success in the rehabilitation demonstration.

Protection measures will be applied to those areas classified as protective in the upper watershed and which are either in natural vegetation or are otherwise stable. One or both problem watersheds will be used for demonstration and training in upper watershed management.

a. Classification, Delimitation and Management Analysis

The 61,700 hectares of the combined Jad@n and Burgay subwatersheds will be mapped at a scale not smaller than 1:50,000. All existing thematic maps will be used to produce a composite land capability map. On this composite map the protective forest areas can be delimited, both those requiring protective management and those requiring different rehabilitation treatment.

b. Protective Forest Management

The delimitation of the protective forest in the Burgay and Jad@n watersheds will be followed by the establishment of a program for administration of the protective forests. Management of the protective forests of the two watersheds will provide the opportunity for applied training for personnel responsible for managing protective forests and parks elsewhere in Ecuador.

c. Social and Agricultural Assessment

The land use, agricultural settlement density, cultural attitudes, and service infrastructure will be assessed for the combined watersheds. Extension needs to achieve rehabilitation goals will be defined including programs for extension agent/management technician training, field days for campesinos and the development of audiovisual materials.

d. Rehabilitation

Based on the capability map, five paired demonstration sites for treatment will be selected. The choice of sites will be based on a review of the capability map and text along with detailed field reconnaissance

observation. From the time of selection throughout the five year duration of the project a slide and video tape record will be maintained. Demonstrations will be in natural micro-watersheds ranging in size from 100 to 300 hectares. Each watershed will be carefully surveyed to define the area in order to determine precisely the cost per hectare of the different treatments and for comparison with each paired control receiving no treatment.

Treatments include but are not limited to:

(1) Protection with native vegetation.- Fencing and guarding will be used to exclude grazing animals and agriculture. Measures to exclude fire will be included where needed. The protection treatment under controlled conditions will allow accurate measurement of the recuperative capacity of the land and will provide strong evidence for the economies inherent in protecting natural protective forest areas from degradation. Protection is primarily a PNF function.

(2) Revegetation.- Planting of native and exotic trees, shrubs, grasses, cacti and agaves will be carried out with the primary objective of controlling erosion and secondary objectives of wood, forage, grazing and other products. This treatment will allow PNF to determine relative costs and benefits of simple protection (see (1) above) compared with accelerated recovery through revegetation.

(3) Soil Conservation Measures.- Diversion ditches, contour planting, terracing or other measures, using both hand and mechanical means will be carried out where severity of water erosion represents the typical situations. Application and costs of the different conservation measures will vary with slope and soil conditions. Soil conservation works combined with reforestation/revegetation involve both PNF and PRONACOS input. The soil conservation subproject under Title XII can be expected to pay part of the costs of these treatments.

(4) Check Dams.- Check dams and similar infrastructure will be an integral element of an overall sediment control strategy. Check dams represent a costly activity which must be integrated with other measures if full benefit is to be gained from the investment. Check dams will require technical input from PRONACOS and INERHI/CREA. Funding can be expected under the Title XII soil conservation subproject.

If any microwatershed, variation in slope, soil, bedrock and degree of degradation will require a combination of treatments. Choice of sites should be governed by overall site differences and the degree to which each represents a common problem area in the watershed. Exact costs will be determined by the size of microwatersheds chosen and the mix of treatments applied.

4. Economic Assessment

An economic analysis will be carried out as part of the case study. It is essential that this analysis document the costs of the land capability assessment, delimitation, management and rehabilitation demonstration activities. When extrapolated to the scale of the whole watershed the analysis should take into account economies of scale. Estimates of overall sedimentation control results at given investment levels must be converted into measures of extended useful life of the infrastructure and the economic value thereof. The economist will be on hand at the beginning of the management and rehabilitation process in order to provide guidelines for data gathering which will permit benefit/cost analyses to be implemented later.

ECONOMIC ANALYSIS

This annex presents the details of the economic analysis which was conducted to determine financial and economic feasibility of the project elements relating to the field level demonstration. The annex is divided into two sections. The first section provides an overview of the sector. It details forestry's contribution to gross domestic product (GDP) and the potential role of forestry within the overall national economic development objectives. In the second section, the financial and economic feasibility of the specific field demonstration activities to be undertaken in highland and lowland Ecuador are analyzed utilizing benefit/cost and sensitivity analysis.

A. Forestry Sector Overview

1. Forestry Sector Contribution to the Economy

Ecuador's forestry sector is a potentially important contributor to the economic welfare of the country. Over 75,000 people directly or indirectly depend on forest related activities for their livelihood. Between 50 and 60 percent, or approximately 16 million hectares of Ecuador's total land area is natural forest. Another 48,000 hectares are dedicated to plantation forestry. The five year National Development Plan of Ecuador recognizes the importance of this sector and has identified forestry development as an integral part of project activities designed to improve the economic lot of rural people, conserve Ecuador's fragile eco-system and reduce the balance of payment deficit.

The current contribution of the forestry sector is estimated to be 3% or 4% of GDP and is equivalent to more than 25% of the total value of agricultural production. However, Ecuador's national accounts understate the value which should be imputed to fuelwood use. Ecuador's forestry sector does not fully supply internal requirements for wood and wood products. In 1980 the balance of trade deficit for this sector was $50 million. Industrial use of wood has been growing rapidly. The total production value of forest industries (excluding particleboard) has increased from 2.2% of total manufacturing output in 1970 to 4.6% in 1978 (CENDES, 1979).

The forestry sector employs approximately 20,000 persons in forest industries and 8,000 in harvesting activities (CENDES 1979.) Forestry plantations and management employ around 1,000 persons, and the Programa Nacional Forestal around 600. Moreover, a considerable amount of labor is required for gathering fuelwood for domestic use.

In addition to the direct economic impacts which result from forestry activities significant indirect economic benefits are generated. Protective forests can help significantly extend the useful life of major hydroelectric and irrigation investments. Forests and on farm tree planting activities can reduce soil erosion and help maintain Ecuador's agricultural production.

2. Current and Future Internal Demand for Wood and Wood Products

Forestry can play an important role in Ecuador's future economic development. However, the rate of planting must be drastically increased and the natural forest must be better managed. Table IV-A shows that Ecuador's requirements for roundwood in 1990 could approach 10.2 million m^3 compared to current requirements of a little more than 5.2 million m^3. By the year 2000 it will be even greater. To meet 1990 needs, 50,000 hectares of forest have to be harvested per year. The current rate of reforestation, which is estimated at 2,323 hectares per year, is totally inadequate to replenish the forest resources harvested. According to the USAID sponsored forestry sector economic analysis, Ecuador's new forestry plantations should approximate 1.0 million hectares in order to meet the 1990 internal demand for forest products on a sustained yield basis. Comparing this requirement to the current rate of new planting, Ecuador will need to increase its plantations by more than twentyfold.

The greatest current demand for roundwood is projected to be for charcoal-fuelwood. The need for fuelwood represents about 67 percent of the total needs while the rest is divided among sawnwood, panels, poles, and pulp and paper. The demand for fuelwood is expected to grow significantly during the next decade, particularly if existing subsidies on petroleum derivative domestic fuels (kerosene) are reduced or eliminated. By 1990 the demand for fuelwood will be twice current levels.

Sawnwood represents the second largest current use of wood. It accounts for approximately 30 percent of current consumption. The demand for sawnwood is also projected to double over the next decade.

Industrial uses account for a relatively small percentage of current consumption of wood. Wood panels (plywood), particle board, and paper products are manufactured in Ecuador. However, imported materials (waste-paper) or alternatives such as bagasse, are currently used for paper manufacture. Industrial uses are, nevertheless, the area where internal demand is expected to grow most rapidly. Particularly noteworthy is the proposed construction of a 150,000 metric ton per year pulp and paper mill. Should this mill be built the requirements for long fiber wood such as pine will be greatly increased. Current consumption of pulp and paper products accounts for almost the entire volume of wood and wood product imports which are imported. (In 1980 more than 86 million dollars of wood products were imported.)

3. Potential Export Possibilities

The potential export possibilities for Ecuadorean wood projects are great. Exports of wood products have increased very rapidly during recent years. The value of exported wood products has increased from less than 15 million dollars in 1977 to more than 54 million dollars in 1980. A significant percentage of the value of these exports was accounted for by manufactured products such as wood panels, particle board and furniture.

An analysis of world market conditions for wood and wood products indicates that consumption will significantly increase during the next 20 years and that the relative prices of wood and wood products will also increase. The FAO projects that the European wood deficit will continue to grow and will increase two and a half times its current level by the year 2000. The Japanese deficit will also increase sharply and the near east/north african regions are foreseen to be substantial importers of wood. These three are estimated to require net imports of 200 million cubic m^3 per year by the year 2000. Consequently Latin America is expected to become an important exporter of wood in the last two decades of the century, both in its net exports of softwood and hardwood, as raw material and processed products. Latin American's own internal demand is also expected to roughly double by the year 2000. Consumption of sawlogs is expected to double between 1980 and 2000, rising from an estimated 18.4 million cubic meters in 1980 to 36.4 million cubic meters in 2000. Consumption of fiberlogs should almost double as well, growing from 13.9 to 25.2 million cubic meters in the 1980-2000 period. The U.S. also provides a potentially very lucrative export market for high value wood products such as furniture and fine veneer panels. The extent to which Ecuador takes advantage of these export opportunities will depend to a great degree on the development of its forestry sector during the next decades.

TABLE IV-A - ROUNDWOOD REQUIREMENTS 1980-1990
in Thousand of Cubic Meters (m^3)

Wood Products Years	Assumptions	Production	Unit	Conv. Fact.	Roundwood Equivalent
Sawnwood					
1975-1980	x	772.7	m^3	50%	1545 m^3
1990 1		1,520.5	m^3	50%	3041 m^3
Income Elasticity = 1.2					
Wood based Panels					
1975-1980	-				
1990 1	x	38.5	m^3	70%	55 m^3
		76	m^3	70%	108.5 m^3
Income Elasticity = 1.2					
Poles					
1975-1980	x	70	m^3	85%	82 m^3
1990		98	m^3	85%	115 m^3
Annual Increase in Consumption					
Charcoal-Fuelwood					
1975-1980	x	4,232	m^3	120%	3,527 m^3
1990 1		7,920	m^3	120%	6,600 m^3
Income Elasticity = 1					
Pulp and Paper					
1975-1980	import and use non-wood raw materials				
1990	1 plant 150,000 T capacity	150,000	MT	50%	300 m^3
Total roundwood Requirements					
1975-1980 average					5,210 m^3
1990 projection 2					10,165 m^3

SOURCE: USAID/Ecuador, Forestry Sector Analysis, 1982.

1/ Assumes per capita income growth of 3%.

2/ Using the lower consumption estimates, the total consumption for 1990 would be 8,183 m^3.

B. Benefit/Cost Analysis of Selected Project Activities

1. Introduction

Given the nature of most of the project activities, i.e., adaptive research, technology transfer and pilot field demonstrations, relevant data for an in-depth financial/economic analysis are difficult to obtain *a priori*. Nevertheless, in order to demonstrate that the types of forestry activities which are proposed for field demonstrations are likely to be economically feasible, an *ex-ante* cost-benefit analysis has been carried out on a number of the major alternatives included in the productive forestry field demonstrations.

The measures of benefits and costs can be analyzed both from a financial (internal) standpoint, measuring only the market value benefits from that investment, and from an economic viewpoint which considers adjustments to some of the market prices. In the case of forestry activities investments are both financially and economically viable, i.e., benefit/cost ratios are higher than one and internal rates of return are greater than the opportunity cost of capital. In addition, other factors which have an economic impact should be considered. These include externalities such as an improvement in the productive capacity of the land, based on the soil conservation and natural resource management objectives, employment generation, and supplementary income generation.

Of lesser quantifiable impact, yet also of similar societal impact, is the fact that the project will help to strengthen the National Forestry Program's capability to delimit and manage protective forests which will protect major infrastructural investments in electricity, irrigation and potable water.

2. Types of Field Demonstrations Analyzed

The following table outlines examples of the demonstration activities that are analyzed.

Examples of Field Demonstration Activities Analyzed in Financial/Economic Terms.

	Field Demonstrations	Examples
In the Sierra:	(a) Plantation Demonstration Activities	Pine
		Pine and potatoes
		Eucalyptus

(b) On-farm Demonstration Activities	Pine and potatoes
In the Humid Tropics:	
(a) Lowland Humid Tropical Enrichment Plantations:	Laurel, cedro pachaco, Mascarey.
(b) Lowland Humid Agro-Forestry	Laurel/cedro with bananas/ Pachaco/coffe/ Teca with rice/ corn
(c) Lowland Humid Natural Regeneration.	none
Others:	
(a) Lowland long-fiber Plantations	teak, laurel
(b) Plantations of Balsa and Rubber	Balsa/Rubber

3. Methodology

The various field demonstrations listed above were subjected to an analysis of benefits and costs using market prices. This financial analysis was carried out for all of the alternatives. Various indicators of viability were calculated including net present worth, cost-benefit ratios and, where possible internal rates of return. A discount rate of 10 percent was employed for this analysis. Results of the analyses carried out are presented in Table IV of the Project Paper.

In addition, economic feasibility was analyzed for some of the alternatives. The analysis was not done for all alternatives because it is possible to extrapolate the results of the analyzed alternatives to the other alternatives which were analyzed only in financial terms. For the purpose of evaluating the economic viability of highland activities the following shadow prices are assumed:

-Land	0 and 700 sucres per hectare per year (two alternatives)
-Wages	50% of market value
-Capital	10%
-Fuelwood	500 sucres per 1 m^3

-Land: The basic economic analysis has been carried out using a zero opportunity cost for land. This value is based on the assumption that land used for forestry plantations has no alternative use. In many cases this is an appropriate assumption because the land is degraded, very steeply sloped or is located in an area which suffers from adverse climatic conditions. In some instances, however, land may have alternative economic uses. Therefore a second value has been assigned to account for this possibility. The value of 700 sucres per hectare per year is based on available information about the rental value of average land in the highlands. In practice it is unlikely that much reforestation will occur on land which has this rental value.

- Wages: The forestry plantations use unskilled rural labor contracted and paid by work completed (i.e., plantations/ha.). The financial analysis was based on a salary of 116 sucres per day. Since the possibility of alternative job opportunities is low in these areas (most workers engage in subsistence agriculture), the real opportunity cost for society of drawing a worker from the labor force should not represent more than 50% of the wage used in the financial analysis. For this economic analysis, however, a conservative shadow wage corresponding to 80% of the used market wage was used.

- Capital: No official social discount rate is available. However it is estimated to range between 10 and 15 percent. Additionally, foreign capital flowing into the country, where the official rate is currently "overvalued", as in the case of Ecuador, needs to be adjusted by some 50%, to truly reflect the worth of a dollar at the official rate (33 sucres), while the free market value of dollars is around 50 sucres.

- Fuelwood: The rural population is using kerosene for approximately 50% of its fuel needs. The fuelwood production that would substitute for kerosene will permit Ecuador to increase its exports of oil. The international price for kerosene or other products derived from the oil saved by the forest- ry production is the appropriate shadow price to use in the economic analysis. The relation between the price per calorie of fuelwood and kerosene can be derived under a set of assumptions, based on which the equivalency between 1 m^3 of fuelwood and kerosene is:

1 m3 fuelwood = 23 gallons/Kerosene

If the price of kerosene in the international market is $22, the shadow price of 1 m^3 fuelwood is around 500 sucres. The financial analysis used a very conservative price of 200-400 sucres per cubic meter.

For the economic analysis it is assumed that in the case of pine 25% of the non-sawlog roundwood will be used for fuelwood. This percentage is higher for eucalyptus.

132

4. Pine Plantations in Ecuador's Highlands

a. Financial Feasibility

As described in the body of this PP, a major field demonstration will involve the plantation of pine in Ecuador's highland. Table IV-B summarizes 1/ the financial costs and receipts of planting one hectare of land in pine and Table IV-C shows the various measures of profitability. The analysis assumes a twenty year time horizon and planting to take place under good soil conditions. Associated benefits are not included in the estimate.

The results of the analysis indicate a B/C ratio of 1.38 and an IRR equal to 12.4 percent. It must be emphasized, however, that these measures of profitability are probably underestimated. Societal benefits due to soil conservation and siltation control because of forestry plantation are not included in the analysis presented.

TABLE IV-B - SUMMARY 1/ OF CASH FLOW
RESULTING FROM PINE PLANTATION OVER A TWENTY YEAR PERIOD
(SUCRES/Hectare)

AMOUNT AND TIMING OF EXPENDITURES AND RECEIPTS
(SUCRES/HECTARE)

		NAME	AMOUNT	IN YEAR(S)
COSTS:	1.	Previous work	750.00	0
	2.	Site Preparation	1370.00	0
	3.	Fencing	3406.00	0
	4.	Plantation	3220.00	1
	5.	Replanting	460.00	2
	6.	Weeding	700.00	3
	7.	Maintenance	100.00	0 to 20
	8.	Administration	1000.00	0
RECEIPTS:				
	1.	Pulpwood	5400.00	10
	2.	Pulpwood	7680.00	15
	3.	Sawlog	6144.00	15
	4	Sawlog	75000.00	20

1/ See, USAID/Ecuador, Forestry Sector Economic Analysis, pages 43-47, for an explanation and list of assumptions.

TABLE IV-C - MEASURES OF PROFITABILITY FOR PINE PLANTATION IN HIGHLAND ECUADOR

	CRITERION	MEASURES
1.	Net Present Worth (if Discount Rate = 10%)	4,457 sucres
2.	Internal Rate of Return	12.4%
3.	Benefit/Cost Ratio (assuming a Discount Rate of 10%)	1.38

SOURCE: Computation based on Table IV-B

In order to determine the potential variations in the estimates of costs and benefits, a sensitivity analysis was conducted. Table IV-D shows the variation of costs and benefits in order to lower or increase the IRR by 1 percent and the NPW by S/ 5,000 per hectare, thus demonstrating the implications of overestimating or underestimating costs. As can be appreciated, a reduction in planting costs by S/ 44 per hectare would increase the IRR to 13.4 percent. On the other hand, with cost overruns of S/ 514 per hectare, the IRR would decrease from 12.4 percent to 11.4 percent.

TABLE IV-D - SENSITIVITY ANALYSIS 1/ ON THE PROFITABILITY OF PINE PLANTATION IN ECUADOR'S HIGHLAND

CRITERION	MEASURE	
	THRESHOLD	
	UPPPER	LOWER
Internal Rate of Return (IRR)	13.14	11.14
Net Present Worth	S/ 9,547	S/ 4,520

1/ Based on the assumption that B/C could be increased or decreased by S/ 5,000 per hectare.

To appraise the sensitivity to potential changes in annual gross production volume for pine plantations, the impact of an increase/decrease in growth rates of 5 m^3 per year was analyzed. Applying these rates new output and income values are estimated as follows:

Output	Volumes (m3)					
	At					
Type of Production	Increased	Decreased	Price	Increased	Decreased	Year
Pulpwood with bark	45	27	150	6,750	4,050	10
Pulp, particle, fuel	60	36	160	9,600	7,760	19
Sawlog	24	14.4	320	7,680	4,608	15
Final Harvest	335	161	350	83,750	56,350	20

On the basis of these new outputs estimated, the measures of financial possibility changed as shown in Table IV-E.

TABLE IV-E - MEASURES OF FINANCIAL PROFITABILITY AFTER CHANGING PRODUCTION VOLUME BY 5 m3 PER YEAR

C R I T E R I O N	Measure	% Change
NPW at 10% discount:		
Increased Production	7,132	57% +
Decreased Production	386	92% -
IRR:		
Increased Production	13,7	1.3 pp.
Decreased Production	10,2	2.2
B/C Ratio: at 10% discount		
Increased Production	1.60	16% +
Decreased Production	1.04	25% -

The analysis suggests that pine plantations are quite sensitive to increases or declines in the yield or output, and that they would not be worthwhile, at least in financial terms, at a low production volume. Conversely, benefits from an increased gross production volume would significantly increase their present worth.

Pine plantations on non-marginal lands were analyzed using an opportunity cost of 700 sucres/hectare/year. This value was derived considering: (i) potential costs of renting a hectare of land per year (ii) rates or return expected from land valued at around 60,000 to 80,000 sucres/ha., and (iii) the net farm income of all lands over 100 has. in the country. The financial return to pine plantations using this assumption is low; however, pine plantations on non-marginal lands will involve inter-cropping or other demonstrations which will raise the rate of return. The financial measures using this assumption are presented below.

Criteria	Measures
NPW at 10% discount	-2,159
IRR	9.26
B/C	0.88

Still another type of sensitivity analysis was conducted by changing the assumption of planting pine on average to poor soils, to soils which have been severely eroded (Cangahua). This change in the analysis increases site preparation costs considerably from S/ 1,370 to S/ 16,500 per hectare. Table IV-E summarizes the impact of this assumption. The results demonstrate that the B/C ratio is reduced to less than one (0.61), and the IRR to 6.7 percent. Although this would indicate that pine plantations on Cangahua soil would not be financially feasible, it should be remembered, however, that benefits derived from erosion control, which can be substantial, and other societal factors, are not considered in this analysis. Cangahua soils are similar to hard pan soils and have limited potential from the point of view of agricultural food production; thus land which has reached this state of erosion has an opportunity cost which approximates zero.

b. Economic Feasibility

Based on the shadow prices indicated above, the NPW of pine plantations utilizing a discount rate of 10 percent is $11,765 and the IRR increases to 13 percent. Pine plantations in Ecuador's highland areas are economically feasible.

5. Pine Plantations with Inter-Cropping

In some instances pine plantations will be undertaken on land which may have alternative uses, e.g., páramo land which may be used for grazing or potatoes. One alternative considered is the shared use of the lands in plantations with some form of inter-cropping. This offers the possibility of

greater total return per hectare. Assuming pine and potatoes (yielding roughly 11,000 Kg./hectare. at a cost of 30,000 sucres/hectare) are inter-cropped in the first and second years of the plantation, the results are significant. The returns to this alternative are shown in Table IV-F.

TABLE IV-F - FINANCIAL RETURN OF PINE PLANTATIONS INTERCROPPED WITH POTATOES

NPW al 10% discount:		58,972
IRR	Higher than 50%	
B/C	1.92	

The potato yields considered in the analysis above do not reflect the full potential productivity of the land if only potatoes were grown. Consequently, a more realistic assumption is one in which the costs are increased to reflect alternative use of the land by taking into account an annual opportunity cost of some additional 550 sucres/ha. per year.

The pine with potatoes alternative optimizes the returns to the land. Thus, the benefits are substantially higher than only pine plantations. This agro-forestry approach assumes the alternative of producing potatoes during the 20 year period of analysis is not a possible alternative because of soil erosion or degradation and that the mixed use of the land comes only as an alternative derived from the decision to implement forestry plantations. The IRR accrued to this agro-foresty alternative is higher than 50 percent and the B/C ratio is 1.8.

6. Eucalypt Plantations

a. Financial Feasibility

The assumptions on physical inputs for eucalypt plantations are similar to the ones made for the pine plantations, except that plant costs are lower (S/ 80/plant). The volume of production of the plantation is, however, different. Based on the estimated costs and benefits the financial profitability measures are lower than for pine, when the comparison includes only one rotation of eucalyptus. (See Table IV-G).

TABLE IV-G - FINANCIAL PROFITABILITY FOR EUCALYPTUS GLOBULUS PLANTATION IN THE HIGHLAND

Measure		
On Normal Soils:		
1. NPW		
(Discount rate = 5%)	S/	14,588
(Discount rate = 10%)		606
(Discount rate = 14%)		- 3,441
2. IRR	10.6%	
3. B/C (Discount rate = 10%)		1.05
On Cangahua Soils		
1. NPW (Discount rate = 10%)		- 14,623
2. IRR		4.9%
3. B/C (Discount rate = 10%)		0.45

b. Economic Feasibility

Eucalyptus plantations are not financially profitable at a cost of capital above 10.6 percent. However, economic viability is greater. Utilizing the same assumptions made in the economic appraisal of pine plantations, the economic evaluation reveals that the IRR is estimated at 20 percent and the NPW increases to S/ 11,232 utilizing a discount rate of 13 percent. The large difference is due to the high shadow price for fuelwood that is a consequence of the depressed market price for fuelwood which results from the large subsidies on petroleum derivitive domestic fuels such as korosene.

7. Agro-Forestry Plantations in the Humid Tropics

The management of some valuable secondary growth species (laurel, teak, balsa, cedar) was analyzed under options of combining those species with permanent or seasonal crops. Six alternative production mixes were analyzed. All of these assume the use of forestry resources primarily as sawnwood with secondary uses of poles, fuelwood or to make charcoal; agricultural crops were assumed to have the same yields prevalent among the low-income farmer's existing technology. The results of such analyses are presented in Table IV-H.

TABLE IV-H - FINANCIAL MEASURES OF AGRO-FORESTRY PLANTATIONS IN HUMID TROPICS

Alternatives:	Net Present Worth (at 10% Discount) (Sucres)	Benefit/Cost Ratio (at 10% Discount)
-With permanent crops		
Case 1: Laurel and bananas	36,595	1.62
Case 2: Laurel and coffee	28,595	1.54
Case 6: Cedar and bananas	59,969	1.96
-With seasonal crops		
Case 3: Pachaco with rice, corn and pastures	17,316	1.30
Case 4: Teak with rice, corn and beans	22,033	1.29
Case 5: Balsa with rice and corn	58,699	1.96

Thus, some of the yields (alternatives 5 and 6, particularly) are comparable to those of the inter-cropping of pine and potatoes in the Sierra. The analysis suggests that as a guide for future experimental options, that inter-cropping with agricultural crops is an extremely attractive alternative.

5. Demonstrations on Protected Enrichment Plantations in the Humid Tropics

Two options were considered under this forestry management approach: (1) to exploit the forest for the production of wood with further treatment of the residual mass to promote natural regeneration, using laurel, thinned after 20 years, and (2) to enrich the forest without previous exploitation of the wood, using pachaco, to be thinned at 15 years.

Alternatives	Net Present Worth 10%	B/C ratio 10%
Case 7: Pachaco without previous thinning.	6,996	1.37
Case 8: Laurel with thinning.	11,010	1.49

8. Watershed Management Activities

The management of natural forests or forestry plantations that protect economically important watersheds can have a high economic rate of return. Fleming has estimated for the Poza Honda that a conservation program consisting of protecting forest on 870 hectares of the watershed, planting trees on 505 has. of the area, grazing land with conservation measures on 2,850 has. and cultivating land on 320 has. needing terracing, and including in addition some administrative costs, would sum up to 45 million sucres. This investment would serve to reduce the sedimentation rate from 4% to 2%, which would double the life of the dam from 25 to 50 years. The benefits generated by such actions would amount to 770 million sucres in present value terms. This example illustrates the potential benefits of forestry actions on a watershed in which one, or in some cases, several dams are built.

A field demonstration activity in the Paute watershed will be undertaken. The erosion control on the Paute watershed would need the same type of actions than for the Poza Honda case. The field demonstration activity is intended to help derive accurate estimates of costs and benefits applicable to a major watershed management program in the Paute watershed. Preliminary estimates indicate that an investment of $10 million would generate an annual savings of $4.5 million in present value terms.

SOCIO-CULTURAL FEASIBILITY AND SOUNDNESS ASSESSMENT

Introduction

This report reviews the social soundness and other social considerations of present forestry sector activities, and considers the potential impact of activities planned under the project. The report concludes that the project design is sound from a social-cultural aspect, but identifies a number of factors that must b. considered and taken into account in project implementation.

Because expanded forestry work is expected to affect programs and projects throughout Ecuador's vastly different geographic zones and because social conditions vary significantly from area to area, this report is divided into three parts corresponding to the gross geographical differences of the eastern lowlands (Oriente), highlands (Sierra), and the Western lowlands (Costa).

Each part begins with a broad but geographical and historical description. Each then reviews those critical social patterns which have developed as a response to geography and history, and which, in the opinion of the author, directly or indirectly relate to the broad goals of the forestry sector. As such, the report is far from a complete ethnographic analysis. Rather, for different groups, it attempts to answer the following questions:

(1) How can the development of Ecuador's forest resources directly or indirectly benefit campesinos and indigenous people? In turn, what sorts of institutional activities or incentives would be required to promote such benefits?

(2) How could aspects of forestry development directly or indirectly threaten or otherwise negatively influence the economic and cultural life of campesinos and indigenous people? In turn, what sorts of institutional and other safeguards would be required to prevent or at least minimize the negative impact?

PART I - THE SIERRA

A. General Social and Geographic factors which will influence attitudes toward reforestation.

1. Minifundia vs. Use of Multiple Ecological Zones

The patchwork of small cultivated plots on the Andean slopes are often referred to as minifundia, small holdings, whose genesis is understood to be either the meager plot given or sold to a campesino by a large land owner, or the result of a larger holding divided up through inheritance.

Compared to large extensive holdings, they are described as inefficient or, depending on one's sympathies, pathetic examples of inequitable land distribution. In many cases they are the only arable lands of families who must complement its small output with a number of activities (e.g., wage labor). In other cases, however, patchwork agriculture is the continuation of a historical adaptative pattern through which Andean farmers gain subsistence security through the use of multiple ecological zones.

The pattern is a response to the sharply differentiated microclimates produced by slope, altitude, direction, rainfall, sunlight and a variety of other climatic and soil conditions. In any given season a farmer might encounter frost at high altitudes; at another time drought may parch the lower slopes. Conditions can vary radically as one rounds a slope or moves up and down it. To protect oneself against the vagaries of such conditions, families prefer to maintain a number of small plots scattered across the landscape. Under all but the worst conditions this guarantees subsistence security. Such adaptation can be traced back to early pre-Columbian times; present day campesinos and Indians are unlikely to alter this pattern willingly.

Thus, when considering the possibilities of any new program such as forestry development, one must distinguish between minifundia, a campesino's single small holding, and small plots which represent one of many which a campesino might maintain. In each of these areas plots are farmed in such an intensive fashion that hardly a square inch is left unworked and it would be hard to duplicate more efficient production. Under such circumstances true minifundistas would be unlikely to convert any of their preciously small plot into anything other than food production; those working a series of dispersed plots (i.e., those whose subsistence is a bit more secure) would be more willing to experiment. Neither, however, will be likely to risk subsistence security from some activity such as lumber production where benefits are uncertain and long-range at best. Experience has also led them to distrust any schemes designed by elements of the society who, on the one hand, are perceived as having progressively alienated their land for about 450 years and, on the other hand, as having imposed a number of unsuccessful and ill-managed schemes upon them. Much of post-conquest social history chronicles the exploitation of campesino and Indian labor and the alienation of their lands. Present day inter-ethnic relations are noticeably asymmetric and racist. So-called campesino or Indian "conservatism" with regard to innovation, therefore, is not backwardness; it is simply good sense from their historical and existential experience. In many ways the situation of most Andean campesinos and Indians is like that of a person up to his chin in water; things are bad but not disastrous unless one moves and causes a ripple. Although conditions vary from region to region in the Ecuadorian Andes, unless one approached communities with the idea of providing incentives without incurring great risks, even the most technically sound forestry program could meet with either apathy or violent resistence.

B. Forestry and Communities

During the 1960's peasant federations were formed in numerous Andean provinces, most noticeably Chimborazo where project activities in the sierra will be carried out. Indians in this densely populated relatively dry, and sparse landscape have been fighting with large landowners for centuries and have been pushed into some of the most inhospitable areas of the province. As a result many are extremely distrustful and hostile to outsiders. Census takers have been killed and many communities forcefully prohibit outsiders. Howard Handleman recently wrote that "while CTE, FIE and other leftist labor groups were of some help to the Chimborazo peasants, sympathetic clergymen, especially Archbishop Proa]o (of the city of Riobamba), one of the most politically progressive and outspoken Catholic leaders in Ecuador.....were more influential. A number of haciendas in Chimborazo and elsewhere in the southern highlands were expropriated by IERAC and turned into peasant cooperatives". Thus, although the situation in the area may have improved a bit, it is not perceived as the result of improved inter-ethnic relations.

Against that background, Ministry of Agriculture officials, through the PNF (previously DDF) stated that they have been trying to get communities to plant trees in Chimborazo for at least the last eight years. They have met with very limited success. Traditional hostilities to government workers have been compounded by university programs or social investigation and extension work in which students are said to work to get communities opposed to any projects designed by the government.

The officials stated that, because of their limited staff and facilities, they were focusing their efforts on communities or land holdings which were fairly large (eventual potential from several hundred to several thousand hectares). They simply did not have the time to work with those who wished to plant a few hectares of a few trees; although, legally, communities could be obliged to plant trees and efforts had in the past been made to enforce this law. Currently, however, PNF only works with communities which express interest. The PNF is working in an informal manner with about 50 communities. The communities simply purchase the plants and own the trees outright. In addition, the head of PNF's program in the area, reported that formal plantation agreements had been signed with 28 communities. Under most conditions the community mebers prepare the land and plant the trees. PNF supplies the trees and whatever technical assistance is needed. At harvest time (approximately 15-20 years) the community receives 90 percent of the value of the product and PNF receives 10 percent. Several criteria determine the selection of communities.

1) Whether or not the community or individual has clear title to the land. PNF indicated, and the new Ley Forestal States, that for Indian communities without clear title but which are desirous of establishing a plantation, PNF will help push the titling process through IERAC's lengthy labyrinth, an obvious advantage for communities.

2) Proximity to access roads, to allow shipment of trees and permit arrival of technical assistance.

3) Local community structure, i.e., a) are they organized? and b) can they demonstrate some past communal achievements?.

4) If the community allocates a significant amount of land for plantations.

For most communities, the major incentives for tree production are three:

1) The first and most obvious is the fact that, in 10-15 years, they will be able to regularly harvest wood for construction, or for firewood. In an area where most cash must be earned by wage labor, and where natural firewood is virtually non-existant, this is an advantage.

2) Because of population pressure and, until recently, the fact that most lower, flatter slopes of Chimborazo were the property of large land owners, the campesinos were forced to utilize every square inch of arable land. Erosion is a major problem on steep slopes. Trees alone will not solve this problem. However, if combined with a program of soil conservation, tree plantations could reduce the visible and detrimental effects of erosion in an area with no natural ground cover.

3) Perhaps, most importantly, to establish a contract with a community, that community must have legal title to its land. Despite agrarian reform legislation and recent confiscation of haciendas in Chimborazo, IERAC has been astoundingly slow in processing land titles. PNF officials report that, in order to develop their community plantations program, they have used their power to speed up IERAC. Of all incentives this far mentioned, this is probably the most significant.

Land titling is, nonetheless, an indirect incentive. It offers no encouragement to care for the trees. Observations on several plantations indicated that, by comparison to carefully manicured and maintained food gardens, tree plantations were left on their own, with little effort to replace dead trees. Additional, more immediate incentives are needed if one is to expect long term care and maintenance of trees.

A possible and partial solution is EMDEFOR's policy of paying the community to undertake tree planting. Rather than providing only brief technical assistance and trees, EMDEFOR (a mixed public-private enterprise) pays 4,500 sucres per hectare to the community as wages for getting the trees in the ground. Individual labors are paid 120 sucres/day, or a lower rate which places the remainder into the community's treasury. The obvious value of this incentive is illustrated by the fact that, according to EMDEFOR's well managed and easily retrieved statistics, they have been able to establish contracts with 11 established and titled communities and with an additional 12

"pre-cooperatives" which they are helping to obtain title. And they have been able to do this in the 1 1/2 years (PNF has only about 28 contracts after eight or more years of work including its predecessor agency, DDF).

Wages paid for planting trees also indirectly benefit the family by providing wages locally, thereby allowing some members of the community to remain in the area rather than travel to look for work in Quito or Guayaquil. This provides a more stable family structure and decreases the amount of work women must undertake, who in the absence of males must take on part of their traditional role. Although it is unlikely that tree plantations will absorb much of the available labor, EMDEFOR claims already to have provided 100,000 days of work for people in Chimborazo.

Moreover, EMDEFOR's relative success reveals something else about tree planting. People care less about the tree than the other incentives (land titling and cash). To illustrate, EMDEFOR has contracts where 75% of the eventual return goes to the company and only 25% stays with the community. Yet, there was no complaint by community members. And EMDEFOR's General Manager indicated that when he explained the economics of his program to local church officials, particularly the influential Archbishop Proaño, they accepted the logic. EMDEFOR claims to have won these officials' support to the extent that the project is promoted on the widely heard radio broadcasts transmitted by both Protestant and Catholic missionaries. An active promotional program, equipped with Quichua language slide shows and vide tape programs, and carefully planned follow up has undoubtedly contributed to EMDEFOR's success.

EMDEFOR's relatively high number of contracts perhaps is best explained by the cash incentive of 4,500 sucres per hectare as wages for planting. Although wages seem to be a far greater stimulus than the eventual profits from the plantations these cash payments only get the trees into the ground. There appear to be no incentives to maintain, prune, or replace trees subsequent to planting. Several possibilities exist:

1) Provide a small amount of wages for caretakers;

2) Encourage, through promotional work, regular maintenance through regular visits (i.e., don't let the community forget that it has planted trees);

3) Development short seminars for leaders of tree planting communities which could establish or reinforce a sense of pride in planting;

4) Perhaps most importantly, whenever possible try to mix tree plantations with agriculture, in rows or whichever way is appropriate, so that trees are not something which sit isolated on the high grasslands, but rather are part of the regular agricultural complex. Otherwise, with the campesino's busy schedule and established priorities, plantation maintenance could become a secondary (or non-existant) activity.

145

Cash payment for planting is an obvious incentive in some communities, but the idea should not be generalized to all communities. Land tenure is, almost always an overriding concern and concerns for land can be manifested in a variety of ways. Although situations vary locally and should be analyzed before attempting to impose any program, two examples illustrate concerns for land tenure.

1) Several communities in Chimborazo were reported to be interested in tree plantations and appreciate EMDEFOR's efforts to promote them by accelerating land titling procedures. However, they had no interest in receiving cash payments for planting. They felt that by paying for labor to plant trees on their own land, the organization (EMDEFOR) was establishing a strong de facto claim to that land, i.e., creating a situation analagous to those which earlier allowed haciendas to occupy Indians' lands. These suspicions indicate that any organization must be aware of a community's priorities and fears. Field investigations are essential.

2) Land tenure concerns were mentioned by both PNF and EMDEFOR officials as an expressed concern of the communities.

However, they fail to consider that tree plantations usually are placed on high common lands which are usually unsuited for any form of food production. As such, these lands have not been strongly coveted by others. However, when this land becomes part of a forest its value will increase. For campesinos and Indians this exposes the land to a threat, the same sort of seizures which pushed them from the lowlands to the slopes. Whether or not this perceived threat can be realized is irrelevant; as long as potential beneficiaries perceive a threat they will be reluctant to embrace any development scheme. The assistance being provided by forestry programs is an enormous incentive and it also promotes the success of forestry work.

2. Promotion of Forestry Activities

Several ways to promote forestry activities have already been mentioned in passing:

1) assistance in land titling;

2) wage or other cash incentives;

3) community-level promotion activities;

4) improved audio-visual programs, assistance for which EMDEFOR and MAG have requested; and

5) radio promotion through influential local church or political organizations.

This section will consider two additional promotional techniques which can be quite successful. These are described below.

a) Collaboration with grass-roots organization

The best promotion is word of mouth. This is particularly true in areas where a number of communities can also see the results of forestry work. Thus, while organizations now say that they select communities which are easily accessible to urban areas (for purposes of supply and maintenance), the best models can perhaps be drawn from sites which are highly visible to a number of communities and whose work can be easily discussed and questioned.

A settlement which, to the outsider, appears to be an appropriate model community is not necessarily a good choice. The idea that the development organization should select the model communities is erroneous. The sorts of criteria they search for are: 1) the degree of internal cohesion and 2) demonstrated ability of the community to work together. Such ideas develop from the notion of "community development" which, on the one hand, ignores the fact that each community is part of a larger set of communities which share a common identity and that certain communities have greater or lesser influence and respect within the larger set. To select and support a single community could inadvertently promote that community to a status which may be unacceptable to the larger set. In this way community projects can and have produced division and jealousy.

A far more effective approach is to work through legitimate grass-roots organizations which have arisen throughout Ecuador and promise to become a major force within Ecuador's plural society. Both in the Sierra and the Oriente, these organizations are extremely proud, independent, and agressive groups concerned with promoting the general well being of their constituents, which are usually their own kinsmen. Not only is it advisable to work with such organizations, but essential they will oppose any efforts to circumvent or debilitate them.

In the Sierra the organizations, the legitimate ones, are in the process of defining and organizing themselves and, as such, they cannot be precisely identified. And by the time the forestry project is actually implemented, considerable change and maturation will undoubtedly have evolved. A few critical caveats, however, are worth mentioning at this time.

Many of the local organizations throughout the Sierra were first formed by organizations such as CTE, FEI, Ecuarunari, FADI and other organizations which argued, from a strongly marxist viewpoint, that campesino communities needed to unite and recognize their common situation with regard to the rest of the working class. These ideas were new, appealing, and, in may ways, appropriate analyses of Ecuadorian stratification. However, many

local groups eventually begin to see that "class interests" were being defined and imposed upon them by a small elite leadership corps which, the Indians argue, did not respect their cultural background and was unwilling to consider that ethnic differences and values should persist. Many felt that they were being incorporated undemocratically. As a result, groups which are more concerned with local interests and immediate gains are emerging and gaining strength, without denying that they share poverty and discrimination in common with other segments of the society. While it will be important to work with these groups when the project is eventually implemented, their presently fluid development will require that they be defined at the time of implementation.

b. Fundación Natura

Non-profit, non-governmental organizations can provide considerable stimulus to forestry promotion. Fundación Natura does so in two complementary manners:

1) Public education and policy planning. Prior to the 1970s Ecuador's concern for the environmental impac of most activities, with the exception of a few individuals and areas (e.g., Gal@pagos), was negligible to non-existent. Today, Ecuadorians are being informed and pressured to take such matters seriously. Fundación Natura has been responsible for a large amount of this change in attitude.

2) Recently, they have begun to develop three small pilot projects which could serve as models for certain aspects of forestry work which could be adopted by larger and more broad based groups.

In the pilot project in Imbabuela, Province of Imbabura, the community is converting a previously unutilized upland zone into a productive area, utilizing a variety of natural and introduced food and forestry resources. In addition to pine and eucalyptus they have experimental plots with some natural species among them -- Aliso, and Capul§ de Monte. Each of these three types serves specific local artesanal and farming needs and therefore can be used an sold locally. The communi s has plans for a nursery of its own and, being part of a large regional federation of communities can, and has made plans to display and promote its work at a regional level. The possibility for a widely accepted and successful regional forestry program which produces a variety of natural and introduced species appears quite high. Fundación Natura's role has been both significant and sensitive.

They have responded to a local request and therefore do not appear to be imposing their will. The community and a regional organizer, makes suggestions to and, occasionally, demands on Fundación Natura. The organization has responded thus far with punctual and respectful attention, which has not gone unnoticed in the community. Their attitude towards the recipients sharply contrasts with that of many government and private agencies.

Also, they have been able to provide technical assistance when necessary and perhaps more importantly, have encouraged a spirit of experimentation among community members. The scope and nature of Fundación NATURA's work will not satisfy Ecuador's forest product needs, but nevertheless serves as a positive example of what can be done with local communities and how to go about doing it.

c. Negative Considerations

How could the development of forestry resources threaten or otherwise negatively influence the social and economic life of Andean people? And what measures can be taken to diminish or minimize such effects? By and large the development of forestry resources will benefit Andean campesinos and Indians. However, several negative effects could result:

1) Lands designated as "appropriate" for forestry development are understood to be those unsuited for other activities. However, in their zeal to expand their activities, PNF or other forestry organizations may encourage planting on lands which could serve other purposes. Land use maps are helpful but do not reveal local ingenuity. For example, Indians and campesinos of Chimborazo are planting land which, to others, would appear useless for agriculture. While yields may be low, such considerations are not critical to those preoccupied with subsistence. Local people should be consulted as to what they think lands might be capable of producing.

2) Sheep are an integral part of rural Andean communities. But they present a problem to young trees. The required fencing of plantations will undoubtedly stir up conflict with sheep owners. To minimize such problems ample land should be left for pasture. New plantations should only be expanded when previously planted areas reach a growth level where animals can be introduced without destroying the plants.

3) Local factionalism is an aspect of many Andean communities, or groups anywhere for that matter. One can expect factional differences to interfere with present development of forests. These problems however should not preclude consideration of local support. If there is a clearly perceived benefit to be accrued, fractionalism can often be overridden. Under no circumstances should an organization attempt to influence the acceptance of a project by getting involved or manipulating local politics in order to "create" a support group. In the long run such activities will be counterproductive.

4) Perhaps the most serious threat to local communities lies in the relationship between agrarian reform and the new Ley Forestal. The 1974 Ley de Reforma Agraria, in order to encourage production, did not limit the size of large holdings. The law threatened expropriation only of land were underutilized or if local population pressure made division essential. In many cases of highland Ecuador, particularly in the south, population pressure and unused land threaten large land owners.

In turn, the Ley Forestal excludes Agrarian Reform activities in areas determined to be producing useful forest resources. Such restrictions are essential for parks and reserves. However, this exclusion can be used to avoid agrarian reform in areas which could serve other agricultural needs. To il- lustrate, on holdings of 500 hectares or greater, the owner can plant forests in three manners:

a) On one's own, by providing one's own labor and getting the same 90% return;

b) By utilizing community labor, in which case, the owner receives 25% of the eventual profits; and the community labor group (cooperative) gets 65%, with the remaining 10% for PNF; and

c) By establishing an agreement with the Ministry of Defense, soldiers perform the labor of preparing and planting, and the Ministry of Defense receives the 65% return mentioned in item B above.

PART II - THE ORIENTE

A. A Brief Review of Changing Man-Land Relations in the Oriente

Depending on the boundaries which will eventually define Ecuador's national territory, the Oriente comprises about one-third to one half of the nation. Yet in terms of populations and cultivated land, it is seen as one of the most "underdeveloped" regions of the country. Until the 1960s most Ecuadorians were relatively uninterested in the area (with the exception of short-lived activities such as the rubber boom at the turn of the century, oil exploration in the 1930s and 1940s, a few colonization attempts, and the 1930s dream of a railroad from Ambato to the Curaray river). In general, Ecuadorians looked on the regional as a disease infested, impenetrable forest littered with snakes and other dangers.

However, indigenous people - Cofán, Siona-Secoya, Huaorani, Zaparos, Quichuas, and Shuars - who now number 25,000 to 50,000 had been living there for centuries. In addition to hunting and fishing, swidden horticulture provided the basis for subsistence. Polycultural swidden plots whose diversified plant communities closely parallel the natural forest, are considered one of the more ecologically sound and economically productive sustained-yield systems currently practice in the Amazon. Swidden plots nearly replicate the natural forest and thereby minimize the effects of sun, rain, pathogens and pests which can destroy the relatively fragile soils.

Since the 1960's, as attention was focused on the development of tropical forests throughout the world, debates have raged as to the feasibility of intensive land use in lowland tropical forests. Some argue that intensive utilization is impossible and will produce optimistic and suggest that intensive land use with high-yield crops is both possible and, given current world demands, advisable for Amazonia. To test such ideas, long-term controlled experiments are underway. Since 1974, John Bishop has been working to develop a sustained-yield tropical agro ecosystem in Napo Province. William Prentice has been conducting similar tests in Pastaza and upper Napo regions.

While debates on the value of these experiments continue, a land use pattern has developed in the Oriente which most specialists, and even many of those campesinos and Indians, regard as ecologically and, in the long run, economically unsound. This pattern involves clean clearing of land for pasture and cattle raising. The MAG-ORSTOM Report (1978) indicated that in the Northern Oriente petroleum-producing region 48.5% of the land under production was in the form of pasture. Observations in the Provinces of Pastaza, Morona-Santiago, and Zamora-Chinchipe indicate similar, if not higher percentages. PNF programs of controlled deforestation and well managed reforestation, based on rapidly growing wood producing species, can help to stem a destructive pattern which has not yet reached the extremes of other nations and can help to develop a sustained-yield and economically productive pattern.

The 1973 Ley de Reforma Agraria focuses almost entirely on increased production rather than expropriation and redistribution. Land owners, particularly those in Oriente, were told that their holdings were liable for expropriation if they failed to cultivate or otherwise improve one-half of their holding. IERAC officials recommended that land be converted to pasture. At the same time, the availability of agricultural credit from the BNF was increased substantially. Thus, those campesinos and Indians who held titled land in the early 1970s were required to exploit their land holdings, encouraged to raise cattle, and provided with the economic means to do so. In turn, those who held only título de posesión or less stable tenure were stimulated to plant pastures which would: 1) permit them to obtain permanent title to their land; and 2) gain them access to easy credit for cattle. It is thus no surprise that almost one-half of land cultivated in the Oriente is pasture. Despite recent decreases in the availability of credit, campesinos and Indians alike see pastures as the means to legalize their tenure.

Added to this are at least two other factors which promote indiscriminate deforestation and pasture growth.

1) For colonists there is considerable prestige attached to being a cattle rancher.

151

2) Perhaps, more importantly, marketing of most agricultural goods is difficult at best. Very few holdings be close to a road; most are many hours work from the nearest access to trucks or other means of marketing. Transportation of commodities from garden to access road and then to market is thus time consuming, complicated, and difficult. And rarely does the price of agricultural commodities warrant such an effort. Cattle, by contrast, are usually sold to travelling buyers who periodically visit settlements, purchase cattle, and then walk the animals to an area where they can be trucked to the provincial capital. Cattle are presently the easiest commodity to buy and sell.

B. Forestry Alternatives to Cattle

To reverse the trend to cattle raising will be extremely difficult. However, the long range forecast for sustained yield cattle ranch is not optimistic, so efforts are warranted, and perhaps essential. Trees, like swidden plots, replicate the forest and therefore could be long term alternatives of cattle raising. For those colonists who are presently involved in cattle raising, such a swift will be difficult. For even if one attempted to scatter trees throughout the pasture, owners might oppose this, for they have seen that trees exposed in relatively open areas easily topple during violent thunderstorms, often injuring or killing cattle underneath.

Large scale tree plantations are perhaps a possibility but fall out of the scope of this report. There is still plenty of unoccupied and unclaimed land which can be utilized for this work. In terms of social soundness, however, any industry working in the area must respect the land of colonist and Indians alike. With the exception of allowing valuable lumber to be extracted from colonists' land, programs which do not offer immediate return will have a tough time competing with colonists' preoccupation with cattle raising.

However, on a smaller scale, Indian communities offer a potential source for PNF activities. Indians are not so much drawn to the image of being a "cattle rancher". Indians, men and women alike, dispise the smell of the animals, many are afraid of their size, and all complain that cattle tending takes time away from subsistence activities such as gardening and, particularly, hunting and fishing. Most Indians have become cattlemen because it is the only way to defend oneself against accusations that they are unproductive and should therefore be denied land rights. The Shuar, perhaps the most extensive cattle raising Oriente Indian group, readily admit that this new economic system is their best defense but not necessarily in their best interest. To do so will require two separe approaches, described below:

a. Large Indian Societies

The first is envisioned for those more numerous Indian population living closest to the Andes who have been in more regular contact with colonists and who, consequently, have become more involved with colonists, market economics, education, Spanish-language, and cattle raising. These groups include:

1) Quijos Quichua - (Population: 25 - 30,000) Residents largely of Napo Province, most of whom originally lived in he area surrounding Loreto, Payamino, Tena, Archidona, Puerto Napo, Ahuano, and other communities of the upper Napo. Recently, however, population growth has scattered Quijos Quichua along the lower Napo River (e.g., Limonococha) and onto comunas located along the Quito-Coca road (two 300-family comunas are located on the road between Lago Agrio ad Coca, just north of the Cooperativa Shushufundi).

2) Canelos Quichua - (Population: 10 - 20,000) Residents largely of Pastaza Province. The largest concentration of Canelos Quichua live in the comuna of San Jacinto, near Puyo, and along the Bobonaza River near the settlements of Canelos, Pucayacu, Sarayacu, and Montalvo.

3) Shuar - (Population: 25 - 30,000) Living in the Provinces of Morona-Santiago and Zamora-Chinchipe. Clustered most densely in the area west of the Cordillera del Condor, near the Upano Valley settlements of Macas, Sucúa, Gualaquiza, and Zamora.

The groups, particularly their leadership, are extremely sophisticated, proud, and determined to maintain themselves as equals with other numbers or segments of the national society. They likewise wish to contribute to the national society and to take an active role in its development. They insist, however, on a degree of self-determination and local control. These feelings, and the accompanying rejection of either imposition or paternalism, are particularly strong at the present moment. Any organization or program which attempts to force itself on these groups might be rejected simply because it fails to respect them. By contrast, a program which incorporates them as equals, listens to them, and responds to local requests can be extremely successful.

The new Ley Forestal contains an article which could serve to stimulate Indian participation in programs of rational deforestation and subsequent development of tropical forest reserves. Article No. 36 states that:

> "....Las áreas de bosques productores del Estado en donde existan asentamientos de grupos aborígenes, --- serán aprovechadas exclusivamente por éstos, previa autorización del Ministerio de Agricultura y Ganadería y con sujeción a lo establecido en esta Ley."

153

Article No. 38 states that:

"Las comunidades abor§genes tendr@n derecho exclusivo al aprovechamiento de productos forestales diferentes de la madera y de la vida silvestre, en las tierras de su dominio o posesi@n, de acuerdo con el reglamento. El Ministerio de Agricultura y Ganader§a delimitar@ dichas tierras y prestar@ a las comunidades asesor§a técnica.

For groups or communities which are primarily concerned with their land tenure, their rights over resources, and ways to guarantee both without being forced into cattle raising, these articles are particularly promising. And they provide fertile ground for PNF programs which are worked at in collaboration with Indian communities.

At present, a structure exists for working directly with these groups and if this structure is circumvented opposition will undoubtedly arise. Following a model largely established by the Shuar in the early 1960s most communities of each ethnic group have formal federations. The most powerful of these, and perhaps the most well organized Indian organization in Latin America, is the Shuar Federation, which is headquartered in Sucúa and maintain an office in Quito. Their leadership maintains direct access to top government officials, and they meet regularly with Ministers and even the President. For the Napo area FOIN (Federaci@n de Organizaciones Ind§genas del Napo) has organized many of the communities of the upper Napo (Tena-Archidona Region) while UNAE (Uni@n de Nativos de la Amazon§a Ecuatoriana) works with communities along the lower Napo (Coca-Limoncocha area). In Pastaza Province OPIP (Organizaci@n de Pueblos Ind§genas del Pastaza) has recently begun to organize the Canelos Quichua communities of Pastaza. Several smaller splinter "Federations" (Many organized and supported by either Catholic or Protestant missionaries who sense a threat to their previous authority) have also cropped up. Recently, the major federations of the Oriente have formed a confederation to coordinate the activities of the member groups. In many ways these federations are more well organized and internally cooperative than competitive government institutions. Any program which neglects these organizations or threats them insensitively will probably fail.

b. Small Indian Societies

A different approach can be used for the smaller populations - The Siona-Secoya, Cof@n, Huaorani and Coaiquer - Their size, degree of contact with outsiders, educational level, and general understanding of the non-Indian dominant society puts them into a more disadvantaged position with regard to defense of their territorial and cultural integrity. Moreover, these groups lack the internal political organization of the more numerous groups.

Groups:

Siona-Secoya - (Population: 500 - 800) Occupy the middle Aguarico River with two principal settlements, San Pablo and Cuyabeno.

154

Cofán - (Population: 500 - 600) Occupy sections of the upper Aguarico River, with some settlements divided by colonists.

Huaorani - (Population: 900) Occupy the Curacay and Nushijo River, upstream from the settlement of Curaray. Also have scattered settlements in the upper Nashijo and Cononaco areas.

Coaiquer - (Population: less than 500) Occupy settlements along the upper Rio San Juan on the slopes of the Andes, near the Colombian border.

Unlike the more numerous lowland populations, these groups have not yet become involved with the "cattle raising" complex which characterizes most recent land use in the Oriente. They presently maintain a much more traditional life style, centered on hunting, fishing and subsistence horticulture. However, like all other Indian groups confronting an expanding frontier, they are preoccupied with their territorial base and are fully aware of IERAC's demands to exploit their land or else run the risk of losing it. But to simply assign each family the standard fifty hectare plot and oblige them to improve it, is to abandon them to a life where their lack of skills will guarantee them a permanent position at the bottom of the socio-economic ladder and on the margins of national political life, Ecuador will not benefit by creating such populations.

Beginning in 1979, a partial solution to this dilemma was undertaken; efforts to secure the territorial base were initiated. The purpose of this territory was not to establish a "primitive Indian Park" or the equivalent of a human zoo; such land use would neither benefit Ecuadorian development nor satisfy the expressed desires of Indians to become active and successful members of a multi-ethnic national society. The purpose of the project was to provide an adequate territorial base which would permit the gradual transition from a traditional to a modern economic system without trauma. Initiated as a response to Indian demands, the project was coordinated by an Inter-Institutional Commission composed of representatives from INCRAE, IERAC, and PNF, with technical assistance from Cultural Survival (Cambridge, Mass. USA). The Commision was officially recognized and inscribed in Ecuador's Registro Oficial in October 1980. Several months of field studies developed the criteria for territorial needs and determined the border of the reserves. Drafts of the joint report have been circulated to appropriate offices. The work which remains to be done is the physical demarcation and formal titling of the land.

Aspects of the new Ley Forestal now offer opportunities to develop the economic base for these communities in a manner which will draw them into the national economy without immediately and abruptly requiring them to risk their subsistence security. The law can likewise assure them tenure. Articles No. 36 and No. 38, cited above, guarantee Indians the exclusive rights to forest and other natural resources on their land. And Article No. 35 states that the Ministry of Agriculture will demarcate such land and provide technical assistance to develop it. Such legislation provides significant incentives to Indians.

Traditional jungle Indian economic patterns require extensive territory, mainly to insure access to fish and game for subsistence. However, to claim large land holdings as exclusive Indian territory will be difficult; they would be disproportionately larger than colonists' land. To resolve this, it was decided that Indian land holdings can and should exist adjacent to areas of national patrimony held in reserve (e.g., national parks, reserves, etc.) There are several reasons for this:

1) Indian land per se need not be so extensive. The reserves and parks could be utilized for subsistence hunting and fishing without upsetting the ecological balance of the parks and reserves.

2) A buffer zone of Indian land could prevent encroachment by colonists, whose attitute toward the parks could be more destructive.

3) The Indian area outside of the park could be used to develop market oriented activities, thus allowing Indians to become involved in the national economy while also maintaining access to traditional subsistence activities.

In some areas of Amazonia, Indian presence has been destructive to parks or other natural areas. Indians, in order to obtain cash, have responded to outside demands for pelts of endangered species, collections of exotic birds, and other objects which are sold directly or manufactured into tourist curios. Park officials and others have been justifiably concerned with such depredation. However, in an environment where animals and birds are widely dispersed and usually solitary (unlike the easily poached herds which roam African plains), collection for sale is not a very lucrative activity and is very time consuming. Alternative economic activities related for forestry and forest control could offer appealing alternatives to the "skin trade".

To illustrate:

1) Selective deforestation of Indian lands, controlled by Indians, could prove immediate cash income.

2) Indians would be receptive to ecologically sound forestry development programs (balsa, pulp producing species, etc.) And then familiarity with forests and tropical soils would make them far easier to train than outsiders.

3) Such experience would also be useful in helping to carry out items d) and e) of Article No. 76 of the Ley Forestal, viz.:

> d) Establecer zoocriaderos, viveros, jardines de plantas silvestres y estaciones de investigación para la reproducción y fomento de la flora y fauna silvestres;

156

e) Desarrollar actividades demostrativas de uso y aprovechamiento doméstico de la flora y fauna silvestres, mediante métodos que eviten menoscabar su integridad.

Thus, to most successful implement certain aspects of the Ley Forestal and to promote the rational economic development of forestry resources which can assure the continued utility of the Ecuadorian Oriente, it is recommended that the PNF begin with indigenous communities along the lines described above. In doing so, it will allow native people, both women and men, an opportunity to become an active segment of Ecuador's private sector development, and progressively diminish the role of government agencies in the lives and livelihoods. Such a program could serve as an examplary and unique experiment in forest management and local development, one which would serve as a model for other nations with Amazonian territory and with similar problems.

PART III - THE COSTA

A. Arid Coastal - Jipijapa

1. Campesino Social and Economic Adaptation

For the purposes of this report, the Jipijapa area can be divided into two sections:

a) The hilly region known as the Cordillera de Colonche which, during the dry season, forms a barrier to the westerly ocean current and, in the event of a "rainy season", receives considerable rainfall. This is the principal coffee producing area.

b) The lower region, principally to the west of the Cordillera and along the Pacific shore, which receives little or no significant moisture during the garúa season and depends, for agricultural production, on the presence of a noticeable rainy season. Groundwater for wells is scarce and local residents report that much of it is brackish and contains sulfur. Water for drinking and cooking is brought into the area by tank trucks.

While local climatic conditions near Jipijapa do not determine social and economic patterns, they clearly limit possibilities given the unpredictable local conditions campesinos in the lower, drier regions provide themselves with a set of economic options which guarantee minimal security during the worst conditions (e.g., prolonged drought which they are presently experiencing) rather than attempt to maximize their gains or profits during optimal periods (e.g., years of regular and abundant rainfall). The most intelligent strategy is to minimize risk by not putting all of one's eggs in one basket. Several activities are predominant.

157

a) Agriculture

It is sometimes observed that people in the lower areas were not really concerned with farming because they did not seem to be dedicating much time to it. Campesinos, however, indicate that if and when the rains fell, every family would begin to work its traditional plots, planting principally maize but also including beans, peanuts, and a number of other crops. Agricultural clearings are visible along all hillsides and much of lower land was said to be arable with adequate rainfall. Unless this area is truly atypical one would expect subsistence agriculture to be the campesino's principle concern.

b) Wage Labor

Perhaps the second most important source of income is wage labor. Houses and communities appeared to be sparsely occupied, particularly by males. Many work in nearby large towns or cities such as Jipijapa, Portoviejo, or Manta, returning home on weekends. Others have settled temporarily in Quito or Guayaquil. All can be expected to return, at least temporarily, if rain begins to fall.

There are also several local wage labor options. Dispersed throughout the area, in what appears to be newly built installations, are several large lumber yards; one, called Expromadera, is being built opposite PNF's experimental plantation just south of Montecristi. In a few cases these yards are producing furniture from Guayacán trees cut from the hills of Manabí. Most, however, are storing wood brought in as logs from either Esmeraldas or Santo Domingo. Thus, in some cases trees are felled, cut, transported to Esmeraldas, shipped via boat to Manta, unloaded, and trucked to lumber yards where they are cut into boards which are said to be exported subsequently, again via Manta. Manabí's relative dryness undoubtedly explains part of this movement. But an impoverished and abundant labor force willing to work for low wages and in a non-unionized fashion is probably a stronger attraction.

c) Local Industry

i) Bricks. Brick making offers another and, judging by the number of newly constructed brick building in the area, fairly recent source of income. Most of the walls or rural dwelling are made from split guadua; however, local residents reported that guadua, most of which comes from Santo Domingo, was now as expensive as bricks produced locally.

ii) Figurines and Mattress Stuffing. Utilizing the same locally available clay as is used for bricks, several communities along the road from Montecristi to Jipijapa are producing imitations of pre-Colombian stone figurines. In early times, these and many other communities also gathered the cotton-like from Ceiba trees which provided the primary source of mattress stuffing before foam rubber became available and before deforestation depleted the Ceiba trees.

iii) Firewood and Goats. Two other secondary, but nonetheless widespread, economic activities have left a noticeable mark on the forest landscape - firewood and goat production. These not only have contributed significantly to the need for assistance to the region's forest resources but will pose a major problem to any efforts to expand such resources in the area. To farm, one needs water; to get a job locally or in cities, one needs a bit of luck; to raise most livestock, one needs money for purchase and feed; but anybody can raise goats and cut firewood. And, judging by the sparse landscape, most people seem to have done so.

Coffee growers in more moist upland regions can now be expected to adopt similar strategies. Here, in previous years, fairly regular moisture and high coffee prices encouraged people to focus most of their time and energy on coffee plantations. They were able to expand their activities through credit provided by the Banco de Fomento. Recently, however, low coffee prices and decreased production have not only limited their income but left them straddled with debts which they are going to have problems in paying.

Land tenure patterns and concerns regarding land tenure vary between the upland coffee growing zones and the drier lowland regions.

1) Coffee Growing Area. Most producers in this area work small individual holdings. According to local officials, these lands had previously been titled (Título de Propiedad) by IERAC but have subsequently and informally been subdivided by the original owner's family. Due to the crisis of coffee production and the small size of the plots, many claimants are periodically absent and cannot be brought together. Even if they could be brought together, the present low incomes of coffee growers would not allow them to pay the fees for surveying and processing titles required by IERAC.

2) Communal land holdings were the pattern in the lower drier regions. Here land is understood to be held in common by all recognized members of the community. Individuals or families have use rights, frequently in perpetuity, to certain agricultural plots while the rest of the land is available either for communal activities or for use by new adult members, either off-spring or in-laws. IERAC had not yet formally titled this land but had recognized the community (Título de Posesión). By contrast to Sierra and Oriente communities, there does not appear to be any pressing desire to speed up the process of land titling. It would seem that:

1) There is not the sort of pressure on the land or competition for land which motivates people to seek permanent title. This is undoubtedly explained, in part, by the poverty of production and out-migration from the area. However, if any sort of development activities or improved climatic conditions alters this pattern, concern over boundaries will increase. Land titling, therefore, should be a component of any development plans for the area.

2) Credit is not a major concern. Local GOE officials indicated that land titling was essential in order to allow land owners to obtain the credit essential for expanding production. However, in the coffee producting zones, where low prices, poor production, and outstanding debts characterize the region, it is highly unlikely that farmers will be anxious to incur in more debts. Residents in lower drier areas expressed a similar reluctance to search for sources of credit.

2. Potential Effectiveness of Expanded PNF or other Forest Sector Related Activities

How can development of forestry resources directly or indirectly benefit campesinos? And what institutional activities and incentives would promote side development?

For a denuded and dry landscape with large amounts of unutilized land, expanded plantation forests are highly desirable. Communities would probably accept and tolerate projects initiated and maintained by the PNF, but it is doubtful that such projects would generate much enthusiasm, even the minimal amount required to reforest. In areas where growth potential is fairly high, the idea of a 15-20 year delay of return on investment provides few incentives. In Manabí the situation is even worse. On the one hand, the fragile existence and borderline subsistence can be expected to draw people into activities which provide immediate returns. On the other hand, observations of PNF's activities indicate that, even if communities did become involved in plantations, little success could be expected.

In several test areas and plantations established by PNF, workers have carefully cleared the land, overturned the hard soils, and planted large numbers of trees. Local drought conditions however, have turned these areas into patches of dryed-up sticks. Some of these may spring to life if rain falls, but the overall PNF effort has been unimpressive and certainly has offered few incentives for local people to imitate it. The PNF's exclusive focus on wood producing species would probably frustrate any extension or promotion work. People in the area cannot be expected to generate enthusiasm for such species.

This does not mean, however, that local people are unconcerned with reforestation. They indicated that shade trees are absolutely essential in coffee growing area, both to provide regular protection from the sun and to retard rapid evaporation and scorching which often follows thunderstorms, when they occur. Similar need for shade trees was expressed by people in the lower drier regions where small experimental irrigated gardens are beginning to develop.

Thus, the previous lack of enthusiasm for PNF's program and the strongly expressed interest in reforestation (and programs to support it) only need appear as contradictions if reforestation is limited to species

produced solely for lumber. Campesinos express a desire to reforest with trees which could not only provide shade and erosion control, but food. They would like fruit trees, an obvious advantage in an area where basic subsistence is precarious.

3. Review: Positive Social Impact of Forestation and Incentives to Support it.

1. Reforestation and other forestry work in the Jipijapa area can be of significant advantage to campesinos living in one of the nation's poorest and unproductive areas.

2. Shade trees are essential to protect coffee plants and vegetable gardens form regular strong sunlight and scorching of plants often subsequent to heavy rainfall.

3. By enhancing local agricultural production, forestation will assist campesinos primary economic concern, agriculture, and may help to decrease present tendency for male out migration.

4. The activities required to initiate forestation would not force campesinos to cease participation in the varied set of economic activities presently undertaken to insure subsistence security in a harsh environment.

5. Forestry programs will be most effective if they can be linked to immediate economic gains. As campesinos themselves have suggested, this can best be done by mixing tree and agricultural production while encouraging forestation of food producing tree (e.g., fruit and nut).

6. At present there is no indication that expansive commercial lumber plantations will be established in the area. Thus, the territorial base of the present residents appears unthreatened. Nevertheless, as forestry programs develop local land could become more desirable. A land titling program could thus become an important incentive to expanding interest in forestry.

7) Technical assistance provided by individuals with social skills is essential.

How could development of forest resources directly or indirectly threaten or otherwise negatively influence the economic and cultural life of local residents? And what sorts of safeguards could prevent or minimize negative impact?

The extreme poverty and aridity of the Jipijapa area encourages radical and imaginative solutions. Such ideas must be carefully evaluated and cautiously implemented so as not to upset the campesino's fragile economic equilibrium with programs where long range benefits are uncertain.

To illustrate, goat production and wood cutting are undoubtedly responsible for the presently sparce landscape of south western Manab§. Goats will also thwart any effort to reforest the area. And the increased vegetation which could result from enclosed forestry projects will undoubtedly reveal the destructive ingenuity of goats and goat owners alike. Likewise, firewood gatherers can be expected to continue their work for some time. And if evidence from Loma Alta (Guayas Province) is any indication, plantations will not be spared. There, people carried off even the wooden tree identification plaques for firewood. People undertake goat production and firewood gathering not because it is extremely lucrative or tied into some ingrained cultural pattern. These activities are simply part of a complex set of social and economic adaptations. But they probably will not end until viable alternatives are offered and tested.

B. Humid Tropics - Northwest

The northwestern humid tropics include most of Esmeraldas Province and a small part of northwestern Pichincha Province.

They are inhabited by three distinct ethnic groups: Blacks, Indians, and Mestizos. Each of these groups is characterized by a different type of relationship with the land and forest resource. Also, because of differing historical experiences, each has a somewhat different perception of tenure considerations.

These considerations are described for each of the three ethnic groups:

1. Man-Land Relations

a. Blacks

Although Blacks have resided in Esmeraldas for centuries, the inhabitants of the humid tropical forest must be divided into two sub-groups: natives and recent settlers. The native Blacks engage primarily in subsistence agriculture and fishing. They have a strong affinity for the land which they have occupied for years. They do not engage in intensive exploitation of the forest resource.

Black settlers are continually moving into the forested area of Esmeraldas. Many times they have been evicted from other areas because they lacked land title or they have emmigrated because of economic difficulties. Some of the Black colonists have been urban dwellers prior to migrating to the forest. These Blacks tend to engage in the exploitation of the forest

resource as their primary occupation. They harvest for the concessionaires and a significant number engage in charcoal manufacture. In a lesser extent they engage in market-oriented agricultural endeavors.

b. Cayapas Indians

This Indian population is small, numbering perhaps less than 1,000. Some observers believe that it is on the verge of cultural extintion. The Cayapas practice swidden agriculture and engage in hunting to supply part of their dietary proteins. Their present life style is well adapted to relatively stable humid tropical forest environment and they as yet do not perceive gradual change which is occurring in their environment as a result of the in-migration of other ethnic groups into their domain.

c. Mestizos

A significant in-migration of mestizo colonists into the humid tropical forests has occurred during the past fifteen years, particularly in southern Esmeraldas province and in lowland area of Pichincha Province. These colonists have come primarily from Loja and Manabí Provinces where they have been affected by recurring drought or have had tenure problems. They engage in agricultural and some livestock activities. They deforest the land in which they settle to undertake these activities and to clear sufficient land to obtain title to it. Because they come from much drier regions, their agricultural and livestock technologies are totally inappropriate for the humid tropic area. Paradoxically, many of these settlers do relate the deforestation which has occurred in Loja and Manabí with the recent drought conditions in those areas and do have some appreciation of the need for good management of the forest resources.

2. Tenure Considerations

Land tenure conditions in the northwestern humid tropics are complex. A very low percentage of the inhabitants have property titles. This is related to, although not necessarily caused by the existence of several forest concessions which hold a right to exploit forest resources on approximately 30 percent of the humid tropical forest. Often, colonists have settled on concessions' lands while in other cases, concessions have been granted to lands which were already occupied by colonists. Although concessionaires do not hold title to their concessions -- the land continues to be state owned -- the right of usufruct of the forest resource limits the possibility that colonists settled on concessions may obtain title to that land. This, however, does not preclude the possibility of land titling. The major part of the land lies and most colonists are settled outside of the concessions. Nevertheless, within the context of a conflict situation in the forest concessions land titling in Esmeraldas has been particularly slow.

Given this reality, each ethnic group has a specific attitude toward land tenure considerations and, specifically, the need for legal title to the land.

a. Blacks

The attitude of blacks toward tenure legalization is function of their permanence in the area. Native blacks have little felt need to obtain title to land which they have utilized for many years. They often reject the notion that they be required to obtain title to land which they have held in usufruct for years.

Blacks who are recent immigrants, however, generally are aware of the need for land titles since in many cases they have been evicted from other areas because of lack of title. As a result, they view the tenure as precarious and their stay as possibly short-lived. Consequently, they tend to rapidly exploit the forest resource.

b. Cayapas Indian

The Cayapas do not have a clear understanding of legal tenure rights nor of the concept of physical space. They require large extensions of land for hunting and swidden agricultural activities. They feel that they possess the land and its use potential. Their territory has not yet been affected extensively by encroachment but is likely to be severely affected within the next several years.

c. Mestizos

Mestizo colonists have a generally held desire to obtain land titles to which they firmly adhere. They attempt to place as much land into cultivation or pasture as they can in order to establish their right to the land in accordance with their perception that IERAC requires that at least 50 percent of a holding be cultivated.

Although they carry out substantial amounts of forest clearing, they do so primarily for agricultural ends and only secondarily to exploit the timber resource.

3. Current and Possible Future Involvement in Forestry Related Activities

As indicated in the preceding sections, the different groups within the area tend to have differing perceptions of the economic role and function of the humid tropical forest. Specifically,

native Blacks and Cayapas live in a relative equilibrium with the humid tropical forest environment. They currently engage in relatively minimal exploitation of the timber resource. They would most appropriately participate in natural forest management activities.

- migrant Blacks engage in the exploitation of the forest resources to a significant degree. Currently, they exploit the existing natural forest. They could appropriately engage in enrichment plantations and agroforestry activities.

- mestizo colonists exploit existing forest resources as a secondary occupation. They are primary candidates to participate in agroforestry activities.

PART IV - RECOMMENDATIONS

This report has attempted to identify ways in which Ecuador's forestry sector could be improved or expanded to benefit rural communities, both campesino and peasant. Unlike many social impact studies, where the social scientist is uncomfortably obliged to confront a large development scheme designed to benefit the nation as a whole (e.g., hydroelectric project with large dams and reservoirs) but which unfortunately prejudices numerous small communities or societies, forestry projects offer considerable benefits to campesinos and Indians. These benefits have been outlined in the text and are only summarized here.

1. In the Sierra increased forestry development can provide new sources of cash income, albeit long range. Incentives are essential.

2. From the Sierra and Oriente campesinos' and Indians' standpoint, public and private forestry institutions' support of land titling (a requirement for plantation contracts) is perhaps the greatest incentive. Small holders are extremely concerned with land tenure. In the Jipijapa area the perceived low value of local land makes titling a lesser incentive.

3. In the highlands wage labor provided to the community or paid for their labor on larger land holdings is perhaps the second most important incentive. Such labor not only provides cash but also an opportunity to work closer to home; it provides opportunities for women to become involved in forestry projects and also helps to maintain more stable households due to more permanent male populations.

4. Additional incentives can be provided through improved outreach techniques (e.g., audio-visual). A program for such outreach has been elaborated by PNF.

5. The most effective manner to increase incentives and assure local support will come through close collaboration with local and regional organizations of Indians and campesinos. Such collaboration must be carefully negotiated but, if successful, will greatly increase the effectiveness of any project. Such organizations exist on the Coast and in the Sierra and Oriente. These groups, if they are convinced of the worth of the project, will be the best link to the communities and the most effective outreach agents.

6. Fundación Natura's increasing technical knowledge, sensitive and respectful relations with campesinos and Indians, relative anthropological sophistication, and ability to reach a wide national public makes the organization an excellent model for expanded activities. Their collaboration will benefit any program, and should be encouraged.

7. In the tropical forest, non-Indian colonists' concern for cattle raising will be difficult to replace with more ecologically appropriate land use patterns. Indian communities will probably be quicker to realize the appropriateness of such projects, and will be particularly receptive if, as the Ley Forestal states, MAG assists them in demarcation and titling of land. Two different approaches are suggested in this report.

8. The dry, near desert condition of Manabí's Jipijapa area will make plantation forestry a risky, and therefore not particularly appealing possibility. PNF's program in this area wold be more well received if their exclusive focus on wood producing species could be modified. Campesinos would be willing to dedicate essential watering time and other attention if fruit or nut trees could be considered as a possibility for shade in coffee producting and other areas.

9. PNF and other forestry sector agencies will be able to improve their relations with local communities through more sensitive and anthropologically advised assistance. Misunderstanding often produces arrogance and/or paternalism.

TECHNICAL ANALYSIS

A. Productive Forestry Pilot Demonstration Activities

1. Project Methodology

The project will finance a series of commercial size field demonstrations of plantations, natural regeneration, and agroforestry systems in the Sierra, humid lowlands (coastal and Oriente), and the arid lowlands. This approach to forestry recognizes that there is a lack of experience with the very different land, forest, and tree management schemes which are required for the extremely diverse natural environments from which Ecuador's future wood supplies must come in order to provide the multiple forest products the Ecuadorian society needs. It considers the need to implement schemes in which there is a relatively high degree of certainty with regard to their feasibility, but which must be field tested before being implemented on a massive scale. At the same time it must be recognized that there are many gaps in technical knowledge which can be filled through applied research carried out in conjunction with the field demonstrations. This applied research can be more effectively carried out when the potential users of the information actually assist in implementing the research activities.

The technical feasibility of each type of forestry pilot demonstration is discussed below.

a. Plantations

Commercial size pilot plantations in the sierra are technically feasible, since eucalypt and pine plantations have been planted there for a number of decades.

There are technical issues related to the Sierra plantations which must be resolved by the field demonstrations and/or applied research. These include: studies of diseases of P. radiata and of E. globulus, which are the most common pine and eucalypt species; the possibility of intercropping these species with agricultural or forage crops during the first years of the plantation and of grazing livestock in plantations in later years; and use of alternative species of pines and eucalypts. For example, preliminary indications show that P.patula should be planted where P. radiata exhibits signs of dieback and slower growth, especially above 3200 meters. Other Mexican and Asian pines could prove productive on these sites, but must be tested in small plots before planting extensive areas. More than 1,750,000 hectares in the highlands have potential use for forestry, so successful plantation reforestation methods can be replicated widely if resources are available and if the market demand exists.

Enrichment plantations in the humid tropical lowland forest areas can be tested on a commercial basis, since the four species being proposed in this project are well enough known in similar environments and have been tested to a certain degree in Ecuador. The species which will be used in the humid tropical enrichment plantations -- "Laurel" (Cordia alliodora), "Cedro" (Cedrela sp.), "Pachaco" (Schizolobium parahybum), and "Mascarey" (Hyeronyma chocoensis) --have shown good growth characteristics in preliminary trials at the La Chiquita experiment station in Esmeraldas province. Similar reforestation projects in Venezuela and Surinam are known to have been successfully implemented. Present growth levels of commercial species in the native tropical forests are extremely low (about 1 m^3/ha/yr.). This can be increased at least 10 times (depending on soils and tree species) when proper management methods are used.

Little experience exists in the arid coast with plantation forestry which is therefore technically less certain and should be undertaken on a more limited basis than in the highlands or humid tropics. Exotic species, (e.g., Eucalyptus camaldulensis for fuelwood), as well as native species for fuelwood (e.g., Prosopis juliflora), fodder and fruit (e.g., tamarindo) should be tried.

b. Natural Regeneration

The inclusion of pilot demonstrations of natural regeneration is especially valid in the remaining tropical closed forest in the lowlands. Large extensions of land in this type of Ecuadorian forest are not suitable for intensive agriculture or even reforestation with a relatively homogenous tree cover. Because of the rapid rate of deforestation in these areas, it is necessary to initiate immediately adequate and extensive management of the natural forests for wood production as the only means to conserve this forest resource and convert it into a permanent source of wood and non-wood products for export as well as for the local inhabitants of the forest. While basic research on small test plots would provide data upon which management could be based in the future, the results would be available too late, and much of the remaining forest area would be destroyed. Consequently, the experimental management approach of this project will progressively and systematically incorporate the results of the applied research activities into the management systems of large expanses of tropical forest.

Demonstrations of natural regeneration in the Sierra and the arid coast are extremely important and are valid components of this project for technical and economic reasons. First, natural regeneration is exceptionally important from a biological standpoint, since the biological diversity inherent in the natural environment is maintained (relative to the creation of homogeneous plantations). This natural vegetation is often an excellent source of fuelwood, wild fruits, berries, flowers for honey making, and

habitat for faunal species used by the local population for food. In addition, natural regeneration of grasses, shrubs, and trees provide immediate and lasting soil and water protection, and is an economical way to protect watersheds since very little site preparation and no reforestation activities are needed. Observation in the interandean zone and the dry coast reveals that the reproductive capacity of these very degraded and overused areas is still high, and protection from occasional fire and grazing is all that is needed to allow this valuable natural regeneration to occur. Technically, this land management system is possible. Difficulties are primarily social in nature. However foresters and other land managers are not well prepared to deal with natural regeneration forest management systems since much of their training and subsequent professional activity has been in plantation management or timber extraction control. Therefore, they will require training in this area.

c. On-Farm and Agro-Forestry

The agroforestry pilot activities included in this project will present a number of technical problems that need resolution. This attempt to deal systematically with on-farm forestry activities is a basic and radical change for traditional foresters and forestry sector development agencies. Instead of dealing with forests and man-made plantations which are relatively free of human activity, foresters must deal with the planting of trees (not forests) on lands that are populated and cultivated for food crops. The first step in this important process is to get foresters out of the forests and into tree planting activities along roads, canals and railway lines. After this, they can begin to deal with on-farm forestry working with the planting of trees in windrows, borders and around houses and community buildings. This type of tree planting can produce a household's fuel supply and on-farm building materials. The environmental influences of windrows and border plantings can be crucial to sustainable land management.

However, it must be noted here that the major responsibility for on-farm soil and water conservation must be assumed by the agriculture sector, its agents, and the farmer. Tree cover can only make a partial contribution to sustainable farm management. Forestry activities tend to be higher cost and to have a lower productivity on extremely marginal lands. If the agriculture sector (food producing activities) continues degrading the land, which is then put into forestry, both food and wood productivity will be lower than it need be. From the technical standpoint on-farm forestry can and should be introduced before the land is completely degraded. However, in the Sierra the transition from crop production to a combination of food crops, animals, and trees is equally difficult for the farmer as it is for the forester. Farmers claim to have no room for trees, when in fact, between 5% and 10% of most farms, no matter the size, could be used for trees without taking land away from food crops. The technical question which foresters must address, and then convince farmers of, is the choice of tree species for on-farm

planting. Species that do not compete with crops for surface water, that provide beneficial shade, that produce food, fodder and fuel themselves, that are easy to manage, and that are available locally must be used. To determine these characteristics substantial pilot activities and, in some cases, species trials must be undertaken.

The strategy of on-farm forestry is one of gradually placing greater emphasis on individual initiative, and integrating forestry techniques with rural development. Because of this, it is important to address the process through which technical information is acquired and used in this component. While it is important that nurseries produce the right amounts and kinds of trees for on-farm forestry, and that foresters become able and socially sensitive extension agents, it is most important that farmers learn which trees are appropriate and for what products in terms of their basic needs for fuel, food, fodder, and building materials. If the farmers select the different multipurpose tree species to be planted for windrows, boundaries and live fences, the trees are more likely to be planted. Where appropriate, linear plantings across slopes can be established with grasses (e.g., penco) and fruit trees (e.g., capuli) to retard soil erosion and produce fodder and food. The demonstrations implemented in this project should result in initiating a process of tree planting among farmers. If this process is inititated, it will not greatly matter how many trees have actually been planted under this activity in the project. The activity has the potential of being widely replicated almost totally by private initiative once farmers appreciate the positive benefits of tree planting.

Arid coastal on-farm forestry should focus on provision of shade in areas with coffee plantations. Two-level shade provided by trees is a critical element in coffee plantation management in the hill area within the Jipijapa IRD project area and elsewhere in the coast. Species selection, management for shade, and harvesting for lumber, fuel, or fodder are aspects of this agroforestry system that should be investigated.

In the lowland humid areas agroforestry systems will provide sustainable production of food and fiber where intensive agriculture cannot be sustained and multiple sources of income must be developed or where the basic infrastructure (roads, markets, etc.) force farmers to produce much of their own food and building materials. The tree species and crop combinations selected for the humid tropical agro-forestry activity (Laurel or Cedro with bananas or coffee; Pachaco with rice, hard corn and pasture; and Mascarey with rice, corn, and beans) are in principle technically sound. They need to be tested for their response to differing soil and climatic conditions.

170

2. Site Selection for Demonstrations

In the Sierra and arid coast the overall quality of land available for reforestation on plantations is not likely to be high. However, growth rates will be higher and management techniques simpler when plantations can be established on somewhat more fertile, level sites. In light of this fact, average or better sites, within those available for reforestation, should be selected for the demonstrations. Sites close to villages, visible from roads or cities should be chosen if they can be protected, since they will serve the demonstration function better than isolated sites.

With regard to natural regeneration, the importance of these trials will be to record the type and value of the natural vegetation that grows, and to demonstrate the potential productivity of apparently unproductive land. Land of this sort that is found within the reforestation activities of other segments of this project should be used, since protection will already be assured.

In the humid lowlands, site selection should be based upon accessibility and the willingness of the local population to enter into the necessary agreements for sustained management of the demonstrations. Also, they must be within areas that can be used to expand the demonstrations as the various management techniques prove viable. Suggested locations for the initial pilot natural forest management plots in the northwest are land adjacent to the Cayapa River and within Cayapa Indian Land Reserves, and land selected by PNF within the concession assigned to Industrial Forestal Cayapas C.E.M. In the Oriente, the plots recommended sites are at: Comuna Sinangue/Cayambe-Coca Ecological Reserve, Comuna Dureno, and Comuna San Pablo/Cuyabeno Faunal Reserve. For agro-forestry first consideration for location of plots should include the Shushufindi Project, the Settlement of San Miguel, the Comuna Rucullacta in the Oriente, and land held by Industrial Forestal Cayapas in the northwest.

3. Cost Estimates for Productive Forestry Field Demonstration Activities

Cost data for the productive forestry field demonstrations are presented in Annex VII -- Financial Exhibits. Standard (per hectare) costs for each type of the major field demonstration activity have been carefully estimated, where possible on the basis of experience in Ecuador. Specific costs for Sierra pine and eucalyptus plantations have been obtained from the PNF and EMDEFOR. In the case of humid tropical forestry activities (agroforestry, natural forests management and enrichment conditions) where there is negligible prior experience in Ecuador, data from other Latin American countries, which adjusted to Ecuadorian unit prices, has been utilized.

The cost estimates for humid tropical forestry were developed by a professional forester who has worked for many years in this subject area in Venezuela and Surinam and who is fully familiar with each of the humid tropical field demonstrations being proposed.

USAID has carefully reviewed the cost estimates for the productive field demonstration activities and concludes that they provide a reasonably firm basis for estimating aggregate project costs for the productive forestry pilot field demonstrations activity.

4. Seed and Nursery Production

Seed collection, storage, and treatment as well as nursery management must be upgraded through this project. To support the reforestation activities included in this project, and to build up the forestry sector institutions that will be involved in increased levels of reforestation in Ecuador, tree nursery operations of the PNF and other forestry sector institutions, in general, require upgrading. Current operations are poorly managed and inefficient. The technologies which are employed are rudimentary at best. Little or no nursery experience exists for many of the species which should be tried as part of this project. The following specific concerns should be addressed through the technical assistance component of this project:

- Better attention to soil conditions in nurseries.
- Correct use and handling of fertilizers, herbicides and pesticides.
- Hardening and stressing of plants to be planted in adverse climatic conditions
- Transplanting vs. direct seeding in pots.
- Type of container.
- Use of resowing.

Existing nurseries can handle the increased quantity of trees needed for this project, but eventually the participating institutions will have to expand production capacity in their own nurseries, and begin to help communities, individuals, and private enterprises establish nurseries that are closer to the planting sites. This of course is only justified once sustained demand for seedlings reaches the level at which a local nursery is justified.

5. Plantation Establishment and Management Techniques

This project will produce a large amount of information on plantation establishment and management techniques. The demonstrations will be designed to provide a much better data base than is presently available with regard to basic technical information.

172

A myriad of reforestation establishment and management options will be tried in demonstrations designed under this project. Technical information on the following are especially needed and must be addressed through the design of the demonstrations:

-Survival and growth rates of the most commonly planted species in relation to soil type, altitude, rainfall, and other site characteristics.

-Feasibility of interplanting of crops with trees during first years of plantations. This would allow trees to be established a few years before land is taken completely out of crop production, while still allowing the farmer his yearly food production.

-Feasibility of growing grasses for forage (to be cut and fed to animals outside of the plantation) within newly established plantations.

-Possibilities of grazing animals under pine and eucalypt plantations.

-Methods for establishing plantations in paramo and cangahua soils.

This experience is needed to guide future reforestation efforts towards the best sites, establishment techniques, and management methods.

6. Species Trials

The number of species that are being used in Ecuadorian forestry projects is very low. Use of a greater number of species is beneficial since diversity protects against extensive losses from insects and disease. The disease in eucalypt plantations and the die-back in P.radiata should be addressed through research and a program of control, but species diversification is another way to decrease this type of risk.

A larger number of tested species most likely will also reveal exotic and native trees which can be planted on problem sites on which currently used species do not produce well (paramo, saline sites, areas subject to frost, etc). Also, a number of faster-growing leguminous tree species that are proving to be valuable throughout the world due to their ability to fix nitrogen in the soil, produce fodder and fuel, and resist some very extreme climatic and soil conditions should be tested. Species of Eucalyptus, Cupressus, Casuarina, Acacia, Juglans, Salix, Alnus, Populus, Prosopis, and native fruit bearing trees will be considered in the Sierra.

In the arid coast a number of trials should be carried out using different varieties of Prosopis, eucalypts, acacias and other legumes, and a variety of fruit trees. In addition species trials can be conducted with exotics such as Jojoba and Guayule.

In the humid tropics there is an extremely wide variety of native species, only a few of which have been subjected to systematic trials.

The establishment of traditional species elimination trials throughout the demonstrations implemented under this project is of vital importance to future success in reforesting the many diverse micro-environments in Ecuador. Species trials are not new to Ecuadorian foresters, but the data collection and exchange (including follow-through on protection and measuring of existing trial plots) must be greatly improved; under this project this is certainly possible. In the trials emphasis should be placed on testing different provenances of the same species for both native and exotic species.

7. In-Service Training Requirements

The above described network of forestry field demonstrations will provide the technical information and field case study opportunities upon which a series of in-service technical training courses and workshops can be organized for PNF and collaborating institution field personnel. By taking advantage of the presence of the technical assistance team provided in this project, and of the PNF's increased role in training, applied research coordination and information collection and dissemination, the following workshops are recommended:

- Nursery management techniques. -- Site selection for central and community-based nurseries; soils characteristics and fertilization; use of herbicides and pesticides; seed collection, storage, and treatment; watering systems; use of transplanting and different types of planting containers; transportation of plants.

- Plantation Establishment. -- Site selection; species selection; site preparation techniques; planting techniques; protection of plantations; spacing and weeding; use of inter-cropping in initial years of plantation, use of terraces and canals.

- Species trials. -- Technical design; species selection; site selection and preparation; trials protection methods; data collection and reporting.

- Plantation Management -- Initial planting spacing; fertilization, weeding, inter-cropping, grass establishment for grazing; pruning and thinning; management of species that sprout; determining timing of final harvest.

174

- Agroforestry -- Techniques of on-farm tree planting; nitrogen fixation through use of leguminous and other (Alnus sp.) tree species; multi-purpose tree species; soil fertility and stability in the humid lowlands; shade trees.

- Natural Regeneration -- Methods of protection of sites from fire and grazing; uses of natural regeneration; elimination of undesired species; enrichment planting; basic ecology.

- Pine Plantations in the Sierra -- Silvicultural characteristics of various Pinus species; seed collection and nursery techniques; relationship between site characteristics and growth; insect and disease problems; uses of the wood; plantation management for secondary forest products such as mushroom cultivation and agriculture.

- Plantation Economics. -- Theory and calculations of plantation costs and benefits; site/volume relationships; benefits of intercropping and grazing; value of prunings and thinnings; optimum rotation age; characteristics of supply and demand of wood.

- Fuelwood -- Macro and micro level characteristics of fuelwood supply and demand; valuable native and exotic fuelwood species; on farm production of fuelwood; natural regeneration as a source of fuelwood; management of fuelwood plantations (spacing, thinning, pruning).

- Insect and Disease Control. -- Nursery problems; pines and eucalypt; species diversity vs. monoculture; early warning and control systems; low land humid forest diseases and insects.

- Protective Forest Management. -- Short courses for field personnel and immediate technical supervisors in the management of areas designated as protective forests, involving both classroom and field experience.

The list is not complete, nor are the topics mutually exclusive. Any combination of items can be put together to address a certain training need. Various workshops on the same subject, but of increasing technical level, could be offered to the same group of participants.

These workshops will be of most value if they are planned such that field work is held on demonstration sites developed under this project. Ideally, every demonstration site would be included as a case study in one or more workshop. This system will produce a peer pressure to carry out demonstrations more consciously, and will produce an informal network of field personnel who are informed about the work of either colleagues and who, to a certain extent, will continue contact between those working on similar problems.

8. Technical issues in relation to social and economic issues

Technical issues are important in this project. The technical assistance team proposed is crucial to assisting the PNF and collaborating institutions upgrade the technical level of personnel (especially field personnel), establish well designed applied research programs, and to improve forest and on-farm production of those wood and non-wood products that trees can provide. However, the real bottleneck in forestry sector development in Ecuador is the lack of participation of communities, Indian groups, individual farmers, and private enterprise in the sector's productive and protective activities. Because of this, technology transfer from the forestry institutions and foresters to these other members of society is the prime task and challenge of this project. If it is successful, technical sophistication will follow. If it is not successful, no amount of technical development will result in increased benefits from forestry.

9. Time Frame of Project

Significant progress can be made in the five-year term of this project to establish the demonstrations, to collect data, and to carry out much of the training and information dissemination activities necessary to build PNF's capacity as the lead forestry institution in the country. However, a program commitment of at least ten years would be appropriate due to the long-term nature of forestry development. The level of funding for the second 5-year phase of the program for continued monitoring and data collection and interpretation of the demonstrations and trials already established could be considerably lower than the first phase. A second phase of the program should also strongly focus on the utilization of forest products. (See next section.)

10. Industrial Use of Wood

While this project does not address the industrial processing function of the forestry sector, attention must be given to the industrial demand side of the forestry equation. Efficient, small-scale sawmills and chipping machines must soon be used in areas where communities and individuals are planting (especially pine), to show that a demand that includes mechanized equipment will be available when trees reach maturity. In addition future internal and export markets should be developed. There is no better incentive to farmers and other individuals and groups to plant trees than a growing market for their wood. This includes mechanized processing nearby and a price for raw material sufficiently high to allow the forest owner the expected profit.

B. Protective Forest and Watershed Management Activities

The project will finance delimitation and management planning of protective forest activities, which are oriented to the protection of major infrastructural investments such as irrigation and hydroelectric power systems. At the same time training will be provided to PNF and other agencies' personnel in order to improve PNF's capability for watershed and wildland areas management, and to expand the national parks and wildlands unit's currently limited capacity to implement protective forest delimitation and management planning activities.

It will also implement the pilot field demonstration in the Paute River watershed. The technical feasibility of these activities is evaluated below:

With regard to the Paute watershed field demonstration activity, the institutions concerned with the problem have recently formed an interinstitutional committee for watershed management under the leadership of INECEL, the Ecuadorian Electrification Institute. INERHI and CREA have also signed an agreement to work in the Paute watershed and have started with minor protection works such as check dams. With respect to soil conservation, INECEL has signed an agreement with INIAP (COMSA) which will jointly participate with PRONACOS in the soil conservation activities in the Paute Area.

1. The delimitation of areas which are or must be under protective forests, and development of management plans for those areas

The PNF Operational Plan for 1982 includes a large protective forest delimitation activity but this activity has not yet been implemented. An interdisciplinary group of professionals within the PNF structure must be formed which can delimit develop management plans for protective forests, selected watersheds and other economically important areas

The delimitation and management planning for protective forests is simple and straight forward provided that adequate land use capability information is available. The land capability maps which are required to delimit and develop management protection forests can be made based on information already available, in conjunction with aerial photointerpretation and field verification. The National Regionalization Program (PRONAREG) has a series of thematic maps for many areas of Ecuador and these can be completed as necessary to perform the activities. Two additional professionals will be added as a result of the project which will also provide funds for equipment and training. In addition, technical assistance will be provided to the parks and wildlands department staff in delimitation and management planning for protective forests.

2. Field Demonstration Activities

The recently created Interinstitutional Committee for Watershed management has chosen Paute as the most urgent case to be dealt with in watershed management. The activities to be implemented will try to establish an efficient set of methodologies and techniques for determining watershed management strategies and costs, and for execution of an integrated management plan of a watershed. In this context PNF will test through agreements with CREA, several methods of establishing vegetative covers such as tree planting, vegetation regrowth in protected (fenced) sites, revegetation with grasses, etc. A well kept record will be maintained of the results of each of these measures of development in order to establish costs and quantify the economic feasibility of these erosion control measures by subjecting the resulting data to a benefit/cost analysis.

The establishment of vegetative cover is not completely unknown as tree planting for conservation purposes has been previously carried out in Ecuador and the other methods are no difficult to apply from a technical point of view. Instead, a major function of these activities will be to test the social acceptance of the different forms of vegetative cover being used, given the conditions prevailing in the area (land tenure, minifundia, traditional attitudes, etc.)

The field demonstration activity will also implement a series of other erosion control measures which have been tested in Ecuador and other Latin American countries with similar topography. These measures will include, where appropriate, diversion ditches, contour plowing, grassed waterways, field borders, and terracing. The above measures have been applied in other sites in Ecuador and some of them are neither costly nor difficult to learn and apply by the rural people. Even the tools used can be easily made with simple technologies and materials found in the area.

The soil conservation component will be performed through the INECEL/INIAP agreement or with the participation of PRONACOS, being thus funded from other sources.

The demonstration activity will not include any major infrastructure works and only small check dams will be built when necessary to reduce siltation down river in the watersheds and some terracing will be used when the slope or other conditions require such conservation measures.

In sum, USAID concludes that the protective forest and related demonstration activities are technically feasible and appropriate because:

1. A major input in human resources will not be necessary as most of the delimitation work can be effectively done using the present human resources of PNF with few additional staff.

2. Some of the protective forest field demonstration activities have been tested in Ecuador and other are not technically difficult, although they will require continuous monitoring and recording of their evolution.

3. There will be adequate technical assistance provided to the PNF and other GOE agencies.

4. The proposed soil conservation demonstrations are not difficult to apply or costly, and several of them have been tested elsewhere in Ecuador and other Latin American countries.

ANNEX VII
Exhibit A.

ESTIMATED PROJECT DISBURSEMENTS BY CALENDAR YEAR

(US $1,000's)

	1983				1984				1985				1986				1987				TOTAL			
	Loan	Grant	G.O.	Total	Loan	Grant	G.O.	Total	Loan	Grant	G.O.	Total	Loan	Grant	G.O.	Total	Loan	Grant	G.O.	Total	Loan	Grant	G.O.	Total
I. Institutional Development	192	300	93	585	302	200	175	678	360	200	165	515	125	200	177	502	120		190	310	900	900	800	2,600
A. Technical Assistance		300		300		200		200		200		190		200		200						900		900
1. Long Term		(110)		(110)		(110)		(110)		(110)		(110)		(110)		(110)						(440)		
2. Short Term		(190)		(190)		(90)		(90)		(90)		(80)		(90)		(90)						(460)		
B. Training	95		35	130	120		45	165	70		25	95	65		25	90	50		20	70	400		150	550
1. Long Term	(40)		(15)	(55)	(60)		(20)	(80)													(100)		(35)	(135)
2. Short Term	(5)			(5)	(10)		(5)	(15)	(20)		(5)	(25)	(15)		(5)	(20)					(50)		(15)	(65)
3. Training Course	(50)		(20)	(70)	(50)		(20)	(70)	(50)		(20)	(70)	(50)		(20)	(70)	(50)		(20)	(70)	(250)		(100)	(350)
C. Equipment and Materials	60			60	110		50	160	30		50	(80)			50	50			50	50	200		200	400
D. Studies Cost	20		20	40	20		20	40	20		20	40	20		20	40	20		20	40	100		100	200
E. Additional Staff			30	30			30	30			30	(30)			30	30			30	30			150	150
F. Inflation	17		8	25	53		30	83	40		40	(80)	40		52	92	50		70	120	200		200	400
II. Productive Forestry Field	662	125	1.3	675	960	130	900	1,090	1,075	130	1,155	2,360	1,103	75	1,564	2,744	982		2,079	2,981	4,500	450	5,500	10,450
A. Technical Assistance	125	125		250	130	130		260	130	130		260	75	75		150					450	450		900
1. Long Term	(75)	(75)		(150)	(110)	(110)		(220)	(110)	(110)		(220)	(55)	(55)		(110)					(330)	(330)		(660)
2. Short Term	(50)	(50)		(100)	(20)	(20)		(40)	(20)	(20)		(40)	(20)	(20)		(40)					(120)	(120)		(240)
B. Equipment and Materials	90		10	100	60		75	135			80	80			80	80			80	80	150		325	475
C. Field Demonstration Activities	225.25		65.25	290.5	604		354	958	622.75		572.75	1,195.5	629		679	1,308	529		929	1,458	2,600		2,600	5,200
1. Source Plantations	(200)		(50)	(250)	(250)		(100)	(350)	(250)		(200)	(450)	(250)		(300)	(550)	(150)		(350)	(500)	(1,000)		(1,000)	(2,000)
2. Small Farm Plantations	(8.25)		(4.25)	(12.5)	(12.5)		(12.5)	(25)	(31.25)		(31.25)	(62.5)	(37.5)		(37.5)	(75)	(37.5)		(37.5)	(75)	(125)		(125)	(250)
3. Small Tropical Dwelling Plantations					(62.5)		(62.5)	(125)	(62.5)		(62.5)	(125)	(62.5)		(62.5)	(125)	(62.5)		(62.5)	(125)	(250)		(250)	(500)
4. Source Natural Regeneration	(1.25)		(1.25)	(2.5)	(1.25)		(1.25)	(2.5)	(1.25)		(1.25)	(2.5)	(1.25)		(1.25)	(2.5)	(1.25)		(1.25)	(2.5)	(5.25)		(6.25)	(12.5)
5. Small Farm Natural Regeneration	(3)		(3)	(6)	(3)		(3)	(6)	(3)		(3)	(6)	(3)		(3)	(6)	(3)		(3)	(6)	(15)		(15)	(30)
6. Small Tropical Natural Forest Management					(100)		(100)	(200)	(100)		(100)	(200)	(100)		(100)	(200)	(100)		(100)	(200)	(400)		(400)	(800)
7. Source on Farm Tree Planting	(2.25)		(2.25)	(4.5)	(2.25)		(2.25)	(4.5)	(2.25)		(2.25)	(4.5)	(2.25)		(2.25)	(4.5)	(2.25)		(2.25)	(4.5)	(11.25)		(11.25)	(22.5)
8. Small Scale on Farm Forestry					(7.5)		(7.5)	(15)	(7.5)		(7.5)	(15)	(7.5)		(7.5)	(15)	(7.5)		(7.5)	(15)			(30)	(60)
9. Small Tropical Agro-Forestry	(100)			(100)	(162.5)		(62.5)	(225)	(162.5)		(162.5)	(325)	(162.5)		(162.5)	(325)	(162.5)		(362.5)	(525)	(750)		(750)	(1,500)
10. Species Trials	(2.5)		(2.5)	(5)	(2.5)		(2.5)	(5)	(2.5)		(2.5)	(5)	(2.5)		(2.5)	(5)	(2.5)		(2.5)	(5)	(12.5)		(12.5)	(25)
D. Additional Staff			25	25			65	65			65	65			65	65			65	65			275	275
E. Inflation	40		10	50	106		106	272	267.25		237.25	504.5	324		642	966	323		705	1,028	1,100		1,500	2,600
F. Reserve for other demonstrations									75		200	275	75		200	275	50		300	350	200		800	1,000
III. Productive Forestry	130	200	50	330	145	140	280	565	160		160	320	175	10	180	365	190		190	380	800	250	900	1,950
A. Technical Assistance		100		100		140		140	20		10	30	20	10	10	40							250	250
B. Training					20		10	30			10	10			10	10	30		10	30	80		40	120
C. Equipment and Materials	70			70			10	10			10	10			10	10			10	10	70		40	110
D. Productive Forest Inventory and Field Demonstration Activities	50		50	100	100		150	250	100		50	150	100		50	150	100		50	150	450		350	800
E. Additional Staff			30	30			60	60			60	60			60	60			60	60			270	270
F. Inflation	10		10	20	25		50	75	40		30	70	55		50	105	70		60	130	200		200	400
SUBTOTAL	782	515	283	1,580	1,410	470	1,055	2,933	1,395	330	1,480	3,205	1,403	285	1,923	3,611	1,212		2,459	3,671	6,200	1,600	7,200	15,000
CONTINGENCIES	60		40	120	60		60	120	60		60	120	60		60	120	60		60	120	300		300	600
TOTAL	842	515	323	1,700	1,468	470	1,115	3,053	1,455	330	1,540	3,325	1,463	285	1,983	3,731	1,272		2,519	3,791	6,500	1,600	7,500	15,600

COST ESTIMATES FOR STUDIES COMPONENT

The following studies are proposed for financing under the project.

1.	Forest Industries Sector Analysis Up-date	
	1. Services of Local Consulting Firm (6 months)	$ 40,000
	2. PNF Personnel (part-time)	4,000
	3. Publication Costs	3,000
		$ 47,000
2.	Study of Financing Forest Sector Development in Ecuador.	
	1. Expert Consultant's Financial Aspects of Forestry Programs (2 pm)	$ 17,000
	2. PNF Counterpart	3,000
		$ 20,000
3.	Evaluation of Existing Forest Plantations in Ecuador	
	1. Contracted Forest Engineer (8 pm)	12,000
	2. 2 Contracted Forest Technicians	7,500
	3. PNF Counterpart (part-time)	3,000
	4. Data Processing	500
		$ 27,000
4.	Analysis of Forest Inventories	
	1. Contracted Forest Engineer (4 pm)	$ 6,000
	2. PNF Counterpart	6,000
	3. Data Analysis and Publication	3,000
		$ 15,000
5.	Mid-Project Evaluation (Principal Advisor and Other Consultants will also participate)*	
	1. Local Management consulting Firm (2 months)	$ 13,000
	2. PNF Counterpart	3,000
		$ 16,000
6.	Final Project Evaluation (Principal Advisor and Other Consultants will also participate)*	
	1. Contracted Evaluation Specialist (4 pm)	$ 35,000
	2. Local Management Consulting Firm (3 months.)	20,000
	3. PNF Counterpart	12,000
	4. Data Analysis	5,000
	5. Report Preparation and Printing	3,000
		$ 75,000

* Not included in this budget.

EQUIPMENT AND MATERIALS LIST

1. Component I: Institutional Development.

a.	Micro-Computer/Word Processor including software and programming.	$40,000
b.	Off-Set Press	10,000
c.	Printing Materials	10,000
d.	Pathology Laboratory Equipment	25,000
e.	Entomology Laboratory Equipment	15,000
f.	Seed Bank	50,000
g.	Imported Certified Seed	20,000
h.	Nursery Equipment	30,000

2. Component II. Productive Forestry Field Demostrations.

a.	Six pick-up trucks	90,000
b.	Small tools and Implements	60,000

3. Component III.

a.	Aerial Photographic Interpretation Equipment	45.000
b.	Mapping Equipment	25.000

TRAINING COSTS

1. Short Term Internal Training

Unit Costs

Local Instructors	$100/day
Per Diem	30/day
Materials Cost	10/participant per week
Course Development (equal to length of course)	100/day

a. Project Design (four weeks)

Instructors	$2,000
Per Diem x 15	10,000
Materials Costs	1,000
Curriculum Development	2,000
	15,000

b. Forestry Training (25 two week courses)

Instructors	$1,000
Per Diem x 25	7,500
Materials Cost	500
Curriculum Development	1,000
	10,000

10,000 x 25 = 250,000

2. Long Term Training (U.S. or Third Countries)

a.	Planning	1 year x $20,000 = 20,000
b.	Research	2 M.S. x $40,000 = 80,000
c.	Protective Forest Planning and Management	2 M.S. x $40,000 = 80,000

3. Short Term (U.S. or Third Countries)

a.	Forestry Statistics, including Data Management on Micro-Computer (3 months x $1,600/month).	$ 5,000
b.	Forestry Field Research Techniques ($2,500 x 1 month x 10)	25,000

STANDARDIZED COSTS
ESTIMATES FOR PRODUCTIVE FORESTRY PILOT FIELD DEMONSTRATIONS

1. Sierra Pine or Eucalyptus Plantation (cost per hectare)

a.	Preparatory Work (includes land titling and demarcation, promotion)	$25
	Site preparation	40
c.	Fencing	105
d.	Planting (labor tools and seedlings)	100
e.	Replanting	15
f.	Weeding	20
g.	Plantation Maintenance (100 x 20 years)	60
h.	Administrative Costs	50
		414

In addition to the basic planting cost other costs which may be incurred according to the specific situation include:

- additional site preparation for plantations on Cangahua soils

- hand labor	$250
- machine labor	450
- additional costs for pasture establishment	150
- additional costs for inter-cropping (potatoes)	450
- additional costs for closer planting	100
- additional costs for planting native species	50

This activities will be used in with the pine or eucalyptus plantations in approximately 35% of the Sierra plantations at an additional cost of approximately $250/hectare. This raises the average cost per hectare to $500/hectare.

2. Sierra On-Farm Forestry

It is assumed that a maximum of 20 percent of a farm plot will be dedicated to forestry. The estimated cost is 20 percent of the cost of a hectare of plantation forestry in the Sierra. Although certain direct costs are lowered or eliminated, this is offset by closer plantings, the use of native species and higher per hectare preparatory and administrative costs.

3. Sierra Natural Regeneration

Selected areas will be fenced separately. Fencing costs are calculated at $105 per hectare.

4. Arid Zone Plantations

(Same as Sierra plantations)

5. Arid Zone On-Farm

(Same as Sierra On-Farm)

6. Arid Zone Natural Regeneration

(Same as Sierra Natural Regeneration)

7. Humid Tropical Natural Forest Management (per 400 hectare plot)

a.	one Forest Engineer (1/2 time)	$3,500/year
b.	two Forest Technicians	$7,000/year
c.	four unskilled workers	$9,500/year
d.	twenty Contractors	15,000/year
		35,000/year
	$35,000 x 5 = $175,000	
e.	Materials and Equipment	20,000
f.	Other	5,000
		200,000

8. Humid Tropical Enrichment Plantations (per hectare)

a.	Sivicultural Inventory	$ 55
b.	Delimitation	10
c.	Pathways	35
d.	Opening of Lines	75
e.	Planting	65
f.	Seedling Cost	20
g.	Weeding	30
h.	Maintenance	170
i.	Administration	40
		$500

9. Humid Tropical Agro-Forestry (per hectare)

a.	Inventory	$ 35
b.	Delimitation	15
c.	Paths	35
d.	Site Preparation	80
e.	Tree Planting	35
f.	Seedling	10
g.	Crop Planting	425
h.	Weeding	125
i.	Maintenance and Harvest	60
j.	Administration (includes technical assistance to farmer)	715
		$1,500

COST ESTIMATES FOR PROTECTIVE FORESTRY ACTIVITIES

1. Protective Forest Delimitation (500,000 hectares)

a. Delimitation and Marking ($.30/hectare)	$ 150,000
b. Cooperative Agreements with CLIRSEN and PRONAREG for Specialized Services.	24,000
c. Contracted Personnel	
(1) 3 Surveyors (x 4 years)	48,000
(2) 6 Field assistants (x 4 years)	28,000
d. PNF staff contribution (excludes new staff included as project counterpart)	72,000
e. Materials and Supplies	8,000
f. Implementation for Protective Forest Management (INECEL and other Agencies)	130,000
	$ 450,000

2. Paute River Watershed Field Demonstration

a. Delimitation and Marking of 60,000 hectares	$ 18,000
b. Equipment and Materials	47,000
c. Protective Revegetation (100 hectares)	40,000
d. Natural Regeneration (100 hectares)	15,000
e. Field Monitoring of demonstrations	
(1) 1 civil engineer (4.5 years)	40,000
(2) 2 technicians (4.5 years)	40,000
f. PNF Staff time (excludes additional staff)	20,000
g. Implementation of related activities by GOE institutions.	130,000
	$ 350,000

ANALYSIS OF ECUADORIAN COUNTERPART CONTRIBUTION
(U.S. $1000's)

	PNF	Other Public	Private Sector	Communities
I. Institution Building				
A. Training	130	20		
B. Equipment and Materials	200			
C. Studies	60	20	20	
D. Staff	150			
E. Inflation	180	10	10	
Sub-total	720	50	30	
II. Productive Forestry Research and Pilot.				
A. Equipment and Materials	280	20	20	
B. Field Demonstration Activities.	985	510	970	990
1. Sierra Plantation	270	280	150	290
2. Sierra On-Farm and Natural Regeneration	105			70
3. Arid Zone Activities	50	30		50
4. Humid Tropical Enrichment Plantations	70	60	120	
5. Agro-Forestry	250	50		450
6. Natural Forest Management	240	80		80
7. Resource for Other Field Demonstrations	(50)		(700)	(50)
C. Additional Staff	275			
D. Inflation	700	250	1,000	450
Sub-Total	2,240	780	1,090	1,450
III. Protective Forestry				
1. Training	40			
2. Equipment and Materials	40			
3. Protective Forest Delimitation and Field Demonstrations Activities	275	75		
4. Additional Staff	70	200		
5. Inflation	105	95		
Sub-Total	530	370		
Total	3,490	1,200	1,120	1,450

DETAILED TIME-PHASED IMPLEMENTATION PLAN

ANNEX VIII
Exhibit "A"

1982 (III, IV) · 1983 (I, II, III, IV) · 1984 (I, II, III, IV) · 1985 (I, II, III, IV) · 1986 (I, II, III, IV) · 1987 (I, II, III, IV) · 1988 (I, II, III, IV)

II. Pre-Implementation Actions

- A. Project Authorization ---
- B. Project Agreement Negotiated and signed ---
- C. Identification of Candidates for Principal Adviser -----
- D. Initial Conditions Precedent Fulfilled ---

III. Institutional Development Activities

- A. Principal Adviser — contracted; On-Board
- B. Short-Term Technical Assistance — recruited and contracted; On-Board (See Annex VIII, Exhibit B)
- C. Long-Term
  - 1. Planning
  - 2. Research — Pathology; Entomology
- D. Short-Term Training
  - 1. Data Management and Statistics
  - 2. Field Research Design Methodology
  - 3. Project Design — 10
  - 4. Short Courses — 25 courses x 25 participants
- E. Equipment and Mater.
  - 1. Information Process. — Specif. Deliv. Installed
  - 2. Laboratory Equip. and Seed Bank — Specif. Delivery; Installed
  - 3. Nursery Equipment — Specif. Delivery; Installed
- F. Studies — Forest & Ind. Up-Date; Ev. of For. Plant's Mid Proj Ev.; Forest. Sect. Fin.; Proj. Evaluat. Analysis of For. Inv.
- G. Additional Staff — Recruited On-Board

III. Productive Forestry Field Demonstration Activities

- A. Technical Assistance
  - 1. Long-Term — Recruited & contr.; On-Board
  - 2. Short-Term — Recruited & contr.; On-Board (See Annex VIII, Exhibit B)
- B. Equipment and Materials — Specifications Delivery; In-Use
- C. Additional Staff — Recruited; On-Board
- D. Field Demonstrations
  - 1. Sierra Plantations — 300 has.; 700 has.; 900 has.; 1000 has.; 1000 has.
  - 2. Arid Zones Plant". — 25 has.; 50 has; 125 has.; 150 has.; 150 has.
  - 3. Humid Tropical Enrichment Plant". — 250 has.; 250 has.; 250 has.; 250 has.
  - 4. Sierra Natural Regeneration — 25 has.; 25 has.; 25 has.; 25 has.; 25 has.
  - 5. Arid Zone Natural Regeneration — 60 has.; 60 has.; 60 has.; 60 has; 60 has.
  - 6. Humid Tropical Natural Forest Manag. — 400 has.; 400 has.; 400 has.; 400 has.
  - 7. Sierra on Farm Planting — 45 has.; 45 has.; 45 has.; 45 has.; 45 has.
  - 8. Arid Zone on Farm Planting — 150 has.; 150 has.; 150 has.; 150 has.
  - 9. Humid Tropical Agro-Forestry — 66 has.; 150 has.; 217 has.; 217 has.; 350 has.
  - 10. Species Fruit — 20 trials; 20 trials; 20 trials; 20 trials; 20 trials
- E. Other Field Demonst.

IV. Productive Forestry

- A. Technical Assistance — See Annex VIII, Exhibit B
- B. Long-Term Training — T.W.S.; T.W.S.
- C. Equipment and Materials — Ordered; Delivered
- D. Additional Staff — Recruited; On-Board
- E. Productive Forest Delimitation — 60,000 has.; 100,000 has.; 150,000 has.; 150,000; 100,000 has.
- F. Paste Field Demonst. — Planned; Implemented; Evaluated

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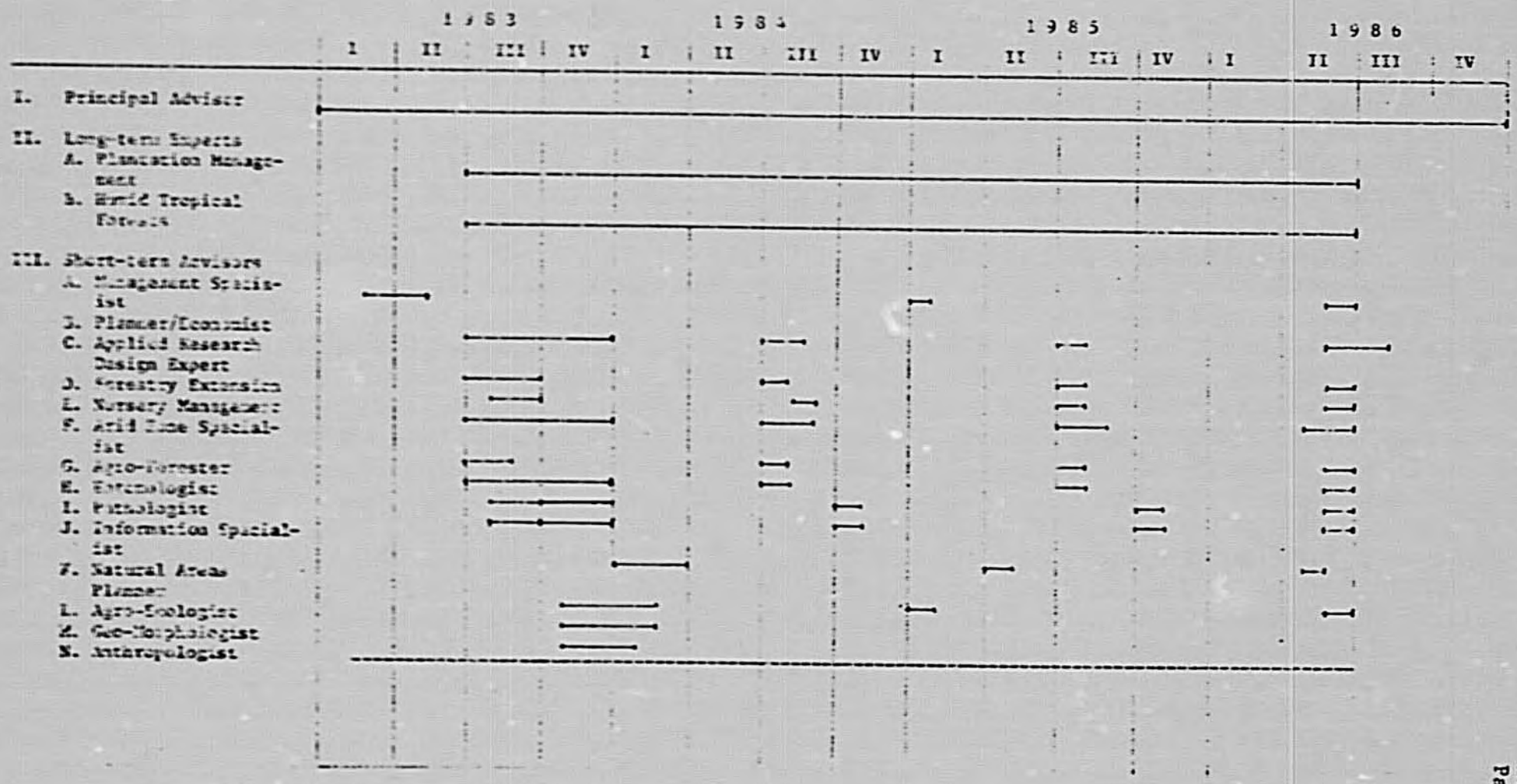
138

TECHNICAL ASSISTANCE SCHEDULE



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189

INSTITUTIONAL ANALYSIS

1. Organization and Staffing of National Forestry Program (PNF)

A major revision of the law governing the forestry sector was accomplished with the enactment of the "Forestry and Conservation of Natural Areas and Wildlife Law" (Ley Forestal y de Conservación de Areas Naturales y Vida Silvestre) on August 14, 1981. The law contains major chapters on such matters as: the National Forest Patrimony; Protective Forests and Vegetation; Private Forest Lands and Forests; Forest Plantations; Forest Production and Utilization; Control and Transport of Forest Products; Training and Forestry Research; Incentives (for private sector) Forest Protection; Forest Industries; Administration of the Patrimony of Natural Areas; Conservation of the Wild Flora and Fauna; Financing; and Infractions of the Law and their Judgement. It sets broad policies, authorities, and reponsibilities for the administration of programs in the subject matters areas.

In anticipation of this new, comprehensive law, the Natural Forestry Program (PNF) was established within the Ministry of Agriculture (MAG) through the issuance of its Functional Organizational Regulation on March 31, 1981. Previously, the GOE's forestry concerns were managed by a division level directorate within MAG. PNF is headed by an Executive Director who reports directly to the Subsecretary of MAG. The incumbent is a career professional (Ingeniero Agrónomo, with post graduate training in forestry outside of Ecuador) who previously headed MAG's forestry directorate. The Executive Director has an advisory committee composed of:

- the Subsecretary of MAG;
- a representative from the Ministry of Industry and Commerce;
- a representative of the Ecuadorean Institute of Water Resources(INERHI);
- a representative of the Ecuadorean Agrarian Reform and Colonization Institute (IERAC);
- the general manager of the National Development Bank;
- the president of the Wood Industrialists Association;
- the president of the Wood Artisans Association; and
- the president of the Nature Foundation, a local PVO concerned with the promotion of conservation.

Since it represents the broad spectrum of the various concerned parties of the forestry sector, the advisory committee can serve a useful communication and coordinating function. However, this committee has not yet met. To date, the PNF has lacked the capacity to develop the preplanned agendas and to carry out appropriate staff work necessary to make effective use of the committee.

This is also probably due to a lack of dialogue between PNF and the private sector, namely the industrialists or concession owners, who are not considered marginados, or rural poor, and are "supposed" to receive assistance

of MAG services. On the other hand, it is a general trend in Ecuador to demand much from the public services without cooperating with them. Nevertheless, based on conversations with both PNF officials and private sector representatives, there are strong indications of a new trend of cooperation which will be encouraged through the joint activities proposed in the project.

Below the Executive Director, the PNF is organized into three staff departments and a technical Directorate which supervises five operating departments and 20 District Offices (one in each province). The chart in Section IV-D of the Project Paper shows the overall organization and the staffing levels. Details on the staffing positions are included in pages 12-16 of this Annex. The headquarters staff amounts to 115 of which 30 are professional and 18 are technical (i.e., vocational high school level).

The Legal Department and the Administrative and Finance Department provide the Executive Director and other PNF staff with services regarding personnel, procurement, general services, disbursing, accounting, and records. They have a total of 18 staff members of which four are professional and five are technical. Matters such as personnel appointments and procurement actions must be carried out in accordance with prescribed GOE norms and procedures. Although it has recently been organized at the Program level, PNF's Administration and Finance Department is adequately staffed and some general experience exists to manage procurement of local and imported goods and materials envisaged under the project, including such aspects as import permits, customs clearances, and contracting for local services. Nevertheless, the GOE procurement system has certain "built-in" delays which must be anticipated as a part of the procurement process. For this reason, it is recommended that USAID assume responsibility for contracting dollar cost consulting and technical services as well as provide short term technical assistance to improve the administrative unit organization. The Legal Department provides guidance the the various departments as may be required. Currently, it has a major role in the preparation of the regulations for the new Forestry Law. It reviews any legally binding document, e.g., cooperative agreements. It is responsible for dealing with IERAC in land titling matters.

The Programming and Evaluation Department is a key staff unit which serves as the coordinating point for program development and financing and for evaluation of program implementation. It has responsibility also for the preparation of statistical data to serve as a basis for program planning, implementation, and evaluation purposes. A total of seven persons are assigned to this unit, of which three are professional and two are technical. A major effort of the Department is the development of annual operational plans. Although the Department is still in a formative state, it functions reasonably well and has a good potential for bringing to PNF more effective staff services in program managment. This Department will be the focus for a number of technical assistance and training activities under the project.

PNF's technical operations are grouped under a Technical Directorate staffed with one professional (the Technical Director) and three administrative/clerical personnel. The Technical Directorate is responsible for assuring that PNF programs are implemented. It takes a lead role in dealing with other Ecuadorian and international agencies such as FAO and A.I.D. and is responsible for negotiating convenios (cooperative agreements) with other institutions. Five technical departments based in Quito and 20 District Offices report to the Technical Directorate. The five technical departments and their functions are:

Industries and Marketing - promotes the development of forestry related industries with a view to satisfying national housing needs, increasing exports, and filling domestic demand for processed wood products. The wood technology laboratory was recently transferred to this Department. This Department is intended to be a service facility for the private sector. However, its relationship with the private sector is still limited. New procedures and approaches are needed in order to develop a more collaborative and supportive relationship. By drawing increasingly on the private sector, the PNF may even be able to effect personnel savings in this Department. Being the main information users, the private sector may play an important role in establishing within PNF a system of demand and supply statistics, for instance, a need that is strongly felt by both the public and private sector. Also, in this case the private sector representatives consulted by the project preparation team have indicated their willingness to support PNF's efforts to improve the Industries and Marketing Department performance.

Currently, this is the largest single Department with a total staff of 34 of which seven are professionals and five are technicians. The remainder, including 18 contracted staff are dedicated largely to prepare wood samples for the different mechanical or chemical treatments to be tested. The Department was expanded through an agreement with the JUNAC (Junta del Acuerdo de Cartagena), but needs to be improved.

Research and Training Department - undertakes forestry research, trains technical level forestry personnel, and is responsible for establishing a seed bank. FAO has provided past assistance to this Department in the development of its training program. Its dual role of research and training will facilitate the dissemination of research results to PNF's foresters and others. Because of the importance of the short term in-service training activities planned under the project, the Project Agreement will require PNF to appoint a fulltime training director. The training director will not only be responsible for organizing and administering the individual courses, but also for institutionalizing the in-service training process with PNF. To the extent practicable, the training will draw in other PNF professional staff for instructors. This department is also responsible for implementing the PNF's research program. This research program presently consists of about 40

ongoing species elimination and provenance trials on going administered by the PNF, but a strong need exists for other non-silvicultural research, in topics such as plant diseases, natural regeneration of forests, etc. At this time there is no effective service for the publication and dissemination of research results.

This department is the second largest within the Technical Directorate with a staff total of 29, including three professionals and four technicians. This total also includes 12 contract workers who work preparing training materials, in the room and board services, machinery maintenance of machines and seed bank nurseries. The research and training facilities are located in Conocoto, approximately a thirty minute drive from PNF's Quito headquarters. There are training facilities to accomodate 20 students. The PNF is also located at the Conocoto research facility. This department will be considerably strengthened by the project.

Forest Management - is responsible for the utilization of the productive forests. It prepares the national forest inventory, supervises the control of the movement of forest products, and recommends policies on the use of natural forests. The various field demonstration activities in the humid tropical forest will be developed jointly with the personnel of this department. Its headquarters staffing totals nine of which three are professionals and three are technicians.

Forestation develops the policies, programs and projects and technical standards of forestation or reforestation activities and oversees their execution at the field level including the operation of tree nurseries. It participates in the establishment of the production goals for each of the provinces. The project will work with this Department to improve the management and operation of PNF's tree nurseries. The Department has a staff of six, of which four are professionals.

Natural Areas and Wildlife - administers the national parks and natural areas, makes studies to identify and delimit protective forest areas, and is concerned with all aspects concerning the flora and fauna. Among the parks under its jurisdiction are those of the Galápagos Islands, Machalilla, and Cotopaxi. It has six staff members of which four are professionals and one is technical.

There are twenty District Offices, one in each of Ecuador's provinces. Prior to the enactment of the new organization for the National Forestry Program these offices were under the supervision of the Zonal Office of the Ministry of Agriculture (MAG). Under the present organization they report directly to the Technical Director of the Program in Quito. However, they continue to depend on MAG's Zonal Offices for administrative or financial management services, with support from PNF, Quito. The major activity under the District Office is the implementation of reforestation programs, for which, 16

District Offices operate nurseries for the production of seedlings. The actual planting activities are carried out in cooperation with community organizations, students, private owners and military conscripts of the Ministry of Defense. Some 56 percent of PNF's 1981 budget is allocated to reforestation activities. Current practices call for one of two types of agreements to be entered into for the specific plantings to be undertaken. The first concept provides for the PNF to make an agreed upon payment for the planting and a fifty-fifty sharing with the community group or individual of financial returns at such time as the wood is marketed. The second provides no payment for the planting and a 10 percent return to PNF and 90 percent to the community organization, at times of marketing, i.e., at least 15 years later.

Following the general policy of the Ministry of Agriculture,plantation projects with communities receive the highest priority at least in the Sierra. Other activities covered by the District Offices include the administration of parks or protected forest activities in their area, matters assigned relate to flora and fauna, and the control of forestry production and its commercial movement. Also, two of the District Offices (Pichincha and Esmeraldas) have small research operations for species testing and development. The total staffing of the district offices is 717, of which 566 are accounted for by non-career day wage workers engaged in field nursery activities. Of 151 regular PNF employees at the field level, 38 are professionals and 104 are technical.

2. Other Participating Entities.

a. Private Sector. Private sector groups will participate in project implementation through cooperative agreements with PNF. Under these agreements the PNF will provide technical resources to permit the participating party undertake a research and/or demonstration activity to develop a specific technology. Such arrangements are planned with the private association of wood product users and a private non profit forestry corporation supported by wood product industries. These corporations are encouraged under the new forestry law. Additional groups may be formed during or come to PNF's attention during project implementation and also participate. This type of cooperation between the PNF and the private sector will permit both data generation and information dissemination, that is oriented to the main user: the private sector.

The AIMA (Asociación Ecuatoriana de Industriales Madereros) is comprised of the large and medium size manufacturers of plywood, pressed particle board, furniture manufacturers and other wood users. They represent major industrial users of both tropical hardwoods and long-fiber species. It was founded in 1975 and presently has a considerable number of members. The association has financed studies in wood product demands. It has a small staff and office facilities located in Quito and employs a forestry consultant on a regular basis. Among its important roles AIMA is to function as a trade group to represent the wood products manufacturers interests.

The Corporación Forestal "Juan Manuel Durini" is a non profit foundation formed in 1980 with the objective of carrying out applied research and promoting community reforestation. It is currently involved in researching species development in the humid tropics of the northwest. They have developed some ideas on how to share the participation in research efforts with PNF.

b. EMDEFOR. As a mixed enterprise for forestry development, EMDEFOR is principally (95 percent) owned by the National Development Bank (BNF). The balance is owned by the Provincial Councils of Chimborazo and Azuay, the Economic Rehabilitation Center for Azuay (CREA), the Polytechnical School of Chimborazo (ESPOCH), and the Ecuadorean Populorum Progressio Fund. It was established in late 1980 to promote the planting of rapid growing species in the highlands (i.e., pine, and eucalyptus) for anticipated future needs for pulp, sawn lumbers and boards.

The highest authority of EMDEFOR is the Board of Shareholders which decides on the nominations of the President, General Manager, and others. It authorizes expenses higher than 20,000,000 sucres and decides any changes in the bylaws or to increase the capital. The Board of Directors can authorize expenses higher than 5,000,000 sucres, but less than twenty million; it reviews and approves reports submitted by the Manager; and it approves EMDEFOR annual budgets.

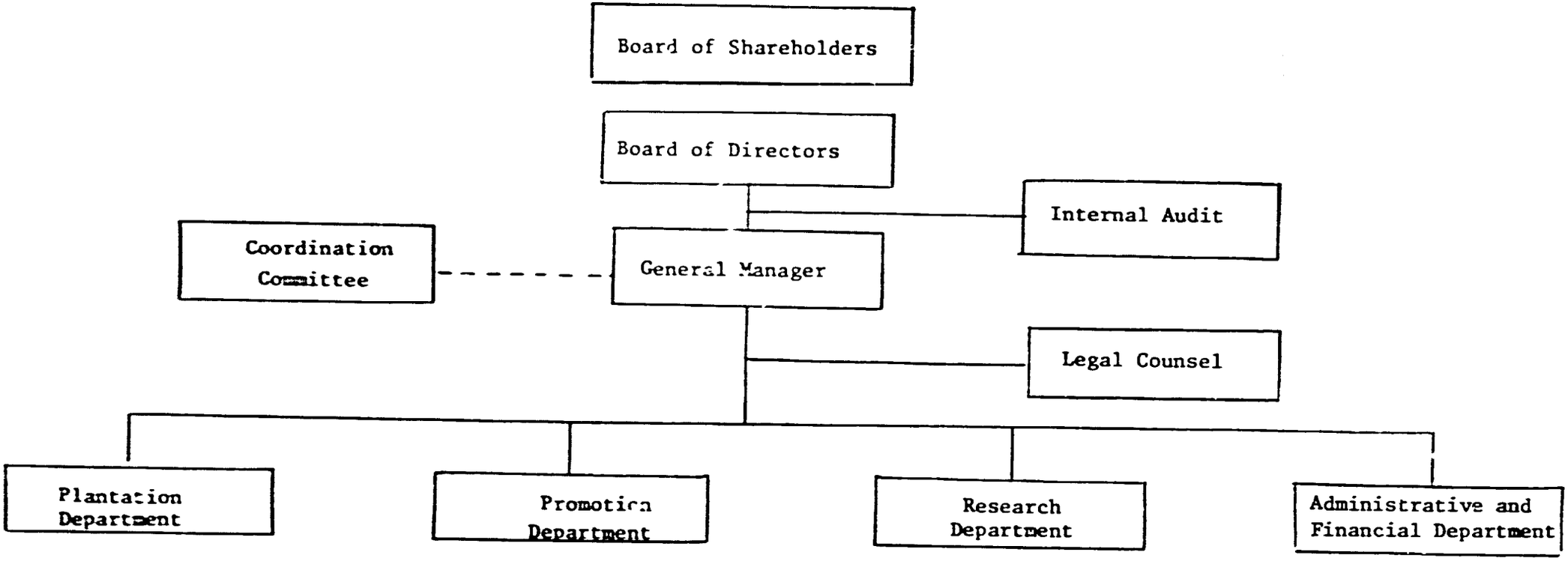
The President of the Board of Directors and the Manager are authorized to sign agreements, contracts, etc.

Chart I shows the overall organization of EMDEFOR. It has a total staff of 42, including 13 day-wage workers. Nine of these people are professionals and seven are technicians. EMDEFOR has four Departments: Promotion, Plantations, Research and the Administrative and Financial Unit.

The Promotion Department carries out the promotion of plantations in areas where people are interested in planting trees or which are considered of interest by EMDEFOR. It has responsibilities in forestry training for the rural people. It is the Department in charge of obtaining the agreements and compiling documentation for all contracts, which it prepares with the assistance of the Plantations Department and the Legal Advisor.

The Plantations Department is in charge of the nurseries and seedling production. After studying and defining the areas to be reforested, it implements and monitors the evolution of plantations. This department is also in charge of plant protection and it manages the nursery and plantations in general.

CHART 1


Board of Shareholders
Board of Directors
Internal Audit
Coordination Committee
General Manager
Legal Counsel
Plantation Department
Promotion Department
Research Department
Administrative and Financial Department

The Research Department plans, implements, evaluates and coordinates with other Departments, MAG, ESPOCH and others, the research activities that are considered of interest for EMDEFOR.

The Administrative and Financial Department provides services regarding personnel, administrative and financial functions, procurement, general services, etc.

The general procedure to establish plantations starts with the promoters' visits to interested campesino groups. The Promotion Department has prepared several slide shows with Spanish and Quichua scripts and uses the radio services of different stations to announce visits. The Promo- tion Department also prepares the necessary documents for the Legal Advisor and coordinates the preparation of contracts and with the Plantation Depart- ment, the organization of the work.

The Plantations Department then carries out, with the campesino group, the plantation and it is in charge of the monitoring and control of pests, diseases and other dangers.

EMDEFOR has signed agreements with PNF, CREA and ESPOCH for different purposes. A specific agreement will be signed with PNF as part of this project for reforestation with pines in about 1500 hectares. including 500 where some species trials will be tested as well as agro-and on-farm forestry combinations.

EMDEFOR has shown itself as a very active and dynamic institution. During 1981, the Promotion Department signed agreements with communities to reforest 6,126 hectares of which plantations have been established in 2.857 hectares. (78% in Chimborazo, 20% in Bol§var and 2% in Tungurahua provinces).

The general economic situation of Ecuador has also affected EMDEFOR and this enterprise is looking for funding from several sources. It has requested a loan to IDB but other priorities determined by the GOE have delayed the submission of this request until 1983. The project, as mentioned, will finance part of EMDEFOR's plantations and on-farm forestry activities through the agreement with PNF. On the other side, training offered is also open to EMDEFOR professionals and technicians and some of the technical assistance will also benefit EMDEFOR.

c. Rural and Regional Development Agencies.

The Integrated Rural Development Secretariat (SEDRI) was legally established in late 1980 to plan and coordinate the implementation of 17 area specific projects listed in the GOE's five year development plan. The areas involve some 700,000 rural poor and are distributed throughout Ecuador. In

addition to A.I.D. assistance for the IRD projects of Salcedo and Qu§miag-Penipe in Chimborazo Province and Jipijapa in Manab§ Province, IDB and IBRD are financing the implementation of other selected IRD projects. Also, FAO, OAS, and IICA are providing technical assistance for some of the IRD Projects still in the study stage. The GOE's IRD program represents its single most significant effort in rural development. SEDRI is a part of the GOE's Office of the President.

Its headquarters staff consists of approximately 25 professionals from varying disciplines. Its field offices are staffed by individuals on loan from the different line Ministeries or other technical agencies. SEDRI functions through operating agreements signed with various collaborating public and private organizations. SEDRI focuses on campesino organization and participation in making better use of natural resources and the productive infrastructure and services offered by the various GOE ministries and technical entities. SEDRI also administers the national IRD fund, FONADRI, for financing investments and operations at the field level. FONADRI has only recently become operational.

Forestry and reforestation activities are essential elements of most of the IRD projects. Many of the field demonstrations planned by PNF under the project will be carried out in conjunction with SEDRI. The two entities will enter into agreements in which PNF will provide technical assistance, and seedlings, and the SEDRI mechanism will provide extensionists to work with individual communities within an overall IRD context.

In addition to SEDRI, there are a five regional rural development organizations that receive GOE financing (and in some cases international aid) and are interested in expanding their forestry activities. These are:

CEDEGE - Studies Commission for the Development of the Guayas Basin.

CREA - Center for the Economic Rehabilitation of Azuay, Ca]ar, and Morona.

CRM - Center for the Rehabilitation of Manabi.

INCRAE - National Institute for the Colonization of the Amazon Region.

PREDESUR - Regional Program for the Development of Ecuador's South.

Most of these have some kind of large investment in infrastructure works (either hydroelectric generation or irrigation systems, or both) which need to be protected. Some have reforestation or plantation programs which must be encouraged.

These organizations operate with varying degrees of efficiency, but all are quite dedicated to promoting appropriate resource development models for their respective regions. All offer detailed knowledge of their

respective regions and represent potential mechanisms for disseminating PNF technology and research results. PNF will enter into agreements with INIAP (IDAPA RTTS subproject) to work in Napo Province for carrying out applied research and demonstrations in humid tropical forestry, with the Industria Forestal Cayapas to carry out similar activities in Esmeraldas province, (among other institutions) for protective forestry activities in the Paute watershed. Other agreements may possibly be implemented with CEDEGE or CRM for Caribbean pine species trials. These organizations will also be principal users of the technology information generated by the PNF.

3. Institutional Feasibility

The new forestry law, which stimulated the rise in PNF's status from a Directorate to a National Program, provides an ample mandate for PNF's future development. The project will lead to certain institutional evolution that will strengthen PNF's relationships with its clients and potential clients. These changes in operational approach almost certainly will have to be reflected eventually in modifications to the operating regulations. However, the current law is quite adequate and consistent with the change towards a service orientation sought by this project.

The improved degree of autonomy PNF has as a National level Program will provide it with a better capacity for making decisions and taking the actions necessary to implement the project. However, future institutional development beyond the gradual changes envisaged under this project may prove to require even greater autonomy, such as found in the several semiautonomous institutes (e.g., INIAP, INERHI, etc.) attached to MAG. From time to time during project implementation USAID together with the PASA advisor will review with appropriate GOE officials the continuing adequacy of PNF's institutional structure as its responsibilities and functions evolve.

PNF's current organizational plan and staff levels are essentially adequate for project needs, although some minor staff adjustments and increments will be necessary. The project provides for the addition of fifteen new positions in PNF's structure. Eight professionals and seven technicians are envisaged who will have specific responsibilities not included in the current PNF program. Of these, four professionals will work in research, training and information management;two forest engineers and seven technicians will assist in field demonstrations activities; and two professionals will work full time in the delimitation and management planning of protective forests. These are considered necessary additions to PNF's personnel and represent less than 10 percent of the present professional and technical staff.

Ecuador's recent devaluation further clouds the economic forecast for the country. Indications are that the GOE will have to increase its current austerity measures. All efforts will be made during Project Agreement negotiations and implementation to insist that GOE funding for the new positions

will be assured. Nevertheless, the project agreement will have enough flexibility to authorize the use of up to $100,000 of the unprogrammed contingency in loan funds to assist in covering the costs of new PNF personnel on a declining scale.

Changes in the overall organization and increases in staffing positions are minimal because PNF will expand its operations largely by working through other institutions, and by reassigning functions of its personnel to provide support services to these institutions. By improving PNF's capacity to provide services valued by its clients, its organizational capacity as a development institution will be strengthened. As described in the preceeding section, there are a number of clients and potential clients at the community level that need PNF's services.

Training and research will be key elements in reshaping PNF's institutional style. Although PNF has good physical facilities for training and research in Conocoto, it has not institutionalized an in-service training capacity nor has it fully utilized the installed research facilities. The project will insist in the assignment of a full-time training director to administer all training. In service short-term training for members from the technical de- partments will be emphasized.

The range and depth of PNF's research will be expanded significantly by working through other participating entities. Even when a specific research activity is expected to focus narrowly on a technical concern, a broader learning experience concerning overall acceptability and appropriateness is likely to occur since the participating entity usually will be working closely with a campesino community. The results of these efforts will be fed back into PNF's programming and training processes. Thus, the project will help to establish an institutional learning capacity.

PNF PERSONNEL HEADQUARTERS OFFICES

	Appointment					Daily Wage			
	Prof.	Tec.	Adm.	Serv.	Sub	Skilled	Unsk.	Sub-total	Total
Executive Direction	1		1		2	1		1	3
Technical Direction	1		1	1	3				3
Legal Advisor	2		1	1	4				4
Programming and Evaluation	3	2	1	1	7				7
Administration-Financial.	2	3	5	2	12		2		14
Forestation	4		1	1	6				6
Forest Operation	3	3	1	1	8	1			9
Natural Areas	4	1	1		6				6
Industries	3	1	1		5				5
Research & Training	3	4	5	5	17	7	5		29
Wood Technology	4	4		3	11	11	7		29
TOTAL	30	18	15	81					115

DISTRIBUTION OF PERSONNEL OF THE NATIONAL FORESTRY PROGRAM
DISTRICT OFFICES

Province	Sub-Program	Appointment					Daily Wage	
		Prof.	Tec.	Adm.	Service	Sub total	Sub-total	Total.
Carchi	Forestation	1	3			4	26	30
	Operation		1			1		1
Sub-total		1	4			5	26	31
Imbabura	Forestation	1	3			4	20	24
	Operation		2			2	2	4
	Natural Areas	1	1			2	4	6
Sub-total		2	6			8	26	34
Pichincha	Forestation	2	5	1		8	67	75
	Operation	1	8			9	7	16
	Natural Areas	1	2			3	9	12
	Research		1			1		1
Subtotal		4	16	1		21	83	104
Cotopaxi	Forestry	1	3			4	56	60
	Operation	1	1			2	1	3
	Natural Areas	2			1	3	13	16
Sub-total		4	4		1	9	70	79
Tungurahua	Forestation	1	3			4	16	20
Sub-total		1	3			4	16	20
Chimborazo	Forestation	2	4			6	33	39
	Natural Areas		4			4	11	15
Sub-total		2	8			10	44	54

Province	Sub-Program	Appointment					Daily Wage	
		Prof.	Tec.	Adm.	Service	Sub-total	Sub-total	Total
Bolivar	Forestation	1	2			3	8	11
Sub-total		1	2			3	8	11
Cajar	Forestation	1	1			1		1
Sub-total		1	1			1		1
Azuay	Forestation	1	3			4	10	14
	Natural Areas	1	2			3	6	9
	Operation						6	6
Sub-total		2	5			7	22	29
Loja	Forestation	1	1			2	34	36
	Operation	1				1	8	9
Sub-total		2	1			3	42	45
Esmeraldas	Forestation		2			2	12	14
	Operation	4	8	1	4	17	14	31
	Natural Areas	1	1		1	3	3	6
	Research		1			1	22	23
Sub-total		5	12	1	5	23	51	74
Manabí	Forestation	2	3			5	10	15
	Operation		5			5	6	11
	Natural Areas	1	2			3	5	8
Sub-total		3	10			13	21	34
Guayas	Forestation	2	3			5	37	42
	Operation		2			2	13	15
	Natural Areas	1	2			3	4	7
Sub-total		3	7			10	54	64

Province	Sub-Program	Prof.	Tec.	Adm.	Service	Sub-total	Daily Wage Sub-total	Total
Los Ríos	Forestation		1			1	13	14
	Operation	1	1			2	1	3
Sub-total		1	2			3	14	17
El Oro	Forestation	1	1			2	12	14
	Operation	1	4			5	8	13
Sub-total		2	5			7	20	27
Galápagos	Natural Areas	2	6	1		9	51	60
Sub-total		2	6	1		9	51	60
Napo	Forestation						7	7
	Operation	1	3			4	2	6
	Natural Areas	1	4			5	4	9
Sub-total		2	7			9	13	22
Pastaza	Operation		1			1	1	2
	Natural Areas		1			1	2	3
Sub-total			2			2	3	5
Morona	Natural Areas		1			1		1
Sub-total			1			1		1
Zamora	Operation	1	2			3	2	5
Sub-total		1	2			3	2	5

District Offices

	Prof.	Tec.	Adm.	Service	Sub-total	Daily Wage	Total
Totals	38	104	3	6	151	566	717

District and Headquarters.

Totals	68	122	21	21	232	600	832

District Offices.

Totals by Sub-Program	Prof.	Tec.	Adm.	Service	Sub-total		
Forestry	16	38	1		55	360	415
Operation	11	38	1	4	54	71	125
Natural Areas	11	26	1	2	40	112	152
Research		2			2	33	25
Totals	38	104	3	6	151	566	717

Source of Data: Operational Plan 1982.

Province	Sub-Program	Prof.	Tec.	Adm.	Service	Sub-total	Daily Wage Sub-total	Total
Los Ríos	Forestation		1			1	13	14
	Operation	1	1			2	1	3
Sub-total		1	2			3	14	17
El Oro	Forestation	1	1			2	12	14
	Operation	1	4			5	8	13
Sub-total		2	5			7	20	27
Galápagos	Natural Areas	2	6	1		9	51	60
Sub-total		2	6	1		9	51	60
Napo	Forestation						7	7
	Operation	1	3			4	2	6
	Natural Areas	1	4			5	4	9
Sub-total		2	7			9	13	22
Pastaza	Operation		1			1	1	2
	Natural Areas		1			1	2	3
Sub-total			2			2	3	5
Morona	Natural Areas		1			1		1
Sub-total			1			1		1
Zamora	Operation	1	2			3	2	5
Sub-total		1	2			3	2	5

District Offices

	Prof.	Tec.	Adm.	Service	Sub-total	Daily Wage	Total
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Natural Areas	11	26	1	2	40	112	152
Research		2			2	33	25
Totals	38	104	3	6	151	566	717

Source of Data: Operational Plan 1982.

LAC/DR-IEE-82-25

ENVIRONMENTAL THRESHOLD DECISION

Project Location	:	Ecuador
Project Title and Number	:	Forestry/Natural Resource Management 518-0023
Funding	:	$6,000,000 Loan; $1,500,000 Grant
Life of Project	:	5 years
IEE Prepared by	:	David Senger, USAID/Quito
Recommended Threshold Decision	:	Negative Determination
Bureau Threshold Decision	:	Concurrence with recommendation
Action	:	Copy to John Sanbrailo, Director USAID/Quito
	:	Copy to David Senger, USAID/Quito
	:	Copy to Karen Peake, LAC/DR
	:	Copy to IEE file

Date

James S. Hester
Environmental Officer
Bureau for Latin America
and the Caribbean

Best Available Document

INITIAL ENVIRONMENTAL EXAMINATION

Project Location:	Ecuador
Project Title:	Forestry/Natural Resource Management (518-0023)
Funding:	FY: 1981: Loan $6 million, Grant $1.5 million
IEE Prepared by:	David M. Songer, Rural Development Assistant, November 6, 1980
Recommended Threshold Decision:	The USAID Project Committee has undertaken a complete Initial Environmental Examination of the potential impacts of the proposed Project and has arrived at a recommendation for a Negative Determination. (See section entitled "Examination of Nature, Scope, and Magnitude of Environmental Impacts" and the "Threshold Decision Recommendation" subsection thereunder).

Mission Director's Concurrence:

John A. Sanbrailo
Representative
USAID/Ecuador

Examination of Nature, Scope, and Magnitude of Environmental Impacts
Description of Project

The Project is in furtherance of USAID's sector goal to begin a sustainable process of forestry/natural resource management that will benefit Ecuador's rural poor through increased income, employment, and improved quality of life. The Project will establish and support institutional cooperation and coordination aimed at achieving the sector goal. Project activities will include institutional strengthening, forestation, soil conservation, improved agricultural practices, and the involvement of campesino organizations.

This Project will be implemented at the national level through National Development Council (CONADE) under the auspices of the office of the Vice-President. Through the Project USAID will provide technical assistance, training, and some hardware for the establishment and coordination of the GOE's natural resource management activities.

Under the Project selected areas of the central Sierra and the coastal province of Manabí will be reforested. In areas deemed not appropriate for forest cover, alternative types of ground cover will be experimented with and established. Small farmers in the Project areas will be exposed to conservation-conscious cultivation practices.

Discussion of Environmental Impacts

Many of the Project activities will have no environmental impact. These fall primarily into the institution building and training category. The activities that can be expected to have environmental impact, such as reforestation and soils work, will have a net positive effect.

One of the Project activities will be experimentation with various tree and ground cover species. To the extent that new species are introduced, it is possible to also introduce new pests and plant diseases. It is expected that the research conducted on new species will take this factor into consideration and, therefore it will not become a major problem. The Project will also seek to establish plantation forestry operations over large areas. The primary species under consideration for this are pine and eucalyptus. Although pine and eucalyptus, are not native to Ecuador, neither are they recent introductions. There have not been major disease or pest problems with either pine or eucalyptus thus far. Neither species, however, has been planted in large concentration at lower altitudes, and it is possible that the grouping of a single species over hundreds of contiguous hectares will create an environment for pests and diseases that heretofore did not exist. If this is the case, then the possibility of the field use of pesticides will exist. In any case, even with the considered use of pesticides, it is felt that the net environmental impact of the plantations will be positive.

Another possibility is that the existence of forest plantations will contribute road construction. It is not felt, however, that this will have a negative environmental impact because roads already exist in all these areas.

Therefore the most likely course of action will be road improvement (surfacing, leveling, etc.), rather than clearing of new land for initial construction.

The Project will also sponsor work with small farmers on soils management. This will take the form of demonstration sites showing the advantages of such techniques as contour plowing. These techniques, when adopted, will reduce soil erosion, stream and river siltation, and watershed degradation, and therefore will have a positive environmental impact.

Threshold Decision Recommendation

After analyzing the various areas of potential environmental impact and considering the nature of the Project, USAID concludes that in those areas where impact is expected under the Project, such impact will likely either be positive or will have a net positive impact, USAID therefore recommends a Negative Determination.

IMPACT IDENTIFICATION AND EVALUATION FORM

Impact Areas and Sub-areas	Impact Identification and Evaluation *
A. LAND USE	
1. Changing the character of the land through:	
a. Increasing the population	N
b. Extracting natural resources	L +
c. Land clearing	N
d. Changing soil character	M +
2. Altering natural defenses	M +
3. Foreclosing important uses	N
4. Jeopardizing man or his works	N
5. Other factors	
. . . . .	
. . . . .	
B. WATER QUALITY	
1. Physical state of water	M +
2. Chemical and biological states	N
3. Ecological balance	L +
4. Other factors	
. . . . .	
. . . . .	

* The following symbols are used:
N - No environmental impact
L - Little environmental impact
M - Moderate environmental impact
H - High environmental impact
U - Unknown environmental impact

IMPACT IDENTIFICATION AND EVALUATION FORM

C. ATMOSPHERIC

1 Air additives . . . . . N

2. Air pollution . . . . . N

3. Noise pollution. . . . . N

4. Other factors

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D. NATURAL RESOURCES

1. Diversion, altered use of water . . . . . N

2. Irreversible, inefficient, commitments . . . . . N

3. Other factors

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E. CULTURAL

1. Altering physical symbols . . . . . N

2. Dilution of cultural traditions . . . . . N

3. Other factors

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F. SOCIOECONOMIC

1. Changes in economic/employment patterns . . . . . N +

2. Change in population . . . . . N

3. Changes in cultural patterns . . . . . N

4. Other factors

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IMPACT IDENTIFICATION AND EVALUATION FORM

G. HEALTH

1. Changing a natural environment . . . . . M +
2. Eliminating an ecosystem element . . . . . N
3. Other factors

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H. GENERAL

1. International impacts . . . . . N
2. Controversial impacts . . . . . N
3. Larger program impacts . . . . . M +
4. Other factors

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I. OTHER POSSIBLE IMPACTS (not listed above)

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See attached "Examination of Nature, Scope, and Magnitude of Environmental Impacts."