EVALUATION OF THE NATURAL RESOURCE CONSERVATION PROJECT

LOAN No. 515-T-032

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CONTENTS

EXECUTIVE SUMMARY

The Costa Rica Natural Resources Project emerged out of the concern of the GOCR and the USAID Mission to fully utilize the renewable resources without further degradation of the resource base. To this end, a strategy was outlined to strengthen the capabilities of the GOCR to develop through an integrated, pragmatic approach, a long-term plan that should leave the GOCR in a position to cope with the deterioration of the natural resource base and be able to move forward with a strong nationwide program for its utilization, conservation and management in the mid 1980's. The project was designed to operate through five major components: Policy Analysis, Research and Coordination; Experimental Projects; Preparation of Management Plans; Environmental and Conservation Education; and Training and Technical Assistance.

The Project was approved by USAID and signed by the President of Costa Rica in the fall of 1979, but was not ratified by the Legislative Assembly until March 1981. As a consequence, only some 25% of the alloted funds have been utilized. Implementation was hampered by too many delays in contracting vital technical assistance, turnover of personnel, intricate GOCR administrative procedures, credit regulations, lack of experienced technical personnel and other constraints.

Consequently, Project performance and achievements have been below expectations.

The Project is currently under a competent, dynamic leadership and considerable progress has been achieved.

The evaluation team strongly recommends that Project implementation continues for at least the remainder of Project life, through September 1985. The main reason being that GOCR badly needs to gain experience in implementing a comprehensive approach to strengthen institutional mechanisms and strategies through which natural resources are managed. Project 032 provides an excellent opportunity. Equally important is that all major ingredients are now in place as: a) the existence of a highly motivated director of CORENA, b) the signing of the two main technical assistance contracts that are instrumental to the successful implementation of the Project, c) having now secured badly needed ounterpart funds that before caused many delays.

The evaluation team feels that if the recommendations made are adopted there is a good chance that by the end of Project life, enough experience will have been gained to permit making a rational decision relating to the future of this Project.

I. INTRODUCTION

The design of the Costa Rica Natural Resources Conservation Project began in 1978 with inputs from members of various government agencies forming a team identified as the National Work Group. The purpose was to develop a nation-wide long-term plan for the appropriate use, development and conservation of natural resources. A proposal was then prepared and submitted to the consideration of USAID/Costa Rica. With this as a starting point a Project Paper was prepared and approved by AID/Washington on August 15, 1979. After the corresponding Agreement was signed on September 1979 with the GOCR, the Legislative Assembly did not ratify it until as late as March 1981. Loan funds were appropriated in the amount of $9.8 million. In addition, the GOCR was committed to provide $11.2 million as counterpart. This was reduced to $5.8 million in June 1981 by mutual agreement between USAID and the GOCR due to GOCR's fiscal difficulties. The local funds became available in September 1982 and provided with local currency through P.L.480 funds. As of October 1983, CORENA has spent or encumbered 31% of the USAID Loan and 22% of the corresponding GOCR allotment. The Project is due to terminate on September 13, 1985 unless otherwise agreed by both USAID/Costa Rica and the GOCR.

In the original design, two in-depth evaluations were scheduled: one in July 1982 and one at the termination of the Project in July 1984. Joint annual evaluations were scheduled for July 1981 and July 1983.

This report presents the results of the first in-depth evaluation which was conducted in October 1983 by a 4-person team under contract with Servicios Técnicos del Caribe. The team included Mr. Pedro Negrón-Ramos, former Secretary of Natural Resources of the Commonwealth of Puerto Rico and himself a specialist in Natural Resource Economics and Management; Dr. Humberto Sosa, an experienced agricultural economist and planner; Dr. José Villarrubia Cruz, specialist in forest resource management; and Dr. Miguel A. Lugo-López, an experienced soil scientist and tropical agronomist. The team stayed for about 20 work days in Costa Rica, except Pedro Negrón, who dedicated around 13 days in three visits. A close relationship with MAG was achieved during the evaluation.

II. BACKGROUND

The main purpose of the Project is to strengthen the institutional capabilities and mechanisms through which the GOCR manages the nation's renewable resources. In the process of preparing and reviewing the Project, weaknesses and potential problems where identified especially concerning the institutional arrangements and capabilities. These institutional problems and weaknesses are precisely what the Project intends to correct. The 5-year Project was set up to finance research, gathering data, planning educational and promotional programs, training, and pilot management activities that should leave the GOCR in position to cope with the deterioration of the natural resource base and move forward with a program of natural resource utilization, conservation and management in the mid-1980's.

Over the years, the GOCR has almost exclusively assumed responsibility concerning the utilization and conservation of renewable natural resources. Present GOCR policies tend to actively involve the private sector and the general public in these matters. Currently, MAG has shown increased interest in supporting DGF whose strategies have been defined and priorities identified. DGF has direct nation-wide responsibilities for natural resource utilization and conservation. To implement the policies and activities set forth in the Project Paper, CORENA was created. CORENA was originally attached to the DGF under the leadership of a Coordinator. In 1981, a Director was appointed as executive officer of CORENA. Most of 1981, since ratification by the Legislative Assembly, was spent in the planning process. Almost all the personnel of the DGF was assigned to work on the Project. When the local funds became available - 1982 - new appointments were made. Currently 107 persons are assigned to CORENA, including both, those newly contracted and regular MAG employees. With the 1982 change in government, the Deputy Director of DGF became simultaneously the Director of CORENA. Currently, he is on leave from DGF, working on a full time basis handling CORENA affairs and responding directly to the Minister of Agriculture.

Project components are the following:

Policy Analysis, Research and Coordination

This component was originally set up to analyze the effects of legal, political, financial and socio-economic policies and activities on the utilization and management of natural resources and to conduct research which would permit the shaping of a policy framework more favorable to productive utilization and coordination of the resource base. Due to its coordinating role, it has eventually evolved into the unit that provides leadership, direction and coordination to the Project.

Experimental Projects

This component was designed to build experience in managing on-the-ground programs and test and apply workable financial incentives and new management practices for bringing about land-use changes on private farms. As it now stands, it includes:

1. Forest Production
2. Reforestation and Pasture Management, and
3. Management of a Microwatershed

Preparation of Management Plans

This component was designed to develop natural resource management plans for optimum land use and examine the overall feasibility of different alternatives on three key watersheds.

Environmental and Conservation Education

This component was designed to increase public awareness on the value of natural resources and the importance of conservation measures in the Braulio Carrillo National Park near San José.

Training and Technical Assistance

The objectives of this component include upgrading of human resources through workshops, seminars, in-service training in foreign countries, and post graduate studies in critical areas. It includes considerable technical assistance -- approximately 241 person months.

III. EVALUATION OBJECTIVES

The major objectives of the evaluation study were to:

1. Undertake a comprehensive review of the Project, including an assessment of the efectiveness of the various components and activities;

2. Review the management processes and procedures being applied in the implementation of the Project;

3. Make recommendations concerning those elements of the original Project design which should be continued under the current and any future natural resources project of this type as well as those elements which should be revised or deleted entirely.

The scope of work of the evaluation team included the following aspects:

1. Evaluate progress achieved toward established Project objectives by components.

2. Determine barriers to achievement of these objectives.

3. Assess the overall management of the Project. Specifically, the team was asked to review, evaluate and document efforts to date regarding:

   (a) Preparation of annual implementation plans;

   (b) Management of the various components;

   (c) Overall coordination and support provided to the Project by the Dirección General Forestal (DGF);

(d) Utilization of technical assistance; and

(e) Coordinating Unit's management role.

4. Provide USAID/Costa Rica with recommendations, where appropriate, for improving Project effectiveness and implementation activities.

5. Review the original Natural Resources Conservation strategy as described in the Project Paper and appraise the current validity of the design approach.

6. Review and determine, if the technical and administrative organization and procedures being used in the implementation of the Project are adequate and compatible with the Project design.

In analyzing the effectiveness of MAG in carrying out individual Project activities for which it is responsible as well as ascertaining MAG's absorptive capacity for managing Project resources indicators of Project performance will be used. These performance indicators include:

1. The degree to which loan-funded technical assistance has an impact on achieving Project objectives;

2. Effectiveness in developing Project work plans;

3. Program budgeting;

4. Institutional capabilities relative to Project monitoring; and

5. Degree of impact that institutional staff training has had on the loan Project as well as on long-term institutional capabilities for developing and implementing problems directed to the conservation of natural resources.

A review of these objectives indicated the necessity of the evaluation team to examine past and current Project performance as well as anticipated future objectives of this type. This evaluation purports to provide both a critical analysis of Project activities to date and a basis for using this experience to plan future programs on natural resource utilizaton, management and conservation.

IV. METHODOLOGY

The initial step in the preparation for the evaluation was for the team members to clarify its objectives and obtain a general briefing on the background and status of the Project from the USAID/Costa Rica staff and the Director of the Natural Resources Conservation Project. After studying the Project Paper and other basic documents, a work plan for the evaluation was prepared and submitted to AID.

Since there is concern about the slow implementation pace of the Project, special efforts were made to determine its causes. Also, since this is a mid-point, and not an end evaluation, emphasis was given to the determination of the weak implementation aspects that could be corrected during the second half of the Project.

The Project's staff had prepared a document containing important information on Project implementation so far and problems encountered. This document was made available to the evaluation team and was of considerable help in rapidly grasping current situation. A thorough analysis was also made of other documents dealing with different aspects of the Project. They included plans of work, reports, results of studies made in the different components, manuals on operating procedures, budgets, financial statements, and others.

The evaluation team was briefed by the Director of the Project and each one of the component coordinators, on the progress made and the problems encountered during the life of the Project. Interviews were made also of key officials of the different agencies that participate, in one way or another, in the implementation of the Project.

On-site visits were made by team members to each one of the areas in which work is being done. Beside observing the field work, the team members had the opportunity to interview field personnel and some of the beneficiaries.

Subjective appraisals were also made on the quality of the job done and its adequacy to attain the objectives of the Project.

V. INDIVIDUAL PROJECT COMPONENTS

A. Coordination, Policy and Research

1. Coordination

The objective of this Subcomponent is to coordinate Project's activities and perform all administrative and management functions.

The progress made toward attainment of objectives can be summarized as follows:

- After having for two years only a Project Coordinator, a Director with full administrative authority was finally appointed in May 1982.

- Component coordinators were appointed by the new Director.

- An administrative office in charge of budgeting, finance, procurement and personnel management was established. Some of

the staff members are attached to the corresponding MAG administrative office, performing tasks for CORENA in a semiautonomous way.

- After trying different coordination schemes for the Project, a Central Coordinating Committee, composed of the directors of DGF and SPN is now functioning effectively.

Major strengths of the Coordination Subcomponent are:

- The present Project Director is exerting a strong leadership.

- Adequate vertical and horizontal communication procedures have been established.

- The Director of DGF is giving complete support to the Project.

The following major weaknesses and problems have been identified:

- The ineffective participation of SEPSA and IDA in the implementation of the program caused some serious difficulties during its initial stages.

- Although theoretically there exists coordination at the regional levels of MAG, in practice it looks as a loose set up. It was not encouraging to see in one region that even the DGF Regional Supervisor, does not have much authority over the CORENA personnel. Project Components Coordinators communicate directly with the Project Director even when they are located within a given DGF region.

- The new law levying taxes on all sales including GOCR agencies' procurements of equipment and supplies, has created problems and delays in Project implementation.

- The delay in the approval of the counterpart funds caused a virtual stall in most Project's activities during more than half of the year 1983.

The following calendar of events illustrates this situation:

August 1979	USAID/Washington approved the Project.
Sept. 1979	Loan Agreement was signed.
March 1981	The Legislative Assembly ratified the Loan Agreement. Eighteen months elapsed between signature of the Loan Agreement and GOCR Legislative Assembly ratification.
March 1981	Initial CP's are met by the GOCR.
April 1981	USAID extends the PACD from September 1984 to September 13, 1985 in order to partially compensate for delays in the initiation of the Project.

April 1981 — GOCR Counterpart funds are reduced from $11.2 million to $5.8 million because of Costa Rica's difficult economic situation.

June 1981 — Other CP's, with the exception of those related to credit, are met.

October 1981 — First disbursement is made, after the approval of the Loan funded budget by the Controller of the Republic of Costa Rica.

January 1982 — Some DGF personnel are assigned to the Project and recruitment of new employees started.

May 1982 — Change in government and appointment of a Director with real administrative authority.

Sept. 1982 — Counterpart funds assured by the use of P.L.480 funds.

Dec. 1983 — Technical Assistance Contract is signed between MAG and FAO.

Due to the change in government in May 1982, several months of work were lost as the outgoing government was unwilling to make important decisions and commitments. The new government reorganization activities caused further delays.

Although four years have passed since the Project approval by USAID/Washington, its effective implementation time has been only about 18 months.

The establishment of a strong organization in CORENA has been instrumental in solving many of the administrative and communication problems faced by the Project during its initial implementation stages. This scheme has meant, however, the creation of a semiautonomous body with rather loose ties with other DGF and MAG units. Since the major objective of the Project is the strengthening of the capabilities of the DGF to address the problems related to the conservation and management of renewable natural resources, the evaluation team is concerned with this type of approach that gives the impression of creating one organization within another. However, this appears to be working effectively in achieving short-term goals.

2. Policy

The objective of this subcomponent is to analyze the effect of laws and GOCR policies, as well as national attitudes and traditions on natural resources conservation and management.

The following studies contemplated in the Project design have been contracted:

a. Analysis of the effects of existing laws on renewable natural resources conservation and management. This study is being made by a private law firm. Its main objective is the recopilation and analysis of all existing laws that might affect the conservation and management of the renewable natural resources. Out of this analysis recommendations may arise for new legislation if needed.

b. Survey and analysis of the people's attitudes and traditions on the use and conservation of renewable natural resources. The private firm that was contracted to make this study will conduct a country-wide survey in order to determine the opinions and attitudes of the people on the different issues involved in the conservation and management of the renewable natural resources. The results of this study will be used as a basis for making recommendations on policies.

c. Biological and economic survey of the various forested areas of Costa Rica. This study is being made by FAO technicians assigned to the DGF.

d. Preparation of a policy framework as a basis for the development of a management plan for the national forests. This study was contracted to CATIE.

The last two studies will provide data and criteria for establishing policies and procedures aimed at improving the management of the natural forests.

The evaluation team considers that if these four studies produce the information called for in the contracts, they will constitute an important and necessary body of knowledge contributing to the establishment of sound renewable natural resources conservation and management policies and legislation. This objective will be attained only, however, if concerned administrators become really interested.

Four other studies are in the planning stage. They are aimed at evaluating the areas under the jurisdiction of the SPN and the methodology used in Costa Rica for determining land use capability, costs of renewable natural resources conservation and conflicts arising out of alternative uses of soils and forests.

These studies, although not addressing such important issues as the first four, will produce valuable information to guide the establishment of policies for the conservation of natural resources.

3. Research

The Project Paper and its amplified description outlined, in general terms, a research program regarding land use practices, silviculture, management of native and exotic forest species, growth and yield of species in forest plantations, wood technology, economics of agroforestry, and management of improved pastures, forest plantations and nurseries. Research needs and activities were to be identified and supervised by the DGF in consultation with CONICIT and in coordination with MIDEPLAN. Mechanisms and methodologies to conduct this program were not well defined and specific priorities not identified. These activities were to be closely linked with on-going field activities of other components in the watersheds, especially those connected with reforestation and soil conservation. They were also to be closely linked to on-going MAG research programs. Short-term research projects

are contracted to universities, research institutions and individuals. The long-term projects are the responsibility of CORENA and DGF. In addition to the Research Coordinator, the staff includes two Forest Research Scientists, one Forester, and one expert from FAO. A research associate from FAO is expected to join the program soon. Two from the CATIE staff help by selecting experimental sites, mapping and others. The Coordinator states that foresters from other components are also involved in the research program.

To date, research activities appear to have had only a minor role in the Project, consisting mainly of having formalized several contracts with various universities.

An agreement with the Universidad Nacional calls for research on the fertilization of teak, thinning of forests, propagation of cuttings of Leucaena and Gliricidia in Guanacaste and development of a key for the identification of species of firewood in Sarapiquí. The proposed studies on propagation and identification of species do not appear to the evaluation team to be of high priority.

An agreement with the Instituto Tecnológico de Costa Rica calls for a hydrologic study of the Río Parrita Watershed, costs of establishment and maintenance of forest plantations, genetic improvement of Pochote, agro-forestry systems, improvement of natural forests, forest utilization and utilization of mangrove cortex in the Gulf of Nicoya.

Two agreements with CATIE call for the development of strategies for the management of forest reserves and for defining policies for the management and use of national parks.

An agreement with the Instituto de Desarrollo Agrario calls for basic studies for settlement of the Osa Península. A 16-month study was requested to the Centro Científico Tropical to determine a suitable methodology for land use.

Other research under contract include the climatological studies of the Río Parrita Watershed, the collection of plant samples and ecological studies in the Parque Nacional Braulio Carrillo.

Some of these studies can provide valuable information particularly as to forest management, while others appear irrelevant. In general, it is apparent that research needs have not been carefully identified. It appears as though the program moves haphazardly with no clear and definite orientation.

The research program does not include so far any significant activities in the area of improved pasture management. It appears that the staff of the Research Program rely on the Experimental Projects Component to produce the necessary information. However, this component is not conducting really valid research activities, mainly due to inadequate planning design and execution.

The evaluation team feels that the research program is weak and that efforts must be made to quickly strengthen this important component. Otherwise, the research results will never enable the GOCR to shape a policy framework more favorable to efficiently utilize, manage and conserve the natural resources of the country. The management does not seem to be able to grasp the urgent need to put together an aggresive, creative, cohesive, relevant research program. The limited personnel in field research feels abandoned and without adequate guidance and support from the staff at CORENA headquarters and from other units of MAG.

On-going research does not appear to cover some of the high priority needs. One of these could be measurement of erosion rates and the evaluation of alternative soil conservation practices. In general, it appears as though the soils of the hillsides of Puriscal and Nicoya are subject to a great deal of erosion. The steepness of slopes is the main causal factor. Data from other areas illustrate the importance of these aspects. For example, in Jamaica soil losses of 179 t/ha were measured from crop plantings on steep slopes under traditional cultivation. The losses where reduced to 43 t/ha with continuous contour mounds and a grass buffer strip. Under the gradient, rainfall and cropping pattern conditions obtained during the period, the upper 15 cm soil layer would have been lost in the first case in 12 1/2 years whereas 52 years would be required to sustain a similar loss if the land is prepared in mounds interrupted at appropriate intervals with a grass

buffer strip (40). No basic erosion measurements have been made or are planned for the watersheds. It must be recognized that losses by sheet erosion depend to a large degree on the intensity of rainfall. Under conditions in Puerto Rico, soil losses of 0.60 mt/ha were measured at a rainfall intensity of 6.4 cm/ha/60 min while only losses of 6.63 mt/ha/60 min were measured at a rainfall intensity of 12.7 cm/ha/60 min (24).

Under adequate protective cover these ill effects would be minimized as shown in data obtained on 40 to 50% slopes: 2 mt/ha/yr were lost under grass cover; 39 under crop rotations; 283 on bare fallow; and 334 on soils where the upper 1 m was removed mechanically (22).

The choice of crops is an important feature in any conservation program. All the crops traditionally cultivated by the small farmers are erosive (22).

The effect of ground cover and mulching in minimizing soil erosion should be included in the research program. This effect is evident from data obtained on coffee growing on 60% slopes (22). In 1943, soil losses of only 4 t/ha were measured. In May 1944 the plots were completely cleared of trash and leaf mulch. All ground vegetation was cut and removed. The losses during the year increased dramatically to 735 t/ha. Two full years were then required to build up the same degree of protection as that removed through cleaning and eliminating the ground cover.

Another area not adequately covered by the research program is that relating to minimum tillage. The less the mechanical operations the less the soil losses likely to occur during the crop cycle. Evidence from other areas show that high yields of food crops are possible with no tillage or only with a minimum disturbance of the soils on steep slopes (37). Just cutting the weeds with machetes or controlling them with herbicides and digging holes for planting can produce good yields of food crops if otherwise well-fertilized and managed. Guinea, star, pangola and Napier grasses have been established in unplowed slow-growing, native volunteer grass pastures by planting in furrows two weeks after applying herbicides. Equal results were obtained by planting pangola grass in soil previously killed by two application of 1.8 Kg/ha of Dalapon and 0.45 Kg/ha of 2,4D, as by planting in well-prepared soil (36).

Mulching has proven to be an extremely effective soil protection measure (34). Soil and water losses on 40% slopes in mulched soils were 2738 kg/ha and 38 mm while in unmulched soils were 15047 kg/ha and 150 mm (22).

The research program fails to cover the need to develop intensive production systems well-suited for small and medium-sized farms. Technological packages of practices should be developed for diverse farming system. These include the selection of crops. Tall-growing perennial crops such as coffee, plantains, bananas, citrus

and papaya can be grown on steep hillsides with proper conservation protection. Minimum tillage, combined with the dense foliage and thick mat of roots of these crops, when they are closely spaced and intensively managed, protects the soil against erosion. A cover crop can offer additional protection when needed. Non-protective crops such as tobacco, beans, soybeans, Irish potatoes, peanuts and others are important crops which are not well suited to soil conserving management systems on hillsides. However, limited planting of these crops can be made on hill lands alternately with contour grass strips and other soil conservation methods to provide cash and food and reduce risks by diversifying farm operations.

In general, the farmers use local, low-yielding varieties of crops. There is a dire need of selecting high-yielding varieties of major crops and forages and produce high-quality seeds for distribution to the farmers. The research component must address this issue aggresively.

A program geared to improve yields and soil protection must include fertilization. Fertilizers are essential for the full utilization of the natural resources. One ton of fertilizer can be "converted" into 5 tons of rice or 20 tons of plantains (38). High yields of food crops and forage have been obtained elsewhere on severely eroded soils with little organic matter. In Puerto Rico, for example, an Ultisol subsoil yielded 2.8 t of soybeans, 12 t of sweet potatoes, 12 t of green beans and 100 t of green forage/ha when properly limed and

fertilized (36). Increased fertilization improves plant cover and increases crop residues, thus helping to reduce erosion. The productivity of eroded, steep mountain soils can be raised dramatically through the use of fertilizers from 150 kg of dry forage/ha/yr to 18500 kg/ha/yr (36).

It has been shown that well-fertilized, well managed pastures on steep, medium deep or deep soils can produce more than 1,000 kg/ha of gain in weight or 7000 liters of milk/ha/yr (36).

Liming is another component of a technological package of practices that cannot be overlooked in acid soils. Even the very acid soils of the watersheds of Costa Rica probably contain sufficient calcium to meet the nutrient requirements of crops for many years. Liming may be primarily required, however, to prevent or correct high levels of soil acidity which can result in manganese and/or aluminum toxicity, in reduced availability of soil phosphorus and in reduction of desirable microbiological activity.

The control of weeds, diseases, insects, nematodes, and other pests is an essential component of production systems under conservation farming.

The possibilities of silage and hay in the Nosara Watershed should be explored to guarantee the development of a stable, sound, livestock industry.

The Research Component of CORENA must look into these areas in an integrated systems approach involving forestry, livestock and pasture management and intensive crop production in a management scheme leading to an optimum utilization of the resources compatible with their conservation.

B. Experimental Projects

1. Forest Production

As envisioned in the Project, the Forest Production Subcomponent will lay the groundwork for a large scale forest production program. The activities to be carried out are: (1) management of natural forests; (2) reforestation; (3) forest protection; (4) a Technical Center; and (5) a forest colonization plan.

Although mentioned in the January 26, 1981 Work Plan, up to this moment there is no study underway to compare different methods of managing natural forests. The study was planned to gather all necessary information during the first 6 or 7 months after Project approval, but problems in contracting technical assistance has delayed this action by more than two years.

The natural forest management techniques proposed to be studied were selective cutting with enrichment planting, selective cutting with natural regeneration and clearcutting.

Selective cutting with enrichment planting involves the cutting of preferred trees after determining the desired diameter and planting of suitable species to be harvested in a second cutting. Selective cutting with natural regeneration consists of harvesting selected species periodically and continuously at a determined diameter. Regeneration of the forest will depend on the seedlings and saplings already present. Another method to be studied is clearcutting with natural regeneration. The area will be clearcut and surrounding trees will provide the seeds for regeneration. Other methods that will be investigated in a smaller area are: shelterwood, seed tree, and improvement cutting.

A reforestation scheme has been developed but the species selection has been limited to local ones due to lack of information on other species. There is great need for adaptability studies to select local or exotic species with the best rate of growth and resistance against local pests and diseases. Due to lack of time it has been decided to reforest most of the land with Cordia alliadora, a local species known as laurel that has shown great potential on a small scale. Several other species are being tried out. One nursery has been established mostly for trial purposes because no land is yet available for reforestation. Unfortunately this nursery has not been provided working funds by the DGF. It was established as an emergency measure of a temporary character until a more suitable site can be found.

Forest protection is carried out only on a minimal scale. Field personnel lacks technical knowledge other than identification of trouble spots. There has been no coordination with the Training and Technical Assistance Component to provide specialists to identify, and study pests and diseases with special emphasis on the Cordia alliadora which could be susceptible to pests under large scale commercial planting.

The Technical Center apparently has been discarded by the Component Coordinator according to an October 1983 report.

There is no evident need for colonization of the area because a government institution, ITCO (now IDA), bought and distributed the land during the 60's.

The site chosen for the implementation of this Component was an area located between the Sarapiquí and Puerto Viejo Rivers, in the province of Heredia, in the Canton of Sarapiquí.

In January 1982, after a meeting between USAID/Costa Rica and MAG, the area to develop the Forest Production Component was transferred from Sarapiquí to Península de Osa on the Forest Reserve of Golfo Dulce. There were problems with infrastructure in the area and in May 1982 this Project was transferred again to the Sarapiquí area.

At present, the staff of this Component includes a Coordinator, an Area Director; an Agronomist, a Wood Technologist; seven Foresters and other support personnel.

A resource inventory was recently completed for a pilot area.

Although a work plan was prepared for the area, it was never implemented. There were problems in contracting personnel and technical assistance and the purchase of equipment and materials. This, together with the structural problems mentioned elsewhere in this report, caused undue delays in the implementation of the work plan. Technical assistance is urgently needed to provide expertise; land tenure should be defined so that an area could be chosen to establish experimental projects; the contracting of personnel must be completed and methods of purchasing of equipment and materials must be improved. The Component requires technical assistance in data analysis, forestry inventory, regeration of natural forest, logging and harvesting, tropical silviculture, forest phytopathology, forest entomology, soil conservation, agroforestry, forest economics, and wood utilization.

It was brought to the attention of the evaluation team that the MAG, through the DGF, is pursuing a policy of encouraging the industrial forest private sector to become interested in the proper utilization of the country's forest resource, since this is in their own interest. The sooner the resource is exhausted the quicker they will go

out of business. Private enterprises formed by the owners of the forest land and the industrial sector seem to be the thrust of the scheme. These enterprises will be committed to rationally and technically utilize the resource following an appropriate conservation approvach, including sound management of natural forests and reforestation. In this context, the Sarapiquî forest production project seems to be the logical starting point, according to CORENA.

An enterprise is presently in the process of being formed promoted by CORENA. Although it started bringing together the forest industrialists and the producers of raw materials in Sarapiquí, only the latter are presently included in the Project due to differences between the two groups. The organizers of the enterprise are expecting that it will be a mixed endeavor with government having an interest in the enterprise. They also expect some sort of financing and technical assistance from the government. In this regard both the organizers and CORENA's management are looking to 032 as the source of both financing and technical assistance. Whether this is feasible or not is beyond the scope of this report. However, the evaluation team feels that the involvement of the industrial forest private sector and its commitment to a sound forest resource utilization and conservation is comendable and merits whatever support is possible. The plan, as now envisioned in Sarapiquí, is to evaluate the potential of this type of operation as a model for other parts of the country. The experiences gained in developing this type of project can be useful for the establishment of similar types of enterprises in other areas.

The economic feasibility study for which they are expecting some technical assistance from the Project, will not be completed until early 1984.

Low prices for stumpage have always been a deterrent for farmers who envision forestry as a business. For a forest enterprise to have economic prospects industrialization will be necessary.

The Project, as a scheme that involves the small and medium-sized farms of the rural areas, is sound in its developmental aspects. The inclusion of the private enterprise in the scheme will contribute to strengthen the concept of natural resource protection, development and reforestation as envisioned in the Project Paper. Some positive factors are:

(1) The management of the forest land comprised in the project as a single unit instead of each individual owner going his own way.

(2) The study and development of new management techniques for the utilization of natural forests.

(3) Develop a new concept of utilization of the natural resources that fit well with the financial capabilities of the country.

(4) Participation of the rural population in the development of the natural resources.

(5) The protection of forest and forest lands that otherwise might be utilized for uses incompatible the land capabilities.

(6) The creation of new alternatives for rural development compatible with the need of forest products in the country.

(7) The reforestation of forest land at no or greatly reduced cost to the GOCR.

Still it has to be shown that the proposal is economically sound. Until a feasibility study is completed it will be impossible to have a definite opinion on this aspect. As this is a pilot plan with many unknown variables and with great potential impacts upon the future of forestry it seems that outside technical assistance will be necessary.

Another aspect of this component involves the construction of a power plant for the town of Horquetas in the cantón of Sarapiquí, where the industrial enterprise will be located. The investment approved by USAID/Costa Rica for planning and implementation is of the order of $34,000. This Project will provide a ready market for otherwise unmarketable trees of undesired species, cull trees, and residues from the sawmill. All of which could be used for producing energy. In the absence of this market this material will have to be

is an example of good utilization of the country's natural resources and will complement the planned development of an industrial forest enterprise.

2. Reforestation and Pasture Management

This Subcomponent aims to provide for reforestation of soils of low productive livestock capacity in small and medium sized farms. It also aims to increase livestock production in other parts of the individual farms through forage improvement.

The original Project Paper called for testing a reforestation subsidy scheme in combination with a supervised credit program for pasture and cattle improvement. The subsidy was eliminated when the Project Agreement was negotiated, the alleged reason being that GOCR cannot forgive loans.

The Project is being carried out in the Pacífico Seco and Pacífico Central. It calls for the reforestation of 1,040 ha and 3,120 ha in improved pasture. So far only 124.5 ha have been planted to selected forest species. In the case of pasture 2,097 ha have been established. As part of the component, farm demonstration plots and a small dairy module are operating in the Nicoya Península.

The elimination of the reforestation subsidy precluded testing what the evaluation team considers an interesting and possibly

effective mechanism to encourage farmers who have small and medium sized units to participate in reforestion.

Financing for partial reforestation and cattle improvement was to be provided to farmers whose incomes are too low to qualify for the GOCR reforestation income tax credit. The GOCR was to pay back the reforestation loan to the bank on behalf of the borrowers as long as these farmers maintained their forest plantations properly.

The credit facility, provided by BNCR, for small and medium sized farms started requiring that these farmers could only borrow 50% of the value of their assets of which 40% had to be devoted to reforestation, fruit tree planting and soil conservation, while 60% could be used for livestock operation. Reception of said credit was very limited.

The credit facilities offered through CORENA are subject to major restrictions. The Banco Nacional de Costa Rica, through an agreement with MAG, administers these funds according to the terms set forth by the Banco Central and the Ministry of the Treasury. The Banco Nacional de Costa Rica can loan to farmers participating in the reforestation and pasture improvement activities in the Nosara Watershed and in the Río Parrita Watershed. The bank requires as a collateral a mortage of the property, and an approved farm development plan. Interest rate for forestry and related projects is set at 8%, but for livestock activities is 15%, while other banks in the areas, within the

national wide banking system, charge 12% rate without any mortgage on the property and without any reforestation requirement. The BID also has a credit program similar to that of CORENA, but does not require reforestation work.

Requirements for reforestation were modified very recently in an effort to increase demand. Only 20% of the loan has to be devoted to reforestation, fruit tree planting and soil conservation. The other 80% can be devoted to livestock, including pasture improvement. Still reforestation calls for substantial investment per hectare that may very well be beyond the capacity of most of the small and medium size farmers. In the Guanacaste region the cost of planting one hectare is about $619 for the first year. For comparison in Panamá, the cost is about $320. It is highly improbably that this high cost could be absorbed by the small and medium land owners under the present credit-structure.

Progress achieved in credit operations are as follows:

- An agreement was signed with the BNCR to serve as executor of the Project's credit activities, in May 1982, and credit regulations were agreed upon.

- Nine field technicians were assigned to promote the credit program and provide technical assistance to prospective and actual beneficiaries.

- Adequate working relationships have been established between the BNCR officials and the CORENA personnel in charge of the credit activities of the Project.

- A total of 72 loans, amounting $194,382 have been granted up to August, 1983. Total funds available are $2.5 million.

- A new credit regulation based on the experiences gained was approved in September 1983.

Among the major strengths of the credit operations stand:

- The credit program has given a boost to the reforestation and pasture improvement components of the Project, including fruit tree planting.

- CORENA personnel are learning to make use of supervised credit as a tool to carry out their resource conservation and management orientation program.

Major weaknesses and problems can be summarized as follows:

The credit activities of the Project suffered a serious set back from undue delay in the approval of the required agreement with BNCR. The credit program has been in effect for only about one and a h

The BNCR does not have all the personnel needed to make an adequate analysis of the loan applications and even less to supervise the development of the financed farm operations.

The personnel that lacked adequate knowledge or experience in credit programs when they joined CORENA have not received training on this subject.

In some cases, specially in Nicoya, inadequate communication between bank officials and CORENA personnel resulted in delays in processing of loan applications.

The original regulations approved made the Project's credit so unatractive, that it appears that many possible candidates decided to use other sources. This situation might be corrected in part by the new credit regulations.

Loan applications above a certain amount have to be approved by the Credit Commission in San José and this takes exceedingly long.

The fact that the credit supervision is mainly done by the CORENA personnel is not the best arrangement and may result in a dangerous vacuum at the end of the Project's life.

The extension of the Reforestation and Pasture Improvement Subcomponent to the Pacífico Central signified that the staff in charge of the Preparation of Management Plans Component had to become involved in credit operation. At least one technician is now working full time in credit in Pursical.

The Reforestation and Pasture Improvement Subcomponent appears to the evaluation team as slowly moving away from its original objectives and towards a regular agricultural project with credit as its main ingredient. Reforestation has hardly any acceptance while pasture improvement seems to be favored in Nicoya. Fruit trees and crops receive prime attention in Puriscal (Quiveland and Gamalotillo).

3. Management of the Nosara Microwatershed

The microwatershed project was designed to build experience in managing on-the-ground programs and test financial incentives and new management practices to bring about land-use changes in the Nosara Microwatershed. The Project consists of four activites: 1) updating of the master management plan and basic studies; 2) reforestation; 3) range management and soil and water conservation practices; and 4) extension support.

The evaluation team was informed that the updating of the management plan will be completed soon. The basic soil studies were conducted by MAG and a study of ecosystems by CATIE. A farm survey was

conducted at the Microwatershed covering 122 farms and contains data on size of farms, land use and others. Only 25% of the goals to establish a forest cover in 400 ha of the microwatershed has been achieved. The pasture improvement program within the watershed has been successful insofar as the goal has been exceeded by a 100%. The establishment of demonstration plots with king grass (Pennisetum purpureum X P. typhoides) is a commendable effort. So is the so-called "forage micro station" where 18 species of grasses and legumes are being tested. The test includes four replications in a randomized block layout. It attempts to evaluate the various species as to percentage of coverage, response to cuttings, total dry matter yields and protein levels. The only flaw in the design is that data are taken only in the wet and dry seasons, but not in the intermediate months. Thus, no data on yield/yr will be available. The recent appointment of a FAO specialist in forage management is a valuable addition concerning the strengthening of the capability of MAG in this area. Another field trial recently completed was the evaluation of five tomato varieties. Again, the evaluation team feels that this type of activity should receive more support from the Research Component.

The field demonstrations relating to soil conservation in the microwatershed are excellent examples of what can be accomplished in spite of staff limitations and apparent lack of technical support from MAG. Reportedly 600 m of hillside ditches protected by vegetative barriers, 500 m of diversion channels, 100 m of infiltration channels and 12 dams to control gullies have been constructed. These are

excellent soil conservation measures, simple, low cost and effective and, therefore, could be readily accepted by the small farmers. However, the evaluation team was distressed on the emphasis given to the design and construction of bench terraces. Bench terraces may be effective under some conditions in controlling soil erosion, but they are generally expensive to build. They require much labor, equipment and subsidies to the farmer. In all probability crop yields will be reduced during the first 3 to 5 years because of soil movement and exposure of heavier and less fertile subsoils. A partial corrective factor will be heavy and costly fertilization. A method has been developed by the U.S. Soil Conservation Service, under tropical conditions, that permits building up bench terraces over a period of four to five years at a low cost (36). For this purpose a live hedge of thick-stemmed grass (Napier, Sudan, sorghum, sugarcane) is planted on the contour and after it develops the soil is worked against the hedge. Eventually, a bench terrace is formed. This method does not reduce soil fertility markedly because the annual movement of soil is minimum and provides forage. Because of high cost and susceptibility to erosion until the soil settles and is stabilized by vegetation, bench terracing should not be encouraged in Costa Rica.

The construction of individual terraces or catchment basins for established coffee trees observed in some farms of the microwatershed is not worth the effort. The heavy pruning of roots that is likely to occur during the process of building the terrace more than offsets any possible beneficial effects that could be attributed to the

individual terraces. This practice has been long discarded in other coffee producing countries.

The planting of protective vegetation with strong, well-developed root systems can be very effective in stabilizing, at a low cost, small gullies provoked by uncontrolled runoff after heavy intense rains. Other low-cost measures involve the construction of simple dams accomodating tree trunks and other readily available materials. Bamboo can be very effective in stabilizing gullies. More complex dams using wire and concrete are too expensive and it will not be realistic to recommend their use.

Seemingly lacking in the overall plans to reduce soil erosion in Costa Rica is the use of strip cropping. In some of the longer slopes, the planting of row crops in alternate strips with protective vegetation such as grasses may prove to be effective in reducing soil and water losses. The width of the strips will depend on the steepness of the slopes. The idea is to plant several crop sequences on a given strip and, in a sort of land-use rotation cropping system, alternate the use of strips under cultivation and under sod in the following years, then go back to the original use. The grass could be cut and fed to livestock. Strip cropping offers a distinct possibility for efficient crop production under adequate conservation management.

The Project is still in its initial stages and the

must be promoted. The erosion problem is serious mainly due to indiscriminate deforestation and subsequent farming of steep slopes.

Special efforts are being made to establish small demonstration plots in different farms. It is evident that major progress has been achieved in this subcomponent as compared to other subcomponents and even to other components involved in field work.

C. Preparation of Management Plans

This component aims to prepare natural resource management plans for selected watersheds in high-priority areas. The plans, based on data on physical geography, population, land use, farming systems, availability of infrastructure and others, would examine the feasibility of diverse land-use alternatives. The Project Paper called for the preparation of five management plans. This was later reduced to three by Letter of Implementation No.7: The Río Grande de Térraba Watershed, the Parismina-Pacuare Watershed and the Río Parrita Watershed. These goals appear to be unrealistic considering the scope of the studies envisioned, and the lack of timely technical assistance. As a result of this, CORENA confined the work to the Río Parrita Watershed. This has been a wise decision. Otherwise, covering the three watersheds, the Project could hardly have attempted to sketchily diagnose the problems affecting them.

Originally, OPSA, now SEPSA, was to provide leadership to this component, in coordination with MIDEPLAN, and with the corresponding inputs from the Instituto Geográfico Nacional (IGN), the Instituto de Desarrollo Agrario (IDA), the Instituto Costarricense de Electricidad (ICE) and the Instituto Costarricense de Acueductos y Alcantarillados (A&A).

The Río Parrita Watershed, 40 km from San José, is in a catastrophic state in terms of resource conservation. Only an estimated 10 to 15% of the total 134,000 ha. is under forest cover when probably 65% should be. A large part of the watershed is used for livestock. Native grasses predominate. Brachyaria performs well in the upper parts of the watershed while stargrass seems adaptable to the lower areas. Carrying capacity is low (0.6 ha). Pastures need about 4 months to recuperate while in the Guanacaste region they recuperate in 1 1/2 to 2 months. This obviously reflects poor management. Slopes are the major factor inducing accelerated erosion under poor management and conflicting land-use. Some 15% of the area is devoted to the production of clean row crops such as tobacco, beans, corn and other annual crops. Livestock production occupies areas of very steep slopes, often more than 85%. Coffee is produced in the upper watershed. Sugar cane is grown for producing "dulce". Erosion rates are high. Based on data from Puerto Rico (22) and Jamaica (37), soil losses should probably be not larger than 3 to 8 t/ha/yr. However, an inspection of the area reveals that losses must be way above 30 t/ha/yr; in some cases, probably more than 100 t/ha.

The staff of the Component is located in rented quarters in the city of Puriscal, physically apart from the MAG regional office which is located about four kilometers from Puriscal on the road to San José. The Watershed was divided into three subareas and formal work has been initiated in one. However, certain basic studies are being conducted in the watershed as a whole.

The group at the Puriscal headquarters, under an active leadership, has been working well, but under serious constraints mainly attributable to lack of timely adequate technical assistance. Studies on climatic conditions, hydrology, land use, infrastructure, land tenure, marketing, population and farmers organizations have been recently completed or are underway. A study of the soils of the Watershed is pending approval of a contract with the Universidad de Costa Rica (UCR).

The physical location of the component staff in Puriscal has prompted local groups to pressure CORENA to get involved in action programs, not contemplated in the Project design. In response to this pressure and an action motivated staff, the Quivel Microwatershed has been selected for intensive study. Farmers have been selected to promote and carry out development projects involving resource conservation practices. This received a big boost with the extension of the credit program to the area. This involvement in action programs is justified by the Component Coordinator arguing that the experience obtained could enrich the staff awareness of the practical implications

of resource planning. In addition, the adaptable technologies could be later transferred to areas of similar conditions within the Watershed. To a certain degree these action projects give a kind of realistic approach to the Component and a proving ground for the planning. On the hand they also have the effect of slowing down the preparation of management plans with the risk that if a balance is not achieved the objective of the component may not be accomplished during the life of the Project.

Furthermore, the staff has become involved in an action project outside of the Río Parrita Watershed. This project is located on a low place in the Gamalotillo area where the soils are clayey and heavy. Drainage is essential for successful crop production. Some 100 ha of the total 430 of the Project area have been drained. Excellent crops of rice and papaya were observed during an evaluation team visit to the area. Approximately 18 ha have been planted to mango of selected varieties such as Haden. The evaluation team was pleased to observe the excellent working relationships between farmers and the Component Coordinator. This official should be commended for establishing such a high degree of confidence and credibility that is certainly an asset to MAG. The project has been fostered through credit granted to 15 farmers.

In spite of the achievements and the potential of the Gamalotillo project, the evaluation team feels that this kind of development is not within the scope of the component which should concentrate in the preparation of management plans for the Río Parrita

Technical assistance has been provided at a rather late stage. One Planning Expert arrived in 1982, another in 1983; only now three other experts (sociology, soils, watershed planner) are arriving in addition to a Hydrologist provided by the Government of Spain.

In general, a strategy for the utilization of conservation of natural resources in the Río Parrita Watershed has not yet clearly emerged. At times it appears as though the staff does not quite know what to do with all the data being gathered in terms of developing a meaningful master plan. The absence of timely technical assistance is basically responsible for this situation.

D. Environmental and Conservation Education

The purpose of this Component is to create public awareness of environmental and conservation education activities. To this effect the Project will develop a long-range management plan of the Braulio Carrillo National Park; build various educational and research facilities; construct a Visitors' Center to provide information, orientation and assistance to the public; and construct an Environmental Education Center.

The Braulio Carrillo Park is located in sections of the Provinces of Heredia, Cartago, San José and Limón and covers 32,000 ha. About 80% of the land is government-owned and 20% is in private hands but is to be purchased by the government using P.L.480 funds. The

1. Protect one of the regions of greater richness that still exists in the country not only because of the diversity of plant and animal life typical of two areas of the country but also because of its extraordinary hydroelectric potential.

2. Prevent a greater degradation of the park ecosystem, as a result of the influence of the San José-Gupáiles-Limón road, which is under construction.

3. Develop scientific investigation of the environment to increment the knowledge of hydrological, cultural and biological resources of the area.

4. Provide the visitors opportunities for recreation through activities that stimulate the observation of nature.

The National Park Service (SPN) is responsible for the project. CORENA is responsible for coordinating procurement of equipment and materials and contracting services and assistance. CATIE, private contractors and universities provide technical assistance.

Presently, the Component staff includes a Geographer and Coordinator; a Forester; a Project Administrator, who is an Arqueologist; a Biological Technician and other SPN personnel.

Although park needs for personnel and structure have been defined, a plan indicating where structures will be located, and providing general guidelines for trails construction and landscape architecture is still lacking.

Problems with procedures to contract technical assistance have unduly delayed the preparation of the GPMD and starting construction of facilities funded by the Project.

In the contract between SPN and CATIE the latter will provide assistance to define areas suitable for recreation as well as design the structures and facilities for park visitors. An inventory of flora and fauna was contracted in August 1983. When completed, it will provide information on the conditions of plants and animals within the park, as well as indicate areas that are in need of more detailed investigation. The public education and information aspects should be provided by the Visitors' Center that will be located in the Park.

Training the personnel involved in dealing with the public should be coordinated with the Technical Assistance and Training Component. Several training sessions have been programmed already. This phase will also be executed when the contract for technical assistance is signed with CATIE. The contract provides that CATIE will bring expertise in the areas of landscape design, ecology, biology, and park planning.

The National Center for Environmental Studies has not yet been established. There are doubts about its functions and the capacity of the SPN to administer such a facility. There are doubts shared by the evaluation team, as to the need of the Center within the SPN.

Other facilities for recopilation of metereological and sismic information should be built as planned and contracted to state agencies responsible for th se tasks.

The fact that technical assistance has been delayed by almost a year has had a very negative effect on the Component. All other actions have been delayed and the completion of constructions is jeopardized. The component director strongly believes that no construction should be started until a management plan is completed; this management plan depends on the information gathered by the technical assistance personnel. Hopefully this is expected to start soon. If there are no others unexpected delays, the structures could be terminated during the time left to the Project.

Most of the personnel hired are recent graduates from the universities and lack experience to formulate plans and to undertake the required tasks. Personnel must receive more assistance from the Research Component, from contracted CATIE personnel and from other experts hired for such ends. Training must be defined by the needs of the personnel to help them overcome their lack of experience and improve their skills. Some areas that should be touched on are: game and fish

management, wilderness management, courses to deal with visitors, landscape design and general administration. This should be coordinated with the Training and Technical Assistance Component.

E. Training and Technical Assistance

1. Training

The general objective of the Training Subcomponent is to upgrade the trained human resources needed to implement the Project and establish the basis for an eventual broader program.

Specific goals are as follows:

- Fourty four in-country workshops of one or two weeks duration each will impart 1,035 person-weeks of training to 315 participants.

- 35 person-months of foreign in-service training and observation training for 36 participants.

- 13 person-months of short-term foreign training for 42 participants.

- 60 person-years of graduate level training for 26 MS level participants and 4 PhD level participants.

The progress made toward the attainment of objectives and goals can be summarized as follows:

- A manual establishing the selection procedures and criteria, and the general regulations for graduate studies was prepared.

- The regular MAG Scholarship Commission, composed of administrative and line personnel, acted as a screening committee for the selection of graduate study candidates.

- A training program for 1982 and 1983 was prepared. It consisted of short courses aimed mainly at in-service training of the Project staff, and formal graduate level studies. An analysis of each one of the training activities proposed showed that, with a few exceptions, all of them are addressed to solve the training needs of the components. Eight in-service training sessions have been held in 1983. Twelve staff members of different agencies are enrolled in graduate studies programs in Costa Rica and abroad.

Major strengths of the Training Subcomponent are:

- The coordinators of this subcomponent are capable and hard working.

- The selection of graduate study candidates by a screening committee composed, in part, by their own peers, assures a fair treatment to all applicants.

- The in-service training program is not only geared to the needs of the technical staff but also to the needs of the administrative and support personnel.

During the initial stages of the Project, the training needs of the personnel were not adequately detected by the coordinators because of their own lack of experience. This at present is not such a big problem because of the experience gained already by these staff members.

Major weaknesses and problems relate to the delay in the start of the training program. These delays permanently affect its effectiveness in the development of the Project staff and in the graduate level training of Costa Rican technicians. Since it takes at least two years for a student to complete a graduate program, it will be impossible to reach the original goal of preparing 30 graduate level technicians during the rest of the life of the Project. In the case of the in-service training, the late start is not so critical if special efforts are made to regain the time lost. That could mean, however, the cramming of training activities in a short period, thus affecting the execution phases of the Project.

The graduate studies program was delayed at the beginning of the implementation of the Project because the GOCR was reluctant to assign monies to hire replacements for the students. This problem was solved by using P.L.480 funds for that purpose.

The fact that the training program contemplated in the Project might not be completed in its remaining life is particularly frustrating, since this would have been one of the most important contributions of the Project to the objective of strengthening the capability of Costa Rica to manage its renewable natural resources.

2. Technical Assistance

The objective of this Subcomponent is to upgrade Costa Rica's human resource management capabilities, through the use of competent specialists and advisors in the different Project Components.

MAG, with the approval of U.S.AID, contracted with FAO to provide this technical assistance. Actually, what took place was an extension of an on-going contract between MAG and FAO in operation since 1980 to provide assistance in carrying out "priority forestry programs."

The contract to provide technical assistance to CORENA was signed in December 1982 providing about 195 person-month of effort, of which 130 are outside consultants and 65 locally contracted. A total of 15 technicians are contemplated of which 7 are long-term (one year or

The categories included in the composition of the technical assistance are broad enough to cover all important aspects of the 032 Project. Since other FAO technicians are also providing technical assistance to DGF in areas related to overall conservation and utilization of forestry resources, the evaluation team feels that this technical package is instrumental for CORENA in achieving Project objectives.

In this context it is extremely necessary that this technical assistance is finely tuned to effectively provide in a timely fashion the myriad needs of CORENA's different components and subcomponents. This is not an easy task to accomplish. The evaluation team is somewaht concerned with the fact that this technical assistance is not only coming on board almost two years late, but it also has had a slow start. Until October 1983 only 17 person months of technical assistance had been delivered. The agreement signed with FAO contemplates that a total of 84 person-months of technical assistance will be provided during the year 1983. This goal seems now very unrealistic: at the most only half of this assistance will be provided.

Major weaknesses in Project Implementation, can be associated with lack of timely technical assistance, hence, any further delays may permanently impair even the effectiveness of the technical assistance itself. Many of the shortcomings and weaknesses of the

program herein reported could have been prevented if the young unexperienced Project personnel had from the beginning, the guidance of the experienced advisors called for in the technical assistance component of the Project. The preparation of management plans is a case in which the technicians think that they should reorientate their work all over again, because they are not satisfied with what they have been doing for more than a year.

The contract finally negotiated with CATIE to provide technical assistance to the Environmental and Conservation Education Component also ilustrates a case of badly needed technical assistance coming late on board due to a myriad causes. The component staff opted to postpone all action regarding the planning and construction of physical facilities funded under the Project, rather than risk making serious mistake, because lack of technical assistance.

Now that the two major technical assistance packages have been contracted, one should expect this input to start pretty soon making its important contribution to the Project.

VI. EVALUATION OF OVERALL PROJECT PERFORMANCE

A. Balance of Project Strategy and Components

The Costa Rica Natural Resources Project strategy emerges from the recognized need of fully utilizing the resource base while at the same time minimizing soil erosion in the upper watersheds. It is fully recognized at the outset that the GOCR capabilities to manage the natural resources are not yet at the level that they should be and lack the necessary strength. AID strategy postulates that natural resources can be used efficiently and degradation reversed only through integrated programs of reforestation, land-use planning, erosion control and improved agricultural and livestock practices through the use of appropriate technologies. A major component of AID strategy is to help the GOCR define and obtain experience with long-term institutional mechanisms to cope with the problem of resource degradation.

The evaluation team generally agrees with the approach and hasten to add that even controlling the degradation process of natural resources in developing countries characterized by growing populations pressing upon a limited natural resource base, is a monumental job. Programs geared to this end can not be thought of as short term (3-5 years). A broader horizon is necessary if meaningful impact is expected. The Costa Rica experience with CORENA is no exception.

The strategy, as outlined in the Project Paper, is based on various elements: policy analysis, research, a pilot microwatershed management project, a reforestation and cattle management improvement pilot project, a forestry production pilot project, the preparation of resource management plans, environmental and conservation education, and training and technical assistance to upgrade the GOCR capabilities in natural resource utilization, management and conservation.

The GOCR limited resources and capabilities and the delays concerning the ratification of the Project by the Legislative Assembly adversely affected the initiation of the Project. The strategy was further affected by an ineffective initial organization and by the complexity of the GOCR administrative and financial process and procedures.

The evaluation team has no major problem with the project design except that it appears to be sophisticated for the environment under which it was to be carried out. The DGF responsible for Project implementation has not received priority in government funds appropiated to the MAG. Hence, its technical capacity and operating budget is far from adequate to carry out its functions. Of course, 032 is meant to improve all that. It may, but if 032 terminates less than two years from now and no provision is made for continuing providing necessary budget and technical support then the long term effect of 032 will be very limited.

The research program is one of the areas severely handicapped by lack of adequate identification of problems and prioritization. The lack of clear cut guidelines as to the scope of the research and its relationship to the reforestion and pasture management activities has caused some confusion at the operational level. This has been further aggravated by the rather broad objectives of the reforestation and pasture management program. The lack of experienced personnel, the spread of anticipated coverage, limitations of credit facilities and the intricate and long administrative process have further affected this component.

The Microwatershed Management Component is also involved, to some extent, in research activities insofar as it attempts to search and validate designs to develop experience in planning and executing programs at the watershed level. Specific objectives of this component deal with forest work, improvement of forage species, and adoption of new and improved technologies. These objectives are closely related and probably more pertinent, to the Research Component. Once again, the updating of the basic data on soils, climate and others relate to the Research Component.

In general, research activities in the microwatershed are conducted almost in isolation and unrelated to corresponding component. The pasture improvement activities, again apparently independent from other Project activities, could have been used to promote more effectively an integrated soil erosion control program.

The difficulties in securing credit within a reasonable time frame for reforestation and cattle improvement program has negatively affected the image of CORENA in the Nosara Watershed.

The lack of appropriate technical assistance in natural resource planning, has been a major limiting factor.

The elements of a balanced strategy were present in the Project design, but were not sufficiently detailed. CORENA has not been able to improve substantially upon this situation.

In general, the experiences obtained from the Project have been rewarding and enriching. Much has been learned concerning the integrated management of natural resources as evident in Guanacaste. Expectations are that MAG will be strengthened to such a level that it can take over CORENA programs upon termination of the USAID loan. To this end, the DGF is preparing a proposal and expects to obtain financial support from the Fondo Forestal created 14 years ago and from other sources. Its effectiveness will depend in the amount of funds available and the priorities assigned for its use. More MAG support will have to be harnessed for the cattle and pasture improvement program and for the soil erosion control activities. This is based also on the assumption that MAG personnel in these critical areas will take a more active role in the research, extension and action programs related to the full utilization, management and conservation of the resource base.

B. Project Administration and Management

CORENA has primary management responsibilities for all Project activities. USAID/Costa Rica mission's involvement in project management includes contracting technical assistance and monitoring project expenditures. Furthermore, USAID/Costa Rica has been actively and effectively involved in many Project activities.

The evaluation team feels that most administrative and management problems have arisen out of the laws and intricate mechanisms for disbursement of funds. The undue delays have affected to some extent the morale of the field staff which often faces difficult problems concerning payments of bills for rent, equipment, supplies and services.

Problems have also arisen out of the limitation in administrative power within the structure of CORENA. Originally, CORENA was an appendix of the DGF. Its executive officer was also Deputy Director of the DGF with the duties and obligations corresponding to that post. Recently, the position of Director of CORENA has been established on a full-time basis. This will permit the Director to devote all his time to the administration and decision-making process within CORENA.

The on-going in-house reexamination of Project objectives, goals and activities is to be commended. This will permit further identification of major constraints and evaluation of each Project component and subcomponent on basis of the experience gained since Project operations were initiated. It can be expected that this reexamination will focus on critical areas which in the opinion of the CORENA staff should receive more emphasis to lay the basis for further strengthening of the GOCR capabilities to execute a successful natural resource, utilizaton and conservation program.

C. Reforestation

Project activities are directed toward increasing public awareness and understanding as to the efficient management of the country's renewable natural resources. Reforestation of areas virtually denuded of forest cover, where favorable climatic and soil conditions prevail, should proceed instead of attempting cropping or cattle grazing. This approach will fulfill the final goal envisioned by the Project.

According to recent studies, two thirds of the area of Costa Rica has already been deforested. The deforestation rate has been estimated as between 40,000 and 60,000 ha per year, and can be attributed to harvesting trees indiscriminately for wood products or to land clearing for crops and pasture.

In the Sarapiquí area the problem is not one of credit but of the structure of the Project. Here it is envisioned that a private enterprise will be responsible for the reforestation program for industrial purposes. There is an urgent need of an economic feasibility study.

The evaluation team feels that more native and exotic species should be tried and more observation plots established. These trials should follow a valid statistical design to test adaptability to the area, pest and disease resistance, and growth potential. Nurseries must be established to assure a continuous stock for planting.

The evaluation team feels that probably one effective way that the small and medium farmers can initiate a real reforestation program is by implementation of a subsidy program similar to the one included in the Project design, where the government will pay the reforestation loan if the farmer fully complies with his part of the deal. This is a good incentive for small and medium landowners to reforest. An ambitious campaign by the government to explain the benefits of growing trees not only for soil protection but as a source of cash is essential. To be effective, prices for stumpage must be more competitive in order to work as an incentive for forest conservation and planting of deforested land. Although the government can expropriate those lands that are more critical to protect the water resources of vital areas and assume the reforestation costs, it is highly improbable because of costs to the government. It could be applied in small scale projects.

The Sarapiquí experiment could be the answer for those private and some public lands where private enterprise can work profitably. In lands where forestry operations are not profitable, cost of reforestation must be assumed by the government by direct involvement in reforestation or through subsidies to private owners.

Planting in small patches separated by pasture or crops is innapropriate and self-defeating if oriented to commercial purpose. First, it rarely fulfills its purposes of protecting the soil and water resources because the land between the patches is still used for purposes incompatible with the land capability. Second, it is uneconomical because the cost of harvesting small patches are prohibitive and preclude the formation of private companies that could manage the forest productivily. Third, cost of reforestation increase when the area to be reforested is small. More advanced techniques and equipment that would save cost could be justified if the area to be reforested is large enough.

D. Pasture Management

Most of the land in pastures within the watersheds are covered by volunteer grasses of low productivity and low protein content. Overgrazing increases the erosion hazard. To cope with the ensuing problems the work in pasture management and livestock improvement has not been very extensive in its impact, but has allowed CORENA to obtain

valuable experience in implementing some aspects of new technology in the Río Nosara Watershed. The introduction of King grass and Taiwan grass and the subsequent demonstration and seed multiplication plots should be commended. These grasses are to be used as cut forage to supplement grazing particularly in the drier months. Taiwan grass (Pennisetum purpureum) appears to grow well in the Nicoya Península and can produce at least 45 t/ha every four months. Whenever possible the local Jaragua (Hyparrhenia rufa) pastures should be substituted for other high-yielding more nutritive species. Stargrass (Cynodon niemfuensis) has been observed growing well in the vicinity of Nicoya and Hojancha. This grass spreads rapidly by extremely vigorous surface runners and quickly covers the ground. It is resistant to pests and diseases and relatively drought-tolerant once well established. Congograss (Brachyaria ruziziensis) also performs well under conditions in Costa Rica.

Establishment of a good grass stand can be hastened by proper management. Three hundred pounds of a 15-5-10 or similar fertilizer should be applied about one month after planting and again three months later. In Venezuela, large tracks of tropical forests have been converted to pastures by cutting back the underbush and then seeding to Guinea grass (Panicum maximum).

Cattle can be raised economically on steep, improved grasslands in the watersheds. The possibility of silage and hay to supplement grazing during the dry summer months can not be overlooked.

The research team of CORENA, with the assistance of the appropriate MAG units, should get quickly involved in this type of work. Such possibilities will guarantee the development of economically sound milk production enterprises.

The selection of grass species to extend the grazing season into the dry months should receive a high priority. Studies should also explore management techniques of suitable grasses to be left as carry-over for the dry season. This will also involve the determination of suitable management practices for that purpose.

E. Alternatives to Forest and Pasture

Citrus fruits are well-adapted to the deeper soils of the hillsides of the Río Parrita and Nosara Watersheds. At the Quivel model microwatershed, at Río Parrita, a grove of oranges was recently planted under conservation farming. The variety used was "Naranja Criolla. For future plantings other varieties should be considered such as Valencia and Washington Navel. Grapefruit varieties recommended are the Marsh seedless, Red Blush, Duncan and Triumph. Lemons could have a good local market particularly of the varieties Eureka, Sicilia, Lisbon and Villafranca. The Tahiti or Persian lime could be easily channeled through local markets.

Mangos of selected varieties, guava, cashew nut and other fruit trees also offer a vast potential for the watersheds. Mangos

could be sold as fresh fruit for the local and export markets. Guavas and cashew nut could provide raw material for small, efficient industrial developments.

Fruit trees and coffee, as well as forest trees, under appropriate technology, will increase the potential production of the land and provide excellent protection against soil erosion. For developing a program of this nature, the farmer will need both technical and financial aid. He must be provided with seedlings, grafted fruit trees, credit and other inputs.

Again, the various components of CORENA as well as the resources available in MAG, including the DGF, should work in close coordination to assure the success of a program of this type that can only be matched in terms of soil erosion control by well-managed forest plantations. Furthermore, they provide cash for the farmer within a 3- to 5-year period.

F. Soil Conservation

Intensive agricultural development must be compatible with the conservation of the soil resources. Careful planning must precede farm operations. These include identification and recognition of differences in soil conditions and limitations, weather, slopes and erodibility. Considering farmers needs, markets and other factors, use plans must be prepared for each farm. This includes the choice of crops, timing of

plantings and the kind of protection needed to minimize soil and water losses. Soil conservation practices, to be readily acceptable by farmers, must be simple, low cost and effective. They should be conducive to yield increases rather than reductions. For this reason it is important to consider such practices as using high-yielding crop cultivars, pest control, rational fertilization and liming as essential components of the soil conservation package of practices.

The package must contain the basic elements of soil conservation in terms of no tillage or minimum tillage, contour tillage, mulching with crop residues, vegetative and inanimate barriers, hillside ditches, grassed watersways and others of a simple nature. Strip cropping must be tested in the least sloping lands of the watersheds.

G. Park Management

The Environmental and Conservation Education Component is commissioned to develop a management plan for the newly created Braulio Carrillo Park and at the same time create an environmental education program that educates while creating general public awareness of environmental subject and problems.

So far neither purpose has been accomplished. Poor planning have been the norm and unexpected events have been delaying the implementation of approved plans. There is a lack of highly qualified technical assistance to help prepare the General Plan of Management and

Development. Most of the field personnel consists of new graduates hired from outside the agency and not members of the existing department. They have not been well-integrated into the work of the component. Moreover, training have been sporadic and not always concerned to the specific needs of the Project.

Thus, although Costa Rica has a well designed and progressive strategy/plan for the creation and management of protected areas there are flaws in the implementation and management of the law that are being reflected in the Environmental and Conservation Education Component and the Braulio Carrillo Park Management.

H. Credit

Even when the credit activities of the Project are not considered as a component by themselves, they play such an important role in the development of the program that they deserve special consideration in this evaluation.

The objective of providing credit was to facilitate the adoption of various renewable resources conservation and management practices. The goal is to loan a total of $2.5 million to farmers and other private institutions in order to improve their capability to carry out activities that will enhance the conservation and appropriate management of renewable resources.

It is important to mention that the subsidy to the beneficiaries of the credit program contemplated in the original Project design was ruled out because the Costa Rican laws do not provide for this type of incentives. A Project to revise all incentives related to the conservation and management of renewable resources is now being considered by the Legislative Assembly.

VII. MAJOR CONSTRAINTS

A. Linkages Among CORENA Components and MAG

The evaluation team feels that a major weakness of CORENA is the inadequate linkage among Project components and even among subcomponents. This has lead to involvement of action units such as the Experimental Projects, which should be more properly identified as Pilot Projects, into a sort of informal, adaptive, not well designed research activities. On the other hand, the Research Subcomponent shows little interest in these activities, instead of providing support in terms of valid statistical designs and interpretation of data.

The Preparation of Management Plans Component is actually involved in action activities that pertain more properly to the Experimental Projects Component. A vivid example of this is the involvement in the Quivel Microwatershed. The Gamalotillo Project dramatizes the need for clarification of the objectives of the

Preparation of Management Plans Component. This type of activity is more in line with the MAG extension activities and should be channeled through CAR.

Throughout the evaluation period it became evident that the other units of MAG provide but minor support, if any, to the program. It should be expected that the responsible officials at MAG look into the possibility of greater involvement in areas such as pasture and livestock, soil fertility and management, erosion control and others.

Extension services must be fully developed and its rather loose, weak linkage to CORENA must be strengthened.

Without this support and involvement, CORENA's responsibilities are adversely affected and its leading role in natural resource utilization management and conservation becomes more difficult to fulfill.

It appears as though at Nicoya there is a fairly good coordination and working relationship between CAR, DFG and CORENA. At Puriscal, such a coordination is not evident. At both locations, support from MAG central headquarters is notoriously lacking.

B. Administration

CORENA has suffered from changes in leadership since its inception. The present executive officer of CORENA, the third in its short history, is a very resourceful highly qualified, experienced and capable individual but lacks the necessary support to coordinate more effectively, supervise and manage the program as desired. His staff should be strengthened. One requirement is the addition of a highly-qualified top-notch administrator to carry on the routine tasks that he is often obliged to do. During interviews with team members at his office he was often interrupted with telephone calls and messages mainly concerning delays in procurement of supplies and materials, payments of the rent of regional CORENA offices and other routine matters. To facilitate operations the CORENA administrative staff should be close to the office of the Director and not separate as they are now. All in all, he has been able to develop a kind of mystique that pervades through most of the Project staff.

The evaluation team feels that the CORENA Director must dedicate his time to evaluation, coordination, supervision and follow-up of program activities. Most important among his duties is the decision-making process. The appointment of an experienced Deputy Director will provide for appropriate linkages between the central office of coordination and the field operations at the technical level. The proposed Deputy Director will be the liaison officer in constant contact with on-going field activities.

The evaluation team is pleased with the action converting CORENA from a coordinating to an executive body. CORENA, not the DGF, is now recognized as the central axis of forestry activities in the country.

The lack of appropriate manuals defining procedures, duties and reporting is recognized by the CORENA Director.

One serious limitation concerns the lack of experienced personel mostly at the field level. In general, the CORENA staff consists of 107 employees. This include 15 foresters, 10 "ingenieros agrónomos", one agricultural economist, 9 "egresados agrónomos", and other 23 professionals and paraprofessionals. Main problems relate to rapid turn-over of personnel, inexperience and relatively low level of academic preparation. The prevailing low salary is a serious handicap to recruit and retain personnel. In some cases, the lack of adequate office space and facilities has been cited as a handicap. The evaluation team was informed that the normal processing of an appointment in the GOCR takes approximately three months.

The process of using USAID loan monies was affected by the "Ley de Impuestos de Ventas" because even the GOCR has to pay taxes and the terms of the USAID loan do not permit this payment. At this time, the Ministry of the Treasury has provided a dispensation but each action requires approximately one month or more.

C. Credit

The credit facilities offered through CORENA are subject to major restrictions. The Banco Nacional de Costa Rica, through an agreement with MAG, administers these funds according to the terms set forth by the Banco Central and the Ministry of the Treasury. The Banco Nacional de Costa Rica can loan to farmers participating in the reforestation and pasture improvement activities in the Nosara Watershed and the Río Parrita Watershed. The bank requires as a colateral a mortage of the property, and an approved farm development plan. Farmers can borrow up to 50% of their active assets. This loan is restricted as follows: 20% or 40% is conditioned to be used in activities related to forestry, fruit tree planting and soil conservation; 80% or 60% can be used for cattle and pasture improvement on small and medium-sized farms, respectively. Interest rate for forestry and related projects is set at 8%, but for livestock activities is 15%. It is claimed that other banks operating in the area charge 12% interest rate without any mortgage on the property and without any reforestation requirement.

VIII. RECOMMENDATIONS

In this section the main recommendations that have been incorporated through out the report are consolidated to facilitate making basic decisions regarding the Project.

A. General Project Recommendation

The evaluation team strongly recommends that the Natural Resources Conservation Project continues for at least the remainder of Project life through September 1985. The main reason being, not that the evaluation team feels a great implementation job has been done so far, but because AID and the GOCR can hardly afford bringing to an abrupt end an excellent oportunity to continue implementing a comprehensive approach to strenghen institutional mechanisms and strategies through which renewable natural resources are managed in a country that desperately needs to gain this experience. Although the relative slowliness in implementing the Project is discouraging the blame cannot be pinpointed. On the other hand, overall progress achieved, so far, in overcoming the myriad obstacles encountered, prompts one to conclude that the best interest of both AID and GOCR are served by proceeding ahead with the Project. All the important ingredientes are now in place, and needed modifications are being identified and made. Salient features justifying continuation of the Project are:

1. The existence of a highly motivated local staff working under the guidance of a dynamic and competent person presently serving as Director of the Project and answering to the Ministry of Agriculture;

2. Having recently signed and put into operation the two main technical assistance contracts (with FAO and CATIE) to assist in all the

key areas that are instrumental to the successful implementation of the Project, and having also recently entered into a series of contracts with local institutions, private firms and individuals to do important pieces of research needed to formulate watershed development plans and forest management, among others;

3. CORENA staff having already gained substantial experience in dealing with the GOCR and AID's rather complex regulations regarding finanacial affairs, should help to expedite and make more fluid the management of the Project during the rest of its life.

4. Having already secured badly needed counterpart funds, the lack of which previously caused so many delays in starting meaningful Project implementation;

5. An on-going rather large training program that is vital to strenghen GOCR and, particularly the MAG's capability to manage meaningful natural resources conservation programs;

6. The start of what has the potential to became a major shift in forestry management, that consists of pursuing a policy to encourage the industrial forestry private sector to became interested in the proper utilization of the country's forest resources, through the stimulation of private enterprises committed to the rational and technical utilization of the resources following an appropiate conservation approach that includes sound management of natutal forest and reforestation.

B. Project Management and Coordination

1. There is a need to clarify CORENA's role in relation to achieving the Project's objective of strenghening the Forest Directorate's capacity to plan and implement sound natural Resource Conservation programs. Presently, CORENA seems to be moving away from the D.G.F., since its Director ceased to be Sub-Director and report directly to the Minister of Agriculture, which means that the Director of the D.G.F. is no longer directly involved in CORENA's operations.

The evaluation team feels, however, that the present set up, although probably the best way to achieve short term objectives, is not conducive to developing the envisioned capabilities within the D.G.F. Furthermore, the evaluation team is concerned that there are other MAG Directorates that have a direct bearing on any comprehensive approach dealing with natural resources, and these units are not being brought into the project's implementation as would be desirable and necessary.

The specific recommendations are:

a. Keep CORENA as the day to day operating entity of the Project to capitalize on the experience already gained;

b. Make the Director of CORENA respond directly to the Director of D.G.F., holding the latter as the MAG official responsible for overall Project implementation;

c. Review present D.G.F. organization, programs and operations with the purpose of prioritizing programatic ativities in view of budgetary limitations and to bring the 032 Project more directly to bear in helping to strenghen the D.G.F., while pursuing Project specific goals. This means that D.G.F. units will be strenghened instead of canibalizing them, so to speak, in strenghening CORENA;

d. Broaden present CORENA's COordinating Committee to include the heads of other MAG units that can directly assist in achieving Project goals while carrying-out their normal operations, cases in point being the Livestock Directorate and SEPSA. This Committee should be headed by the Vice-Minister of Agriculture and should meet periodically with an agenda prepared by the Director of D.G.F. assisted by the Director of CORENA;

e. Fully integrate CORENA personnel into the rest of D.G.F. at the regional level and make sure that CAR's Directors are fully aware and participating in assisting to achieve Project goals. CORENA's field activities should be viewed and operate as integral part of MAG regional operations.

2. Appropiate documentation must be prepared defining operating procedures and specific job descriptions of Project personnel;

3. An effective, periodic (quarterly) reporting system should be rapidly completed and implemented. The report should concentrate on progress achieved against well defined targets, obstacles encountered and remedial action being taken or recommended. A copy of this report should be given to AID and meetings held as necessary between AID and CORENA to review progress and take necessary actions.

Priority must be given to ensure speeding up 032 implementation with the necessary modifications being recommended. But it is also of vital importance to start projecting the natural conservation program beyond 032 and present CORENA set up.

As the various Project components start producing results, particularly those related to the development and approval of watershed conservation plans, the need to harness overall MAG resources, to effectively implement meaningful programs will be clearly evident. The D.G.F. should not be held responsible for implementing a comprehensive multi-disciplinary action program that may exceed the Directorate's legal framework and capabilities. All MAG entities concerned must participate.

Other GOCR institutions, like banks will also have to play an important role. MAG regional offices will have to be fully involved.

In this context, the DGF will continue playing a vital role within its legal and operational scope, but not venturing into areas for which other MAG units are responsible. However, Project funds should be used to strengthen those entities that have an important contribution to make to the successful implementation of Project 032.

C. Project Components

The evaluation team recommends to continue implementing the components, with the modifications recommended below. Two important general recommendations are:

1. More concrete and realistic programming of activities is needed to ensure that adequate implementation is achieved by each component during the life of the Project.

2. The contracting with a large number of local institutions, private firms and individuals to conduct research, make surveys and analyses,need to be carefully scrutinized to determine those projects that are really needed, and modify or bring to an end those that, although interesting, are not vital to the Project. Particular attention should be given to contracts with universities.

D. Specific Recommendations by Component

1. Coordination, Policy and Research

Recommendations on the coordinating role of CORENA are included under "Project Management and Coordination" presented above.

On policy formulation, there are about eight different studies in various stages in planning and execution. Priority should be assigned to those that are really important to formulate policy, like the four identified in the Policy section of this report.

Assign dates for completion of these studies and make sure they are completed as scheduled. Start simultaneously devicing preliminary policy options based on information that is already available. In this respect, the evaluation team recommends that the SEPSA unit be brought back to fully participate in this area.

The research component is underdesigned and its implementation is very weak. Principal recommendations are:

a. Start with an assessment of the DGF research department to inventory and assess technical staff, budget, programs. Determine what effect CORENA has had in strengthening this unit.

b. Design a realistic research program for the department concentrting on achieving Project goals. Discussion and recommendations included in the research section of this report (pages 19-27) should serve as the baseline in designing research activities. Well defined targets and dates of completion should receive very special attention.

Areas of research that should be included are, among others:

- Development and updating of complete packages of technological practices through adaptive research on high-yielding species and varieties of forest tress, fruit trees, coffee, forages and hosticultural and field crops; fertilization; pest control; and soils management. Leadership in this respect must be taken by the appropriate MAG directorates with CORENA support.

- Determine the value of mulching with crop residues as a soil conservation practice.

- The appropiate units of MAG should conduct, with CORENA assistance, simple studies on soil erosion losses under various plant covers and management systems. In this respect, the models used by the Escuela de Postgraduados in Chapingo, Mexico; by IICA and the Ministry of Agriculture in Jamaica, and by the University of Puerto Rico and the U.S.D.A. Soil Conservation Service in Mayaguez, Puerto Rico, might prove useful.

- The Dirección General de Ganadería (DGG) should work, with CORENA assistance, on the selection of grasses suitable to extend the grazing season into the drier months. This aspect should receive a high priority in the research program.

- Studies should be undertaken as to the feasibility of hay, silage and carry-over pastures.

- More effective coordination of the Research Component with the programs of the various directorates of MAG, universities, CATIE and other institutions is needed.

Although extension is not a component, its methods need to be employed particularly in the experimental projects. The evaluation team recommends that:

- Field extension work be closely coordinated between CORENA and other MAG activities to prevent duplication, like building extension capability in areas already covered by other MAG units.

- Demonstration plots should be used more often as a tool to show the farmer the benefits of adopting soil conservation measures together with appropriate technology.

- Evaluation of the effectiveness of technology transfer from the pilot microwatersheds to the farm level should receive more attention.

2. Experimental Projects

a. Forest Production

Two of the five activities of the sub-component are no longer valid and should be dropped from project design: the colonization plan and the technical center, the latter mainly because CORENA feels, and the evaluation team concurs, that there is no real need for it and its establishment and operation is costly and probably beyond DGF capability.

Implementation of two of the other three activities (management of natural forests and reforestation) are being linked by CORENA to the establishment of a mixed-owned enterprise formed by the owners of the forest land and the industrial forest private sector. The enterprise will be committed to rationally and technically utilize the resource, including sound management of the natural forest and reforestation. The evaluation team recommends:

- MAG should make an official presentantion to AID of its new approach to forest management and utilization, and explore the possibility of using 032 loan or counterpart funds to help develop the

private enterprise concept. The evaluation team feels that the thrust of the approach is sound and merits whatever support is possible.

- In relation to forest protection, this is DGF's legal responsibility and should be implemented accordingly. The existence of a private enterprise does not change this situation.

- Technical assistance for the forest production project should focus on industrial and economic planning and administration, logging, road construction and maintenance as well as nursery management.

- Short-term training activities for forest production at the technical level should continue and focus in those skills required by field activities, relating practical training to technical assistance whenever possible. Long term training should focus on the development of natural resource administration and planning skills. CORENA should work on a long term training plan that will reflect current and expected future needs.

- Aerial photography for the entire Sarapiquí area should be made as soon as possible. The photography should be used for management planning (completing forest inventory), land use studies, and as a baseline for subsequent monitoring of the results for soil conservation and forest rehabilitation programs.

- Programs should be reviewed to assure that cooperating farmers are allowed to participate in planning forestry projects.

- Experimental projects for studying regeneration methods, nursery management, tree improvement and adaptability studies should be contracted with academic or research institutes, which have the technical skills, facilities and capabilities to accomplish the objectives in a longer time frame. The financial capabilities of DGF for long-term projects is questionable and the possibility exists that the experimental projects will be discontinued after termination of Project funding.

b. Reforestation and Pasture Management

Principal recommendations are:

- Bring the sub-component back to its original design: testing a reforestation subsidy scheme in combination with a supervised credit program for pasture and cattle improvements.

The reforestation subsidy is underdesigned. The interpretation was that it called for GOCR to f[illegible]debts, and apparently, this is illegal. The design should [illegible] stated in effect that the GOCR, would use loan funds to help small and medium sized farmers to pay a portion of loans made to them by the bank to invest on

pasture and cattle improvement and reforestation. It is also recommended that the credit incentive be extended to other soil conservation practices that are costly to adopt. The rationale being that these practices are of great interest to the country as a whole but may be beyond the means of small and medium sized farmers trying to eek out a living with very limited resources. The incentive would be only for other than normal practices (reforestation and other costly soil conservation) and only as long as farmers establish and properly maintain them. There is no legal problem with using loan funds for this purpose. The evaluation team recommends that a fund be set up in MAG using loan money for this purpose. MAG will approve the incentive portion for each individual borrower. Individual borrowers will authorize the bank, in writing, to collect from MAG his alloted payment as long as MAG certifies that the farmer is properly following the recommended conservation practices.

If the figures given to the evaluation team concerning the cost of planting one hectare of trees are correct (about $619 first year) it is almost impossible to foresee how small farmers with very little financial resources can participate in reforestation in a meaningful manner, without any economic incentive. The very limited acceptance of small farmers to invest in reforestation so far appears to confirm this.

- Review present credit arrangements between CORENA and BNCR with the purpose of the latter assuming greater credit responsibilities and not onduly pending on limited CORENA personnel.

Personnel participation in developing farm plans is a legitimate activity; however, taking loan application, etc. is not; this is BNCR responsibility.

- It is recommended that a concerted effort be made by CORENA and AID to prevent credit facilities being extended to Project areas without a clear purpose in doing so. If this was a credit project it would have been designed differently. If the proposed reoriented reforestation subsidy cannot be implemented, the evaluation team recommends that this sub-component be submitted to a more in depth evaluation to determine whether it should continue as the true representative of original project design or that a more agricultural development oriented project should be deviced. In this event the DGF role should be modified to permit a more active participation of other concerned MAG units.

c. Management of the Nosara Microwatershed

Principal recommendations are:

- A definitive date should be assigned and adhered to for the completion of the updating of a management plan for the Nosara microwatershed.

The evaluation team strongly recommends that, if necessary, part of the staff working in the preparation of the Parrita

watershed plan be temporarily shifted to Nosara to ensure that this management plan is promptly completed. It would be the first of such plans completed and the experience gained could be very valuable to expedite the preparation of other plans contemplated.

- Drop activities related to the construction of bench terraces and catchment basins for established coffee trees.

- Experiment aggressively in some of the areas recommended for the research components that have a direct bearing on the microwatershed, like soil erosion, packages of technological practices that are both conservation and production oriented.

- Soil erosion control efforts must include practices conducive to increased yields (high-yielding varieties, fertilization, pest control) as well as the basic elements of soil conservation. This should include minimum tillage, mulching with crop residues, vegetative barriers, hillside ditches, grassed waterways, strip cropping and gully control. Practices must be simple, low cost and effective. The soil conservation conceptualization must be broadened to include efficient and increased production and not just conservation per se.

Use demonstration plots more often as an effective tool to show farmers the benefit of adopting soil conservation measures together with appropriate technology.

3. Preparation of Natural Resource Management Plans

Principal recommendations are:

- Relieve Project personnel working in Puriscal from the Gamalotillo project. The CAR can perfectly continue providing whatever services MAG is capable of offering regarding normal agricultural programs.

- Assign and adhere to a date for completion of the natural resource management plan for the Esquivel Microwatershed, which has been selected for intensive study. Although the promotion and carrying out of action programs simultaneously and by the same staff has certain advantages, it is obvious that this is delaying the preparation of the management plan which is the main objective of this component. This is a case where the CAR should have been more fully involved in these so called "immediate actions", with the appropriate guidance from the CORENA staff. In this manner the experience obtained could enrich the planning staffs awareness of the practical implications of resource planning without causing undue delay to the component.

- Make a concerted effort, with the full participation of FAO, CATIE technical assistance, to simplify the methodology that is envisioned to prepare the management plan for the Parrita Watershed. To this effect, it is strongly recommended that peliminary natural resource management plans start to be drafted based on information already

available. The Parrita watershed is in an advanced state of deterioration and enough is already known to start implementing important conservation components. The need to start action programs was fully evidenced during the evaluation team's visit to Puriscal and in the meeting held with representative of the municipality and other important community organizations.

The first section of the study area of the Parrita Watershed should be completed in substantial detail as planned. The remaining sections should be studied on a reconnaisance scale on the basis of the experience obtained from the study of the first section. Beyond the planning stage, when action program execution is undertaken by the GOCR, certain studies must be made on a farm by farm case basis.

4. Environmental and Conservation Education

Principal recommendations are:

- Drop the construction of an environmental education center unless a firm agreement is reached with one or more institutions (outside of MAG) that have the interest and capacity to administer and maintain the facilities that the project calls for to be built. Otherwise, this project could really be a burden to the SNP and is beyond the scope and functions of this national park.

- Cause CATIE to commit itself to an acceptable date to provide the general layout for the location of the facilities that need to be constructed, so that detailed design and construction can be completed during life of the project.

- Cause CATIE to commit itself to a reasonable date to produce the management plan for the Braulio Carrillo National Park.

5. Training and Technical Assistance

a. Training

Principal recommendations are:

- Proceed immediately to identify each components priority training needs that will enhance achieving Project goals and promptly proceed to provide the necessary training courses. Make full use of technical assistance already in country to help identify and satisfy these needs.

- Although, project design called for an intensive training program that would be available for a large number of GOCR institutions and training areas, the evaluation team recommends that training opportunities be concentrated to cover needs of the institutions and personnel that presently have or are intended to have direct functions and responsibilities in natural resource conservation. These are basically MAG and IDA.

- Proceed immediately to review training programs underway using above recommendations as a guideline.

b. Technical Assistance

It is recommended that greater attention be paid to ensure a carefully programmed technical assistance package in country to bear in a timely manner on vital activities that are instrumental to Project successful implementation. It is urged that AID become directly involved in programming the use of technical assistance and in closely monitoring progress achieved. Periodic reports should be required from the contractors (FAO, CATIE) and copies sent to AID for review.

E. Recommendations to USA.I.D.

The evaluation team stongly believes that project implementation can be further enhanced if AID strengthens its management functions. This is merited due to the complexity of the project and the time frame for its completion. It is recommended that in addition to the monitoring functions being presently performed by a competent costarrican national, a Project Advisor be added. The Project Advisor should be a seasoned professional highly experienced in management of natural resource conservation programs. The advisor will assist MAG in overall project programming and implementation and will analize major implementation obstacles and constraints and formulate options to facilitate making decissions by both MAG and AID.

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