CATIE COMPONENT OF THE FUELWOOD AND ALTERNATIVE ENERGY SOURCES PROJECT (596-0089) -- FINAL EVALUATION

Prepared for:

ROCAP
U.S. Agency for International Development
San Jose
Costa Rica

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ACRONYMS

AID	U.S. Agency for International Development
ARD	Associates in Rural Development, Inc.
BID	Inter-American Development Bank
CATIE	Tropical Agricultural Research and Training Center
CENREN	El Salvador's Natural Resources Center
COHDEFOR	Honduran Corporation for Forestry Development
DBH	diameter at breast height
DBM	data base management
DGF	Costa Rican National Forestry Directorate
DRNR	Department of Renewable Natural Resources
IICA	Inter-American Institute for Agricultural Sciences
INAFOR	Guatemalan National Forestry Institute
INFORAT	CATIE's Technical Forestry Information Center
IRENA	Nicaraguan Institute for Natural Resources and the Environment
IUFRO	International Union of Forestry Research Organizations
PP	project paper
RENARE	Panamanian Department of Renewable Natural Resources
ROCAP	Regional Office for Central America and Panama
TCP	Tree Crop Production project
USAID	U.S. Agency for International Development
VITA	Volunteers in Technical Assistance

PREFACE

A five-person team conducted this evaluation of the fuelwood component of the Fuelwood and Alternative Energy Sources project. The evaluation team included three individuals from Associates in Rural Development, Inc. (ARD), including Mr. Richard Donovan (team leader and a natural resources specialist from ARD's home office in Vermont), Dr. Hans Gregersen (a forest economist from the University of Minnesota) and Mr. Ian Hutchinson (a forester). The fourth team member, Mr. Alan Randall, is a forest management specialist from USAID/Panama. Ms. Gina Green, a forester from Oxford University, was the fifth team member. She focused specifically on editing the country program assessments that other team members wrote.

The evaluation team's fieldwork was divided in the following manner. Mr. Donovan worked in Costa Rica (mostly at CATIE) for three weeks. Mr. Hutchinson spent five days each in Honduras, Panama and Guatemala, and two weeks in Costa Rica. Mr. Randall was in Panama for seven days, El Salvador for three days and Costa Rica (mostly at CATIE) for about 11 days. Finally, Dr. Gregersen worked in Costa Rica (mostly at CATIE) for two weeks. The draft report that the team produced in Costa Rica was the basis for evaluation briefings at the end of the fieldwork at CATIE in Turrialba, Costa Rica (with both ROCAP and CATIE staff in attendance), and ROCAP/Guatemala City. The draft report was reviewed by ROCAP, CATIE and ARD home office technical staff, then revised by Mr. Donovan at ARD's home office in Burlington, Vermont.

I. EXECUTIVE SUMMARY

The Fuelwood and Alternative Energy Sources project was a six-year project funded primarily by the U.S. Agency for International Development's Regional Office for Central America and Panama (USAID/ROCAP) and implemented by the Tropical Agriculture Research and Training Center (CATIE). The project consisted of two components--CATIE's fuelwood subproject, and ICAITI's alternative energy technology subproject. The overall project was first evaluated in July 1982 by VITA. The ICAITI subproject has already been the subject of a final evaluation by a regional energy advisor from USAID/ROCAP. Thus, this evaluation, conducted by Associates in Rural Development, Inc. (ARD) at the request of ROCAP, does not cover the ICAITI subproject, focusing instead on CATIE's fuelwood subproject.

The project agreement for the fuelwood project was signed on 16 August 1979, with project activities beginning that December. Fuelwood project activities ended in December 1985. The end of the fuelwood project coincided with the start-up of the five-year Tree Crop Production (TCP) project, which is also funded by USAID/ROCAP.

This project evaluation was requested for two primary reasons:

- to serve as a final evaluation of the fuelwood project, and
- to provide guidance to CATIE and ROCAP on ways of using the technical and administrative management experiences of the fuelwood project to improve implementation of the remainder of the TCP project.

This evaluation focuses on assessing the accomplishments of the fuelwood project and providing a series of options for improving implementation of the TCP project.

The goal of the fuelwood project was to improve the welfare and productivity of low-income groups and increase the supply of low-cost energy for the rural and urban poor. The purpose of the project was to develop, demonstrate and make available for transfer improved cultivation practices to increase fuelwood production and supply. During the evaluation, the ARD team focused first on evaluating the success of the fuelwood project in terms of the project purpose given in the logical framework (log frame) of the project paper (PP). According to the PP, the purpose of the fuelwood project would be achieved when:

- specified cultivation and farm management practices developed by CATIE with national counterparts are found acceptable by target populations;

- national counterparts are using these new practices in extension programs; and

- national research institutions and CATIE are continuing research programs on this topic.

In terms of both CATIE and the national institutions, the fuelwood project's major value seems to be establishing institutional capability in the technical area and links with other appropriate institutions. The project appears to have firmly established CATIE as a regional center for information on and seeds for fast-growing species, particularly those of importance regarding fuelwood. The fuelwood project has succeeded in accomplishing most of the quantitative objectives set out in the PP (see the table showing CATIE fuelwood project achievements on page 12). It has also established a good management structure that includes exceptional leadership. Finally, and perhaps most important, it has managed to involve high-quality staff at every level.

Unfortunately, at this time, there are few indications that the notion of self-sustaining fuelwood research activities is viable. CATIE, even more than national agencies, remains almost completely dependent on project funds for its personnel, material and inputs into fuelwood-related activities. The only indications of self-sustainability are at the national level, where local agencies have put a large number of staff to work on project activities. However, inputs of project funds for fuel; maintenance; equipment purchase, replacement or repair; and travel have been crucial to the project's achievements to date. Far too little progress has been made on the long-term sustainability of these types of activities and, in particular, the futures of the well-trained country coordinators.

CATIE-based project staff have been criticized for spending too little time in the field. The technical quality of fuelwood project activities suffered because the combination of administrative, non-project and teaching responsibilities at Turrialba often distracted them from field activities. The problem was exacerbated by the number of unfilled project positions.

It is recommended that the TCP project coordinator immediately review the scopes of work for each technical staff member working on the project and indicate percentages of time to be spent on each activity. It is suggested that a breakdown of time for CATIE-based staff be developed which specifies the percentage of time to be spent in the field, at CATIE teaching,

at CATIE on other project activities and at CATIE on non-project activities. The ROCAP regional forester should assist in this process to ensure that an appropriate percentage of time is devoted to nonteaching project activities. Both parties should work with the director's office to ensure understanding of the need to devote time to project activities in the field. A serious effort should be made to get CATIE-based staff into the field with country-level staff more often, with special consideration being given to ensure that each country program receives equal attention.

Most of the socioeconomic research carried out by the project was actually surveys to gain information on socioeconomic characteristics, trends and implications for potential fuelwood activities. Three studies (all in Costa Rica) examined the reasons why people accept certain species for planting. None of these studies have been published yet, since project staff feels they are not yet in publishable form.

The objectives of the socioeconomic and survey research undertaken by the project were appropriate. For the most part, these objectives were met, and the studies were generally sound in terms of methodology. However, the scope of the socioeconomic research was inadequate in terms of the social and economic issues that needed and still need to be addressed. This shortcoming is being addressed in the TCP project.

The four research areas suggested below are all considered to be within the context of the terms of reference for new positions envisioned under the TCP project--a senior economist, a rural economist to assist the senior economist and a social scientist. Once these three positions have been filled, they should, together with other CATIE staff, develop an overall social science/economics research plan. In the meantime, the following four research areas indicate priorities for this plan in the view of the evaluation team:

- production and investment analyses,
- incentive mechanisms,
- socioeconomic data base, and
- traditional rural wood industry opportunities--market development and access, off-farm employment impacts of rural wood industries, and institutional barriers to and encouragement of traditional rural wood industries.

It is recommended that all species considered for inclusion in project activities should be screened by using "species elimination trials." For a given species, this type of trial

lasts approximately one year. Seedlings are planted in straight lines with considerable repetition. Lines may be placed across any type of soil, aspect or terrain. All information worthy of record is plotted on a map showing the location of each line and the position of each species on a line. No information goes to the data bank. At the conclusion of a trial, those species found suitable for formal trials will have become obvious by their superior growth, good form and healthy appearance.

It is recommended that the fuelwood project conduct a complete, impartial and rigorous review of the data bank's structure and activities. This could be conducted internally by project staff with assistance from the Forestry and Fuelwood Research and Development (F/FRED) project data management specialist or a consultant contracted from outside. The following elements should be included in this review:

- edit programs,
- program flexibility,
- data updates,
- machine memory, and
- data output.

It is recommended that because of disease problems being encountered during project research, an experienced pathologist and entomologist should be contracted to advise on the seriousness of these attacks, their expected effects on the prospects for each species concerned and how to summarize the visual evidence of attack and decay on field data sheets. In addition, CATIE should publish an illustrated field manual for identifying pathogens and deciding on appropriate preventive and/or curative measures.

It is recommended that due to the success and visibility of the field demonstrations, the project should continue these activities, including:

- obtaining and making available technical information on fast-growing tree species to agencies and organizations involved in routine extension;
- establishing and maintaining plots, model plantations and farms to demonstrate the growth and form of chosen species--on the demonstration farms, trees would be used to illustrate the principles of intergrated land use, and the benefits of woodlots, shelterbelts, windbreaks, shade over perennial crops and live fences;

- training national staff in the principles of rural sociology and methods of agricultural extension; and

- preparing and distributing a series of filmstrips on the growth and management of each species of importance to the project, and a booklet for internal use and training on the subject of working successfully with small farmers and local populations.

It is recommended that project staff pay less attention to producing information of a purely scientific or academic nature. Instead, they should place major emphasis on making available to extension agents and policymakers information on tree crop production methods developed or researched by the project. All scientific publications produced by project staff should be officially coauthored, including at least one country-level staff member in every publication.

It is recommended that a basic focus of the TCP project should be to increase both CATIE and national capabilities to extend research results and management packages developed through the project and elsewhere. In CATIE's case, the focus should be on increasing its involvement in training trainers, i.e., those who return to their countries, adapt the general knowledge and skills gained at CATIE to their own situations, and provide training for local people.

There needs to be a much stronger commitment to increasing budget support for project-related activities, through support for technical and scientific personnel involved in training and other technology transfer activities. This holds for CATIE and the project countries. A first step in defining the level of commitment needed is to develop national manpower training plans. Preparation of these plans should involve rapid (probably one week per country) assessments focusing on very practical needs. The TCP project coordinator, in conjunction with country staff, should develop concrete indicators of progress in the technology transfer area, as it is extremely critical to future project success and the continuation of project activities, nationally and at CATIE, once the TCP project ends.

Species demonstrations and some of the management work that has already been accomplished indicate that favorable results will be forthcoming. However, the fuelwood project has not yet prepared technical packages to offer to extension agents or farmers. The lack of emphasis on the socioeconomic aspects of project activities will delay rapid dissemination of forestry research that appears to be quite promising from a silvicultural perspective.

Country-level personnel have been most actively involved in developing cultivation and farm management practices, while CATIE-based staff have provided ideas on species and management combinations--this has been one of the strengths of the fuelwood project. CATIE-based staff have not provided enough assistance with the management of existing trials and parcels, as well as on-the-ground collaboration on data collection and information analysis for national program needs.

If AID had not undertaken the TCP project, serious disruptions in the fuelwood project's ongoing research would have occurred and its level of effort would certainly have been jeopardized. One of the best elements of the fuelwood project has been training national staff on various aspects of research and fast-growing tree species. It is likely that without the TCP project, national agencies would have had little opportunity to use this training--resources provided by the fuelwood project, such as vehicles, fuel, equipment costs and per diem, were crucial in getting out into the field. The fuelwood project was unsuccessful in developing such a long-term survival strategy for its research or extension activities, either at CATIE or national institutions.

The transition from the fuelwood project to the TCP project appears to have been extremely smooth. TCP has the potential to be an excellent project, if it retains a sharp focus. However, the PP for the TCP project is confusing at the purpose level concerning the roles of CATIE versus national institutions. It is recommended that the purpose stated in the PP for the TCP project be revised to clarify the roles of CATIE and national institutions.

Two of the greatest weaknesses of the fuelwood project were that it was unable to accurately document the benefits and accomplishments of its demonstration work in the field, and project monitoring did not adequately focus on attainment of the project's purpose. It is recommended that the TCP project improve its monitoring system to focus on a qualitative accounting of indicators that might show achievement of the project's purpose and end-of-project conditions. Implementation of this system will depend on improved input at three levels:

- from the ROCAP regional forestry advisor, in terms of maintaining a long-term perspective on the project's value and performance, and taking a practical role in purpose-level monitoring in the form of short (two- to three-page) written periodic assessments (either quarterly, twice yearly or, at a minimum, annually) of project performance, which will be distributed to all project staff and reviewed during quarterly project meetings or

whenever regular joint meetings of country- and central-level staff occur;

- from CATIE central-level staff, in identifying better socioeconomic and silvicultural data inputs as well as processing and analyzing field data for output- and purpose-level monitoring; and

- country staff will continue to collect output-level monitoring data--above all, the monitoring system outlined here depends on the quality of information provided through country-level data collection.

II. INTRODUCTION

The Fuelwood and Alternative Energy Sources project was a six-year project funded primarily by the U.S. Agency for International Development's Regional Office for Central America and Panama (USAID/ROCAP) and implemented by the Tropical Agriculture Research and Training Center (CATIE). The project consisted of two components--CATIE's fuelwood subproject, and ICAITI's alternative energy technology subproject. The overall project was first evaluated in July 1982 by VITA. The ICAITI subproject has already been the subject of a final evaluation by a regional energy advisor from USAID/ROCAP. Thus, this evaluation does not cover the ICAITI subproject, focusing instead on CATIE's fuelwood subproject.

The present document is the third and final evaluation of CATIE's fuelwood project. In addition to the VITA evaluation, the CATIE subproject was the subject of a technical evaluation by the regional forester from USAID/ROCAP in August 1983. In addition to these project-specific evaluations, some comments on the fuelwood project are also presented in a June 1984 evaluation of the CATIE Department of Renewable Natural Resources (DRNR).

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In addition to project purpose, the evaluation team also used the outputs proposed in the PP for comparison of expected versus actual accomplishments. Implementation of this evaluation was structured in the following way:

- based on review of background documents and previous experience, briefing notes were developed for conducting country-specific assessments of activities in Panama, El Salvador, Costa Rica, Honduras and Guatemala;

- country assessments varying from three to 10 days were conducted in five countries, with Panama receiving special attention at the request of ROCAP;

- after the country assessments, the evaluation team met in Costa Rica for interviews at CATIE and development of a draft report;

- the draft report was presented to CATIE and ROCAP/San Jose staff during a day-long session at CATIE in Turrialba, including a working session with project staff to discuss how to use the evaluation report for immediate project planning needs;

- the draft report was then presented by the team leader to ROCAP/Guatemala staff in Guatemala City; and

- after comments on the draft report from ROCAP, CATIE and ARD home office staff, the team leader made revisions and produced the final report.

The end product represents the opinions of the evaluation team, not CATIE or ROCAP.

Organization of this Report

The presentation of this report recognizes the dual focus of the evaluation--summative assessment of the fuelwood project, and preliminary assessment of activities in the TCP project.

Section III presents quantitatively what the fuelwood project was, or was not, able to accomplish. This is done by comparing the expected activity outputs described in the PP to actual achievements at the end of the fuelwood project.

Sections IV, V and VI provide a more qualitative discussion of project activities and relate them to current activities in the TCP project.

Section VII discusses the implications of all of the above in relation to the ultimate objectives of the fuelwood project, as described in the PP's project purpose and expected end-of-project status.

Section VIII discusses transition from the fuelwood project to the TCP project.

Finally, Section IX identifies those "lessons learned" which should be taken from this experience and applied to the TCP project or similar forestry research and training efforts that may be taking place in other regions of the world (i.e., AID's Forestry/Fuelwood Research project).

The appendices include the evaluation scope of work, a list of individuals contacted during the evaluation, and short trip reports for each country visited. The trip report or country study for Panama is the most detailed, as requested by ROCAP. Particularly in the case of Panama, country staff will find the country appendices helpful for specific recommendations on future country activities.

Data Limitations

This evaluation relies on information provided to the team by CATIE, and on interviews with CATIE staff and other relevant or interested individuals in Central America and Panama. Unfortunately, the team was not able to visit Nicaragua, where the project has reportedly been quite successful.

III. FUELWOOD PROJECT ACHIEVEMENTS

The fuelwood project has generally been viewed as a successful project since the first project evaluation by VITA in 1982. One of the main reasons for the positive impressions of the project has been the impressive achievement of quantitative objectives (or, in AID terminology, "outputs") of the project. The following table summarizes what the fuelwood project has, and has not, been able to achieve over the last six years.

A. Identification and Choice of Critical Areas

The PP listed a number of criteria for establishing critical or potentially critical areas, including, for example:

- areas where there was no significant major forest resource within six kilometers, or commercial or village fuelwood plantations planted or being planted; and
- areas where a majority of the people were spending roughly 15 percent of their income on fuelwood.

The use of such criteria was found to be too complicated. Instead, the country-level staff, with assistance from CATIE-based staff, used ecological (Holdridge system) life zone identification techniques, social science investigations, and country-level interest/experience in particular regions to select areas for project activities. This change in approach was sensible, and it was a strength of the fuelwood project.

In the PP, it was expected that at least one critical region would be determined for project activities in each country. In practice, the project identified both regions and types of people with a critical need for fuelwood. The project covered a minimum of four regions in each country. It also identified users (across different regions) who are interested in either lower-cost wood or wood as a substitute for fossil fuels (i.e., bunker oil), such as sugar-processing plants, etc. To do this, the project conducted studies of:

- four cases of domestic fuelwood use,
- nine cases of industrial fuelwood use, and
- two fuelwood businesses.

CATIE Fuelwood Project Achievements in Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama

	Cos	Gua	Hon	Nic	Pan	ElS	Total	PP
Critical areas identified	4	4	5	5	5+	5+	28+	6
Socioecon studies complete	9	2	3	3	2	1	20	20
Pre-project species & mgmt plots measured	0	10	15	12	5	1	43	30
Species at CATIE seed bank							150	50
Species trials	19	46	24	14	20	29	152	*
# of species tested	57	97	68	36	27	16	150	15
Mgmt practices trials	10	17	28	24	6	2	87	18
Fuelwood demonstrations:								
small farm	178	160	81	20	67	?	503	20
village woodlots	12	19	5	5	11	?	52	5
plantations	2	0	15	8	6	0	31	15
small farm/agro-for	315	7	18	3	8	?	351	30
natural vegetation	1	2	0	3	0	?	6	10
Total	508	188	119	39	92	?	943	80
Trained personnel:								
master's level	3	1	1	1	1	1(+2)	9	9
seminars at CATIE							5	5
# of students	2	4	2	1	1	2	12	75
seminars in-country							17	5
# of students	72	191	172	90	-	-	525	100
traveling seminars							2	1
# of students	9	10	8	9	7	2(+12)	57	*
Total	86	216	183	101	9	5(+14)	627	+200
Publications produced:								
socioeconomic							10	*
silvicultural							15	*
general technical							2	*
technical bulletins							12	*
training documents							6	*
						Total	45	

*There were no objectives specified in the PP.
?No figures available at CATIE.
+Numbers indicate other Central Americans funded.

Fuelwood Project Objectives Not Achieved:

--A fully functioning data base on all phases of fuelwood production, including ecological, agronomic, social acceptance and economic considerations.

--First-year baseline and final-year assessment of national and CATIE capacities in fuelwood research and demonstration.

--Incorporation into CATIE core staff of at least one of the fuelwood project's international specialists.

The fuelwood project used the above studies to identify general problems and potential opportunities for the project's greatest success. One of the important distinctions that has been made, for example, is clarification of the exact nature of fuelwood shortages or problems in certain countries. In Costa Rica, for instance, there are few areas where domestic fuelwood is in short supply. However, at the small industry level (i.e., sugar factories or "trapiches"), the cost of wood energy is significant and plantings of fast-growing species could provide an alternative to cutting down the natural vegetation which is so valuable for other uses (i.e., watershed conservation).

While these socioeconomic studies were being implemented, it was expected that national staff and/or cooperators would receive training in survey design and implementation. Because of the need for a rapid turnaround on the survey information, this did not occur.

B. Species Identification and Testing

Identification of species for testing and demonstration by the project was done through both forestry and social science investigations using literature and field information. Surveys were conducted to find out what woods people presently use and for what purposes. Two reports on Honduras were written--one by project staff during the project, and one by a staff member (Bauer) based on experience prior to joining the project. The latter report was published by the project and used as an information source for species-related decisions. Also, master's theses on old trials in Costa Rica, Nicaragua and Guatemala were used, in addition to previous trials done in Panama by FAO (Romero). Three studies on species acceptability were also conducted by the project, although they had not yet been finalized and published.

Before testing of the various species was started, the project worked with local forestry agencies in identifying existing plantings throughout each country. In doing so, the project took advantage of past forestry research established by FAO, AID-funded forestry projects, and other organizations on plots throughout the countries.

Based on this work, country coordinators and their counterparts began establishing trials and demonstrations throughout the countries with seed procured through CATIE and from other local sources.

	Cos	Gua	Hon	Nic	Pan	ElS	Total	PP
Pre-1980 parcels measured	0	10	15	12	5	1	43	30
# of species trials	19	46	24	14	20	29	152	--
# of species tested	57	97	68	36	27	16	150	15

The PP indicated that 15 promising species for different ecological life zones in Central America and Panama were to be tested. As shown above, the fuelwood project has tested 150 species. In many cases, however, these were very limited trials and not definitive enough for analysis that could ultimately lead to widespread dissemination.

The project has come to the conclusion that there are 24 especially promising species for fuelwood (and other uses) in this region. This conclusion is based principally on silvicultural, rather than socioeconomic, success. The following is a list of those species and the frequency of trials and/or demonstration units established by the project in each country:

Frequency of 24 Promising Fuelwood Species in Trials and Demonstrations in Central America and Panama (December 1985)

	Cos	Gua	Hon	Nic	Pan	ElS	Total
Leucaena leucocephala	29	25	40	65	30	15	204
Eucalyptus camaldulensis	24	29	33	51	46	20	203
Gliricidia sepium	11	42	17	29	2	20	121
Caesalpinia velutina	2	46	10	3	11	-	72
Calliandra calothyrus	28	12	12	6	2	7	67
Casuarina equisetifolia	12	12	6	13	10	2	55
Gmelina arborea	12	15	5	12	-	8	52
Cassia siamea	7	13	2	10	-	11	43
Guazuma ulmifolia	13	5	5	1	16	-	40
Eucalyptus citriodora	6	10	11	5	2	2	36
Tectona grandis	6	3	5	6	4	12	36
Casuarina cunninghamiana	12	1	7	-	10	-	30
Eucalyptus saligna	19	5	3	-	3	-	30
Melia azedarach	1	19	3	-	-	7	30
Eucalyptus grandis	15	1	10	-	3	-	29
Leucaena diversifolia	4	22	1	-	2	-	29
Mimosa scabrella	17	1	7	-	-	-	25
Eucalyptus tereticornis	2	3	12	5	1	-	23
Acacia mangium	5	-	3	-	15	-	23
Eucalyptus globulus	7	3	2	-	-	-	12
Azadirachta indica	-	-	3	6	1	-	10
Grevillea robusta	-	3	4	-	-	-	7
Alnus acuminata	4	2	-		-	-	6
Eucalyptus deglupta	2	2	-	1	-	-	5
Total	238	274	201	213	158	104	1,188

Based on the original work done for classifying critical areas, it was hoped that trials would be established in varying ecological zones so that comparisons could be made across country boundaries. The following shows, as of December 1985, the coverage in each country of trials and demonstrations in each of 17 Holdridge tropical life zones where the project is working (unless otherwise specified, all are tropical forests):

Project Species Trials in Life Zones of Central America and Panama

	Cos	Gua	Hon	Nic	Pan	ElS	Total
Humid lower montane	-	5	-	-	-	-	5
Humid premontane	52	-	-	-	-	-	52
Humid subtropical	-	52	25	-	-	41	118
Humid	50	-	-	5	8	-	63
Very humid lower montane subtropical	-	1	-	-	-	2	3
Very humid lower montane	1	-	-	-	-	-	1
Very humid premontane subtropical	-	-	2	-	-	-	2
Very humid premontane	21	-	-	-	1	-	22
Very humid subtropical	-	20	4	-	-	3	27
Very humid	2	-	-	-	1	-	3
Very dry	-	-	-	59	1	1	60
Pluvial montane	2	-	-	-	-	-	2
Pluvial subtropical	-	1	-	-	-	-	1
Dry premontane	-	-	-	-	1	-	1
Dry subtropical	-	21	62	-	-	-	83
Dry	5	-	-	124	60	-	189
Thorny subtropic range	-	29	-	-	-	-	29
Total	133	129	93	188	72	46	661

It is hoped that the soils data gathered by the project will aid in future data extrapolation.

C. Development of Management Practices

As can be seen in the following table, the overall number of management practices trials is quite large. Indeed, this number will probably increase as the plantings from the early days of the fuelwood project get to a stage that requires thinning and other management activities. The tables in Section III.D below provide more specific information on the management practice trials that have taken place thus far.

	Cos	Gua	Hon	Nic	Pan	ElS	Total	PP
Management Trials:								
spacing	2	2	7	16	2	-	29	
fertilization	3	6	3	2	2	2	18	
plantation regeneration	2	1	5	1	2	0	11	
natural forest regen.	-	3	4	2	-	-	9	
planting type	-	-	5	1	-	-	6	
direct seeding	2	3	-	-	-	-	5	
plantation harvest	1	1	2	-	-	-	4	
pest control	-	-	1	2	-	-	3	
site preparation	-	-	1	-	-	-	1	
natural forest harvest	-	1	-	-	-	-	1	
Subtotal	10	17	28	24	6	2	87	
Management Parcels:								
plantation regeneration	4	-	25	-	2	6	37	
plantation harvest	1	8	2	7	6	4	28	
live fences	2	8	4	-	-	-	14	
natural forest regen.	7	-	-	6	-	-	13	
natural forest harvest	-	4	3	-	-	-	7	
planting type	-	-	-	5	-	-	5	
Subtotal	14	20	34	18	8	10	104	

The project has not had an overall strategy for selecting the focus of its management practices trials. Nor is there anything in the data bank which allows analysis of non-biophysical factors in management trials (e.g., size of farm, relative income of landowner, equipment owned, etc.). It was expected that annual project reports would relate the findings of the management practices as well as individual reports on each experiment. It was further expected that such reports would detail the economic and silvicultural considerations for species and trials. However, no annual or management practice reports were published. The PP also proposed an overall end-of-project report on the research findings. CATIE is now in the process of producing a cumulative report of experience with different tree species.

D. Fuelwood Demonstrations

This project has been successful in establishing demonstration units in the six project countries, including:

- natural vegetation fuelwood production units,
- farm-level fuelwood production units,
- village woodlots,
- fuelwood plantations, and
- agro-forestry demonstrations.

Fuelwood Demonstrations in Central America and Panama

	Cos	Gua	Hon	Nic	Pan	ElS	Total	PP
Fuelwood demonstrations:								
Small farm	178	160	81	20	67	?	503	20
Village woodlots	12	19	5	5	11	?	52	5
Plantations	2	0	15	8	6	0	31	15
Small farm/agro-for.	315	7	18	3	8	?	351	30
Natural vegetation	1	2	0	3	0	?	6	10
Total	508	188	114	39	92	?	943	80

More specifically, the agro-forestry demonstration units have included:

Agro-Forestry Demonstration Units in Central America and Panama

	Cos	Gua	Hon	Nic	Pan	ElS	Total	
Taungya	44	1	0	1	7	?	53	
Live fences	68	3	3	-	1	?	75	
Windbreaks	19	-	2	-	-	?	21	
Inter-row	35	-	1	-	-	?	36	
Crop shade	138	-	3	1	-	?	142	
Crop borders	5	1	7	-	-	?	13	
Silvo-pastoral	6	2	2	1	1	?	11	
Total	315	7	18	3	8	?	351	PP Goal 30

The PP expected the demonstrations to serve a number of functions, including generation of research data, training activities, and enthusiasm among farmers and extensionists for fuelwood species and management options.

These demonstrations appear to be used regularly to train technical staff. Project staff also attempt to locate the demonstrations within villages so that they are visible to residents and travelers. The evaluation team was not able to determine how much training of villagers and non-forestry extensionists takes place on these units.

Although the project purpose focuses largely on the indirect benefits mentioned above (i.e., extensionist or technician training, or research leading to direct plantings), it is interesting to note that the PP did expect the project to have approximately 3,000 direct beneficiaries (or 500 small-farm families) through on-farm research (page 28 of the PP). Community woodlots were expected to make fuelwood more readily available to

at least 10,000 rural people. Finally, the PP envisioned that the project would reduce the amount of time spent on fuelwood gathering and release labor for income-producing activities.

It does appear likely that a great number of farmers and their families have received fuelwood and other forest products through project plantings. The project has generated a lot of enthusiasm and interest in the planting of fast-growing tree species, as indicated by unsolicited requests for seedlings by residents in project areas. However, any conclusive or definitive assessment of direct benefits is impossible because the project has not gathered and analyzed <u>any</u> demographic, or enough economic, information on the sites where the trials or demonstration units have been placed. The expectation in the PP that CATIE would gather micro-level monitoring data for defining impact has not been fulfilled.

To merely mention the enthusiasm generated about fast-growing fuelwood species through project activities is to miss the larger change in attitudes that many believe the fuelwood project has helped to create. Some people interviewed believe that the project has succeeded in bringing about a widespread change in people's attitudes about fuelwood and reforestation issues. They suggest that the project has introduced a technology that ultimately could change the attitude that land degradation in the region is inevitable. Again, however, there are no hard, dependable data on this aspect of the work to enable more conclusive assessment of the project's impact.

E. Institution-Building

The three most important elements of the project's institution-building work are:

- quality and quantity of personnel;
- establishment of an institutional identity and capability in the technical area, and links with other appropriate institutions; and
- long-term, self-sustaining viability for continuing activities similar to those of the project.

The fuelwood project was implemented by CATIE and national institutions, and its staff has largely continued working with the TCP project. The staff is comprised of 79 full-time and 10 part-time employees, including 20 based at CATIE in Turrialba, Costa Rica, and five country coordinators based in Costa Rica, El Salvador, Guatemala, Honduras and Panama. Roughly 50 percent of those working on the project are paid through ROCAP project funds. The remainder are almost completely supported by the national

agencies. The figure on the following page shows financial inputs from the three main project contributors (ROCAP, CATIE and host-country institutions) and how these contributions changed between 1981 and 1985. Contrary to the expectations of the PP, no senior or junior technical staff who were part of the fuelwood project staff are part of the core budget at CATIE at this time. The expected CATIE inputs described in the PP*--roughly 175 months of technical staff time and 144 months of administrative support staff time--appear to have been very unrealistic.

In contrast, there has been a large and increased personnel input from national agency contributions. In 1980, there were only five full-time (and no part-time) national agency staff working on the project. According to CATIE records, there are now 16 full-time and three part-time national staff working on project activities that are funded through the national budgets. Overall, national agencies have contributed approximately 954 person-months (840 full-time and, considering part-time to be six months per year, 114 person-months of part-time personnel). This is in comparison to the 2,138 person-months proposed in the PP. In other words, according to CATIE figures, it has contributed 45 percent of what was expected in the PP. As low as this might seem, it appears to be substantially higher than the relative percentage of CATIE's input.

The PP expected that a baseline of forestry capabilities would be done at the beginning and at the end of the project to facilitate determination of the fuelwood project's impact. This has not occurred. Thus, the true impact of the project is very difficult to assess.

The project has trained a number of people, as indicated below:

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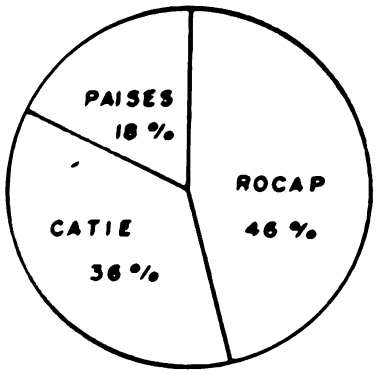
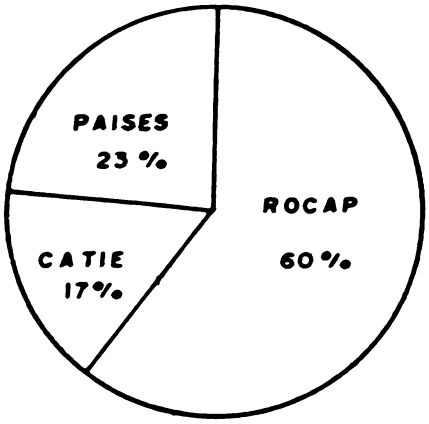
*It is interesting to note that, according to the PP, the TCP project may continue with the same unrealistic expectations. It specifies an estimated 205 person-months, including 45 for the head of the silviculture program, 24 for a silviculturist, 12 for a seed specialist, four for a management information specialist, 30 for an extension/communications specialist (supposedly to be hired by CATIE for the Higher Education project, but spending half-time on the TCP project), 72 for a full-time administrative assistant, and 18 for other staff, not including 204 months of secretarial time. To date, the only staff from this list that are present include the silviculture program head, the seed specialist, and perhaps an administrative assistant. Review of a document produced by the project in early 1986 shows no full-time staff working on the project supported in any significant way by CATIE.

Fuelwood Project Financing--national institution contributions, ROCAP funds through CATIE and CATIE donations



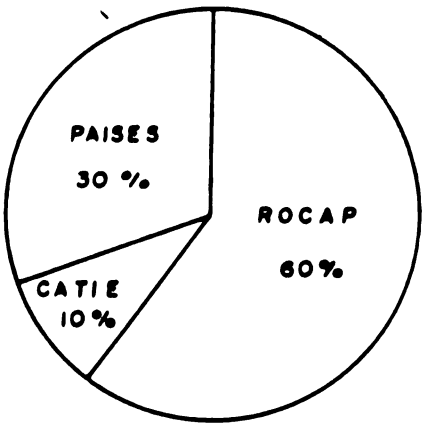
1981

$1,075,0



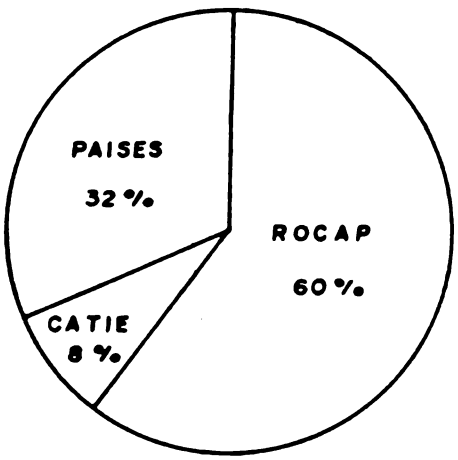
1982

$1,341,0



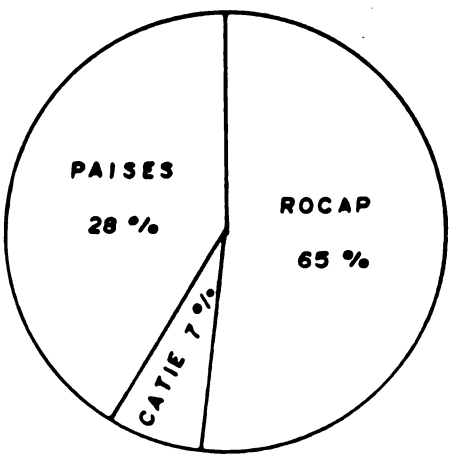
1983

$1,304,0



1984

$1,642,0



1985

$ 1,386,0

Training Conducted by CATIE Fuelwood Project

	Cos	Gua	Hon	Nic	Pan	ElS	Total	PP
Master's level	3	1	1	1	1	1(+2)	9	9
Seminars at CATIE							5	5
# of students	2	4	2	1	1	2	12	75
Seminars in-country							17	5
# of students	72	191	172	90	-	-	525	100
Traveling seminars							2	1
# of students	9	10	8	9	7	2(+12)	57	-
Total	86	216	183	101	9	5(+14)	627	+200

+ Indicates other Central Americans trained.

F. Conclusions

In terms of both CATIE and the national institutions, the fuelwood project's major value seems to be establishment of an institutional capability in the technical area and links with other appropriate institutions. The project appears to have firmly established CATIE as a regional center for information on, and seeds for, fast-growing species, particularly those of importance with regard to fuelwood. The fuelwood project has succeeded in accomplishing most of the quantitative objectives (e.g., people trained, demonstration parcels established, etc.) set out in the PP. It has also established a good management structure that includes exceptional leadership. Finally, and perhaps most important, it has managed to involve high-quality staff at every level.

Unfortunately, at this time, there are few indications that the notion of self-sustaining fuelwood research activities is a viable one. CATIE, even more than national agencies, remains almost completely dependent on project funds for its personnel, material and inputs into fuelwood-related activities. The only indications of self-sustainability are at the national level, where local agencies have put a large number of staff to work on project activities. However, the inputs of project funds for fuel; maintenance; equipment purchase, replacement or repair; and travel have been crucial to the achievements to date. Far too little progress has been made on the long-term sustainability of these types of activities and, in particular, the futures of the well-trained country coordinators.

IV. PROJECT MANAGEMENT

A. Management Structure

The salient feature of the management structure of the fuelwood project has been establishment of important staff positions not envisioned in the PP:

- an overall project coordinator,
- a project administrative assistant, and
- country-specific project coordinators with host-country nationals as counterparts.

While it has taken some time to arrive at this management mix, it is generally responsive and flexible, and particularly effective for establishing links with national institutions. The delays in acquiring resources have been due to administrative processes and bureaucracies (CATIE, IICA and AID) not under the control of project staff, not to the project's management structure.

The existence of a project coordinator since the beginning of the project has ensured that at least one management-oriented person at CATIE has been fully devoted to project activities. The PP proposed having part-time management by individuals within the Department of Renewable Natural Resources (DRNR), such as department and program heads. The PP also envisioned CATIE hiring a senior silviculturist at the beginning of the project to assist in overall technical direction. However, CATIE had difficulty finding a qualified candidate for this position. An interim coordinator, already on staff through outside funding and a participant in the project design, was to assume the responsibilities until a senior silviculturist was hired. This position, however, turned into a permanent project position. Thus, CATIE serendipitously found an effective management mix.

An administrative assistant was added to the project during its fourth year. The addition of this position was in recognition of the time the project coordinator was putting into administrative matters. The time put into administrative matters took time away from technical direction of the project. Overall technical supervision of the project, particularly the silvicultural research, has suffered because of this. Even though it may have been very late in the project, addition of the administrative assistant has been of great value. Fortunately, the position was incorporated into the TCP project, and an individual with more in-depth, specialized training (master's in business administration) was recruited. This has already proven

valuable for reducing administrative loads on the project coordinator and other project staff.

For both technical and managerial reasons, the most significant deviation from the original PP has been the appointment of country coordinators for project activities. The PP envisioned regional coordinators that would cover two or three countries at a time. Two important and very appropriate changes have taken place. First, country coordinators were appointed. Second, the project has gradually moved host-country nationals (versus international staff from other regions) into the coordinator positions. As discussed in previous sections on institution-building, much of the project's achievements have been due to having individuals in place at the local level to manage resources, guide the efforts of local institutions, conduct fieldwork, and deliver valuable research information on project activities to analysts at CATIE.

The management structure described above is possibly one of the most important institution-building aspects of this project. The system of large-project operation and management that has been established has already served as a model for the CATIE watersheds project and should continue to be used for other projects. At present, there is a danger that, as head of a program (as well as part-time department head and teacher), the coordinator may not have time to adequately supervise day-to-day project activities as well as other responsibilities. On the other hand, the project coordinator/program head position is a permanent, core position at CATIE. This enhances continuity at CATIE and, to some extent, strengthens the coordinator's political leverage. The current structure works well at this time because the fuelwood project coordinator is working with the TCP project coordinator on the management of day-to-day activities. The future ability of the project coordinator to devote half of his time to project activities is regarded with some skepticism by the evaluation team. New staff (the senior silviculturist and senior economist) will join the TCP project, and both management and technical qualifications will have to be considered during recruitment.

Ultimately, the value of any management structure relates directly to the quality of the individuals in leadership positions. In this respect, the fuelwood project is outstanding. The management staff is aware of most of the issues and problems confronted by the project. The basic problem they face is not uncommon at CATIE. Staff have teaching, research and technical assistance responsibilities. A review of the PP scopes of work of technical specialists for the TCP project makes the teaching responsibilities clear. Part of the solution lies in reducing the delays in adding new staff. CATIE has been searching for a senior silviculturist for a long time. This person was to start working on the TCP project since project start-up. Recruitment is urgent not only for project-funded staff, but also those that are to be

supported by the CATIE core budget. For example, the delay in hiring a new DRNR department head adds more responsibilities to the TCP project coordinator. Considering the resources (and overhead) that DRNR has brought to CATIE, this situation is unsatisfactory.

Part of the solution is to clarify CATIE/institutional (teaching and committees) versus project responsibilities of project staff. CATIE has not been realistic in this regard. Staff are given scopes of work that do not affix any relative percentage of time to each activity (e.g., teaching versus research versus technical assistance). Ultimately, this situation can undermine project success. While no perfect answer will be found, the demands on project-supported staff must be more reasonable.

Conclusion: The CATIE-based project staff have been criticized for spending too little time in the field. The technical quality of the fuelwood project activities suffered because the combination of administrative, non-project and teaching responsibilities at Turrialba often distracted them from field activities. The problem was exacerbated by the number of unfilled project positions.

Recommendation: The TCP project coordinator should immediately review scopes of work for each of the technical staff working on the project and affix percentages of time to be spent on each activity. It is suggested that a breakdown of time for CATIE-based staff be developed which specifies percentages of time to be spent in the field, at CATIE teaching, at CATIE on other project activities, and at CATIE on non-project activities. The ROCAP regional forester should assist in this process in order to ensure that an appropriate percentage of time is devoted to non-teaching project activities. Both parties should work with the director's office to ensure understanding of the need to devote time to project activities in the field. A serious effort should be made to get CATIE-based staff into the field with country-level staff more, with special consideration being given to ensure that each country program receives equal attention.

Recommendation: CATIE should give the highest priority to the immediate hiring of a new DRNR head and the staff proposed in the PP for the TCP project. The absence of senior project staff could seriously limit the effectiveness of the long-term project planning occurring now. The recruitment of either the senior silviculturist or economist, or both, should emphasize management skills. AID should be responsive to the importance of getting qualified senior staff on board as soon as possible when considering employment waivers (e.g., lack of a suitable silviculturist in the United States, Central America or Panama).

Recommendation: For management purposes, the TCP project coordinator should consider appointing one of the senior specialists now being recruited as a deputy or assistant coordinator.

B. Management Processes

1. Planning, Monitoring, Reporting and Decision-Making

The planning system used during the fuelwood project has become that of the TCP project. This system gradually evolved into a process that uses annual plans, quarterly reports, quarterly meetings in project countries and, to a lesser extent, field visits by CATIE-based staff for interaction with country programs. The system emphasizes annual soliciation of ideas from country programs and CATIE-based staff on proposed project activities and budgets. Negotiations then take place, with decisions made jointly by the project coordinator (now with assistance from the "deputy coordinator") and country coordinators. This process places value on getting input on project direction from host-country agency counterparts.

Generally, it appears that this planning system works well. There are a couple of shortcomings, however. First and foremost, CATIE-based staff have so many responsibilities (teaching, committee work, writing, etc.) that it is often difficult for them to spend enough time in the field. Interviews with field and central staff indicate that almost all parties concerned are frustrated by the excessively sporadic interaction with technicians from CATIE. Staff shortages (e.g., senior economist and silviculturist) complicate the situation. Clearly, this has had technical ramifications, and the evaluation team has a concern about the quality of silvicultural data gathering taking place. Field staff, and the overall value of the research, would benefit from increased monitoring by CATIE-based staff.

Recommendation: An aggressive effort to spend more time in the field by CATIE-based project staff should take place.

Other than the general norms presented in the PP for project emphases and expected outputs, there has been no overall guiding strategy for silvicultural or socioeconomic research, information dissemination activities, or institutional development. Project staff have recognized this and have taken two measures. First, the project brought in a senior silviculture consultant (Leonidas Vega), who has reviewed the quality of silvicultural research being conducted by the project and has provided valuable ideas on the weaknesses of past work. Second, senior project staff are now in the midst of a series of brainstorming sessions to try to clarify the long-term objectives of the project. However, these

sessions do not include country-level staff, and they are being done without the senior economist or silviculturist on hand. With the exception of the project coordinator, who brings a wealth of technical skills to the process, those planning the new activities are the same people who have been involved in past activities. While continuity is important, these individuals have been responsible for technical and conceptual weaknesses in past work (discussed later in this report). New ideas and rigor are needed.

Recommendation: Using this evaluation and Mr. Vega's silvicultural research report, TCP project staff should continue to develop silvicultural, socioeconomic and information dissemination life-of-project strategic plans which clarify the objectives, scope and responsibilities of the project. This draft should be revised only after input from country coordinators, their counterparts, and the new senior silviculturist and economist, which should be no later than September 1986.

2. Use Of Past Evaluations

Three relevant evaluations of the fuelwood project have already been completed--one by VITA, one by Wadsworth et al. on the overall DRNR, and one by USAID/ROCAP's regional forestry advisor, Mr. Henry Tschinkel. The report currently being completed by Mr. Vega will represent another evaluative effort, in addition to the present document.

The quality of the two project-specific evaluations (VITA and Tschinkel) have made implementation of the recommendations difficult. Recommendations are often unclear, have not been prioritized, and are, in some cases, unrealistic. Mr. Tschinkel's evaluation makes 43 recommendations and VITA's 36, which makes it extremely difficult for already busy project staff to put together a "plan of attack" for dealing with the evaluations. More generally, the overall points and priorities are lost within the specificity of the recommendations.

Given the above, it is no surprise that the project's performance in response to the evaluations' objectives is mixed. In general, a review of the past evaluations indicates that project staff have attempted to use them, but two important project weaknesses that the evaluations pointed to have not yet been addressed by CATIE. First, the number of unfilled positions for key staff has always been a problem. Second, for quite some time, there have been serious questions regarding the quality of silvicultural research. These questions have not really been addressed. In each case, these criticisms have not been dealt with adequately. The lack of a senior silviculturist is probably the key in this case.

Recommendation: The TCP project coordinator and ROCAP forestry advisor should take responsibility for ensuring that evaluation recommendations are taken into consideration. Formal review of the response to evaluation recommendations should take place at least once a year.

3. Administrative Issues

Administration of the fuelwood project has generally been flexible and personal. While it has had to operate within the cumbersome CATIE, AID and, at the country level, IICA administrative frameworks, this has not proved to be a major limiting factor to project activities. Early on, the project adopted an administrative framework which emphasized centralized control, flexibility and, to the extent possible, country-level management of project activities.

There are, however, a few problems--both past and present--which are worth noting. First, financial monitoring of and reporting to country-level staff have been loose or absent. No audits of their use of funds have occurred.

Recommendation: CATIE should conduct an annual audit of project expenditures at the country level. Also, as it is difficult for country-level staff to know where they stand on project expenditures, a monthly printout of expenditures should be sent to them.

CATIE, partially because of cumbersome AID procurement processes, continues to have problems delivering vehicles to projects on anything close to the intended schedule. For example, vehicles requested in July 1983 for the program in El Salvador arrived in November 1985. Vehicles requested at the central level in June 1984 also arrived in November 1985. Virtually every evaluation of an AID project points to this problem. Certainly CATIE should have learned something about procuring vehicles through AID regulations by now, although there are indications that CATIE still does not know how to write suitable bidding documents. It is suggested, however, that this is an area in which AID must take more responsibility by streamlining its procurement regulations. Some work has already begun in this area. CATIE plans on using a procurement services agent in the United States for all major AID-funded procurement activities.

Recommendation: In response to past and continuing vehicle procurement problems, AID should attempt to streamline procurement regulations.

V. PROJECT RESEARCH PERFORMANCE

A. Introduction

The PP states that project purpose will have been achieved when, among other things, "the specified cultivation and farm management practices developed by CATIE with national counterparts are found acceptable by target populations, the national counterparts are using these new practices in their extension programs, and national research institutions and CATIE are continuing research programs in this area." Two points are significant here. First, the assumption is that national research institutions (actually, research branches of national forest services) and CATIE already were carrying out research related to fuelwood prior to the project. Second, the requirement that the practices developed be "found acceptable by target populations" implies the need for social science research to understand the basic factors that make new or improved technologies acceptable to target populations.

Concerning the first point, species trial work had been going on prior to 1980, mainly directed at identifying fast-growing (high-yield) species, although not directly related to fuelwood. The real question is the extent to which the fuelwood project systematically considered the previous work, both at CATIE and in project countries. With regard to the second point, the project did recognize the need for socioeconomic research aimed at analyzing species acceptability, fuelwood needs, markets, etc. However, little actual research was carried out. The need is even more directly recognized in the TCP project, and plans exist for major social science input.

In the present assessment, four categories of criteria are used in judging the adequacy and performance of project research:

- relevance in terms of project purpose--are the objectives aimed at meeting project information needs?;
- coverage or scope in terms of overall project information needs or, more broadly, information needed to design and implement fuelwood programs (just because the research objectives are consistent with information needs for project implementation, the overall research program was not necessarily adequate--the research may have focused on a small number of easily addressed, but less critical information areas, while ignoring large, significant information needs);

- achievement of stated research objectives, regardless of whether results were positive or negative; and

- quality of research in terms of basic scientific principles--is it reproducible, based on honest and accurate measurement, and based on appropriate research design?

The following assessment is divided into two main sections. One deals with social science research, the other with biological, silvicultural research.

B. Social Science Research

The social science research was of two main types. One was survey-type research carried out in the early stages of the project to identify critical areas (defined in terms of demand/supply relationships). Most of the studies undertaken looked at fuelwood consumption and production in project countries. These studies have relatively little analytical content compared to the amount of descriptive statistical information included. This situation represents both shortcomings (e.g., inadequate analytical use of data) and an opportunity, since it would appear that the TCP project has the opportunity to further use the data collected earlier in developing a systematic approach to defining socioeconomic "zones" (parallel to the concept of life zones). The other type of social science research, carried out in the latter years of the project, included economic studies of specific industrial wood consumption patterns and production costs.

Nearly all of the social science research studies can be characterized as being socioeconomic studies. It is notable that during the fuelwood project, collection of cost data has been broadly defined to be socioeconomic research, rather than merely being classified as data collection. Thus, socioeconomic research has often meant surveys, rather than analysis of fieldwork, etc., which could have been more helpful for developing country programs.

A number of the socioeconomic studies were carried out by consultants, the notable exception being the work done by Reiche. As such, the consultants arrived, did their studies, and left; little lasting impact appears to have remained, although certainly the personal contacts with regular CATIE staff have provided some benefits.

While the socioeconomic studies carried out by the project are surveys rather than research in the traditional sense, they did meet a very real need in terms of achieving the project purpose and contributing to the quality and relevance of project outputs. For example, a significant aim of the project was to

identify the critical areas in which the project should work. The socioeconomic surveys contributed directly to that aim.

With regard to the scope of the socioeconomic research, a number of significant gaps exist, mainly because manpower and funds were not committed to undertake the socioeconomic studies needed to fill the gaps. Project staff have recognized the needs, and the TCP project includes plans to fill some of the most obvious voids, e.g., related to market studies, economic analysis of projects, broader studies of farmer motivations and appropriate incentive mechanisms, etc.

The quality of the socioeconomic (consumption and production) surveys carried out by the project was adequate. Sampling approaches appear to have been sound and practical, given the constraints faced by the project staff.

Conclusions

Most of the socioeconomic research carried out by the project was really more survey research to gain information on socioeconomic characteristics, trends and implications for potential fuelwood activity. Three studies (all in Costa Rica) looked at the reasons people accept certain species for planting. None of these studies have been published yet, since the project staff feels that they are not yet in publishable form.

The objectives of the socioeconomic and survey research undertaken were appropriate. The objectives were met, for the most part, and the studies were generally sound in terms of methodology. However, the scope of the socioeconomic research was not adequate in terms of the social and economic issues which needed and still need to be addressed. This shortcoming is being addressed in the TCP project.

Recommendations

The four research areas suggested below are all considered within the context of the terms of reference for the new positions envisioned under the TCP project--a senior economist, a rural economist to assist him or her, and a social scientist. Once these three positions have been filled, the three individuals should, together with other CATIE staff, develop an overall social science/economics research plan. In the meantime, these four areas indicate the priorities as viewed by the evaluation team:

Production and investment analyses -- Standard financial and socioeconomic analyses related to existing parcels established before or by the fuelwood project should be continued by the TCP project. This need is fully recognized by project staff; this

recommendation merely underscores the urgency of undertaking such studies. Similarly, support is given to the initial emphasis on methods for collecting cost data. Carrying out the economic analysis is relatively simple if the data are available; the problem in most cases is generating appropriate and usable data. Approximation methods may be appropriate in many cases. Once usable techniques have been developed and documented with actual examples, short courses should be developed to diffuse the techiques. In this case, the research is mainly adaptive--attempting to get the best practical project evaluation models to a point where they can be practically applied in the field. Once they have been developed, the need is for rapid diffusion.

Incentive mechanisms--a review of experience -- A great deal of experience exists worldwide concerning what works and what does not work in getting local people involved in tree crop activities. The incentive mechanisms can be broadly divided into two categories: market and non-market. Both are relevant for Central America and Panama. An effort should be made very early in the TCP project to systematically analyze incentives-related experience and use this to develop approaches for Central America. If possible, central-level CATIE staff should work with country-level staff in field-testing various incentive mechanisms.

Building a socioeconomic data base -- The fuelwood project has had a number of successes with regard to making tree growing part of the local rural development thinking and activity (e.g., Hojancho, San Ramon). At the same time, there are some sites where little if any diffusion of tree-growing technologies and activity has taken place. The TCP project should make it a priority to build on the concrete experience of the fuelwood project in developing a systematic socioeconomic data base that can be used to characterize socioeconomic environments that are or are not receptive to tree crop activities. This data base should be capable of being integrated into the overall data base management system that is under development.

Various statistical approaches might be tried in relating socioeconomic characteristics to tree cropping (e.g., simple correlation and regression techniques or more sophisticated cluster analysis, delphi questionnaire techniques, or factor analysis and magnitude-scaling questionnaire techniques). The key will be to design a practical data base and collect relevant information to be used in the models chosen. Due to time and resource limitations, some appropriate rapid rural appraisal methods (known by project staff) might be used in place of standard, time-consuming and expensive social science research techniques.

It might be useful to relate this work to like efforts elsewhere in the world, since similar themes are being addressed. For example, the World Bank is about to begin a research project

to look at market incentives and investment in fuelwood growing, and the question of justifying subsidies on the basis of downstream costs avoided because of reduction of deforestation. Similarly, the TCP project can draw on the experience of other rural tree crop projects in Haiti, Ecuador, Korea, the Philippines and other countries.

Traditional rural wood industry opportunities -- As the fuelwood project evolved, it became apparent that some of the most critical fuelwood issues in the region relate to industrial uses. Further, it became evident that rural wood industries provide some opportunities for employment and income generation and markets for farm-grown wood. These realizations have correctly been built into plans for the TCP project. Emphasis on this topic is fully supported by the evaluation team. The rural forest industry component should focus on the following elements:

- market development and market access--consideration needs to be given to markets, regarding both rural industry and farmer access to industries purchasing wood (including, of course, commercial fuelwood markets);

- impacts of rural wood industries on off-farm employment--FAO has been looking at the relative contribution of traditional small-scale wood industries to off-farm employment in a number of countries, and a good deal of experience in this area has been accumulated (contact Mr. Maffa Chipeta or Mr. J. E. M. Arnold, Forestry Dept., FAO, Rome);

- institutional barriers to and encouragement of traditional rural wood industries--this includes such considerations as access to credit, taxation and social policies, industry incentives, infrastructure issues, etc.

The evaluation team recognizes that research on traditional rural wood industry opportunties is somewhat tangential to the directly stated purposes of the TCP project. Yet it is critical to the long-term viability of any major tree crop effort with any kind of market orientation. Thus, coordinated funding from other sources might be sought to support some of the above efforts. Also, close contact should be maintained with the AID Forestry Private Enterprise Initiative project, currently focusing on forest industry development in Ecuador. The TCP project might also draw on experiences outside the region, e.g., in Korea, Indonesia, the Philippines, Chile and Brazil.

C. Silvicultural Research

The fuelwood project was intended to cooperate principally with small farmers living in areas characterized by acute fuelwood shortages. Each of the participating countries selected areas where the project was to work. Because the choices were governed by the conditions prevailing at the time, there is no uniformity in the type of area chosen, except to say that a majority appear to be arid.

In its original concept, the fuelwood project was to establish fuelwood plantations of varying size on sites provided by cooperating landholders. These plantations were to grow without silvicultural treatment until clear-cut for firewood at an age of approximately five years. Subsequent events have caused this plan to be discarded. It is now clear that the TCP project will have to accommodate the following activities:

- manage plantations for "multiple use," producing not only fuelwood, but also edible fruits, wood for use and sale in the form of fence posts, lengths for local roundwood construction and telephone poles, and logs for sawing, veneers and special purposes (this change will make new demands for management technical assistance and for recording information in the data bank);

- recognize and develop the links established between the project and industrial-scale consumers of fuelwood, such as sugar mills, cement works and electrical generating plants; and

- provide information on fast-growing tree species to parallel projects working in agro-forestry, cattle grazing and other activities, in conjunction with tree growing.

As the project developed between 1980 and 1985, its techniques and approaches evolved to include solutions to elementary agro-forestry problems. This has greatly assisted project staff in establishing initial links with small landholders. However, the basic objectives of the project have become clouded, as planting of certain species has been proposed because of their importance for nitrogen fixing, not fuelwood production.

Species Trials

The evaluation team observed that trials and plots include a number of species that have not performed well by any standards. Because species elimination trials were not conducted, the

project's management records now carry information on many species which show no promise for being suitable as fast-growing species of multiple use. With this in mind, a CATIE technical adviser visited Guatemala recently and suspended work on certain species. During 1986, a committee will visit each of the other countries for the same purpose. The CATIE advisers have decided not to continue with any species which has failed; shows obviously poor results; is located on an extremely small plot; has been damaged by fire, cattle or other form of intrusion; or is located on land whose owner has changed his mind and no longer wishes to participate in the experiment.

Recommendation: All species considered for inclusion should be screened by using "species elimination trials." For a given species, this type of trial lasts approximately one year. Seedlings are planted in straight lines with considerable repetition. Lines may be placed across any type of soil, aspect or terrain. All information worthy of record is plotted on a map showing the location of each line and the position of each species on a line. No information goes to the data bank. At the conclusion of a trial, those species found suitable for formal trials will have become obvious by their superior growth, good form and healthy appearance.

In the highlands of Guatemala, the project is on the verge of pioneering work with frost-resistant species. It is hoped the results will be applicable in similar areas in other countries of the region. Eucalyptus species stated to be suitable for trial on this type of extreme site include:

Minimum Temperature	Recommended Eucalyptus Species
-20°C	E. niphophila
-14°C	E. coccifera, E. dalrympleana, E. gunnii, E. parvifolia, E. pauciflora, E. rubida, E. urnigera
-10°C	E. cinerea, E. johnstonii, E. macarthurii, E. ovata, E. urnigera
-8°C	E. camaldulensis, E. globulus, E. melliodora

Tree Seeds

By means of seed trees and seed orchards, the TCP project strives for regional self-sufficiency in tree seeds. The project works with the Latin American Forest Tree Seed Bank, headquartered in Turrialba, Costa Rica. The project pays the director's salary, while he divides his time equally between the project and seed bank. Use of the seed bank's facilities is divided between agriculture and forestry research. Skillful use of the chambers

for germination, cooling, freezing and drying has, thus far, kept the sharing of facilities from becoming a limiting factor.

During the past five years, the project has distributed 1,500 lots of seed to the region. Upon arrival, each lot has to be registered with a serial number and documented as to species and provenance. This information should be attached to all lots dispatched for planting.

When the project began, the seed bank was staffed by one person. It now has a staff of five but is scarcely able to keep pace with the work required of it. The volume of work can be expected to increase greatly as seed produced by the project comes on stream. The seed bank has no vehicle assigned to it. It needs a sturdy vehicle of its own, able to accommodate four persons and specialized equipment.

The director of the seed bank follows the custom of examining a region and responding to the conditions in it. For instance, all participating countries express interest in Tectona. Inspection by the director revealed no Tectona of quality growing in the region, so he is currently seeking seed from elsewhere, in accord with his policy for species improvement--as distinct from tree breeding. Recently, the seed bank took the lead in forming the Commission for Genetic Resources in Forestry. It is anticipated that this will lead to a regional network for the exchange of information and seeds.

It is understood that the project plans to establish two seed orchards per country, over a period of two years,. The evaluation team considers this goal inadequate for the needs of the region.

Recommendation: The number of seed orchards should not be selected arbitrarily, but on the basis of the species involved, extent and regional distribution of the Holdridge life zones in which each may be successfully planted, and estimated demand for seed.

Field Implementation

Due to the dispersed nature of the project's field activities, and the large number of people involved, some for only short periods, it is essential that the project design a program of strict field inspection and quality control, and ensure that this program is followed. Reports are to be submitted on the results of such inspections. Looking at the project as it stands today, it is possible to conclude that lack of close supervision in the field is one of the weakest links in the chain of project activities. For example, the evaluation team observed that the project uses indiscriminately both the "square" and "triangular" patterns for tree planting.

Recommendation: By means of manuals and concise instructions, the CATIE technical advisers should make clear that the "square" pattern is preferable on flat areas, but that the "triangular" pattern is obligatory on all sloping terrain.

The evaluation team also observed that Tectona is allowed to grow uninterrupted after the stumps are planted. The practice followed in India is to sever the stem at ground level at the end of the first year after planting, and encourage the resulting coppice to form a longer, straighter and more vigorous stem.

Recommendation: CATIE technical advisers should study alternative Tectona silviculture methods from India (and perhaps other locales) and communicate the findings to the field as soon as possible.

Field Records

Project field observations are noted on a series of printed forms, in accord with the instructions set out in the publication, "Normas para la Investigacion Silvicultural de Especies para Lena" (Salazar, CATIE/ROCAP, 1984). Often, steps in the current recording process are as follows:

- field enumeration as outlined in the publication;
- office comparison of day's figures with those of the previous enumeration;
- making of two clean copies of the current enumeration, one to be sent to CATIE, the other to be filed in the project office;
- in the project office, calculation of survival, mean total height and mean diameter at breast height (DBH); and
- advice from CATIE on errors discovered on the field sheets.

Frequently it is found that such errors have been made during transcription of field notes to typed records in project offices in the countries. The evaluation team also observed that field staff have found the instructions difficult to follow.

Recommendation: The CATIE guide for silvicultural research should be revised, with participation of the field staff. The following changes should be incorporated:

- photocopies of the field sheets from the previous enumeration should be taken to the field so that

current enumeration can be checked while it is being done; and

- the practice of transcribing field sheets should cease immediately and be replaced by photocopying or the use of carbon copies.

The evaluation team was unable to see clearly the project's use of the Holdridge life zone classification. It appears that the life zones tabulated by the data bank do not agree with those shown by Dulin in his "Analagous Climatic Areas" (CATIE, 1984), and that lists of promising species distributed by CATIE technical advisers did not subdivide the species according to life zone. Also, at present, the Holdridge life zone classification is entered only on field form No. 1a/1.

Recommendation: The Holdridge life zone classification should be included on every field form. This classification is not intended for everyday field use. It is primarily a means of stratifying information, thus permitting a more efficient use and exchange of information in a country or region. Given the confusion on life zone names, the project should consider employing the Tropical Science Center as a consultant, if necessary.

It is generally agreed that the field sheets currently in use should be altered to include observations on the nature of the site and the status and health of the stand, in order that trends over time may be ascertained.

Recommendation: The following points should be considered for inclusion on CATIE field sheets:

- plant indicators -- these are important in relation to life zone, soil condition, acidity and the general nature of the site, and may be useful in pointing out sites suitable for certain tree species (for instance, the presence of the bush Lantana sp., seen by the evaluation team at the La Campana farm on the Pacific Coast, shows a site suitable for Eucalyptus grandis and its associated species;

- forest soils -- recognizing that trees do not demand as much from a soil as do agricultural crops, field observations for a majority of plots should concentrate on recording observations of soil erosion/degradation, overgrazing, or incorrect agricultural practices--soils analyses can be more exhaustive for species trials;

- plantation health -- it is appropriate to begin to record observations on the presence and effects of

the pathogens, insects and decay in experimental and demonstration plots;

- frequency of measurements -- after the first year following planting, plots should not be measured more than once a year.

Computer Records

The data bank states one of its aims to be the safekeeping of project data for future use. In this regard, the first question that comes to mind is, how much data needs to be recorded from small plantations due to be clear-cut some five years after planting? Once the goal of multiple-use management has been identified, the section for computation and analysis should modify its program to accommodate appropriate information gathered from a variety of sources, thus permitting the data processing section to lead the work of the project, instead of following it.

Recommendation: The fuelwood project should conduct a complete, impartial and rigorous review of the structure and activities of the data bank. This could be conducted internally by project staff with assistance from the Forestry and Fuelwood Research and Development (F/FRED) project data management specialist or with assistance from a consultant contracted from the outside. The following elements should be included in this review:

- Edit programs -- Editing is essential at the manual field level, as well as at the machine level, in order to detect errors, inconsistencies and changes. CATIE's policy on editing has been expressed in the words "the person who takes the data should be here to analyze it." The project should develop a computerized program that will automatically find data inconsistencies for correction, and technical advisers should visit the countries frequently enough to enable the solution of data inconsistencies at the country and field level.

- Program flexibility -- The data bank possesses an enormous advantage in that it records a wide range of data for individual trees. This advantage should not be lost. The importance of multi-purpose management makes this especially important. For example, the current practice of presenting data in terms of averages of both total height and DBH should not be the sole focus.

- Data updates -- The evaluation team noted that the meteorological data recorded for each plot cannot be

updated. It is suggested that this information be stored in a separate file, where it may be brought up to date annually, thus permitting the periods of recorded observations to be as long as possible. All current data processing for the project should be reviewed so as to identify and correct any similar cases.

- Machine memory -- To analyze the data kept on one species can cost $1,000 or more. Thus, when a species of no further interest to the project is analyzed, money is spent unnecessarily. For this reason, it is recommended that the records referring to species that have not been successful in trials be removed from the active files.

- Data output -- The outputs of the project's data processing are scientific and academic. At the same time, it was noted that field staff are not able to summarize verbally the work accomplished in their respective countries in terms of numbers, areas or species--a sure sign that the data output is not meeting their needs.

Plantation Health

As the project-assisted plantations become older, the presence of insects and fungi becomes more noticeable. On the other hand, when appraising the effects of these organisms, it should be borne in mind that the majority of plantations are established in areas of severe climate and site degradation, implying that trees are not in prime condition to resist the pathogenic attacks.

Recommendation: Because of the disease problems being encountered during project research, an experienced pathologist and entomologist should be contracted to advise on the seriousness of these attacks, their expected effects upon the prospects of each species concerned, and how to summarize on field sheets the visual evidence of attack and decay. In addition, CATIE should publish an illustrated field manual for identifying pathogens and deciding upon appropriate preventive and/or curative measures.

Forest Management

The need for management becomes apparent as more plantations reach a stage at which decisions must be made about the purpose of their management, with treatment of the plantations being modified accordingly.

It appears that one result of management according to principles of multiple use will be to move away from clear-cutting and, at least initially, toward a system of "coppice with standards."

Recommendation: CATIE should prepare a field manual for management of the principal promising species. This manual should give detailed instructions for each species, with any necessary adjustments according to life zones.

Project Demonstration

In the same way that the project is not able to become involved in studies of the physical properties of wood or the problems of their utilization, it cannot undertake the tasks of conducting routine extension work directed at rural dwellers. Similar reasons prevent its entering research on agro-forestry. Project staff find themselves more than fully occupied in producing fast-growing tree species and making them available for trial, demonstration and distribution by appropriate projects and agencies. Nevertheless, the evaluation team perceived a general sense that the project fills an important role in the pre-extension field, with its demonstration plots and plantations. This is a role no other organization is equipped to fill.

Recommendation: Due to the success and visibility of the field demonstrations, the project should continue these activities, including:

- obtaining and making available technical information on fast-growing tree species to agencies and organizations involved in routine extension;
- establishing and maintaining plots, model plantations and farms to demonstrate the growth and form of chosen species--on the demonstration farms, trees would be used to illustrate the principles of intergrated land use, and the benefits of woodlots, shelterbelts, windbreaks, shade over perennial crops, and live fences;
- training national staff in the principles of rural sociology and methods of agriculture extension; and
- preparing and distributing a series of filmstrips on the growth and management of each of the species important to the project and a booklet for internal use and training, on the subject of working successfully with small farmers and local populations.

VI. TECHNOLOGY TRANSFER

A. Introduction

The PP envisioned a number of technology transfer mechanisms within the project. It called for direct as well as indirect linkages between the project at CATIE, and country coordinators and national counterparts. Linkages were also to be established with national public institutions (primarily forest services) and their field personnel. The intended mechanisms and implied linkages are indicated in the figure on the following page. The following discussion highlights accomplishments and assesses the extent to which the intended linkages were achieved. After outlining the basis for assessment, i.e., the criteria used to judge project output, the actual technology transfer activity of the project is discussed in terms of documentation produced, education and training courses organized, and other mechanisms related to technology transfer (e.g., development of a data base management system, extension activity and technical exchanges).

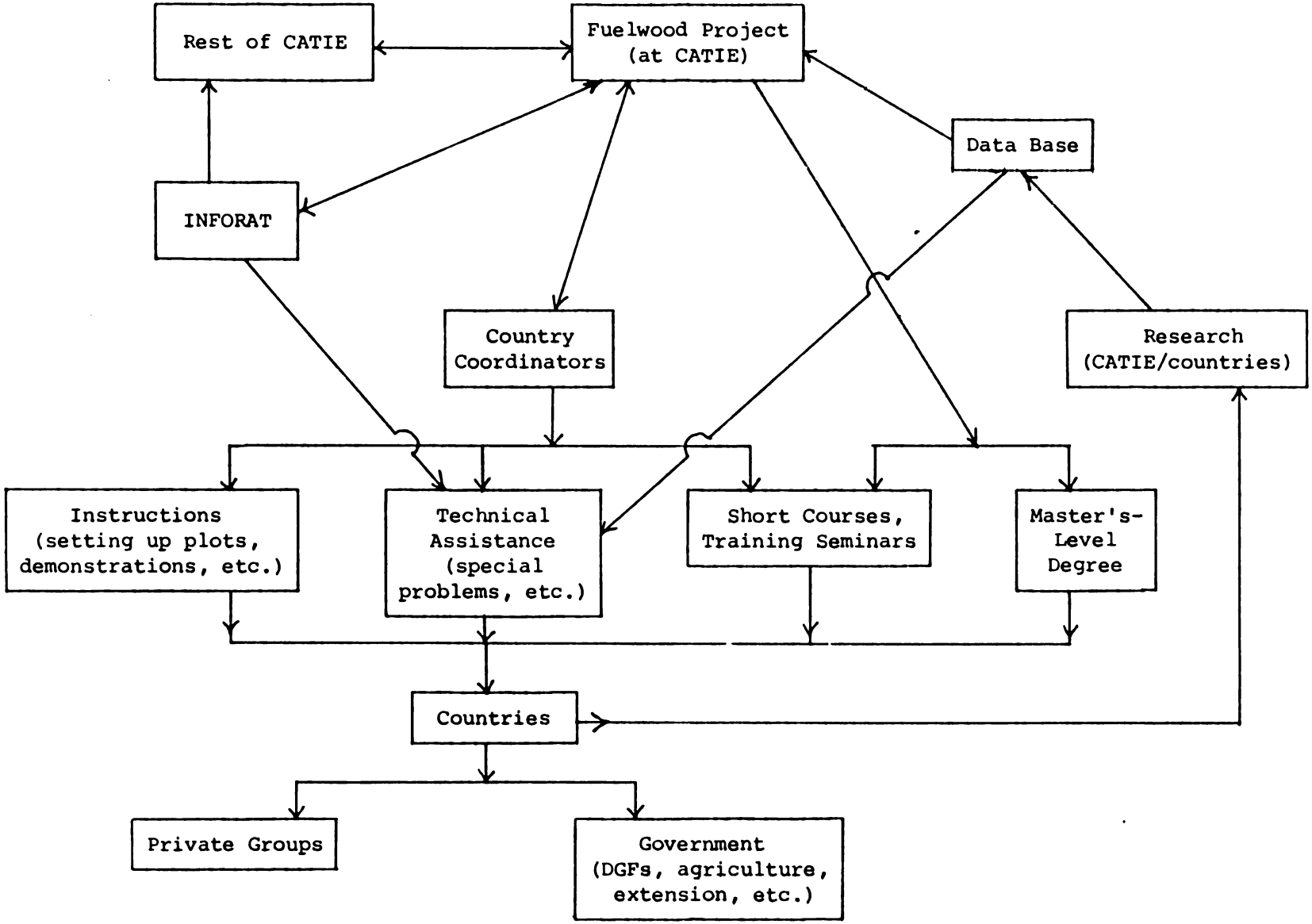
B. Assessment of Accomplishments

Two sets of criteria were considered in assessing project performance in the area of technology transfer. The first is based on how the numbers of publications, courses and other training sessions, etc., envisioned in the PP compare with the actual activity of the project. The second set of criteria are qualitative factors for judging the quality and coverage of the particular technology transfer activity.

For the sake of clarity, the following terms are defined rather narrowly:

- education -- transfer of general or scientific knowledge, that is, the basic tools of the professional (project examples of education include the master's degree program at CATIE);
- training -- transfer of specific skills (and the experience of others) to help in carrying out specific tasks (e.g., the various short courses and workshops imparting skills in plot selection and design, inventory and measurement techniques, nursery establishment, and data manipulation); and
- extension -- imparting specific skills and ideas to intended project beneficiaries, in this case, the small and medium-size farmers and tree-based industries of Central America and Panama (although the project was not to get involved directly in

Technology Transfer: Activities and Linkages



extension, it was intended that it provide training relevant to developing and expanding extension capabilities in national counterpart agencies).

In fact, the three activities form a continuum, starting with basic education of scientists, managers and administrators who will develop the technology and institutions to implement fuelwood projects, passing through training for the field technicians and extension agents who directly impart information to land users, going on to the actual extension to farmers and other land users, and ending with actual application of the technology.

The first set of criteria is fairly straightforward and self-explanatory. Numbers indicated in the PP were compared with actual numbers reported by the project staff. Where the numbers do not match up, explanations are provided and judgments made.

The second set of criteria is more complicated and based more on judgments. Basically, a set of information requirements was postulated, and actual project experience in terms of providing for such information needs was judged. A logical structure for considering these information needs is provided in the following figure, which also considers the actors who need to understand the information in order to make intelligent decisions to successfully achieve project purpose.

Three main types of information are considered essential:

- general background information on the extent of fuelwood problems and needs in the participating countries and the general levels of resources required to solve the problems or meet the needs;

- technical kinds of information needed in the design of projects and programs to promote fuelwood or multi-purpose tree crops--this category includes the silvicultural/technical information generated through the project's research component as well as the socioeconomic information required to put the technical information in the proper context to achieve project purpose; and

- information requirements related to actual implementation of projects and design of monitoring and evaluating mechanisms/approaches to provide additional information for improvement in techniques and approaches, including information on project management procedures, incentives, political systems and actual field management techniques.

These categories of information are presented in an overall systems context in order to realistically discuss achievement of

Information Needed by Different Groups for Support, Planning and Implementation of Fuelwood Projects

Type of Information: / Group:	General Background			Project Planning		Project Implementation		
	1	2	3	4	5	6	7	8
	(see key below)							
administrators, politicians								
forestry professionals, project and program planners and managers								
field personnel, extension workers								
landowners, farmers, other land users, industry								

Key to Categories of Information Needed:

1 -- problems, needs and issues
2 -- potential solutions and opportunities
3 -- resources required

4 -- technical relationships, species management, etc.
5 -- socioeconomic, legal, market, tenure and risk factors

6 -- project management (personnel, budgets, etc.)
7 -- incentive systems, persuasion techniques, etc.
8 -- field techniques (farm management, tree management, etc.)

the project purpose. It is well recognized that the project itself focused very heavily on a few of these categories, e.g., physical/biological information related to species selection, plot design and establishment, inventory and growth data collection, stand management information, etc. This is taken into account below. However, in order to realistically assess project performance in terms of the stated purpose and goal, one must view the entire system.

In determining who needs to participate in order to achieve the project goal, i.e., the audiences to whom information and technology need to be transferred, one can identify five general categories:

- high-level administrators and politicians who need a general understanding of the nature of the problems and opportunities that exist--the purpose of giving them this knowledge is to guide the development of attitudes and policies conducive to expansion of fuelwood management and multi-purpose tree crop investment;

- technical personnel responsible for project and program planning, design and implementation;

- field-level personnel--technicians and extension agents; and

- landowners, farmers, co-ops, schools and industries who will actually be involved in planting and other forest management activities.

In the following sections, information requirements are considered in relation to the various types of transfer mechanisms and the actors involved in the transfer process. In Section VI.G, the various elements are brought together in an overall evaluation of the adequacy of project technology transfer activity in relation to both information needs and actors.

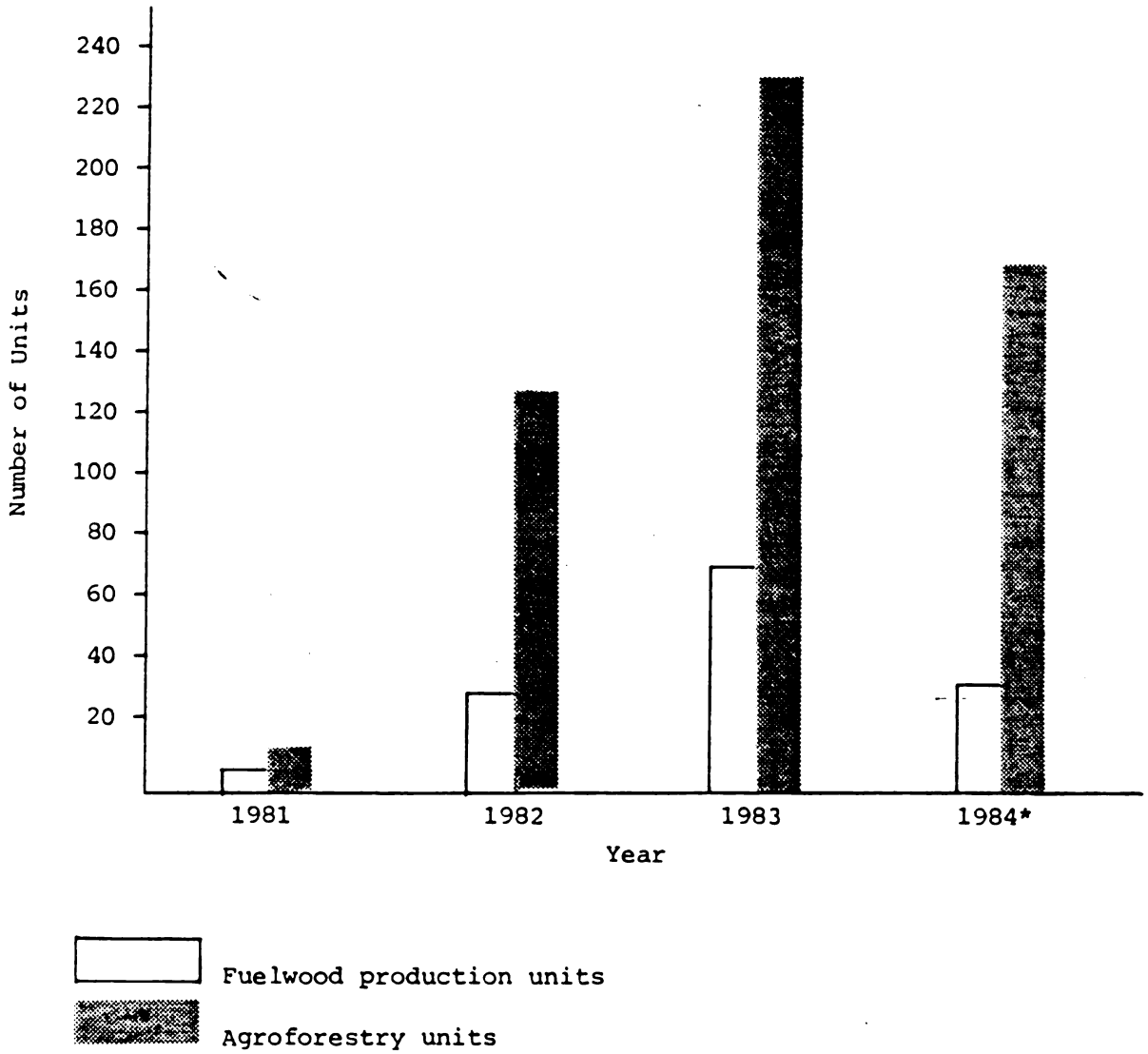
C. Demonstration Plots

As discussed in Section III.D, the project has been quite successful in establishing demonstration units in the six project countries. More than 940 units were established, of which some 350 were agro-forestry demonstration units, illustrating multi-purpose tree technologies where fuelwood is combined with at least one other use for the trees, e.g., live fences, windbreaks, shade or fertilizer/nitrogen fixation. Only six demonstration units were established in natural vegetation. (The figure on the next page shows farmer participation by type of demonstration unit in Costa Rica's central valley.)

Farmer Participation

by Type of Demonstration Unit in the

Central Valley of Costa Rica, 1981-84 Fuelwood Project



* Decrease is due to reduction in project resources from CATIE to the project; national institutions unable to make up the difference.

Demonstration units were generally established by the owners of the lands on which they were located. The project mainly provided technical assistance and seedlings, with the owners providing land and labor. Most participants were farmers with small or medium-size holdings, or industries using fuelwood. Measurement plots were established together with species trials on some 800 of the units. Cost data were collected for approximately 100 units, although these data are not complete and have not yet been fully incorporated into the data bank. An additional benefit of the demonstration activity has been establishment or strengthening of small nurseries, particularly in Guatemala and Costa Rica.

Based on observation and discussion in project countries, the evaluation team realized that the demonstration effect in many areas was quite positive--that is, farmers did see, learn and plant by themselves; and the project has not systematically quantified the effects of its demonstration units. Thus, all one can do at this stage is provide anecdotal illustrations of successful demonstration effects. Further, it is evident that the demonstration units have been used in staff training exercises and that plans call for additional use of these units in future TCP work. At the same time, the project wisely intends to focus more heavily on a few demonstration farms in each country and to work more intensively with these farms, combining a number of different tree crop activities on each farm.

D. Documentation of Research Results

The project produced formal documents which can be classified into various categories. According to project information, the primary category of documents was papers presented at meetings. Many of these presentations had little to do with the project purpose, other than to publicize the existence of the project and its activities. The audiences consisted mainly of forestry professionals, project and program planners and managers, but often included people who were not from the region and thus had no direct interest in the project (e.g., IUFRO audiences from around the world).

The quality of the technical content of project documents is considered in Section V. Below, evaluation focuses on the adequacy of project documentation in terms of meeting information needs and reaching the various audiences identified in the previous figure.

The vast majority of fuelwood project documents cover problems, needs and issues; technical relationships; socioeconomic factors, to some extent; and field techniques, to a lesser extent. This orientation occurred because project staff have generally viewed the project as a research-oriented silviculture project,

with socioeconomic concerns coming rather late in the project's life, as it became evident that most of the problems associated with rural tree planting are social and economic (see Section V.B for further discussion).

With regard to target audiences, a distinct group of documents, giving overviews of fuelwood problems, was aimed at high-level administrators, politicians and the general public. Most documentation was aimed at technical personnel who plan, design and manage projects. Some of the documentation--particularly that produced by country teams--was aimed at field technicians and extension agents. Very few project documents produced at CATIE were aimed at field personnel, farmers, land users or industry.

The project is conspicuous for the number of publications it has produced. However, the evaluation team questions the usefulness of a considerable number of these. Technical papers are published by the project offices at CATIE and in the participating countries. There appears to be no effective link between the two as far as publications are concerned. The evaluation team saw cases in which CATIE had published a technical document on the results of an experiment in a participating country, without that country's staff having been informed, and vice versa.

More seriously, the evaluation team felt that there was too great an emphasis on publication of technical papers written to enhance the professional reputation of the authors, but which contributed nothing to the progress of the project. It appears that few technical documents have been prepared for internal use by the project. The evaluation team observed that the project's publications are often more academically oriented than is prudent for the success of its field operations.

Recommendation: Project staff should pay less attention to producing information of a purely scientific or academic nature. Instead, they should place major emphasis on making available to extension agents and policymakers information on the tree crop production methods developed or researched by the project. All scientific publications produced by project staff should be officially co-authored, including at least one country-level staff person in every publication.

INFORAT

There are three dimensions that need to be considered here, namely editorial assistance to create easy-to-read documents, the turn-around time for completion of research and transfer of technology through documents, and the extent of document circulation to relevant audiences. All three of these

considerations relate to the effectiveness of INFORAT and the relationship between INFORAT and the project. Three INFORAT staff were paid by project funds during the latter part of the project.

The first issue is INFORAT's editorial contribution to project documentation. One dimension of interest here is editorial input aimed at getting documentation into a more readable form for the intended audience. The project recognized the need for such input very late in its life (1984); thus, an editor has only been on the project staff (through INFORAT) for the past two years. INFORAT's editorial assistance does not deal with technical content; that function is handled by a three-person committee of senior project staff.

It should be noted that the INFORAT editor only works with manuscripts produced by CATIE project personnel or by personnel in the field who will be publishing through central project channels. On occasion, the editor has helped local country counterparts or coordinators edit manuscripts for publication through country channels rather than CATIE. The TCP project is attempting to upgrade the writing skills of country field personnel through a series of short courses to be held in each country. These courses, typically one week long, were scheduled to begin in July 1986.

The second critical issue is turn-around time for document requests. It appears both from interviews in the field and from discussions with project personnel at CATIE that the turn-around time from request to receipt of documentation is acceptable. In a typical situation, a document request to INFORAT is responded to with a bibliography of all documentation in the INFORAT files on the subject. The solicitor then picks the items wanted and can request documents (if available through CATIE) or photocopies (at US$0.25 per page). Requests are honored within a month or so.

Circulation of project documents is the third dimension of INFORAT's support. Based on a review of mailing lists for project documentation, it appears that distribution is quite wide. Most recipients are individuals, many of whom are officers of AID or other international or bilateral organizations. A number of libraries receive project documents, although it would appear that this list could be expanded. No analysis has been carried out to assess use of project documentation distributed and the extent to which documents sent out are further circulated by recipients.

It should also be noted that a CATIE-wide publications committee is being established. Such a committee could serve a useful function in establishing overall publication guidelines and policies, and developing criteria for selection in one of the publication series. However, serious delays in publication could occur if the committee were to become involved in manuscript

technical content or quality issues. These concerns are best left to the individual technical departments.

E. Education and Training

A major project objective was to develop capacity in national counterpart agencies and other institutions to carry out effective training programs for preparing people in the region for research, project planning and implemention, and extension. Based on discussions in project countries and at CATIE, it is evident that any kind of manpower training needs survey or identification of skill requirements for different types of positions were lacking. This was true for CATIE and for national counterpart institutions.

Accomplishments Versus Expectations

The table on the next page provides an overview of intended training outputs (as per the PP) and actual outputs according to project records. As indicated, the results were mixed. The PP called for nine master's-level students to attend CATIE. Nine did attend, but only six have received their degrees so far. Further, the intent was for those trained to return to their countries to work with the project, or at least work directly on fuelwood problems. In fact, none went back to work with the project, but six are working in directly related activities.

With regard to short-term training, actual achievements differ widely from the expectations set forth in the PP. As indicated in the second following table, the PP stated that a minimum of 75 people were to attend courses at CATIE, while a minimum of 175 were to receive training in courses given in project countries (at least one in each country). In fact, according to project records, only about 18 people sponsored by the project went to CATIE for short courses, while some 876 people received full or partial support to attend meetings in one or more of the project countries. As proposed in the PP, at least one seminar or other training session was held in each of the project countries. Costa Rica held 18; Guatemala and Honduras, eight each; Nicaragua, six; Panama, three; and El Salvador, one. This represents a very positive focus on country-specific training needs and program development.

In general, more host-country nationals were involved in project activities than envisioned in the PP or in the programming for the project developed in 1981. These nationals all received some training and technical support from CATIE, although reactions in the field about the relative value of such training and technical assistance were highly mixed. For most field personnel, it appears that the project-sponsored meetings of national

Education and Training:

Expected versus Actual Accomplishments of Project

	Planned Number - Participants (project paper)	Actual Number Participants	Notes
Master's degree program	9	9	
Short courses: CATIE	minimum 75	12	5 courses
Short course or training seminars in countries	minimum 100	876	Project paper: at least one short course in each country. Actual: 1 - El Salvador 18 - Costa Rica 8 - Guatemala 8 - Honduras 6 - Nicaragua 3 - Panama

Participation in Training and International Meeting Activities

Number of Events (E) and Participants (P)

	1980		1981		1982		1983		1984		1985		TOTAL	
	E	P	E	P	E	P	E	P	E	P	E	P	E	P
Master's degree study, first year (7 scholarships given)	-	2	-	0	-	3	-	4	-	0	-	0	-	9
CATIE short courses	1	1	-	-	-	-	2	6	1	2	1	3	5	12
Short courses in Central American countries	-	-	1	26	3	100	6	156	4	142	3	101	17	525
Short courses in/outside Central America, organized by other institutions	-	-	1	5	2	4	6	10	1	3	-	-	10	22
Mobile seminars*	-	-	1	23	-	-	1	34	-	-	-	-	2	57
In-service training at CATIE	-	4	-	-	-	-	-	2	-	11	-	6	-	23
In-service training in Central American countries	-	10	-	20	4	26	3	38	3	43	4	45	-	182
International meetings	-	-	1	3	-	-	5	17	3	9	7	38	16	67
TOTAL	17		77		133		267		210		193		897	

* All these activities organized by the fuelwood project. Participants included those from the fuelwood project as well as other institutions and projects.

technical personnel were the most productive forms of technology transfer (see Section VI.F.2).

F. Other Activities

Several other project activities relate to technology transfer. These are covered in the following subsections.

1. Data Base Management System

CATIE, mainly through the fuelwood project and now the TCP project, has embarked on a very ambitious data base management (DBM) exercise. While the project has not yet reached the stage where definitive evaluation is possible, a couple of conclusions can be drawn from what is available. First, the basic structure of the intended DBM system appears to be logical in that it provides the flexibility to adapt to presently unanticipated future uses; however, if it is to be used, staff will have to be trained. Second, there are currently no economic or social data in the data bank, which is a temporary location for the data that will eventually go into the DBM system. It should be noted that detailed cost information on some 40 management sites has been collected and is on file at CATIE. Limited cost information is available on an additional 60 units. In addition, some of the socioeconomic data collected in the process of carrying out the fuelwood requirement surveys could also be entered into the system.

There are several unanswered questions concerning development of the DBM system. For example, who will be the actual beneficiaries or users, CATIE scientists or local counterparts? Will the system be installed in all project countries and be readily accessible to counterpart agencies, or will CATIE not release the system as a whole, but rather provide responses to requests? How will the system link up with DBM systems in other parts of the world? Answers to these questions will not be forthcoming in the near term, but should be available by the end of 1986.

2. Technical Exchanges and Technical Assistance

The project has wholly or partially sponsored a number of technical exchanges between professionals in project countries, in some cases with the participation of CATIE personnel. Based on interviews in the countries, it is evident that national-level project personnel feel that these exchanges--mainly the quarterly project staff meetings--were very productive and informative. The meetings usually included site visits and discussion of actual on-the-ground activity in the host country. Unfortunately, the

quarterly meetings are limited to the same project staff and thus do not reach beyond the project. In the case of some other meetings, travel expenses of non-project personnel have been covered.

These international exchanges, together with short-term technical assistance by project personnel have resulted in some positive, albeit limited, exchanges of information for professionals. While some of these exchanges have resulted in a significant increase in awareness concerning fuelwood issues, financial commitment from countries for new positions or programs has not been forthcoming as a result of such heightened awareness.

G. Conclusions and Recommendations

The following are the main conclusions and recommendations of the evaluation team concerning project activities in the area of technology transfer (defined here to include demonstration units established, documentation produced, education and training programs undertaken, and miscellaneous activities such as establishment of a DBM system and technical assistance associated with building up country-level capacity). It should be noted that in many cases the recommendations are already incorporated into the stated purpose and plan of TCP project. In such cases, the recommendations merely support what is already planned.

Overall Technology Transfer Program

The figure on the following page provides a summary of evaluation results in terms of information types covered (documentation produced) and audiences addressed (training and education activities). This assessment is based on consideration of comments received in the field; review of project documentation, including course outlines and notes; and discussions with personnel at CATIE. In the figure, "NA" (not applicable) is used to indicate categories that the PP did not define as major project responsibilities.

Recommendation: The TCP project should focus more on development and transfer of information on dealing with socioeconomic, market and land tenure issues; design of effective incentive systems; and field management techniques.

Recommendation: More emphasis should be given to courses at a level appropriate for field personnel. Project benefits and impacts in this area could be enhanced if CATIE focused on training of trainers. These trainers can then develop, in each country, their own training programs for field personnel and extensionists, perhaps initially with instructional support from the project. CATIE should deal with counterpart institutions and,

Information Needed by Different Groups for Support, Planning and Implementation of Fuelwood Projects

Type of Information: / Group:	General Background			Project Planning		Project Implementation		
	1	2	3	4	5	6	7	8
	(see key below)							
administrators, politicians	++	+	0	NA	NA	NA	NA	NA
forestry professionals, project and program planners and managers	++	+	+	0	-	-	-	-
field personnel, extension workers	++	+	0	0	-	-	-	0
landowners, farmers, other land users, industry	0	0	0	0	-	NA	NA	0

Key to Project Performance:

++ = very strong + = strong 0 = average - = weak -- = very weak
NA = not applicable

Key to Categories of Information Needed:

1 -- problems, needs and issues
2 -- potential solutions and opportunities
3 -- resources required

4 -- technical relationships, species management, etc.
5 -- socioeconomic, legal, market, tenure and risk factors

6 -- project management (personnel, budgets, etc.)
7 -- incentive systems, persuasion techniques, etc.
8 -- field techniques (farm management, tree management, etc.)

through them or other contacts, with organizations that are responsible for agricultural extension. Given the nature of farm forestry (multi-purpose tree-growing activities on farms), it is essential that agricultural extension personnel get involved and appreciate the needs and opportunities which trees offer in farming systems. Again, the general point to emphasize is that the TCP project should focus very strongly on the problems of transition from project-supported and -directed activity to activity and institutions that can and will be supported nationally after the project is terminated in five years. For this reason, careful choice of appropriate institutions for training and technology transfer activities is crucial.

Demonstration Units: Follow-Up and Consolidation

Conclusion: The demonstration units (some 940) established by the project appear to have generated some interest in planting trees and establishing small-scale nurseries or home nurseries. However, since the project did not systematically collect data on the demonstration effects of the units, there is no solid evidence concerning their overall effects. A clear distinction needs to be made between those units which merely involved some initial technical assistance and seedlings, and those which the project has followed and worked with since establishment.

Recommendation: The project should more closely tie demonstration activities to national extension and training activities.

Recommendation: Early on, the TCP project should follow up with the demonstration units to collect systematic data on demonstration effects, the socioeconomic characteristics of early adopters, and the environments in which they live (e.g., characterized by average landholding sizes, pressures on the land, education levels, access factors, etc.). This recommendation relates directly to one made in Section V.B. As mentioned there, existence of this large number of demonstration units provides the project with a unique opportunity to undertake some ground-breaking social science research on technology transfer and diffusion of innovations.

Recommendation: The TCP project should consolidate its efforts and focus on fewer demonstration units. It should work more intensively with a limited number of units, both to ensure their success and to better understand the dynamics of the demonstration effects associated with them.

Recommendation: The TCP project should produce filmstrips and other educational/extension materials using actual demonstration unit results. Such materials would be most useful

in actual extension work and in training activities for extension agents and trainers.

Recommendation: The TCP project should seek out and develop demonstration opportunities with small, tree-related industries and link them with other tree-crop growing activities.

Recommendation: To the extent that it is possible and appears productive, the TCP project should interact and formally coordinate with other projects and programs (e.g., the new AID initiative in Asia, AID's F/FRED project, and various IUFRO initiatives in Central and South America).

Recommendation: The TCP project should provide strong technical assistance in national-level project identification and development of project profiles.

INFORAT: The Documentation Issue

Conclusion: INFORAT has served a useful function for the project by editing project documentation, and providing duplicating and publication facilities and advice, as well as fairly rapid documentation turnaround time for getting information into the field. These are essential services. At the same time, one can question the organizational aspects of the relationship between INFORAT and the project. For example, would it have been better to have these functions taken care of directly through the project, rather than an entity with diffused funding sources and focus? Or would a more central location (e.g., the CATIE library) have been preferable?

A particularly disturbing consideration relates to the fate of INFORAT's "fauna and areas silvestres" documentation service and the potential implications for the TCP project. Due to termination of project funding, the "fauna and areas silvestres" component was abandoned. INFORAT is now sitting on a collection of documents related to the project theme, but does nothing further to maintain the collection or reproduce and disseminate additional documentation. Again, if explicit consideration is not given to this lack of continuity after project funding dries up, the TCP project faces the same fate down the line. This would result in a waste of resources.

Recommendation: The TCP project should not move the much needed documentation activities (editing, publication, documentation and distribution) into the project itself; this would spell almost certain death for these functions at project termination. Continued support of these functions from INFORAT appears to be the most viable option for the short and medium terms. However, in the long run, it would seem that these functions should be incorporated into a CATIE-wide system of

documentation and distribution, perhaps directly attached to the library, thus merely augmenting current library services.

Recommendation: If the decision is made to build up INFORAT, then some means has to be developed to support its activity after project financing ends. Charges for services will likely need to be expanded gradually.

Recommendation: INFORAT should consider augmenting its current activities as follows. First, greater technical judgment should be exercised in choosing items to be included in bibliographies sent out to the field in response to requests; experts in various fields can rapidly reduce an overall bibliography (all items listed in the document base) to a key set of documents. Second, to the extent possible, the chosen key items should be annotated, however briefly. It is believed that the additional cost would be slight compared to the benefit of the additional service.

Recommendation: A more thorough understanding of who uses project documentation for what would be one step in the direction of tighter control on both usefulness of documentation (which could help in setting priorities) and distribution of documents (an expensive service). The project should study the use and distribution of documentation.

Recommendation: The TCP project should start to develop more field-oriented documentation, including manuals, guides, filmstrips, etc. If CATIE feels that this is not its role, then the work should be contracted to national institutions or consultants, with CATIE providing guidance to ensure quality and accuracy.

Data Base Management: Balancing Efforts and Needs

Conclusions: CATIE has the opportunity to develop a valuable DBM system for use not only by CATIE, but by members and by countries in other parts of the world. Already, considerable amounts of physical-biological data are available for entry into the system. However, there is an almost total lack of socioeconomic data for the same sites for which the physical-biological data are available. Further, there is no concensus on how best to incorporate qualitative (judgmental) data into the system (e.g., data related to the relative accuracy of various data sources). Many problems remain to be solved in arriving at a viable and productive DBM system for Central America. Issues include:

- clearer identification of likely actual uses for the DBM system (the system is expensive to develop and

maintain, thus economic justification is obviously an important consideration);

- most effective means of incorporating socioeconomic variables into the system;

- most effective means of introducing qualitative considerations or data, since these will be critical to the system's usefulness; and

- making the system simple yet effective, so it becomes a "user friendly" system that will truly receive wide use--it is essential that the system be used not only by CATIE, but by people in the field as well, since it would conflict directly with the whole rationale for building such an expensive information system if only CATIE used it. (While some help and expert support will always be needed, it should be possible to build a system that is fairly adaptable to the levels of expertise found in project countries.)

Recommendation: The final DBM system should be simple and easy to work with. The average potential user does not have the background knowledge or skills of a CATIE researcher. Interpretation of even a simple system can be difficult and thus abandoned as not being worth the effort. As the system evolves, constant trials should be undertaken to insure its utility.

Recommendation: Priority should be given to entering useful data into the system. Even though some data may be easy to generate, they should not necessarily be included, nor even collected. Special efforts should be devoted to developing a useful data/information base for socioeconomic aspects of tree crop production and consumption, and better management information.

Recommendation: The project should increase its effort to find better ways to enter qualitative data and data that indicate methods of collection and judgment concerning their validity.

Education and Training

Conclusion: The results of the project's training and education components are varied. Nine master's-level students were trained at CATIE, thus the output goal in this area was met.

Topics covered in the short courses (both in-country and at CATIE) were mainly limited to biological, silvicultural and mensuration topics. Courses did not deal with socioeconomic aspects of fuelwood production, extension methods and related topics. This was due, in large part, to those in charge viewing

the project primarily as a silvicultural research project and the fact that few socioeconomists were on the staff. In the later years of the project, thinking started to shift, giving way to the present, more balanced, view that the project involves both major silvicultural and major socioeconomic elements and needs.

Some of the training activity was relatively inappropriate to meeting priority needs of the project, at least relative to some other topics which seem more urgent, such as development of practical field management guidelines, generation of cost and return data for financial and economic analyses, practical skills related to soil type identification and soil site relationships, and extension methods.

Recommendation: At the CATIE level, the TCP project should focus on training of trainers. At the national level, it should develop training courses for extension agents, including central extension workers in the agricultural sector.

Recommendation: The TCP project should help countries to develop realistic training plans (or update existing ones) to provide some general ideal of the types of training needed and the numbers of people involved.

Recommendation: At the master's degree or post-professional level, the TCP project should support increased study abroad. Many other similar projects exist worldwide, and project personnel could gain valuable experience and lessons from such projects. Some formal (master's-level) training of project staff is called for--in the social science area, for example.

CATIE and National Capacities for Research and Education

Conclusion: In general, CATIE's capacity to expand its efforts in technology transfer related to tree crop production was only marginally affected by the project. INFORAT did take on project-supported staff to begin fuelwood documentation work; however, this has not built up the organization's capacity because there will probably be a transition to a CATIE-supported post or activity when the project terminates (witness what happened to the "fauna y areas silvestres" program at INFORAT).

Recommendation: A basic focus of the TCP project should be to increase CATIE and national capacities to extend research results and management packages developed through the project and elsewhere. In CATIE's case, the focus should be on increasing its involvement in training trainers, i.e., those who can go back to their countries, adapt the general knowledge and skills gained through CATIE to their own situations, and provide training for local people.

Recommendation: There needs to be a much stronger commitment to increasing budget support for project-related activities through support for technical and scientific personnel involved in training and other technology transfer activities. This holds for CATIE itself and for the project countries. A first step in defining the level of commitment needed is to develop national manpower training plans. Preparation of these plans should involve rapid (probably one week per country) assessments focusing on very practical needs. The TCP project coordinator, in conjunction with country staff, should develop concrete indicators of progress in the technology transfer area, since technology transfer is extremely critical to future project success and to continuation of project activities, nationally and at CATIE, once the TCP project ends.

VII. OVERALL PERFORMANCE OF THE FUELWOOD PROJECT

According to the purpose of the Fuelwood and Alternative Energy Sources project, the fuelwood subproject has attempted to develop, demonstrate and make available for transfer improved cultivation practices to increase fuelwood production and supply. In this section, conditions that the PP proposed would ideally indicate a successful project are compared to the actual performance of the fuelwood project.

The first condition is that specified cultivation and farm management practices developed by CATIE, in collaboration with national counterparts, would be found acceptable by the target populations. One of the problems observed in the fuelwood project was a relative lack of emphasis on utilizing the experience of countries both within and outside the region, in terms of species work and management practices. Because of the staff's interests in field research, as opposed to getting research results to extension agents and small farmers, there has been more emphasis on establishing new research plots, even though some of the information to be gathered from these plots may already be known. By using previous research that is available, the project could have produced information earlier for extension agents and small farmers on the establishment and management of some species (e.g., Eucalyptus camaldulensis).

The project has begun to develop cultivation and farm management practices for use by target populations. A great number of species and management trials have been established, and species demonstrations and some of the management work done indicate that favorable results will be forthcoming. One example of a valuable project contribution is the use of Mimosa scabrella as shade trees on coffee plantations--a previously untried combination.

Despite these initiatives and the fact that many farmers are already interested in planting the species tested, the project has not yet prepared technical packages for extension agents or farmers. Management practices have not been subjected to in-depth silvicultural or socioeconomic analysis, and although a large amount of data has been gathered, major gaps in the information are still evident. The project has placed a very limited emphasis on socioeconomic work that would clarify the benefits and costs of the species choices and management practices under development. This lag in the socioeconomic work will delay rapid dissemination of forestry research that appears to be quite promising from a silvicultural standpoint.

Country-level staff have been the group most actively involved in developing the cultivation and farm management practices. CATIE-based staff members have supplied ideas for

species and management combinations that were then implemented by the country staff. This was one of the strengths of the fuelwood project. However, input from CATIE-based staff was often missing on the management of existing trials and parcels, as well as on-the-ground assistance with data collection and information analysis for national program needs. Another strong element of the project was constant interaction with national agency counterparts. Not only were the counterparts identified generally good, but the project also actively involved them in the process of making program decisions at the country level.

With regard to defining the target population, the project succeeded in clarifying fuel and other wood needs, which shifted the focus of the project away from just considering areas where fuelwood is scarce. The major change in project focus has been to work where fast-growing species present a potentially cost-effective agricultural and/or rural production technology, including work with small industries, for example. The project has failed in that too much emphasis seems to have been placed on a technically-oriented audience of foresters. The project has missed the important target population of extension agents, trainers and other links, who could effect much wider and useful dissemination of its technical work.

In terms of whether the cultivation and management practices developed by the fuelwood project have been found acceptable by target populations, one issue is always how far research should go before the information is offered as a technical package to small farmers on a widespread basis. To some extent, requests for seedlings from farmers in project areas indicate that some of the practices have already been found acceptable by the target populations. Indeed, project staff have had to exercise restraint in some areas where farmers have been very eager to plant fast-growing species and receive assistance from the project. Project demonstrations appear to have been generally successful at sparking interest in the target populations. In spite of this, the fuelwood project was weak in that it identified promising species and established hundreds of parcels, but did not utilize the experience gained from this work in a very efficient manner. Little information on management practices has been disseminated in an appropriate form for extension agents or small farmers.

The second condition proposed in the PP is that <u>national counterparts would use these new practices in extension programs</u>. As indicated in the above discussion, it is obvious that only a limited amount of work is being done at this time by extension agents using research results from the fuelwood project.

It should be pointed out that in some countries, the project has begun to use a wider definition of the term "counterpart." Rather than focusing solely on forestry-related extension

services, project personnel have begun to talk to extension agents working on crop and animal production (e.g., the Costa Rica country program). The tendency to communicate only with one's peers (for example, other foresters) is very strong, and initiatives taken by both central and country-level personnel to begin interacting with extension specialists and scientists in crop and animal production could be a major achievement during implementation of the TCP project.

As the third condition, the PP proposes that national research institutions and CATIE would continue research programs on this topic. Given the rapid start-up of the TCP project, it is impossible to guess what the results of the fuelwood project would have been without such a follow-on project. However, a few observations can be made.

There is some evidence that national institutions may continue portions of the research work begun by CATIE. One of the best elements in the fuelwood project has been training national staff on various aspects of research and fast-growing tree species. However, this training may be for naught, if they are not given the resources to put the skills and information they have learned into practice. It is likely that without the TCP project, national agencies would have had little chance to do so--resources provided by the fuelwood project, such as vehicles, fuel, equipment costs and per diem, were crucial in getting out into the field. The fuelwood project was unsuccessful in developing long-term survival strategies for either its research or extension activities.

The remainder of this section provides the evaluation team's overall conclusions regarding the performance of the fuelwood project relative to its purpose. First, the project emphasized establishing new research plots, at the expense of capitalizing on the experiences of countries, both within and outside the region, in terms of species work and management practices. Using previous research, the project could have produced information earlier for extension agents and small farmers on the establishment and management of some species (e.g., Eucalyptus camaldulensis).

Second, species demonstrations and some of the management work that has already been accomplished indicate that favorable results will be forthcoming (e.g., the use of Mimosa scabrella as shade trees on coffee plantations, a previously untried combination). However, the fuelwood project has not yet prepared technical packages to offer to extension agents or farmers. The lack of emphasis on the socioeconomic aspects of project activities will delay rapid dissemination of forestry research that appears to be quite promising from a silvicultural perspective.

Third, country-level personnel have been most actively involved in developing cultivation and farm management practices, while CATIE-based staff have provided ideas on species and management combinations--this has been one of the strengths of the fuelwood project. CATIE-based staff have not provided enough assistance with the management of existing trials and parcels, as well as on-the-ground collaboration on data collection and information analysis for national program needs.

Fourth, national agency counterparts were actively involved in the process of making program decisions at the country level. This has been a very strong element of the fuelwood project.

Fifth, the fuelwood project succeeded in identifying priority areas where fast-growing species are a potentially cost-effective answer to energy problems (e.g., small industries). Requests for seedlings from farmers in project areas indicate that some of the cultivation and farm management practices developed by the project have already been found acceptable by target populations. Although the fuelwood project identified promising species and established hundreds of parcels, it did not utilize the experience gained from these activities very effectively. The project has placed too much emphasis on a technically oriented audience of foresters, rather than on extension agents, trainers and other links who could effect much wider and useful dissemination of its technical work.

Sixth, the project has begun to use a wider definition of the term "counterpart" by interacting with extension specialists and scientists in crop and animal production, rather than focusing solely on forestry-related extension services.

Seventh, if AID had not undertaken the TCP project, serious disruptions in the fuelwood project's ongoing research would have occurred and its level of effort would certainly have been jeopardized. One of the best elements of the fuelwood project has been training national staff on various aspects of research and fast-growing tree species. It is likely that without the TCP project, national agencies would have had little opportunity to use this training--resources provided by the fuelwood project, such as vehicles, fuel, equipment costs and per diem, were crucial in getting out into the field. The fuelwood project was unsuccessful in developing such a long-term survival strategy for its research or extension activities, either at CATIE or national institutions.

VIII. TRANSITION BETWEEN FUELWOOD AND TCP PROJECTS

A. The Transition Process

The transition from the fuelwood project to the TCP project appears to have been extremely smooth. CATIE has been able to keep the same core staff, continuity exists, and the management system developed for the fuelwood project is still in use. An administrative assistant is incorporated into the TCP project who is already proving valuable. Basically, it is as though the TCP project is not a different project, simply a continuation of the fuelwood project.

However, there are substantial differences between the two projects. In terms of management, it is quite likely that CATIE may find itself relying on a part-time project coordinator, which may create problems. This is not a negative reflection on the new coordinator at all. In fact, there is universal appreciation for the qualities this individual has brought to the project. He has initiated a process of reflection on project objectives that is extremely important, and because he is part of CATIE's core staff, he can be more assertive in his dealings with CATIE. However, it is important to keep in mind the demands that a project such as this places on any individual. The current coordinator is also a program director, part-time department head and professor.

At this time, the project is being managed on a day-to-day basis by the project coordinator with full-time assistance from the previous coordinator, who is an unofficial "deputy coordinator." This individual is funded almost completely by outside sources. Though other staff members are currently being recruited, it is not known whether the new senior economist or silviculturist will have the same proclivity for management as the past coordinator and hence, be as much help to the project coordinator.

Technically, the project has designated 1986 as a year for planning and clarification of the project's ultimate objectives and purpose. ROCAP is supporting this process. This evaluation and other work being done by a silvicultural consultant will contribute toward the clarification of objectives and probable reorientation of some project activities.

B. Technical Aspects

The TCP project's purpose is more detailed and potentially more complicated than the objectives of the fuelwood project. The goal of the TCP project is to increase the incomes and social welfare of rural families and alleviate environmental

deterioration through a significant increase in tree cropping for multiple on-farm uses and the sale of wood products. As written, this goal is more explicit in its emphasis on the private sector and broadening the focus of the project to include multiple on-farm uses of trees. This broader focus is rational. However, it also increases the likelihood of the project losing its direction by taking on too broad a mandate. The evaluation team firmly believes that the fuelwood project's successes occurred because it retained a well-defined, focused objective--fast-growing fuelwood species.

The purpose of the TCP project explicitly acknowledges the role of the private sector, while at the same time, retaining the institution-building activities of the fuelwood project. The project's purpose is to strengthen the capabilities of CATIE, public and private forestry services, educational institutions and extension organizations to access, promote and disseminate on-farm, market-oriented, tree crop technologies for the use and economic benefit of small and medium-size farmers and rural industries.

The PP for the TCP project sets forth some challenging and distinct conditions to indicate whether the project's purpose has been achieved. For example, the first condition for its success is (emphasis added by the evaluation team):

- CATIE and national agencies responsible for forest resources will have functioning programs to promote use of fast-growing trees for multiple purposes on small and medium-size farms; sufficient staff with skills needed to work effectively with farmers and advise them correctly on species and site selection, propogation, planting, management practices, on-farm uses and marketing of products from multipurpose, fast-growing trees; and a high level of interest and support from public and private institutions, and adequate financial resources to maintain forestry information dissemination, research and training activities initiated under the project for the benefit of small and medium-size landowners.

This end-of-project condition confuses the roles of CATIE and national agencies. Fortunately, TCP project staff appear to be cognizant of CATIE's distinct role. However, there is always a desire and tendency among project staff to get involved in the type of extension activities referred to in the first underlined portion. The second underlined section is important because it is something that the fuelwood project also attempted and, as has been repeatedly emphasized by the evaluation team, was unable to achieve.

The second end-of-project condition specified in the PP is as follows:

- CATIE and national-level educational and training institutions will have strengthened and expanded their human and physical resources to provide cost-effective graduate and nondegree programs appropriate for the management of multipurpose, fast-growing tree crops, including the provision of 12 master's degrees from CATIE and the participation of 100 people from the region in short courses held at CATIE.

This is one objective that the project should have no problem fulfilling. The key issue will be the extent to which CATIE places emphasis on national educational institutions versus training at CATIE.

The third end-of-project condition specified for the TCP project is:

- Project beneficiaries, including farmers, nurseries, cooperatives, agribusinesses and other small entrepreneurs, will have made direct use of the results of silvicultural and socioeconomic research to grow, utilize and market more tree crops for their own benefit. It is estimated that, at a minimum, 15 demonstration clusters and 100 plots will be established as a means of displaying project technologies and testing new tree-crop management trials and methods.

The project has not established a system for gathering any information that will allow CATIE to determine whether the above objectives have been accomplished. It is quite likely that CATIE can achieve the numerical goals specified in these end-of-project conditions, but it is more important that it be able to ascertain why and under what conditions certain types of trees and management practices are adopted by target populations. The fuelwood project's lack of emphasis on the socioeconomic aspects of tree crops development was a major limitation in quantifying what may have been substantial economic benefits during its life. The TCP project cannot afford to let the same thing happen.

Conclusion: The transition from the fuelwood project to the TCP project appears to have been extremely smooth. TCP has the potential to be an excellent project, if it retains a sharp focus. However, the PP for the TCP project is confusing at the purpose level concerning the roles of CATIE versus national institutions.

Recommendation: The purpose stated in the PP for the TCP project should be revised to clarify the roles of CATIE and national institutions.

C. Monitoring System for the TCP Project

One of the greatest weaknesses of the fuelwood project was that it was unable to accurately document the benefits and accomplishments of its demonstration work in the field. To date, although TCP project staff are concerned about this issue, nothing has been done to address it. This section provides some preliminary suggestions for a monitoring system to track the achievement of project objectives and benefits in the field, in particular. The focus of this system is on monitoring indicators that might show the achievement of the TCP project's purposes and end-of-project conditions. Time limitations prohibited the development of preliminary suggestions for purpose-level indicators. Instead, it is recommended that indicators used by the project should be developed by project staff under the leadership of the ROCAP forestry advisor, possibly during a one-day workshop, using the system outlined below.

Given the many responsibilities of the project staff, the evaluation team believes it is advantageous for the ROCAP regional forestry advisor to maintain a long-term perspective on the project's value and performance. This can be achieved through his involvement in regular reviews of project performance, and focusing specifically on monitoring performance in terms of the project's purpose and expected end-of-project conditions. Ultimately, someone at CATIE should also take on such a role, preferably the project coordinator or a planning and evaluation specialist.

During the fieldwork for this evaluation, the team observed one misconception about project monitoring that should be corrected, concerning purpose-level versus output-level performance indicators. The accomplishment of outputs may, but does not necessarily, lead to achievement of the project purpose. The fuelwood project is a prime example. For this reason, it is important to establish a process for monitoring achievements at the level of the project purpose. This will help ensure that project staff have a broader vision of the direction of the project and what it might ultimately achieve.

The evaluation team suggests that because the TCP project is already doing some limited monitoring, the point should be to improve monitoring at the level of both project purpose and outputs. This can be done in two ways--by conducting regular analyses at the purpose level, and by ensuring that output-level monitoring adequately reports both silvicultural and socioeconomic performance in the field. The evaluation team has

three specific suggestions for implementing a monitoring system for the TCP project.

First, due to the thoroughness of the description of outputs in the PP for the TCP project, it is suggested that TCP staff and the ROCAP regional forestry advisor group output-level indicators in the logical framework (log frame) so that when combined, each grouping represents a purpose-level indicator for every end-of-project status condition. The emphasis during purpose-level monitoring and evaluation should be on a qualitative, not quantitative, assessment of the achievement of each objective. This approach capitalizes on the specificity of the TCP project outputs given in the PP, but emphasizes the need to view those outputs from the perspective of the project's purpose.

Second, data collection should continue to be performed primarily by country teams, who will gather output-level monitoring information. The data collected should feed directly into analysis and be part of the regular reporting process from country programs. No separate reporting system for the monitoring suggested here should be established. Central-level project staff should review the information now being reported by the participating countries to determine how this can be used or modified (preferably in only a small way) to improve its utility for the monitoring system. Specifically, central staff should ensure that there is adequate coverage of both silvicultural and socioeconomic variables. The new country-level economists could make monitoring one of their principal responsibilities.

Third, central-level staff should focus on analyzing the monitoring data in terms of the project's purpose. However, periodic assessments (quarterly, twice yearly or, at a minimum, annually) of project performance in terms of its purpose should be conducted by the ROCAP regional forestry advisor. The advisor could prepare a very short written report (two to three pages) that focuses on purpose-level performance, is distributed to all project staff, and reviewed during quarterly project meetings or whenever regular joint meetings of country- and central-level staff occur.

The most <u>time-consuming</u> aspect of a monitoring and evaluation system is setting it up, but the most <u>difficult</u> task is ensuring that it is implemented. The former should be done by the entire project team, if possible. The evaluation team suggests that the latter be the joint responsibility of the project coordinator and ROCAP regional forestry advisor.

The weakest element of the fuelwood project in terms of output-level monitoring concerned technology transfer and socioeconomic elements of the work done in participating countries. For example, although seedlings have apparently been distributed to many farmers, what they did with them and any

benefits that have accrued are unknown. It appears that some country programs have information about where the seedlings went (e.g., Costa Rica), but that is about all. This must be addressed in output-level monitoring for the TCP project, as the evaluation team is confident that the fuelwood project may have had very positive impacts which cannot be documented. Above all, the monitoring system outlined here depends on the quality of information provided through country-level data collection.

Conclusion: Two of the greatest weaknesses of the fuelwood project were that it was unable to accurately document the benefits and accomplishments of its demonstration work in the field, and project monitoring did not adequately focus on attainment of the project's purpose.

Recommendation: The TCP project should improve its monitoring system to focus on a qualitative accounting of indicators that might show achievement of the project's purpose and end-of-project conditions. Implementation of this system will depend on improved input at three levels:

- from the ROCAP regional forestry advisor, in terms of maintaining a long-term perspective on the project's value and performance, and taking a practical role in purpose-level monitoring in the form of short (two- to three-page) written periodic assessments (either quarterly, twice yearly or, at a minimum, annually) of project performance, which will be distributed to all project staff and reviewed during quarterly project meetings or whenever regular joint meetings of country- and central-level staff occur;

- from CATIE central-level staff, in identifying better socioeconomic and silvicultural data inputs as well as processing and analyzing field data for output- and purpose-level monitoring; and

- country staff will continue to collect output-level monitoring data--above all, the monitoring system outlined here depends on the quality of information provided through country-level data collection.

IX. LESSONS LEARNED

This section is based primarily on the experiences of the fuelwood project during the period from 1980 to 1985, but also on the experiences of a number of other projects around the world. Many of the conclusions reached by fuelwood project staff after observing the results of their work are similar to conclusions drawn by project staffs from such diverse countries as Niger, Korea, the Philippines, Ecuador and Haiti. Thus, it is useful to discuss the major lessons learned from the fuelwood project and compare them with experiences of projects in other parts of the world. Similar results from other projects strengthen the validity of the lessons covered here. Based on this evaluation and assessment of the fuelwood project, 13 lessons with parallels from projects in a number of other countries stand out clearly.

Continuity

Right from the start, a project needs to explicitly consider a plan for building continuity, i.e., a national or local institutional commitment to carry on with project activities once resources from the major external project terminate. This continuity does not just happen--it must be nurtured and built up gradually over the life of the project. This issue relates centrally to the absorptive capacity of a country and its organizations, which will have to continue implementing project activities after the externally funded project leaves.

The continuity issue has been stressed throughout this report and is reemphasized here as it is most important. Without the timely start of the TCP project to take over where the fuelwood project left off, the conclusions of this final evaluation would probably be quite different from the ones reached in the preceding sections. They would have had to be much more discouraging about the project's lasting effects. In fact, ignoring the TCP project, which is essentially an orderly extension of the fuelwood project, the team would have had to conclude that the fuelwood project had not expended enough effort on securing continuity and a productive transition of project activities (i.e., plots, trials, demonstrations, research in progress, training) to national institutions, both public and private. Even in areas where the project was quite successful initially and farmer participation in tree planting had been growing rapidly, the trend in participation dropped significantly and hard-won momentum was lost when project funds dried up. There was no national funding to fill the gap. An example of this is shown in the figure on the following page.

Since the TCP project is a reality, the present evaluation must naturally take it as a given, focusing more on the

transition to it and less on what would have occurred in its absence. However, in planning for the future of the TCP project, or for that matter, any other internationally supported project, such a view would be unwise. Rather, planning should be done as though at the end of the project period, funding and technical support will be terminated. In this case, the issue of continuity is critical, and the need to plan for a smooth transition to a nationally financed activity handled by established institutions becomes important. Such planning cannot wait until the project's last year. It has to involve a gradual strengthening of local capabilities and feelings of national responsibility right from the start.

The issue of continuity has widespread implications. For example, the fact that there was continuity in the national staffs in most fuelwood project countries probably contributed to the successful country programs which were developed and will help with the new TCP project. Continuity is associated with stability, which promotes confidence.

Underestimating Time Requirements

In general, it takes more time and effort than planned to get programs operating smoothly on a meaningful scale, particularly with projects involving the participation of rural smallholders. This emphasizes the point that good administrative and organizational expertise is fully as important as good technical skills. Time costs money, so if the time required to successfully execute project plans can be reduced, significant cost savings can be realized.

It often requires more time than expected to get rural tree crops projects established and running well. In planning social forestry projects that involve many small landowners, the time needed to get activities going on a significant scale is typically underestimated. A reasonable minimum time horizon for a rural development forestry project is eight to 10 years before its results become significant, assuming that the project is a good one to begin with, of course.

Although it sometimes appears as though this time constraint does not hold, in most such cases, hidden "preparation" time was involved. For example, the fuelwood development project in Korea (one of the acknowledged successful tree crops projects in the world) appeared to move from almost no fuelwood/multipurpose tree plantations in the late 1960s to about one million hectares of plantations in the 1970s. In a few years, Korea moved from fuelwood scarcity to near self-sufficiency. However, the fact that Korea had a long history of cooperative and communal activity was hidden. Literally decades of institutional preparation preceded the apparently rapid

evolution of this program. In the case of the fuelwood project, CATIE had a solid history of at least 20 years of silvicultural research and species investigation and development. However, the countries participating in the project did not--they had not been systematically involved with fuelwood or multipurpose tree species development at the farm level. Thus, the concepts and developments were new to them.

Single- Versus Multi-Purpose Tree Species

Farmers tend to plant trees for multiple purposes, rather than a single use, such as fuelwood, partly because they recognize and need the other goods and services which can be had from multipurpose trees, but also because they tend to try to avoid risks and thus, prefer that a number of different outputs can be derived from the trees they plant. The exception is the farmer who is planting strictly for commercial purposes--then, single-purpose trees may be appropriate and desirable from the farmer's perspective.

Up until the late 1970s and into the early 1980s, it was commonly assumed that most farmers plant and tend trees for a single dominant purpose (for example, fuelwood). Slowly but surely that assumption has been invalidated by a number of sources, including the fuelwood project which, in its new form as the TCP project, has explicitly recognized the multipurpose nature of most tree planting done on farms. A summary of some 18 studies from around the world found the same thing--rural people plant trees for multiple uses, except when they are planting for a specific market (e.g., projects in India, the Philippines, Ecuador, Chile). While the reasons behind the choice of multipurpose species have not been adequately investigated, there are several speculative possibilities. Among others, it may well be that poor farmers, who normally display high levels of risk aversion, either consciously or unconsciously try to maintain numerous viable options by planting trees with multiple uses that may be suitable for multiple local markets.

The implications of this realization relative to research and development activities are rather significant. For instance, the relevant factors in choosing trees for species trials as well as extension approaches will be quite different for multipurpose trees, as opposed to single-use trees, such as fuelwood species. Among other things, the need to consider trees in the context of farming systems becomes much more urgent--farmers often recognize to a much greater extent than researchers and extension agents that trees are an integral part of their farming systems, providing fertilizer, shade, fuel, fruits, poles and so forth. In fact, with funds from GTZ and other groups, the CATIE agro-forestry unit is studying many of these types of relationships and the role of trees in farming systems. In this case, there is

a logical linkage that should be made between the TCP project and agro-forestry unit. Thus, a further general lesson is to search out other groups and institutions that are working on similar problems.

Commercial Versus Noncommercial Incentives for Growing Trees

Commercial and noncommercial incentives for farmer participation in tree crops projects can be quite varied, and such differences need to be considered in project design and implementation. In the past, the distinction between market- and nonmarket-oriented tree growing was not explicitly considered to any great extent. Now, it is recognized that the incentives involved in the two systems can be quite different.

The amount a farmer avoids paying for fuelwood by growing it versus the cash realized by selling wood in the market can be two entirely different things from the farmer's perspective. The psychological difference between income earned (i.e., cash in hand) and expenditure or barter avoided (by supplying their own wood needs) can be great, particularly in an economy that is only partly monetized. Correspondingly, the structure of incentive mechanisms and support services built into a tree crops project must vary according to the particular situation. Among other things, for a project such as TCP which is evolving into a program with a significant market component (as distinct from farmers growing wood for themselves), it is critical that advance work be done on markets, market trends, transportation and marketing channels and costs, and so on. In a newly developing market situation or one which is changing rapidly and constantly, these are not concerns that can be taken lightly.

More specifically, as recognized in the TCP project, volume/market demand relationships for species must be projected and monitored to determine if recommendations for planting a limited number of species will either "flood" future markets or be insufficient to supply new specialized industries (e.g., particleboard, mechanical pulp, etc.). Similarly, the logistic issues associated with transportation networks and ensuring the timely availability of sufficient planting stock and credit, if necessary, are important factors to be considered.

In the case of nonmarket incentives, there are a host of different issues to be faced. However, few lessons can be learned from the fuelwood project since nonmarket incentives were not given much attention. The plans for the TCP project call for much more intensive work on this topic.

Roles of Different Actors

It is critical to carefully consider and explicitly define the relative roles and decision-making responsibilities of local people, project personnel and other actors involved in the planning, design and execution of tree crops projects. Clear role definition is essential for a project's success and smooth operation.

The lessons learned from the fuelwood project include an important one about project planning and implementation--while overall program direction can usefully come from the top down, action can only produce significant results at the community level if it is pushed and supported from the bottom up (i.e., with local involvement in project planning, design, promotion and execution). No country has the resources to pay (subsidize) every farmer or community to plant trees, or even provide extensive technical assistance to each farmer in a given area. Ultimately, as was discovered in the successful demonstration areas of the fuelwood project, it is the diffusion of successful results from on-farm demonstration plots, supplemented with some technical assistance and free or low-cost seedlings, that results in the expansion of tree cropping among farmers. Another factor contributing to successful results is the availability of information on actual and/or potential markets for minor (so-called secondary) forest products from recommended species, which permits utilization of thinnings, branches, bark and foliage.

There are many difficulties involved in stimulating strong local involvement. Primarily, it is a matter of finding the right set of incentives, either market-oriented (as in the cases of Haiti, PICOP smallholder forestry in the Philippines and Gujarat in India) or nonmarket ones (e.g., for hill tribes in Nepal, villages in Korea). In addition to incentives, there is a critical need for adequate logistics--assuring that enough seedlings are available at the right time in the right place, necessary technical assistance is available, etc. To reduce risk and uncertainty, robust species must be chosen.

Linkages Between Actors

The link between professionals, field extension workers and potential farmer participants is critical in projects like the fuelwood and TCP projects. The use of intermediate groups, such as private voluntary organizations (PVOs) and community groups as vehicles for the diffusion of technologies and incentives has worked in many instances. Choosing country teams directly from project areas was also an important consideration in this case.

In most social forestry projects, the weakest link is between professionals managing the project and potential farmer

beneficiaries in the field. This weakness is partly due to the fact that social forestry extension systems have not been created before--they are new in most areas, with the exception of perhaps India and a few other countries. The fuelwood project was no exception in terms of initially having a weak link between project professionals at CATIE and the national level (e.g., coordinators, counterparts), and farmers in the field. It is recognized that the project's main purpose was to develop research and training capabilities, but at the same time, it should not be forgotten that the project goal was to improve the welfare of the rural poor. Somehow, sometime, somewhere, the link with the farmer is necessary if the project is to move toward that goal.

The fuelwood project made great progress, particularly in its latter years, in getting field technicians and some extension support in place. By using physical demonstrations of the excellent results from project plantings, rather than relying strictly on verbal persuasion, the project reduced the overall need for field-level technicians who could actually convince people to plant trees. However, funds were limited, so only a certain number of people and areas could be involved in these activities. Furthermore, the prospects for continued widespread support by national governments were not good. Fortunately, the TCP project provided the means for continuing fuelwood project activities, as has already been discussed.

Growing experience worldwide from Haiti, India, Niger, Senegal, Ecuador and the Dominican Republic, among others, indicates that one way to strengthen field-level technical support is to work with local nongovernmental groups, including the PVOs found in most countries. These groups offer a number of advantages in terms of gaining local trust and participation. Among other things, they often use local people who live right in the communities where they work and are thus known to local farmers.

Many private community groups can be tapped for support, including churches, women's clubs and schools, for example. (If every student in Indian schools planted and tended one tree per year, that much of India's wood famine could be eliminated). In many countries (e.g., Kenya, Korea, Costa Rica), women's groups and other local organizations have successfully developed small nursery businesses that support tree crops projects. In Korea, hundreds, if not thousands, of such small nurseries have provided significant incomes for local communities, while at the same time, providing critically important growing stock for tree crops projects. Such nurseries can become self-sufficient in a short period of time, with initial funding from the government, a cooperative or other PVO source.

In most countries, the forest service has a reputation as a "police" force--guardians of the forest estate, rather than an organization that supports the growing and cutting of trees by local people. It has been shown that it is difficult to change this image of forest guards or technicians as adversaries who protect the forest, as opposed to agents who help conserve the resource for community use. The use of PVOs has been very successful in overcoming this problem in some areas, and some exploration of this concept within the framework of the TCP project is worthwhile. (For instance, the evaluation team reviewed the proposed project amendment, and believes this is an appropriate and worthwhile approach that would complement the project's research activities.) Such institutional issues could well form a component of the social science research to be developed by the project's social scientist.

International Institutions in the Project Context

The effectiveness of international forestry organizations and networking depends on the sensitivity of the relationships developed between national and international institutions. A fine balance must be struck between centralized and decentralized decision-making. Ultimately, the lesson to be learned here is that international projects (whether centers or networks) must focus on issues at the national level, if they are to be effective in helping solve problems on the ground.

In keeping with the lessons already discussed, particularly those related to continuity and local participation, a critical lesson learned from the fuelwood project (as well as many other projects worldwide) is the very complex nature of the relationship between international organizations, such as ROCAP (which funded the project), CATIE (responsible for managing it) and national counterpart organizations (implemented project activities). At the international level, the close working relationship between CATIE and ROCAP provided a means for frequent interaction and rapid response to any suggested project modifications due to changes in conditions. Such relationships help keep channels of communication open between the funding and implementing agencies. As was true in the case of bridging the gap between professionals and beneficiaries in the field, the relationship between CATIE and the country counterpart institutions and people is very sensitive. (As one person in the field told the evaluation team, CATIE is not Costa Rica, much less Honduras, Nicaragua, El Salvador, Guatemala or Panama).

While CATIE staff members feel comfortable in the project countries (indeed, many project scientists come from one of the participating countries), they must act with sensitivity since they represent an international organization, not their country. They get complaints (e.g., too much project funding went to CATIE

and not enough to the countries) and criticisms (there was too much orientation toward the international scientific community, not enough concern with what goes on locally in the field). These are typical complaints in dealing with international organizations. Yet, if valid, they must be understood, accepted and dealt with, in order to maintain communication and respect.

The point of this lesson is not that there is a single perfect solution or magic balance between funding levels, the allocation of time and so forth. Rather, in any international program, such as the fuelwood project, the international personnel must be extremely sensitive to issues associated with nationalism, distrust of large international organizations, and criticisms concerning the allocation of funds, salaries, time and effort. If anything, project managers and coordinators should be overly sensitive to these issues, since just one major failure to communicate or compromise regarding national wishes can lead to resistance that may last throughout the project.

Each country has to develop a proprietary interest in a project if it is to succeed in that country and be sustainable. In the case of the fuelwood project, the independence and autonomy given to country groups (the country coordinators and their counterparts) fostered this type of national interest in the project, although the administrators of counterpart agencies gave no indication that they continue funding activities at the end of the project, as stated earlier. (Of course, it can be argued that it would be unwise for them to do so until project funds actually terminated. In the final analysis, their willingness to carry on with project activities can only be ascertained when the TCP project actually ends some five years from now.) In any case, clear definitions of project objectives and participants' functions have proven to be an important element in project success--this lesson should not be lost. The fact that the fuelwood project focused specifically on fast-growing tree species, all of which had to be usable for fuel, gave it a clear technical mission and a distinct image to outsiders.

Networking among countries and the establishment of international research programs are sound ideas, at least in theory. They have worked well in agriculture partly, as Dr. Norman Borlaug says, because of the uniformity of interest in a few crops and problems across many countries. The value of such international mechanisms for generating and sharing information and ideas has yet to be proven in forestry, where the appropriateness of species, management practices and other aspects of forestry tend to vary more with individual country conditions.

The preliminary lesson from the fuelwood project would seem to be that such international mechanisms can work for forestry,

but they need to be highly flexible, at least initially, to guarantee that each country can also independently pursue its own particular interests in terms of species, markets and management systems which are suited to its specific conditions. The balance between central and decentralized decision-making (including budget allocation) must be considered very carefully, and, as was done in the fuelwood project, the benefit of the doubt should be given to the participating countries.

Silvicultural Research Lessons--Quality Control

There are five major silvicultural research lessons to be learned from the fuelwood project:

- a supply of good-quality seed of known provenance should be found;
- there must be good field supervision and quality control, both in the design and establishment of trials and plots, as well as the collection of data that go into a central data bank for processing, if the research is going to stand on its own merits and have long-term value;
- those who work and take measurements in the field should be involved in data analysis--they have the best "feel" for the data's qualitative aspects;
- activities should be rapidly restricted to a limited number of species; and
- the number of plots and trials should also be limited to a sustainable, manageable number, given the capacities of the institutions involved (see the lesson discussed in the next subsection).

Finally, a project that deals with fast-growing species must anticipate information requirements and keep a step ahead of needs in the field. In this instance, the fuelwood project got behind--it was still working on species trials and selection when, because of the very rapid growth of many of the plantings, the field staff was ready for information on management of the species already planted and people who had planted trees were ready for the next step. There was an unmet need for practical, field-oriented management guides. The fuelwood project is not alone in learning this lesson. Ironically, many such projects seem to forget that the species they are working with grow so fast that before the scientists' scheduled species selection research can be completed, information needs have changed. The dynamics of these types of projects must be remembered.

Project Depth Versus Breadth

Projects must strike a balance between depth and breadth--doing a few things well versus exploring a lot of different possibilities. There is no one right answer, as the choice depends on the circumstances. However, the main lesson to be learned is that a project should not take on more activities than it can handle.

Unfortunately, most individuals and projects have the ability to bite off more than they can chew. If funds are available, projects often create programs that are too large relative to the absorptive capacity of the organizations involved. It would appear that the fuelwood project was no exception in the sense that it initiated a great many plots and trials, perhaps too many in terms of sustained ability to devote an adequate amount of time to measuring them and anlyzing the results. To be sure, adjustments have been and are being made to consolidate the work of the TCP project--a limited number of demonstration farms will be the focus of project activity. This should work well, if the project makes certain that the demonstration units represent typical conditions found in the region. The lesson concerning overextension in relation to available resources was learned early and corrections are being made in the TCP project. This lesson should be noted by others.

Scarcity of Land

The scarcity of land for project activities is often more apparent than real. Some fuelwood project countries, such as certain regions of Costa Rica, are in the forefront of showing the world that what often appears to be an overcrowded area still has room for trees without reducing other crop and livestock outputs. Trees are being planted along field boundaries, on slopes too steep for crops and grazing and in areas too poor to support annual food crops or even livestock grazing. This experience is not a unique, but similar to work in countries such as India, China, Haiti, Kenya and Niger. ICRAF and experts from India and elsewhere have written on this subject, and clearly indicate that growing trees on farms need not conflict with agricultural and other productive land uses to the extent expected by those who think of forestry only in terms of block plantations on relatively flat land.

Indeed in the case of a windbreak/fuelwood project in Niger's Majjia valley, crop yields increased by some 25 to 30 percent, while the community also enjoyed wind protection and eventually fuelwood. As foresters have come closer to being agriculturists, they have realized that all along, farmers were integrating trees into their farming systems, often making

optimum use of all available space. Since there are many good examples of this in the countries participating in the fuelwood project, it would seem to be a logical theme that TCP project personnel could develop and analyze, followed by distribution and utilization of the results in the project and elsewhere.

Data Base Management Systems

Data base management systems should not be too complex. They must be user-friendly and capable of providing data on a continuous basis in a usable format. Above all, their benefits, based on expected use, must be compared with the costs involved in developing and maintaining them.

Since the fuelwood/TCP data base management system is still being developed, the lessons noted here are preliminary. However, one lesson--and an important one in this era of scarce funds and resources--is that it takes a lot of effort, time and resources to develop a usable and productive data base management system. There are few examples in forestry of such systems being used on a widespread basis, except for computerized bibliographic data bases (which are not management systems) and more narrowly defined (relative to the breadth envisioned for TCP data base management system) systems that serve very specific functions. In the long run, the lesson to be learned may be that compromises in coverage and depth will be necessary to get the system up and running in a reasonable amount of time, and to make it simple enough for widespread use, rather than confined to a few specialists at CATIE.

Integrating Research, Teaching and Extension

The close integration of research, teaching and extension assists the smooth and rapid translation of ideas into action programs that move toward a goal of welfare improvement for the rural poor. Experiences elsewhere around the world (e.g., the land-grant college system in the United States) indicate that tight integration of research, teaching and extension provides a very effective overall mechanism for progressing from new ideas in science and management through the processes of technology development and diffusion.

CATIE's efforts have concentrated on research, where it has developed an international reputation. Its teaching efforts have been far less notable. The low numbers of students entering the forestry M.S. program (two last year) have hampered its effectiveness and created inefficiencies in terms of demands on staff time. CATIE has not been involved in extension as such, since it is an international institution and farm forestry extension is definitely a local, country function. While CATIE

does not have a clear role to play in actual extension activities, it does have a definite role in terms of training extension trainers, who will work with national extension programs. This latter responsibility is an important one for any institution such as CATIE, particularly since it can thereby introduce social and farm forestry concepts into agricultural, livestock and forestry programs. Country-level project personnel play a major role, and in a number of instances, have done a good job of extending the research produced and keeping channels of communication open between the various project actors.

If there is a lesson here, it is that any program which intends to focus on farmer participation in growing tree crops needs to explicitly consider the role of extension as well as its link with teaching and research. It should be noted that this linkage works both ways. The fuelwood project's extension agents and field personnel brought back to researchers ideas about the "best practices" in the field, the many productive and proven technologies already in use by the most innovative farmers. In sum, regardless of the particular organizational responsibilities involved in a project, the productive nature of close communication and coordination between extension, teaching and research should be recognized.

Recruitment

It is true that the safest way to reach success is to recruit good personnel. This final lesson is perhaps obvious—despite almost any other obstacles that may arise, if a project is staffed by bright, competent, motivated individuals, it will generally produce results which have lasting effects. This may seem self-evident to many and trite to others, but the point is worth reiterating. Adequate time should be spent filling project posts, when possible, but it is important not to get caught up in bureaucracy and red tape, which stall hiring decisions and productive work even more. A delay of some months that is due to a more thorough search for job candidates can be more than made up for by hiring an outstanding individual. It is also worthwhile to cast the net wide and not be confined by convention in choosing people for a project. Based on the evaluation team's past weeks of interaction with fuelwood project personnel, this lesson is clearer than ever--if good people are chosen for a job, the results will be good.

APPENDIX A

Scope of Work

ARTICLE I - TITLE

Fuelwood and Alternativve Energy Sources Project Evaluation (ROCAP/Project 596-0089)

ARTICLE II - OBJECTIVE

The evaluation team will conduct a final evaluation of the CATIE component of the Fuelwood and Alternative Energy Sources Project (596-0089). A principal target audience for the recommendations of the evaluation is CATIE and its collaborating institutions, and primarily the Tree Crop Production (TCP) Project staff. Recommendations should be formulated in such a way as to allow full use of the Fuelwood Project experience to plan and implement its follow-up -- the TCP Project. The evaluation is also intended to allow ROCAP to learn from this experience for planning and implementation of other projects, especially others with CATIE. Another target audience for the evaluation is the AID/ST Forestry and Fuelwood Research and Development Project (F/FRED) and other institutions attempting related development efforts.

ARTICLE III - STATEMENT OF WORK

The Contractor shall provide an evaluation team to be responsible for the following:

A. Project Purpose, Goal and Outputs

1. The evaluation will determine to what extent the Fuelwood Project has fulfilled its purpose and contributed to the Project Paper goal. The project purpose was "to develop, demonstrate and make available for transfer, improved cultivation practices to increase fuelwood production and supply." The project goal was to improve the welfare and productivity of low income groups and increase the supply of low cost energy for the rural and urban poor.

   End-of-project conditions are:

   Improved fuelwood production technologies tested and accepted. National institutions using them in extension programs. National and regional institutions continuing research in these areas.

Project outputs were defined as follows:

Output	Magnitude of Outputs
1. Critical and potential critical areas.	1. Critical and potential critical areas for fuelwood supply identified.
2. Species for fuelwood production in Central America/Panama region identified and tested.	2. a) Listing of properties and production potential of approx. 15 promising species for different ecological zones in CAP. b) Social acceptability of these species verified. c) Data on approx. 30-pre-1980 plots.
3. Management practices for fuelwood production.	3. Data on 3 management practices under trial in approx. 6 critical areas.
4. Fuelwood demonstration units.	4. Not less than: 10 national fuelwood production units; 20 small farm fuelwood production units (planted woodlots, or existing vegetation); 15 village woodlots; 5 fuelwood plantations minimum; 30 small farm agroforestry systems (living fences, shade trees, mixed production systems).
5. Strengthened CATIE and national professionals and institutional capacities in these areas.	5. CATIE continuing capacity to assist national institutions in the area. National institutions financing research and transfer in this area in at least 3 countries. Personnel trained.

2. Annual work plans and other planning documents as well as how the project has responded to two previous project evaluations should also be assessed.

3. The evaluation should also ascertain whether the Fuelwood Project experience has been adequately utilized to initiate the Tree Crop Production Project (596-0117). If necessary, the evaluators should suggest how more

effective use might be made of this experience and determine whether problems identified in the Fuelwood Project are being adequately addressed in the Tree Crop Production Project.

B. Additional Points

The evaluation team will work closely with the Directorate of CATIE, the head of the Renewable Natural Resources Department, the head of the Silvicultural Program, the TCP Project staff and the ROCAP Regional Forestry Advisor in evaluating the project. The team should ensure that the following specific issues are covered.

1. Research Outputs

a. Evaluate relevance and quality of the socio-economic research.

b. Evaluate the utility and quality of the silvicultural research and the operation of the silvicultural data bank. Suggest modifications that might be advisable for the bank's continuity under the TCP Project. (Collaboration of Dr. T. Linkletter will be required for the assessment of data processing.)

c. Assess the relevance and the technical and editorial quality of the major project reports and publications.

d. Assess the use that has been made of project reports and publications, specifically whether individuals working in related fields are aware of the publications, whether they read the publications, to what extent they find them useful. Ascertain to what extent reports and publications are used in training events and research. Suggest how information generated by the Fuelwood and TCP Projects could more effectively be channeled to potential users.

2. Institutional Strengthening

a. Examine information gathering and exchange mechanisms between CATIE and counterpart national agencies. Review the contribution of INFORAT, a computer-based information system at CATIE. Suggest ways in which information exchange, and the provision of technical support services could be improved under the TCP Project. Review the adequacy of information exchange within CATIE as it relates to this project.

b. Examine the evolution of the counterpart contributions of the six countries and of CATIE and the commitment of the countries to continuing project activities. Identify constraints to more counterpart support and the type of support (personnel), infrastructure, operational costs, etc.) that countries gave most freely.

c. Examine the relation of the Fuelwood Project to national programs and projects, especially how the project has responded to ROCAP strategy of supporting bilateral USAID projects. Describe constraints to closer collaboration and suggest how they might be overcome under the TCP Project. Assess technical backstopping provided to other related efforts in the countries.

d. Assess the relevance and quality of the short-term training and M.Sc. education carried out by the project and the efficiency with which this training is offered.

3. Project Management

a. Evaluate the methods and procedures used by the project coordinator, the professional staff at CATIE, and the country coordinators to make and carry out technical and administrative decisions. Assess how project decisions were made and implemented at different levels in the ROCAP Rural Development Office, at CATIE and in the countries, and suggest improvements that might be applicable to the TCP Project, the Regional Tropical Watershed Management Project or other CATIE projects so as to insure that individual decisions are consistent with the overall objectives of the project.

b. Assess the organization of the Project, with special emphasis on regional linkages, the division of responsibility, technical direction and administrative support.

c. Analyze the process of operational planning, specifically the preparation and monitoring of annual work plans for the project and for individuals, the planning and approval of research to be done at CATIE or in the countries and the process of dealing with unforeseen obligations and opportunities.

d. Evaluate the efficiency of the relations the Project staff had with the head of DRNR, the CATIE directorate, the M.S. program Head, other Departments, and the CATIE administration. Assess how these entities responded to Project needs and to what extent they supported the Project.

e. Suggest improvements in TCP Project organization and management in the light of the Fuelwood experience.

APPENDIX B

Persons Interviewed

Costa Rica

Carlos Bonilla Ayud	CONAPROSAL, manager, Costa Rica
Elias Badilla	DGF/Fuelwood, forester
James Barborak	CATIE/Wildlands, acting subprogram chief
Jan Bauer	CATIE/Fuelwood, silviculture specialist
John Beer	CATIE/Agro-Forestry
Rolain Borel	CATIE/Agro-Forestry, program chief
David Boshier	CATIE/Silviculture
Gerardo Budowski	CATIE, retiring chairman of DRNR
Ronnie de Camino	CATIE/Silviculture, program head
Oscar Campos	Pilangosto Cooperative, manager
Gilbert Canet	DGF/Fuelwood, country counterpart
Donald Cass	CATIE/Plant Science, soils specialist
Ben Chang	CATIE/Seed Bank, manager
Harlan Davis	IICA, assistant director
Arnaldo Chibbaro E.	CATIE, chief of technical cooperation and external finances
Orlando Esquivel	cooperating farmer
Claudio Gutierrez	CATIE/RTWMP, Costa Rica country coordinator
Mario Gutierrez	CATIE/INFORAT coordinator
Jochen Heuveldop	GTZ/CATIE, agro-forestry project coordinator
Valentin Jimenez	CATIE/Fuelwood, data bank manager
Jeff Jones	anthropologist consultant
David Joslyn	USAID/ROCAP, agricultural program director
Robert Komives	CATIE/RTWMP, land-use specialist
Terry Linkletter	FFRED/Weyerhauser, computer systems specialist
Hector Martinez	CATIE/Fuelwood, silviculture specialist
John McMahon	ROCAP project officer
Elizabeth Mora	CATIE/Fuelwood-INFORAT, editor
Walter Picado	CATIE, Costa Rica country coordinator
Carlos Reiche	CATIE/Fuelwood, economist
Xinia Robles	CATIE/Fuelwood-INFORAT, documentation specialist
Emel Rodriguez	CATIE/Fuelwood, silviculturist
Jorge Rodriguez	DGF/Costa Rica
Rodolfo Salazar	CATIE/Fuelwood, biometrician
Rodrigo Tarte	CATIE, director
Carlos Trejos	CATIE/Fuelwood, administrative assistant
Henry Tschinkel	USAID/ROCAP, regional forester
Luis Ugalde	CATIE/Fuelwood, production specialist
Ronald Vargas	DGF/Costa Rica, director as of 10/1/85

Leonidas Vega	silviculturist consultant
Chuck Wiegand	CATIE, forest lands manager
Frank Zadroga	USAID/ROCAP, regional watershed management specialist

El Salvador

Santana Belarnino Chavez	PROMOSAL (vertically integrated teak plantation/furniture manufacturer), operations manager
Francisco Salvador Benitez-Argura	Salvadoran Institute of Agricultural Transformation (ISTA), local promoter charge of teak plantation
Humberto Frances	CENREN/Fuelwood, national coordinator
Rafael Granada	Executive Hydroelectric Commission of Rio Lempa (CEL), office of nonconventional sources of energy, superintendent of energy
Adonis Moreira	CENREN, director general
Luis Paloma	USAID/El Salvador, project assistant to rural development officer
Fidel Antonio Ramos	CEL, office of nonconventional sources of energy, chief of biomass energy section (former director of CENREN)
Clem Weber	USAID/El Salvador, deputy rural development officer
Hugo Zambrana	CATIE/Fuelwood, country coordinator

Guatemala

Carlos Estrada	INAFOR
Rudy Herrera	CATIE, country coordinator
Francisco Padilla	INAFOR, country counterpart
Edgar Pineda	INAFOR, chief of planning unit
Salvador Rivera	INAFOR, mensuration specialist
Rolando Zanotti	USAID/Guatemala Rural Development project, forester

small farmers in La Maquina and Quetzaltenanago, and project nurserymen at La Cumbre de Alaska (Solola), Olintepeque, La Maquina and Morazan

Honduras

Paul Dulin	Chemonics/Honduras, watershed specialist
Ileana Mora	CATIE, master's student

Panama

Moises Darwish	CATIE, Panama country representative
Moises Del Rio	RENARE, director general
Sergio Ducreaux	RENARE, deputy director
Feliciano Escobar	RENARE/Fuelwood, field technician
Samaniego Gilberto	RENARE/Fuelwood, field technician
Amable Gutierrez	RENARE/Fuelwood, principal counterpart
Denis Hernandez	IRHE, watershed protection section specialist
Manuel Hurtado	RENARE, director of forest service
Jorge Mendieta	RENARE/Panama
Blas Moran	CATIE/Fuelwood, country coordinator
Natalio Murillo	Buen Retiro, fuelwood grower and sugar producer
Gilberto Ocana	Smithsonian Tropical Research Institute, Barro Colorado Research Center, superintendent
Arturo Romero	Swedish International Development Administration, forestry advisor (first CATIE/Fuelwood national coordinator in Panama)
Sebastian Sutherland	CATIE/Fuelwood, technical assistant
Carlos Vargas	RENARE/Fuelwood, subzone chief
Tomas Vasquez	MIDA/IDIAP, forest research

APPENDIX C

Country Study -- Costa Rica

Objective

This report evaluates the activities and accomplishments of the Fuelwood and Alternative Energy Sources project in Costa Rica, and recommends priorities for the follow-up activities of the Tree Crop Production (TCP) project. The evaluation is based on five days of effort between 22 and 27 May 1986. Activities included field visits to the project areas of Hojancho, San Ramon and Guapolis. The country team, cooperating farmers and fuelwood-using industries were interviewed. In addition, the director of the National Forestry Directorate (DGF) discussed project activities and Forest Service cooperation with the evaluation team. Additional information on project activities in Costa Rica was gathered from discussions with the project staff and other personnel of CATIE in Turrialba.

Technical Aspects

Areas of Implementation

Deforestation is proceeding at a rapid rate in Costa Rica, with the result that increasing fuelwood scarcity is being reported in many areas of the country. A 1980 national survey of the demand for fuelwood and the preferred species was the basis for selection of the critical areas. Of first priority were those areas characterized as relatively dry sites, where repeated burning had been used to clear land for grazing. In these areas--Hojancho and San Ramon--the actual or near-future demand for fuelwood was considered critical. There was also a growing interest in the use of fuelwood for processing salt, lime, candy sugar and coffee. It was predicted that while local farmers still had access to fuelwood, the increased consumption by industry could cause severe local shortages. Hojancho is also an area in which the expansion of coffee cultivation had created a demand for shade trees. An additional factor in the selection of these areas was the presence of active cantonal associations and cooperatives that would support a reforestation project. In 1982, project activities were expanded to Nandayure and Puriscal; in 1983, to El Gusrsco, Turrialba and Quepos; and in 1984, to the natural vegetation areas of Canas, Tres Rios and Sarapiqui. At the end of the fuelwood project, activities were taking place in 10 zones according to project records.

Species Trials

The species selected for trials were based in part on studies of the literature of fast-growing species and the recommendations of individuals, rather that the results of 13 years of species trials experience by the DGF, CATIE and other institutions. Selection criteria included the fuel quality of the wood, rapid growth, coppicing ability, and multiple use potential of the tree. In addition, it was decided to include trials of Bombacopsis quinatum and Tectona grandis even though it was realized that these species had higher values than the production of fuelwood. In all, trials of some 55 species were undertaken, of which 60 percent were native to Costa Rica. Based on this experience, a list of 22 recommended species was prepared. An additional 22 promising species were identified, and the remaining trees were either excluded from further consideration or deferred until additional information becomes available.

The country team reports the establishment of 180 sample plots to measure the increment of 45 species using different fertilizers, spacing and planting methods.

Management Practices

A series of silvicultural treatment and management practices has been started to provide a technological base for technical assistance to participating farmers and cooperatives interested in fuelwood production. Research began with an investigation of nursery practices and formal trials of stake reproduction of selected species. Specific management practices and agro-forestry trials were also implemented through the project. These include interplanting of corn and beans in plantations of Leucaena leucaphylla, pollarding of Guazuma ulmifolia in pastures (at two-meter heights for fence posts) for dry season forage, coppicing of Gmelina arborea for fuelwood yields, and planting of various species as coffee shade.

The country team has also been aggressive in testing various species as live fences, and establishing trial plantings of Bombcopsis as stakes of various dimensions and ages in pastures as a shortcut to establishing a silvo-pastoral system. This testing of various silvicultural practices in Hojancho responds to the requirements of smallholders in the area, who have to make more intensive use of their lands. These farmers have traditionally raised cattle in cleared fields and are concerned with dry-season forage crops, or converting land to coffee production.

Extension and Promotion

Technical Assistance

The country team has complemented its species trials and demonstration activities with a successful program of promotion and extension in the Hojancho area. The team has persuaded individual farmers to allow demonstration planting and species trials to be conducted on their lands and followed up with advisory assistance on management of the plantations.

Particularly successful has been the linkage to a small credit program of the Agricultural Center of the Canton of Hojancho (CACH). CACH has a tree nursery supported by the country team to produce seedlings, and offers loans to cooperative members for tree planting. A forester has been hired by the cooperative to manage the nursery, and to work with the country team in promoting tree planting among cooperative members. These loan funds, and the financing for a small sawmill, a post-treatment plant and a charcoal kiln, are made possible by a grant from the Inter-American Fund. The team has also used these loan funds to finance the formation of a cooperative nursery, managed by six women, to produce seedlings to sell to local farmers.

The country team is advising a salt producer cooperative (CONOPROSAL) that has converted its processing plant to fuelwood. The team did an economic study on the availability and delivery costs of fuelwood within 20 kilometers of the plant. This study was used to support a loan request for the purchase of a wood-fired boiler. Further work with the association includes advising 165 co-op members on the planting of fuelwood on their lands for sale to the processing plant, and on the establishment of 650 hectares of fuelwood plantations on cooperative land. A forest technician has been hired by the cooperative to work directly with the country team.

The country team in Hojancho is providing similar advisory support and assistance to a local cooperative coffee-processing plant and a private lime kiln in the areas of fuelwood supply and plantation establishment.

The success of this work is attributable to three factors: the team members reside in the area and are well known to the local population; they have shown a high degree of initiative in developing the program; and there is a source of credit available to finance extension activities. The team is also adept at dealing with funding sources and in promoting its activities by publishing information on the success of the program.

Recommendation: The experience of the country team in identifying sources of financing and linking them to project activities with cooperatives is unique to the project. While the cooperative tradition of the small farmers in the Province of Guanacaste is not found in all countries, it should be studied, and promotional materials should be prepared for distribution to forestry agencies in the region.

Training

The country team has organized at least seven courses designed to improve the technical skills of national project personnel. Personnel from other institutions and projects in Costa Rica, including the Forest Service and CATIE, have been invited to participate. Team members have prepared papers on the fuelwood project and participated in national conferences and seminars dealing with wood or bio-energy. Other extension activities include the presentation of talks to local cooperatives and other associations, field days at the demonstration parcels, and direct contact with individual cooperating farmers and their neighbors.

Socioeconomic Studies

Four types of studies were implemented through the fuelwood project. The first, on domestic consumption of fuelwood (1980), gave a basis for the development of the country program. This was followed by other studies on fuelwood consumption in various local areas, and the demand for wood or bio-energy by rural industries. The team also participated in the development of a methodology for the collection and analysis of cost data, and completed three studies--nursery costs, harvesting and transport costs, and plantation establishment and management costs.

Institutional Aspects

Country Team

Fuelwood activities in Costa Rica were implemented by a team composed of six staff financed from project funds, and five assigned by DGF. The national coordinator is a graduate forester who is completing studies in the management of agricultural enterprises. The DGF's principal counterpart is a more experienced individual, with eight years of service with DGF. Although an agricultural engineer by training, the counterpart received a master's degree in forestry from CATIE. Together, these two individuals have organized an effective team which has

enjoyed the challenge of working on a special project. As with other countries, there has been some resentment within DGF of the high degree of autonomy enjoyed by the country team, and of the sense of competition resulting from the reported success and publicity.

The country team in Costa Rica is the largest financed by CATIE through the TCP project. Those financed by CATIE are concerned about their scheduled transfer to the staff of DGF. They understand that the new project does not finance their posts through CATIE after the first of the year, and that they are expected to join the DGF staff by the end of the year. Their concern is that DGF will not be able to finance their positions due to a general freeze on new hirings.

National Forestry Directorate (DGF)

DGF is responsible for the conservation and protection of the forest resources of Costa Rica. The agency has a staff of 400 and is organized into six divisions--reforestation, forest reserves, research, utilization, protection, and wildlife. Field operations are administered on a regional basis. The project has activities in seven of the eight regions.

DGF has a research program that established 700 sample plots of 90 species over the last 13 years. Four hundred of these parcels are "active," with measurements taken each year. While DGF staff are familiar with the country team's work in fuelwood trials and demonstration, there appears to be little formal linkage between the research effort of DGF and project activities. Nor was there collaboration on a consistent basis between DGF staff working on the recently completed, AID-financed CORENA reforestation project.

The director of DGF stated that the fuelwood project had a good reputation within the agency, particularly since 1983, as the "value of working with small landholders had been demonstrated." At present, it appears that plans have not been developed for DGF to use this successful experience. While the experience gained by the fuelwood project has been of a research nature, the popular acceptance that has been gained for its activities would make the division of reforestation, or the proposed division of rural development, the more appropriate choice. With this reorganization, DGF would be in a position to institutionalize the experience of the fuelwood project, with the support of the major forestry-sector loan being negotiated with the Inter-American Development Bank. This loan would be used to finance reforestation of 2,500 hectares as part of a total package of $18 million.

It should be noted that legislation has apparently been approved that will remove DGF from the Ministry of Agriculture and Livestock, and place it in the Ministry of Mines and Energy. The new organization will be called the Ministry of Natural Resources. For the next few months, DGF will be attempting to adjust to the new structure and responsibilities, and it will be difficult for the agency to make decisions on how best to use the experience of the fuelwood project.

CATIE Project Support

Technical Assistance

The country team reported that it has had an excellent working relationship with Hector Martinez of the CATIE project staff, but that otherwise it feels it receives no more technical assistance than that given in other countries, despite being in the same country as CATIE headquarters. The visits of CATIE staff were described as sporadic and too hasty for helpful discussions. A common problem seemed to be the heavy workload of the CATIE staff, and CATIE's inability to respond in a timely manner to questions or problems that arose. The perception expressed was that the ROCAP regional forester was more familiar with the team's activities and had visited the project site more often.

Recommendation: The Country Team recommended increased participation by CATIE staff in guiding and advising on project fieldwork, particularly since issues of thinning and other silvicultural practices are arising that are beyond their field of experience.

Training

Three Costa Ricans have received project-financed master's-level training at CATIE. One of these is still at CATIE, another has joined the Technological Institute of Costa Rica, and the third is studying abroad for a doctorate. Through the fuelwood project, the staff of the country team and DGF participated in training in agro-forestry, a course at CATIE, and a UN course in Mexico. The first and second mobile courses sponsored by CATIE were considered very valuable by those who were able to attend. The interchange between the country teams at quarterly coordination meetings was also considered highly worthwhile.

National courses have been given in Costa Rica through collaboration with the Technological Institute of Costa Rica and with the support of the country team. This training included seminars on mensuration (one week in June 1984) and forest

diseases (July 1985). Extension workshops organized by the fuelwood project include: forest nurseries (three days, led by Dick Lensaer); plot design and sample measurements (three days, led by Rudolfo Salazar); cost collection (one day, led by Carolos Reiche); plantations (one day, led by Carlos Reiche); and production technology (five days, led by Gerardo Budowski and Jan Bauer). These workshops were attended by the country team, DGF personnel and other associated individuals.

INFORAT

The country team has used the services of INFORAT to obtain documents on technical matters. It has also received substantial assistance through INFORAT's publication service in the preparation and printing of three annual reports on the results of species trials and demonstrations.

Findings and Recommendations

The country team's work in Costa Rica is complete, from trial and demonstration of fast-growing species and their applications in management practices, to preparation of technical reports and extension work. This experience must be institutionalized by the DGF "to achieve a significant increase in on-farm and community tree cropping for multiple productive use and for commercial sale" (see general purpose of TCP project). The country team cannot achieve this increase by itself; rather, its experience should be adopted and used by DGF and other extension agencies.

The evaluation team recommends that:

- the TCP project country team be phased into DGF, with members assigned to the appropriate division, either reforestation or research;
- continued investigations of DGF focus on the 22 recommended species, with special attention to provenance and variety testing, and identification of reliable sources of seed;
- DGF implement its reforestation activities through local associations and agricultural centers, and link activities to sources of credit and other services of these organizations; and

- successful reforestation projects with cooperatives and local farmers be analysed, and instructional materials prepared to guide the Forest Service and staffs of other agencies in the application of these techniques.

APPENDIX D

Country Study -- El Salvador

Objective

This appendix summarizes and evaluates the accomplishments of the fuelwood component of the Fuelwood and Alternative Energy Sources project implemented in El Salvador, and recommends priorities and emphasis for the follow-up Tree Crop Production (TCP) project. It is based on three person-days of field visits to the country on May 21 and 22, 1986. Activities included visits to species trials and demonstration plots in western El Salvador with the national coordinator and principal counterpart, interviews with the Director General of the National Center for Renewable Natural Resources (CENREN) and AID Rural Development Staff, and meetings with staff of the public electric utility's Office of Nonconventional Energy. Additional information on fuelwood project activities in El Salvador were gathered from discussions with the staff posted at CATIE in Turrialba.

Technical Aspects

Areas of Implementation

The fuelwood project was begun in El Salvador in 1983. At that time, a decision was made to postpone identification of areas by using existing fuelwood deficiencies as a selection criterion. It was reasoned that with so much of the country deforested and 68 percent of the population dependent on wood for fuel, the need for an increased fuel supply is universally critical. Also, continuing insurgency has confined fieldwork to the western portions of El Salvador.

The fuelwood team decided to locate species trials and demostration areas on the basis of ecological (life) zones and soil types. The ecological zone labeled subtropical humid forest covers 85 percent of El Salvador, and is further classified as "cool" (above 500 meters--the area of coffee cultivation) and "warm" (below 500 meters). Twelve major soil groups were identified, covering some 50 percent of the country. This information was superimposed, and 29 sites identified for species trials and demonstrations that cover 50 percent of the country. Subsequently, the ecological and soils information was analyzed on the basis of population and land use to determine critical areas of actual or potential fuelwood shortages. Further species trials will be undertaken in these areas when circumstances permit and resources become available.

Species Trials

There has been considerable recent experience in planting a variety of tree species in El Salvador prior to initiation of the fuelwood project. Starting in 1980, the Forest Service planted some 5,000 hectares through the rural employment program, financed by AID with PL 480 funds. The species planted were Pinus caribea, Cordia aliadora, Tabebuia pentaphylia, Eucalyptus deglupta and Tectonia grandis. For these reasons, CATIE initially directed the project toward concentrating on the establishment of increment plots on existing plantations and in natural forests (regeneration).

The country team analyzed the existing plantations and reached the conclusion that they were concentrated on only a few sites and soils types. These plantations were located in the Pacific lowlands and assigned to cooperatives formed through the expropriation of property before 1980. The reforestation program had employment objectives and utilized seedlings available from Forest Service nurseries, rather than selecting them to match the soils types. Thus, the country team conducted trials of 16 species on 29 plots, located in the representative soils and ecological areas described above.

The principal species tested were Eucalyptus camaldulensis, Melia azedrarach, Gliricidia sepium, Gmelina arborea, Leucaena leucaphylla, Cassia siamea and Tectona grandis. The seed source for all species was local, with the exception of E. camadulensis, which came from Nicaragua. From these trials, it was decided to eliminate further testing of Calliandra calothirsus and Casuarina equisetifolia as the results were unsuccessful.

In future trials, the adaptability of these species to soil associations that have not yet been examined will be tested, particularly soils found in the critical areas defined above. In addition, there are plans to plant four cultivars of Tectona grandis that have been provided by the CATIE seed bank, and a number of new species--Acacia mangium, Eucalyptus citriodora, E. grandis, E. tetrecornis and E. saligneus. These species trials and demonstrations will be conducted on the major soil associations that have been identified as appropriate for testing.

Management Practices

The country team project is just begining to test various management practices in order to widen its technological base. Four silvicultural practices have been initiated or are being designed. The first is application of four levels of nitrogen (30, 60, 90 and 120 grams) to E. camaldulensis plantings.

Second is planting corn with Leucaena leucaphylla, followed by pruning and topping at two meters (the height of fence posts), and replanting the corn. The foliage will be fed to cattle in controlled return mixes of 25, 50, 75 and 100 percent to determine relative animal weight gain and the possibilities of substitution for commercial concentrates. The woody material will eventually be sold for stakes and firewood. This trial is being conducted with the local agricultural university and supported by financial assistance and labor from the project.

Third is trial plantings of Tectona and Bombacopisis quintum stakes. This management practice is being tested as a thesis project of a senior student from the local university, with a small amount of financial assistance from the fuelwood project.

Fourth is thinning of existing teak plantations with increment plots. The teak stand was established 12 years ago on the land of a cooperative supported by the Salvadoran Institute of Agricultural Transformation (ISTA). As yet, thinning of the demonstrations planted through the fuelwood project has not begun, nor have there been trials of sylva-pastoral systems that would combine improved pastures with planting trees at an appropriate spacing.

Other Technical Activities

Thus far, the country team has been limited in its ability to undertake a systematic program of promotion and extension. Forty-seven small nurseries have been established on cooperatives' land, and advisory assistance provided to landowners on the utilization of exisiting plantations and promotion of trees. Soil sampling began in 1984 on the demonstration parcels, but there is still little information on soils that would enable the country team to advise landowners. Given the level of technical expertise of the majority of country team members and relatively short life of their activities in El Salvador, it is not surprising that no socioeconomic studies or technical reports have been produced. A training course on writing technical reports will be conducted by CATIE to assist the country team in this regard.

Institutional Aspects

Country Fuelwood Team

The project staff in El Salvador consists of 13 people, two financed by CATIE through the fuelwood project and 11 by the counterpart agency CENREN. The national coordinator was trained as an agricultural engineer and has received a master's degree in

forestry from CATIE. He had worked in the Forestry Service (CENREN) for eight years prior to his appointment to CATIE. The principal counterpart is a long-term Forest Service employee that was trained as a forestry technician in Guatemala. None of the other counterpart staff members have professional degrees in foresty and are largely trained in agriculture, although they have worked in the area of forestry, particularly with nurseries.

The country team occupies a separate building on the CENREN grounds in San Salvador. Until the recent arrival of a project-financed vehicle, they were entirely dependent on the Forest Service for transportation, and used the nurseries and workers of that agency to establish the original species trials and demonstration areas. A Land Rover was rented by the country team prior to the arrival of the project-financed vehicle.

Direct administrative support of the country team is provided by IICA's national office, as El Salvador is not a member of CATIE. The administrative procedures used are the same as at other sites, with the fuelwood project bank account being replenished through the IICA office.

CENREN Participation

CENREN is the national institution participating in the project. This agency is in the process of being restructured to take on a normative advisory function, as the implementation authority for MAG sectoral activities is assigned to four zones. (This is the reverse of what is being planned in Panama.) CENREN is made up of four departments--Forest Service, Parks, Watersheds, and Meterology and Hydrology--and had a staff in excess of 2,000. At this time, it has not been determined which staff will be assigned to the MAG zones of the number of personnel that will remain attached to CENREN. The agency's technical staff is limited and numbers about 100, of which six are forest engineers and the remainder agriculturists.

The principal reforestation effort of the Forest Service is formulating tree planting activities with the major cooperatives. Seven nurseries provide the seedlings, and co-op members are employed in the planting. Some 5,000 hectares have been planted over the last five years, of which 40 percent have been lost to fire, cattle and lack of supervision. Although this is a major effort, the program is primarily an employment generation scheme, with the usual inefficiencies, and in the past, there has been little cooperative interest in protecting and managing the plantations.

The director of CENREN reported that the success of the project has increasingly been recognized by the agency. Originally, there was some concern that the project would take

over the Forest Service, which resulted in professional jealousy among the eight staff members assigned to this elite research effort. However, he felt that this had passed, and under the new organization, he would be able to increase support to the project team. In 1986, US$100,000 will be provided in support from PL 480 reforestation monies available through AID. This will include salaries for three additional persons, and funding for fieldwork, vehicle repair and maintenance, and other operating expenses. (The project team felt that previously budgeted funds for the project were not received.)

The success of the project's species trials are recognized by CENREN. Based on these trials, the reforestation program will concentrate on E. deqluptus, E. camaldulenisi, T. qrandis, with P. caribea and P. oocarpa used on higher elevations. Further support from the project is required. In particular, in-service training is badly needed in nursery management, silvicultural practices (principally thinning) and agro-forestry. Both the director of CENREN and the country team reported reluctance on the part of the Forest Service to undertake thinning of the existing plantations from the standpoint of both training and experience. The project is taking on that responsibility, but recognizes the need for training in this subject.

CATIE Project Support

CATIE has provided overall guidelines and direction for the project, both directly as well as through its participation and that of the national coordinator in the 1983 mobile seminars, and their subsequent attendance at quarterly project meetings in the participating countries.

Technical Assistance

Fuelwood project activities began in El Salvador in 1983. To prepare for implementation, the national coordinator and principal counterpart were sent on the last mobile course given in Guatemala, Honduras and Nicaragua. Seeing what had been started in these countries gave them the orientation and training that enabled them to get off to a fast start and achieve relative success with the activities implemented. Other than this orientation, the country team received little formal assistance in planning and initiating their activities.

Direct technical assistance from CATIE project staff has been limited to supervisory visits by the staff. As training is a priority for CENREN's Forest Service and the country team, the CATIE staff is being asked to lead a one-day seminar during the course of each visit to a participating country. While there is a need for this type of interchange between field practitioners

a need for this type of interchange between field practitioners and CATIE staff, more formal training courses in combination with technical assistance are also needed.

Recommendation: The TCP project should begin a program of technical assistance to El Salvador using the cadre of experienced national coordinators from the cooperating countries. Teams for these missions could initially be accompanied by CATIE project staff, but would undertake individual follow-up missions, as required.

Training

The project was unable to take advantage of the forestry master's program offered at CATIE, and it has been hard to find suitable candidates from the country team or at CENREN to take advantage of the three-year technical training program offered through ESNACIFOR in Honduras. Two recent graduates of agricultural high schools have been sent to ESNACIFOR with project financing. (An additional two students were financed by the German government.) Despite the need for this level of training in the Forest Service, the requirements of being unmarried and less than 21 years old are too restrictive. (Perhaps the age critera could be waived for candidates receiving financing from the TCP project.) Long-term, advanced, technical training in forestry and agro-forestry is required to improve CENREN's Forest Service and the staff of the TCP project team.

Recommendation: ROCAP/CATIE should approach ESNACIFOR to waive its age requirements for entry into the three-year advanced technical training course so that a wider pool of applicants from CENREN can be considered.

Currently, the major source of training is quarterly meetings of the fuelwood project staff, which are held in different countries on a rotating basis. Although a great deal of time at these meetings is spent on administrative matters, those attending feel that the discussions between the various country team members are most valuable. The country team believes that the most important need of the Forest Service and themselves is for further training. They feel that instruction is required in a number of areas--nursery practices and cost control, soil identification, plantation silvicultural practices (thinning and stand improvement), and agro-forestry promotion and extension techniques.

A review of the number of Salvadorans trained through the fuelwood project, compared to the other participating countries, shows that El Salvador has not received proportional share of training. Only 15 training opportunities have been offered, compared to over 249 for Guatemala and 203 for Honduras. Since

the CENREN Forest Service is one of the least technically trained in Central America, it is strange that they have not been given more opportunities for skills development and instruction.

Recommendation: The TCP project should develop and teach a series of two-week courses in El Salvador on the specialized topics mentioned above. This training should use project-financed national coordinators from other countries as well as the CATIE project staff. The training should be linked to technical assistance provided by the project, and aim at producing an in-service training capability within the Forest Service.

INFORAT

The country team and CENREN were familiar with and appreciated the services available through INFORAT, and the assistance that had been provided to the agency's technical library. The list of publications has been received, but no requests for copies of documents were mentioned as having been processed.

APPENDIX E

Country Study -- Guatemala

Introduction

Guatemala is distinguished by its good infrastructure and the variety of its people, topography and climate. Generally speaking, the highlands region has a long history of exotic tree species introduction. The region is inhabited by indigenous people who work land intensively on small farms, retain their own languages and maintain a closely knit social organization. They have conserved the forest as much as possible, but demand now exceeds supply.

The lowlands traditionally hold large estates, especially in the arid areas of the east. The original rain forest along the Pacific coast has been devastated. While much of this Pacific area remains in large estates, land reform has subdivided certain tracts, where the shortage of wood for fuel and local construction is critical.

Institutional Aspects

INAFOR's Participation

The National Forestry Institute (INAFOR) is currently responsible for the southern portion of the country, or approximately one-third of the total area. (In the Peten, activities equivalent to those of INAFOR are carried out by FIDEP). In Guatemala, the Fuelwood and Alternative Energy Sources/Tree Crops Production (TCP) project claims to be working in 85 percent of the area under the institute's jurisdiction. This area is stated to be larger than that attended by the project in any other country.

INAFOR is the project's counterpart agency. Recent restructuring within the institute placed the project under INAFOR's Office for Forestry Development. Project activities have contributed significantly to improving the image most citizens have of INAFOR, traditionally viewed as an institute for law enforcement.

In 1986, CATIE is scheduled to contribute $61,330 to the TCP project, while INAFOR is to contribute $334,260, one of the largest national contributions to the project. INAFOR provides the services of 128 laborers to the project, but experiences difficulties in supplying transport, fuel, maintenance and per

diems. The TCP project feels that additional budgetary support is required and has considered a number of potential sources of additional funding. A proposal for PL 480 funding is being prepared. Its purpose is to pay operating expenses, as well as the cost of the extra personnel needed to increase the social impact of the project's work (a total of 17 more field technicians, at an estimated cost of $900,000).

Participation of Other Institutions

To assist in implementing programs of social consequence, CARE and the Peace Corps both conduct motivational programs within INAFOR. The Guatemala component of the TCP project has misgivings about either organization being incorporated within the project to assist in strenthening its social impact. The project wishes to continue its demonstration work without running the risk of destroying personal motivation among the farming community by granting foodstuffs in exchange for trees planted. The project wants to keep its technical direction, as well as the existing chain of responsibility, intact.

A great deal of the project's work appears to be done at the request of municipalities. Members of the evaluation team visited project-assisted plantations on municipal land in Gualan, Huite and Morazan. In such cases, the municipality assumes responsibility for care and maintenance of the plantations. Silvicultural treatment and harvesting are to be carried out with technical assistance from the project. In some cases, the evaluation team noted that the number of people participating in schemes of this nature had decreased.

As freehold in Guatemala conveys title to the trees growing on a tract of land, the project is able to work effectively with individual farmers. On the Pacific coast, the evaluation team visited a 30-year-old resettlement area where the project has helped with tree planting, and noted that the existing social organization was weak and not applied to plantations. On the altiplano, social organization is strong and accurately reflects a community's wishes and aspirations. At the same time, where nursery labor is not paid, progress in communal nurseries tends to be limited and slow (Olintepeque).

In addition, the project works with government bodies such as the Ministry of Mines (Programa para Bosques Energeticos) and the Authority for Port Quetzal, and with a number of sugar companies, thus promoting integrated land use and the use of wood fuel instead of oil. AID is currently operating the Highlands Development project, and it has been proposed that this project incorporate within it a section on pine forest.

Technical Aspects

With regard to tree species and plantations established, points of particular interest in Guatemala include the following:

- the outstanding success of Eucalyptus camaldulensis in most places, which is most useful to the project because it attracts the attention of the rural population and helps "sell" the project;

- the planting of demonstration plots in some arroyos and barrancas around the national capital; and

- the promising developments with native species, the most notable being:

  --premontane dry forest: Caesalpina velutina (aripin), Melia azederach (paraiso)--direct seeding proved successful with both species,

  --premontane humid forest: Roseodendrum sibistex, Teminalia oblonga, Cassia siamea, Guazuma ulmtifolia, and

  --low montane humid forest: Alnus spp.

This aspect of the TCP project needs to be intensified because native species are freely available to the small farmer, and applying "management" helps alter the farmer's attitude towards natural resources. The nature of the management to be applied will vary according to the species life zone.

Recommendations

There are several areas where further project efforts could be usefully applied. It is recommended that the TCP project:

- undertake identification and trials of other tree species able to thrive in an area of severe minimum and maximum temperatures--it is likely that the results of this work can be usefully applied in similar life zones in other countries of the region;

- demonstrate, along the altiplano, the multiple uses and benefits of trees for purposes such as shelterbelts and woodlots--to arouse popular interest in growing and protecting trees, the evaluation team suggests that local populations be shown how to use sprays of Eucalyputus foliage as a

means to condense dewfall so that it runs down onto vegetable seedlings;

- o demonstrate the planting of trees which yield both fruit and fuel, such as Byrsonima, and fodder trees, particularly in the dry regions of the country where overgrazing is common; and

- o examine the effects of site degradation on the survival and growth of planted trees, with the aim of outlining in a manual the principles to be followed by the project.

Management Practices

Forest nurseries are part of INAFOR's normal program, but it operates a number of them jointly with the TCP project. At present, seedlings in plastic bags are provided at no charge. However, in the near future, INAFOR intends to charge 20 centavos per plant. INAFOR nurseries appear to be effective and have a good standard of operation. Some community nurseries associated with the project appear to operate at a much lower standard and show signs of a lack of supervision.

Because the project works with fast-growing species, it now finds itself at the "management" stage earlier than was probably expected. In practical terms, this means that field staff now confront the need to manage their plantations, and find themselves without orientation. One example is the plantation of Gmelina, on a good site in La Maquina, which was thinned recently by national staff to liberate the crowns of better-formed trees. The stumps of the harvested trees have begun to coppice.

However, in accord with the concept of multiple use to be applied by Madelena, it is now advantageous to conserve "plus trees" to yield seed and eventually sawlogs. Initially, this leads directly to consideration of "coppice with standards as a system for management." To achieve practical results in this field, it is evident that both national and CATIE staff will be required to work together on the plantations to develop thinning techniques and management regimes appropiate to the tree species, life zones and site. Then, they will be able to draw up a practical manual for use throughout the project.

Recommendations

It is mutually agreed by the evaluators and the chief of the INAFOR Planning Unit that the following observations and comments are important to the project:

- Staff of the project are agronomists, not foresters; it would be an advantage to make available opportunities for professional studies in forestry.

- The project should confine its activities to generating and validating information on fast-growing tree species. Given that a considerable amount of these data will be useful for agro-forestry, the planning chief does not favor the project's becoming involved in either research or extension in agro-forestry. These activities are to be the responsibility of other agencies.

The planning chief gave the evaluation team a list of projects, either current or proposed, that touch upon forestry. As many of these projects emphasize agro-forestry and agricultural extension, it is important that the TCP project confine its activities to trying and demonstrating tree species, and not duplicate activities proposed for other projects.

APPENDIX F

Country Study -- Honduras

Introduction

Honduras is an appropriate country for the activities of the Fuelwood and Alternative Energy Sources/Tree Crop Production (TCP) project because of its rapid and extensive deforestation, and because its social structure favors the activities of spontaneous community development organizations such as cooperatives, committees and patronatos.

Project personnel form a tightly knit group which functions well with a minimum of bureaucratic procedures, and which achieves a conspicuous multiplier effect by promoting tree planting not only through the traditional local organizations mentioned above, but also through agencies such as those listed below. On the other hand, many small farmers do not wish to join the project's activities because they do not own the land they live on and cultivate.

Institutional Aspects

COHDEFOR Support

The TCP project enjoys a good, mutually reinforcing relationship with Corporacion Hondureno de Desarrollo Forestal (COHDEFOR). Through COHDEFOR, the project has established links with the Banco de Semillas (seed bank) in Siguatepeque and the Comision Nacional de Recursos Geneticos Forestales.

COHDEFOR acts as a publicity and distribution agent for the TCP project. District foresters have requested plants from the project and, when processing fuelwood permits, often refer applicants to the project with the intention that the planting of fuelwood species be discussed.

Upon request, COHDEFOR makes the staff of its rural fire brigades available to the project during the rainy season for planting species trials and demonstration plots. These men would otherwise be occupied by thinning work.

Prior to any project planting on private property, COHDEFOR requires the landowner to sign a contract which obliges him or her to maintain the plantation at specified intervals and to pay a stumpage fee of 25 centavos per cubic meter if the wood is sold. In some cases, landowners are reluctant to commit themselves to a written contract. Despite their interest in

fuelwood and plantations, they do not associate themselves with the project for this reason. The evaluation team feels that the task of establishing species trials and plots for management or demonstration should not be hampered by policy and, as a form of incentive, should be legally exempted from any payment to the state.

Participation of Other Institutions

The Escuela Agricola Panamericana at Zamorana administers and safeguards one of the project's species trials, collects tree seeds, and harvests fuelwood from its plantations. This not only provides the school and surrounding area with fuel, but also serves as a continuing practical demonstration to students of how to establish and operate a fuelwood enterprise.

The steelworks at Agalteca have their own fuelwood plantation to provide fuel to the industrial operation. More than 20 species are represented, and some are more than 40 years old. The TCP project is permitted access to the plantations for observation and recording purposes.

Similarly, the project is technically connected with:

- United Nations High Commission on Refugees (UNHCR),
- Cementos de Honduras,
- Aldeas SOS,
- the German-Honduran Corporation for Food for Work (COHAAT),
- the Marcala-Goascoran Program (MARGOAS), and
- the AID-funded Ministry of Natural Resources project to protect the watershed of the Choluteca River.

The subdirector of COHDEFOR would like to see a closer relationship between the TCP project and:

- the Institucion Nacional Agraria (INA);
- the projects implemented by SANAA-CARE-COMUNIDAD and by the Swiss Development Corporation (COSUDE);
- the departments of the Ministry of Natural Resources, such as Recursos Hidrolicos and Ganaderia; and

- offices of COHDEFOR, such as Sistema Social Forestal, Cuencas Hidrograficas, and Seccion de Manejo Forestal as far as its work in mangrove areas is concerned.

USAID/Honduras would like to see a closer working relationship between the project and the AID-funded project that is working to protect the watershed of the Choluteca River.

Technical Aspects

Identification

The primary activities of the project are located within a strip which crosses the country from the Pacific to Atlantic coasts and includes the principal species and major life zones present in the country. The principal highways of Honduras fall within this strip, thus making visible some of the project's activities.

In Honduras, the project has statistically laid out 76 growth plots and 39 species trials, in addition to 127 demonstration plots. Measurement of these plots represents a considerable workload.

In 1983, the area around the capital city (Tegucigalpa) was declared critical because of deforestation and a shortage of both fuelwood and drinking water. In this area, the project looks for "fincas tipicas," something not easy to find because most of the land is owned by city residents. In contrast, land for the project's activities has been readily provided on both the north and south coasts.

In summary, the project has successfully indicated ways to solve the nation's fuelwood crisis. Small farmers no longer resist the project, but now ask for seedlings and information on how to establish their own nurseries. Already, pressure on the pine forest has been relieved in some areas through the provision of other woods for fuel.

Perhaps more important in the long term is the fact that the project has clearly awakened a grass-roots national consciousness of the importance of tree planting, and has provided the opportunity for a number of specialized foresters to develop professionally in their own country.

To serve the area around Tegucigalpa, tree seedlings are raised in the nursery in El Picacho. This means they are sometimes not suitable for plantations in sites at lower elevations. The project has developed the concept of temporary

nurseries, established in one place for a year or so, then relocated 30 to 50 kilometers away. As local people are employed at each nursery site, this practice serves a training function and is a source of employment. The evaluation team commends this concept.

In Honduras, the evaluation team observed rewarding work with the fast-growing, indigenious species of Mimosa tenuifolia, Quercus and Bombacopisi quinatum.

Recommendation

In view of the outstanding results coming from these exercises in national initiative, the evaluation team recommends that this work be continued and extended, with the resulting information being distributed throughout the corresponding life zones.

Conclusions and Recommendations

In Honduras, the project has achieved notable success in establishing plots and demonstrations in most of the life zones occurring in the country. Similarly, the project is outstanding for the way it has organized its field activities with assistance from a number of collaborating agencies.

Principal among the problems in Honduras is the uncertain land tenure in many places, and the technicalities which arise from government ownership of trees and forests.

Among its future activities, the TCP project in Honduras should emphasize the following:

- intensify the degree of technical supervision at all levels of field activity, from seed collection to forest nursery, management and harvesting;
- emphasize multiple plantation management, work with field staff to develop principles and practices, and produce manuals and similar information for field staff;
- critically review all research procedures, in conjunction with field personnel, at all levels from fieldwork to date output;
- reduce the workload on field measurement and data processing by removing from active files any plots which do not conform to a simplified research

layout, and also removing any species judged to have performed poorly by project standards;

- orient the project's technical publications towards themes of methodological and operational problems and achievements; and

- locate some experimental and demonstration plots on steep slopes in order to represent the terrain on which a significant proportion of the rural population lives.

APPENDIX G

Country Study -- Panama

Objective

This appendix presents an evaluation of the activities and accomplishments of the fuelwood component of the Fuelwood and Alternative Energy Sources project in Panama, and recommends priorities and emphasis for the follow-up activities of the TCP project. The evaluation is based on eight person-days of effort during the period from May 9 to 17, 1986. This work included participation in the first field day of the national project team, attendence at the monthly team meeting where the quarterly project meeting in Guatemala was discussed, three days of visits to species trials and demonstration plots, interviews with the management and staff of the counterpart national agency, and interviews with personnel of other national institutions concerned with tree research and reforestation. Additional information on fuelwood project activities in Panama was gathered from discussions with CATIE project staff at Turrialba.

Technical Aspects

Areas of Implementation

Panama has the lowest national dependence on fuelwood of the countries participating in the fuelwood project. However, there are severe fuelwood shortages in localized areas, such as the Azuero peninsula and Cocle province, where population growth and the expansion of cattle grazing have led to widespread deforestation. According to census data, some 78 percent of the area's population use wood for fuel, and there is a shortage of timber for rural construction and to supply the small furniture factories and other industries. As these areas have a relatively large population, they were appropriate for initiation of the fuelwood project. It appears that the selection of areas for project implementation was based on social and economic criteria, rather than to test species with various soils and ecological conditions.

Trials and demonstration areas were concentrated in two ecological zones of the critical areas--tropical dry forest and tropical pre-montane forest. Although trials in three other ecological zones were set up, concentration on Panama's two dry areas has limited the ability of the TCP project to support the expansion of reforestation programs into other ecological zones of the country (e.g., the Panama Canal watershed), where planting

for soil conservation purposes and the improvement of farm income are priorities.

Recommendation: Increment plots at existing plantations and new species trials should be established in the Panaman Canal watershed as soon as possible to develop information to support watershed management development activities which are planned for that area.

Species Selection

Although FAO has established several demonstration plots of native and exotic species over the past decade, there has been little research in the area selected for implementation of the fuelwood project. The species selected for trials were largely exotic, and existing species trials, plantations and native species received little consideration in the initial selection of 10 tree species by CATIE. The country team felt that CATIE's objective was to test the same species in all countries, using a standard trial plot design for later comparability. However, species selection was made without regard to soils classification and analysis, which reduces the ability to make comparisons. It is questionable whether it is appropriate to try the same species in all countries, given the wide variation in soils and ecological zones.

Species trials began in 1982 that tested Alibizia falcataria, Guacimo ulmifolia, Casuarina equiesetifolia, Callindra, Gliricidia sepium, Eucalyptus camaldulensis, Caesalpinia velutina, Gmelina arborea, Leucaena leucocephala, and Tabebuia pentaphylla. Tectona grandis and Cordia aliadora were established by the country team when they recognized that there would be a demand for information on the adaptability and growth of these species. The team continues to use its own initiative to include additional species in trial testing.

Seed was provided by the CATIE seed bank for most of the species trials. There is no information on the provenance of these seeds or the soils and climatic conditions for which they are appropriate, although this information is necessary to select most sites for testing.

Recommendation: Further seed distribution through the TCP project for trials should be controlled in terms of quality and provenance source. It is essential that information on soils and climatic requirements be provided as well to make the testing more effective. This species research needs to be implemented immediately, since at least three years of adaptability trial and yield studies are necessary before preliminary recommendations regarding appropriate species can be made.

Random inspection of the country team's files indicated that they were up-to-date and consistent. However, there have been problems with the manual of transfer of data to duplicate records for transmittal to CATIE's computer center, and entry into the data bank has been delayed. It seems that CATIE has not established a method for processing and analyzing the data received, nor have extract reports been made available to the country team. Reports and listings of species trials are prepared by hand from the project's plot records.

Recommendation: Currently, there is only one provenance trial of Leucaena species. The next phase of the project should initiate a series of provenance testing of the most promising species, particularly Eucalyptus camaldulensis, Tectona grandis, Gmelina arborea and Acacia mangium. These trials should also include native species, such as Bombacopsis quinatum, in which there is substantial local interest. To support these trials, selected seed from known locations will be required. CATIE's seed bank should be strengthened to provide more information and quality control for seeds supplied to participating countries. At present, seeds are distributed with virtually no information on their source or the species' site demands.

The country team is planning to create seed orchards from surplus trees in selected demonstration plots. While this will help provide a better source of planting stock adapted to local conditions, it is too early in the growth of these trees to determine if the best provenance of seeds is being propagated. Thus, this cannot be a substitute for further provenance trials with seeds from other sources.

Demonstration of Management Practices

The country team is testing six management practices at its demonstration plots, including increment studies of spacing trials for Genipa americana and Eucalyptus camaldulensis, intercropping of Leucaena and platano at a windy site to reduce physical damage to the latter, management of natural regeneration of Guazuma ulmifolia using four treatments, and coppice management of Gliricidia and Leucaena. This last trial is of interest as yield data indicate that leaving four shoots on the stump produces the greatest weight of biomass. For this management practice, it is estimated that a hectare of coppice (at a spacing of two meters by two meters) can produce 15,000 stakes, which are in demand locally for tomato cultivation. The price of stakes is five cents each, which suggests a gross annual income of US$750 per hectare.

Another useful management technique that is being prepared for trial is substitution of Eucalyptus camaldulensis plantations for the current practice of harvesting natural regeneration every

10 years for firewood, and planting corn and then yucca for the first two years before allowing the area to return to natural regeneration. This parcel is managed for fuelwood that is used in the on-farm production of sugar candy (panales). The planting of eucalyptus will substitute a three-year rotation for the 10 years, and produce a much higher volume of fuelwood that can be utilized more easily. The net effect will be an increase in the percentage of the farm that can be used for other crops.

An important management practice that is required in Panama is mixing grazing and tree planting in underutilized cleared areas of degraded pastures. Much of the land in the project area and new areas to be added are used for extensive grazing. These areas have been heavily grazed and are suceptible to erosion, thus resulting in a low animal-carrying capacity.

Recommendation: The TCP project should give priority to trials of spacing density that will allow cattle to graze once the trees are established. Species to be tested should include dry-season forage and the introduction of improved pasture grasses being promoted by the Agricultural Research and Development Bank. Trials of pollarding for Leucaena and the introduction of Guauma ulmifolia should also be considered.

Recording Data

Continuing problems with completeness of the formats and errors in recording data were reported. These may be due partly to the need to transcribe data by hand from field notes into the format sent to CATIE for entry on the computerized systems.

Recommendation: Photocopying or making carbon copies of these notes would eliminate the necessity for transcription. It would also free technicians to verify and check the accuracy of field notes. Possible ways of building tighter editing standards into the data entry routine should also be considered, so that data can be entered more quickly and entry errors avoided. Ultimately, the data base should be adapted to microcomputers and processed in Panama. A data disk could then be sent to CATIE containing the reported information. This would allow the project and country team to produce needed reports and analyses, and also resolve any inconsistencies in the field.

Promotion and Extension

In the beginning, the country team had little success in convincing farmers, particularly those with lower incomes and little land, to participate in demonstration trials. However, the rapid growth of the trees planted has convinced participating farmers to continue the plantations and expand them, if land is

available. Many neighbors who once doubted the value of these fuelwood trees are now interested in growing some, and as a result, the demand for planting stock is increasing.

Through various organized promotional events (i.e., field days and an exhibition at the regional agricultural fair) and other activities, such as press and television coverage, the project has been able to promote reforestation in the area. Several larger local landowners, including the Director General of RENARE, are planting trees on their farms. This example, plus the demonstration plots, encourages others to plant trees on their own land.

No formal extension program has been started as yet, although the country team is working with many individuals and groups. Now, there is sufficient experience in the project area and other parts of Panama to mount major educational and extension efforts. Although the country team has not yet begun to produce publications and reports on the results of the project's applied research in Panama, this is an essential activity to support the extension effort. CATIE will present a short course on writing technical publications to project staff and personnel from other agencies.

Recommendation: In order to have a large-scale impact, a substantial increase in the technical capability and number of people assigned to the educational extension work will be required. Hence, it is vital that the country team be trained according to their needs, and their experience with the project should be institutionalized by RENARE. Training is required in extension techniques, as well as a full understanding of the results from the trials and demonstration areas. Personnel from other institutions, particularly the agricultural extension service and private groups, should be included in this training and assisted by the project team in developing reforestation programs. In addition to training, the extension program will require that necessary materials be made available (seeds, plants, publications of field manuals and instructional leaflets, etc.). It is recommended that a radio program for landowners be prepared to support the extension effort.

Institutional Aspects

Country Team

The country team is made up of nine staff members from RENARE, including three forest engineers, two agricultural engineers, three technicians and a research technician, and the national coordinator appointed by CATIE. RENARE also provides an administrative assistant for the country team. The national

coordinator is a long-term staff member of RENARE, who was trained as an agricultural engineer, but has had many years of experience in nursery and reforestation work. The country team appointed by RENARE also lived in the project area, which was an important factor in identifying participants for demonstrations and trials.

The principal office of the country team is located in the project area, distant from RENARE headquarters. This has contributed to the project's development of a sense of an independent identity apart from RENARE and CATIE. With the advantage of consistent, if limited, operational funding and concentration on a single activity that is producing results, they are a unique group within RENARE. Team members have developed a pride in their accomplishments, despite the many difficulties they have had to overcome. However, this group identity may make it difficult for RENARE to institutionalize their experience. If there is to be a major promotion and extension effort in the future, such institutionalization will be necessary.

At present, the country team's role and priority in the TCP project are uncertain. The main issue is whether the project will continue as an applied research and demonstration unit, or will become a RENARE forestry extension effort. This is complicated by the organizational changes planned for RENARE--its restructuring as an autonomous institute with greatly increased authority and implementation responsibilities.

In anticipation of RENARE's new functions, the agency has been reorganized on the basis of geographic zones for implementation, rather than by functional specialty. In the past, RENARE personnel were assigned to project activities on a full-time basis. Recently, two senior forest engineers on the country team, including the principal counterpart, have been assigned as RENARE subzone chiefs with broad resource management responsibilities. The country team is concerned that there will be a decrease in the level of effort to implement the TCP project. However, if reforestation promotion and extension become a major activity, these staff members are well situated to manage this activity. They can also assure that reforestation receives the necessary priority in the allocation of resources and equipment, and that nursery production is coordinated and well supported. In this way, the institutional development goals of the TCP project can be achieved.

RENARE Project Support

At the start of the project, RENARE's major field activities were the AID-supported Watershed Management project, which included reforestation and pasture improvement activities in the

Rio Villa watershed on the Azuero peninsula, and a rural development and pine reforestation program in Cocle, financed by UNDP. Otherwise, RENARE's role was that of a technical advisory agency to the Ministry of Agricultural Development. Chronic budget austerity, as well as a lack of equipment and transportation, were and are continuing problems. There was little material support for the project above the salaries of the RENARE personnel assigned to it. In some cases, the project was able to supplement resources assigned to the Rio Villa watershed activities and share the costs of seedling production from nurseries established for the watershed project. In other cases, administrative agility and the project's control of its budget provided resources and transportation to support watershed activities. For example, the project could directly purchase replacement parts for RENARE vehicles assigned to different activities in exchange for other assistance from the agency.

This independence, and the project staff's obvious sense of accomplishment in comparison with other RENARE personnel, led to some professional jealousy and a lack of interest in supporting fuelwood activities. There were questions about what the project staff was doing between their annual measurement of growth plots. However, this attitude changed as the species trials and demonstration areas became successful, and RENARE had something to show for its investment. RENARE has increased its support of the project and its success may also have led to an increase in responsibilites of the project's two staff members.

RENARE intends to emphasize reforestation activities in the coming years, with the support of the AID/RENARE project being developed to strengthen natural resources management. The experience of the fuelwood project will serve as a useful background for these activities.

CATIE and Other Technical Assistance

There are no records in Panama or at CATIE of the number of field visits made by CATIE project staff to the country. Furthermore, it is difficult to characterize these visits as technical assistance, in the sense of skills transfer, or advisory assistance, as distinct from program planning and administrative supervision. All the visits made by project staff contain an element of all three functions. There is a general feeling among the country team that too much of the time spent by CATIE project staff in Panama is not specific enough in terms of providing a sounding board for decisions that must be made in the field, nor has the development of expertise at headquarters kept pace with information that is required in the field. This is particularly true with regard to the need for technical discussions on the establishment of management trials, application of silvicultural practices and such specific items as

the selection of superior trees for seed production and propagation. Shortages of funds in the last year of the fuelwood project have further reduced travel by central project staff.

In Panama, the country team is combining supervisory visits to demonstration areas and increment plots with technical assistance and promotional activities for cooperators and their neighbors. There is no formal record-keeping for this activitiy that would either aid in follow-up and permit verification of the consistency of advice given by different team members. This is to be expected during the initial development phase, but the implementation of a major promotional campaign will require this type of record-keeping.

Training

A training plan and selection of individuals to attend courses provided by CATIE have not been completed. Consequently, the selection of personnel for courses appears unsystematic and arbitrary, although better qualified individuals are selected largely from the country team. One forest engineer from RENARE has been sent to the CATIE master's-level forestry training program. On his return, he was assigned to head one of the agency's departments and has not been directly involved in the fuelwood project (nor has he had time to finish his thesis).

The first mobile courses offered by the project were considered particularly useful during the initial years, but cost prevents their continuation. The quarterly coordination meetings, held in different participating countries on a rotating basis, have been a partial substitute for the mobile courses. These two- to three-day sessions generally include one day of field inspections and discussions, but inevitably administrative and management issues dominate the quarterly meetings. Those attending find these meetings extremely valuable, particularly the interchange with their peers in other countries. However, these exchanges are confined to the national coordinator and principal counterpart, and thus, have limited training value.

Two instruction sessions were held in Panama on completing measurements of the sample plots in a consistent manner and formats for entry into the data base. These sessions cannot be considered training or transfer of skills, but rather were administrative instructions. Repeated instruction was necessary, as standards and procedures were changed at CATIE on the basis of experience. This suggests that the data collection system was not thoroughly field-tested before it was released for general use.

Other Institutional Participation

The project team is just beginning to inform other agencies and institutions of the success of its trials and demonstration areas. There has been no significant collaboration from other agencies as yet although, there are good opportunities for complementary research and information exchange. The Smithsonian Tropical Research Institute is conducting a major Acacia managium planting trial, the University of Panama has received international funding for testing the nitrogen-fixing properties of Leucaena species, and agro-forestry demonstrations are being implemented by various agricultural agencies. These agencies should be made aware of the TCP-project's research components as well as the results of the fuelwood experimentation in Panama and other countries cooperating on the project. Similiarly, RENARE and CATIE should be aware of research being implemented in Panama, particulary investigations funded by the U.S. National Academy of Sciences through the Board on Science and Technology for International Development (BOSTID), University of Panama and Smithsonian Tropical Research Institute. INFORAT should make certain that all project publications are forwarded to these agencies, particularly the library of the Smithsonian Institute.

Recommendation: CATIE should organize a periodic conference on tree research in Panama, with participants from other countries, to exchange information and foster coordination between the research and extension activities of the various agencies and private organizations promoting tree planting.

AID Project Activities

In recognition of the fuelwood project's success, particularly the demonstration of rapid tree growth in areas that had not been the focus of previous public reforestation programs and interest of small farmers in planting trees, it was decided to expand AID support to farm- and agro-forestry activities. Beginning in 1985, RENARE and AID began development of a major project to support the natural resources management actions of the Panamanian government and private sector. This project will be approved before October 1986 and is scheduled to invest some US$50 million in natural resources activities over the next 10 years.

The project's design was developed with the assistance of the ROCAP regional forester and fuelwood project's national coordinator. This project will provide financing for a major RENARE program to promote tree farming by small landholders. The design also calls for an extension effort based on the fuelwood project's experience in the central provinces of Panama and the Panama Canal watershed. In addition, the project will promote the establishment of industrial forest plantations by medium-size

and larger landowners. Both components of the project are intended to capitalize on the fuelwood project's species trials and demonstrations, and also utilize the capability acquired by CATIE through the TCP project.

Technical assistance and training needs that will be required for effective implementation of this AID project in Panama have been identified in the following subject areas:

- nursery production, particularly cost-effective techniques that can be utilized by private nurseries, cooperatives and local reforestation associations;

- planting techniques and silvicultural practices that increase yields and financial returns from plantations, and reduce the risks of loss through fire, insects and disease;

- promotion and extension techniques, including methods and materials preparation, community organization and techniques for working in groups;

- financial analysis of plantation investments, recording costs and accounting; and

- identification and promotion of markets for minor and intermediate forest products and harvesting sales.

The TCP project's research components can also support other AID initiatives in Panama's agricultural sector. These include ongoing projects in agricultural research, improved pastures and agricultural extension.

Recommendation: CATIE and the country team should collaborate with the Agricultural Development Research Institute on the design and testing of silva-pasture systems and their subsequent extension. Their research is of primary importance to the Natural Resources Management project to be implemented in Panama.

Project Management

The country team receives only general guidelines and directions from CATIE in planning and administering its annual work program, and these guidelines refer mainly to budgeting and administrative procedures. Otherwise, the country coordinator and principal counterpart have a great deal of autonomy in the management of field activities and allocation of resources. At RENARE, the principal counterpart reports to the Director General

of the agency, not to the director of the Forest Service. Since the principal counterpart is stationed in the project area in Azuero (Los Santos), his meetings with the Director General are infrequent, and the country team has general support, but little direct oversight or interference from RENARE management.

Such autonomy, coupled with direct access to the Director General, is a disadvantage for future institutionalization of the fuelwood project's experience into the Forest Service. This is particularly true since a major reforestation campaign is planned through the AID Natural Resources Management project. The chief of the Forest Service has had little identification with or participation in the work of the country team. Annual operating plans and quarterly progress reports are forwarded to him for his information, but otherwise, informal talks with the national coordinator are his principal association with project activities. He feels that he has not been significantly utilized and that training which comes through the fuelwood project is limited to the country team. The weakness of this relationship is unfortunate since the chief of the Forest Service participated in designing the fuelwood project before his promotion.

Recommendation: The country coordinator and principal counterpart should make a special effort to promote the identification of all RENARE staff members with the fuelwood project's success and share lessons learned. This experience must be institutionalized by RENARE if future tree planting efforts and agro-forestry extension work during implementation of the Natural Resources Management project are to succeed.

The success of the country team is due in large part to the leadership qualities of the country coordinator and his excellent working relationship with the principal counterpart. The fact that the project enjoys virtually complete autonomy in its management is another important factor. The CATIE office in Panama provides administrative and overall support for the project, but does not enter into operational matters. Local procurement is handled directly by the country coordinator with the help of an administrative assistant from RENARE and secretarial support provided by either RENARE or the CATIE office. This makes for an operation that runs smoothly.

The national coordinator is concerned about a plan being considered by RENARE to centrally manage and administer all in-country funds for its counterpart projects. In theory, this is a better management practice in terms of improving the planning and allocation of the agency's internal resources. However, the present bureaucratic practices and delays affecting that agency would seriously impede the administrative agility with which the country team operates. Even if this proposal to designate RENARE as the administrator of TCP project funds is acceptable to CATIE, implementation of this transfer of financial administrative

authority should be postponed until the administration of RENARE is significantly improved.

Summary of Findings and Recommendations

The fuelwood project is generally recognized as a success, by both RENARE (the counterapart agency) and the local population in the project area. In terms of the project's formal objectives of identifying critical areas, testing the adaptability of tree species, installing demonstration areas and beginning to test management practices, these activities have been accomplished. More significant is the acceptance of tree planting by small- and medium-size farmers in the project area, and the growing demand for planting materials. This success has been achieved through the hard work of the project's country team and national coordinator. The project has developed a team of eight technicians with the experience and technological background to lead a major reforestation program in Panama's dry areas and extend applied investigations of species trials to other ecological zones within the country.