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# CATIE

TROPICAL AGRICULTURAL RESEARCH AND TRAINING CENTER

## STRATEGIES FOR A JOINT EFFORT

to help small farmers of  
the Central American Isthmus  
to improve forest land use  
and production.



TURRIALBA, COSTA RICA

JANUARY 1980

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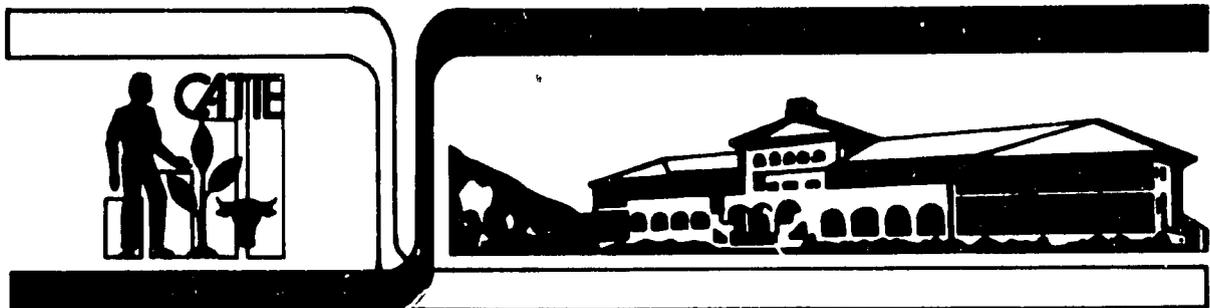
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## SUMMARY

### CHARACTERISTICS OF THE RURAL ENVIRONMENT IN CENTRAL AMERICA

#### An obvious need:

Population will more than double by the year 2000 in the Central American countries. Food and energy requirements will consequently have to be increased accordingly.

#### The area, the small farmer:

The six countries of the Isthmus comprise a population of 16 million inhabitants. Of this, 94 percent live on holdings from less than 4 to 35 hectares. Net income per capita ranges from 49 to 172 dollars for farmers in those units.

Low income per capita, poor housing, poor soils, and small holdings describe the conditions of the small farmers.

Under those circumstances, he cannot take risks.

Most food crops are grown in small farms which account for over 70 percent of the staple food consumed in the area.

#### The technology:

Small farmers produce most of the food in the area; however, technology is not available for them. Most techniques being developed are for farmers having sufficient resources.

NATIONAL INSTITUTIONS AND CATIE:  
A PERSPECTIVE FOR COOPERATION  
TO IMPROVE SMALL FARMERS' LIVING CONDITIONS

#### The mandate:

Small farmers represent a large part of the population, have a large impact on food production, live in poor houses, and raise crops on poor soils; no technology is available in accordance with their resources.

CATIE, a civil, non-profit association is conducting research and offers training and technical cooperation in agriculture, forestry and animal production through close coordination with national institutions in the countries of the Central American Isthmus and the Caribbean.

The objectives:

To increase productivity and production of the small farmers toward improving their living conditions.

The functions:

Research on production, taking into account the economic and biological environment, using a systems approach, considering all limiting factors, studying systems used by farmers and utilizing methodologies to develop suitable alternatives.

Proven technologies and methodologies are transferred to national staff and farmers. This has been some of the main results of CATIE's research efforts. Ten alternatives for cropping systems have been produced in different areas to increase net income up to 334 percent with small increases in production costs.

Improved animal systems have resulted in increasing milk and beef production to the benefit of farmers' diet and the economy of the area.

Natural resources are properly managed toward conservation and efficient use. Technologies and methodologies that do this are being transferred to improve certain environmental conditions.

Technical cooperation from different programs provides assistance to all countries in many aspects.

The farm is considered as a unit; systems being promoted are based on this concept and on the socioeconomic environment.

Training, main resource for development. Graduate training is given to professionals of the area within CATIE's philosophy and methodologies. Noticeable demand from the countries is being partly satisfied through short-term training events.

In 1978-79, a total of 45 graduate courses were taught. More than 200 professionals attended.

Short-term training involved over 450 professionals during the same period. It is done through seminars, short courses, in-service training and workshops.

Technical Cooperation is aimed toward strengthening national institutions.

This activity is carried out through agreements signed with the institutions to promote already proven technology. This technology is transferred to the farmer. The training of national counterparts is carried out as part of this activity by getting them involved in the development of technologies at the farmers' level. A direct impact on production, diet and living conditions is achieved. The countries are requesting an increasing amount of services in the use of natural resources and conservation. Assistance is given in milk, beef, cocoa and coffee production in many countries of the region.

#### Integrated efforts:

To accomplish the main goals of the Center and the countries -improving the small farmers' living conditions.

### A PROPOSAL TO STRENGTHEN THE ACTIVITIES OF NATURAL RENEWABLE RESOURCES PROGRAM

#### Introduction

CATIE is a regional institution to promote research and to provide training and technical cooperation in close coordination with the national institutions.

To utilize its resources to better advantage, and to avoid duplication of efforts, CATIE works in cooperation with the International Centers. Their findings are used in CATIE's research work at the farm, and feedback from the farmer is provided to the International Centers.

Because of CATIE's regional scope, ample support is being provided to the national institutions. This fact, added to the quality and continuity of the staff which works in the field, with the farmer, is the main reason explaining the demand for assistance from CATIE.

CATIE has a germplasm bank unique in the region which collects, stores, and provides high quality genetic material to the countries.

Cooperation between the national institutions and CATIE is needed if the countries are to cope with the need for doubling food production, maintaining a rational use of natural resources and preserving a good environment for future generations. This cooperation is already functioning. Further demand to solve problems will require strengthening of CATIE's budget.

To help the countries meet such a challenge, increased budget support is needed to establish a permanent group of able professionals which will provide continuity of efforts.

Background information:

The six countries of the Isthmus confront increasing problems in the use of natural resources as a consequence of their improper management.

It has been calculated that for the Central American region, from 300 to 350,000 hectares of natural forest are cut every year, while reforestation amounts to only a few thousand hectares. To cope with problems like this, the Program carries out activities in research, training and technical cooperation in wood production through the introduction of fast-growing species; in agro-forestry systems suitable to the area; and in the proper management of watersheds and wildlands.

Justification:

The goals achieved by the Programs and the increased demand expressed by the countries at all levels, should be considered as sufficient evidence to support the petition for strengthening CATIE's basic staff.

The countries have expressed their support for CATIE's activities in the last meeting of the Ministers of Agriculture. This is considered an honor, although it also represents new challenges and more responsibilities.

Activities of the Program needing support:

The strengthening of the Program, necessary to carry out and fully implement their objectives and to achieve the goals within its main lines of action, will concentrate on the following activities:

- a) research, jointly carried out with the countries, on main lines of the Programs,
- b) support for research and extension personnel of the national institutions to carry out their own programs,
- c) support for research, training and technical cooperation activities presently carried out by CATIE's staff.

Human resources needed:

Senior Staff, at high level, is requested in the various disciplines of the Program.

The requested personnel was strategically distributed over the years to complement actual needs of CATIE and that of the national institutions.

The positions requested represent the permanent staff necessary to conduct research, and to provide training and technical assistance according to the projected and increasing needs of the countries.

Budget requirements:

A three-year budget has been prepared to indicate the projection proposed for this period which will be necessary to meet the personnel requirements to cope properly with present and future demands for CATIE's assistance.

The number of personnel will reach a total of 15 by the third year of which 5 will be financed by CATIE's budget and 10 will require extra funding.

The total contribution requested comes to US\$1,472,200. The impact of the additional resources on the total income for the first year represents a two percent.

## CHARACTERISTICS OF THE RURAL ENVIRONMENT IN THE CENTRAL AMERICAN ISTHMUS

### AN OBVIOUS NEED:

More food and energy for an increasing population

To cope with the food and energy requirements of an increasing population, most countries of the Central American Isthmus will have to more than double their food production and properly program the use and replenishment of their natural resources before the end of the next decade, thereby presenting a dramatic challenge for those involved in rural development.

### THE AREA, THE SMALL FARMER: a challenge

The Central American Isthmus is made up of Costa Rica, El Salvador, Nicaragua, Honduras, Guatemala, and Panamá. The population of Central American Countries is about 16 million people and will be more than 35 millions by the year 2000. In 1970 the rural population represented 64 percent of the total inhabitants of which, 76 percent are located in holdings of less than 4 hectares, and 18 percent, in holdings between 4 and 35 hectares; the rest, only six percent, are located in properties over 35 hectares.

The average annual income seems to be correlated to the size of holdings: 49, 172, and 952 dollars per capita, corresponding to less than 4 hectares, between 4 and 35 hectares, and over 35 hectares, respectively.

The low income, added to the small size of the farms, as well as their being located on poor soils defines and puts the small farmer in a difficult situation which inhibits him from taking risks.

Of the total area devoted to agriculture, farmers with less than 4 hectares, dedicate 60 percent of their land to food crops; those with holdings between 4 and 35, dedicate 41 percent to food crops; those with properties over 35 hectares, dedicate only 4.2 percent to food crops.

Although not programmed, small and medium-sized farmers of the area are responsible for producing a large percentage of the staple food consumed in the region. About 80 percent of this production comes from these farmers with small holdings, low net income, and poor soils.

**THE TECHNOLOGY:**  
Unsuited to small  
farmers' socioeconomic  
environment

Although it is a recognized fact that the small farmers are involved in feeding themselves and a large percentage of the rest of the population, no technology has been developed that suits their particular socioeconomic and biological environment. New ideas and new research are needed to produce solutions which are both technically and culturally acceptable to tropical small farmers to increase production and productivity.

## THE NATIONAL INSTITUTIONS AND CATIE: A PERSPECTIVE FOR COOPERATION TO IMPROVE SMALL FARMERS' LIVING CONDITIONS

Small farmers are a large part of either the total or the rural population; they have a noticeable impact on the staple food consumed in the area either from an animal or plant source; they live in poor houses, crop in poor soils, and the technology to improve their productivity and consequently their standard of living, is negligible.

**THE MANDATE:**  
towards regional  
coverage to benefit  
small farmers

CATIE is a civil, non-profit, autonomous association, scientific and educational in nature, established to carry out, promote and stimulate research, and to provide technical cooperation and training in agricultural, animal and forestry production to produce technical alternatives for the regional needs of the small farmers of the American tropics, particularly in the countries of the Central American Isthmus and the Caribbean.

**THE OBJECTIVES:**  
in accordance with  
the environment,  
resources, and na-  
tional

CATIE's objective is to increase agricultural, livestock and forestry production and productivity, especially of the small farmers of the Central American Isthmus, with the purpose of contributing to the improvement of their living standards by making proper use of natural resources within the framework of national policies, in close cooperation with the national institutions.

THE FUNCTIONS:  
toward a  
systems approach

\*Research: for  
production

Research to produce an impact on small farms' production and productivity has to take into account both the economic and biological environment. Methodologies capable of contemplating them are needed. By focusing research on a Systems Approach, considering all limitant factors, and studying systems being utilized by farmers, CATIE has developed a methodology that is being proven at the farmers' level, to generate technological alternatives, according with the farmers resources, consequently, easy to adopt. As a result of the research efforts, both methodology and technologies suitable to the environment are generated by close cooperation between CATIE staff and personnel from the national institutions.

Technologies and methodologies developed, after proven are transferred to the farmers and the national staff of the area.

A methodology to do research at the farm level, assistance to develop national programs in cropping systems, and the initial steps to establish a research network in the Isthmus, are some of the main results of CATIE's efforts. Ten alternatives for cropping systems including corn, beans, cassava, squash, pumpkin, sorghum and cowpea, in different combinations, have been developed.

They may produce an increase in the farmer's net income ranging from 66 to 334 percent, with an increase of only 15 to 23 percent in production costs.

Improved crop management and proper land utilization practices are contributing to a better and more efficient use of the small farmers' resources and producing additional income as a result of combining several annual crops. Significant reduction in soil preparation operations, better use of inputs, and the acquisition of additional products such as those coming from perennial plants and trees are other achievements of CATIE's research efforts.

Improved animal production systems have helped, through better crop management, use of tropical legumes and proper grazing practices, to increase farmer's net income. Breeds and crosses have been evaluate and those proven adaptable to tropical conditions have been selected and are being promoted.

CATIE has worked toward the management and conservation of the natural resources. Crop and tree associations significantly contributing to the farmer's net income have been identified. The Forestry Nursery has been renovated to provide material to be included in the research work. The Collection of New Species has been increased, the Latin American Forest Seeds Bank has been promoted. In addition, the development and utilization of wildlife species in several countries have been of noticeable help to the area.

Annual crops, perennial plants, rugged adaptable animals, animal management, wildlands and wildlife management and the socioeconomic factors affecting these systems are all part of the farm; and as such are considered by CATIE's efforts in order to provide proper answer to the farmer's problems.

\*Training: main  
resource for  
development

Training is considered a fundamental tool to promote the methodologies developed in order to reach the target population. For this, a considerable number of professionals have to be trained to extrapolate and multiply the Center's efforts. Personnel from national institutions, who are involved in research, extension and education, are being trained through a long-term Graduate Program and short-term training activities.

There is a recognized need to design methodologies to accelerate training to help satisfy countries' needs. To achieve this, CATIE is making an effort to carry out training activities at different levels, using methods that make it possible to train larger numbers of professionals.

Agricultural engineers, agronomists, researchers, extension agents, technicians, university professors and students, and personnel from intermediate-level educational institutions will be the target of CATIE's training efforts.

In only one year (1977-1978), the staff of the Center gave a total of 45 courses within the Graduate Program carried out through a joint effort between the University of Costa Rica and CATIE. This involved over 200 professionals of the region and other countries in Latin American. The staff also participated in short-term training activities within the six countries of the Central American Isthmus, working together with the staff of the national institutions. These short-term training activities involved 450 professionals

through short courses, seminars, workshops, in-service training and international meetings. Through these efforts, CATIE is contributing substantially to strengthening a regional network of researchers and experts in agricultural development, interested and trained to do research oriented toward the needs and resources of the small farmers of the American Tropics.

**\*Technical  
Cooperation:  
toward strength-  
ening national  
institutions**

Technical cooperation activities are carried out to make sure that technologies developed reach the farmers, and that there is a feedback from the farmer to the researcher.

To properly do this, appropriate and efficient methods of transferring technologies also have to be produced.

Technical cooperation activities, carried out through contracts and agreements with the national institutions of the countries, are the basic channels through which suitable technologies can be tested at the farmer's level, working with the personnel of the national institutions. This concentrated action serves as a model with the multiple purpose of transferring technologies to a large mass of farmers and to train personnel and test methods of transference to accelerate the process.

To accomplish such purposes, CATIE has signed contracts and agreements with the national institutions of the countries for the application of technologies, the planning and development of cropping systems, to exchange germplasm, to assist technically credit programs linked to livestock development activities, to promote milk production as part of land colonization projects, to train personnel, to develop agricultural practices and to manage wildland areas. Technical assistance has been given to Panama in the form of research related to livestock production in order to generate and transfer developed alternatives in this field. Many countries have been helped in planning the management of their natural resources, in managing watersheds, management and conservation of hydraulic resources, in development of national parks and in training programs for the conservation of the environment.

#### INTEGRATE EFFORTS:

- . Systems approach
- . Interdisciplinary team
- . Training and tech. coop.
- . Working with the farmer
- . At the farm level
- . With national institutions

To accomplish the goals of improving small farmer's living conditions, CATIE is using a multidisciplinary team, working in close cooperation with staff from the national institutions, in the farmers' fields, cognizant of the farmers' problems, and with the farmers' active participation in the process of developing alternatives. Research is conducted away from the experiment station using available inputs. Staff from the countries is trained using methodologies developed and proven suitable. Methods of technology transfer are being developed through promoting proven technologies.

#### THE STRATEGY:

\*The programs:  
four interacting disciplines in the same institution working at Turrialba and at the country level, to carry out research, training and technical cooperation

The Center has the privilege of having the four basic areas of production for rural areas: Animal Production, Annual Crops, Perennial Plants and Natural Renewable Resources.

Altogether, the functions assigned to the Center and the Programs designed to implement them, have made it possible for CATIE to produce a noticeable impact within the important area of production, an action recognized by the support provided by the Ministers of Agriculture of Mexico, the countries of the Central American Isthmus and the Dominican Republic.

CATIE's Programs have a regional projection and their actions are carried out through projects jointly implemented with the national institutions. Activities within the projects are aimed at the

generation of technology, methodologies for transference, training at different levels, and to assist the institutions through technical cooperation actions.

All the Programs carry out initial surveys to find out what are the predominant systems in the area. This survey is used to determine the main limiting factors in the system used by the farmer. Based on these and data on climatic and socioeconomic conditions, alternatives to the farmers' systems are designed. Validation in the farmer's field is the next step. Once validated, transference to the farmer takes place through technical cooperation agreements with national institutions. The Annual Crops Program concentrates its activities in the following areas:

- a. Development and improvement of cropping systems for small farmers in specific environments.
- b. Development of methodologies to increase the geographic area for which cropping systems alternatives can be recommended.
- c. Analysis of cropping systems behavior and their response to environment and management factors.

The Animal Production Program has four main lines of action:

- a. Development of specialized milk production systems.
- b. Development of beef production systems.
- c. Development of dual purpose production systems.
- d. Development of small animals production systems for small farmers.

The Natural Renewable Resources Program carries out activities in:

- a. Wood Production.
- b. Watershed and wildland management
- c. Agroforestry systems

The Perennial Plants Program emphasizes work on:

- a. Development of cocoa production systems.

b. Development of coffee production systems.

c. Multiple cropping perennial plants systems.

Efforts expanded in all these areas will generate technologies, will train people and will produce methods of transferring and evaluating the findings once they reach the main target-the small farmer.

Specific activities are being carried out in all the countries of the Central American Isthmus, and technical assistance is provided also outside the area.

The benefits of joint activities between national entities and CATIE on production, diet, resource conservation, and efficient use of natural renewable resources and inputs are evident. The methodology used is simple, easy to adopt, and applicable to most environments.

Demand for this kind of effort toward developing adequate technologies is increasing.

CATIE's present basic budget will become unsuitable to respond to the challenges of the 80's. Additional support will be needed to cope with it without stretching CATIE's staff beyond the point of reasonable efficiency.

## A PROPOSAL TO STRENGTHEN THE ACTIVITIES OF NATURAL RENEWABLE RESOURCES PROGRAM

### INTRODUCTION

CATIE is a regional institution that works to promote research, training and technical cooperation in close coordination with national institutions. It is becoming a leader in the application of new methodologies for agricultural development by using interdisciplinary teams to work toward solving small farmers' problems.

Technical assistance available in different forms and provided by the Center, is in increasing demand.

CATIE also works in cooperation with the International Centers in a effort to better utilize their findings to avoid duplication of efforts or waste of resources.

Because of CATIE's regional scope, ample support is being provided to the national institutions. This fact, added to the quality and continuity of the staff which works in the field, with the farmer, is the main reason explaining the increasing demand for assistance from CATIE.

Examples of this demand are the recently approved projects on watershed and wildland management for Costa Rica and Panamá, whose governments have requested CATIE's assistance. Coffee and cocoa production are also main concerns of the countries, and a recent project financed by the World Bank in Panamá is going to be implemented through CATIE's assistance in that country.

In addition to this, the Center has a germplasm bank, unique in the area, which collects, stores and provides high quality genetic material to supply the needs of the countries.

To respond to the demands of countries that will be responsible for feeding 35 million people by the year 2000, and that will have to create a large number of jobs per country every year to maintain the increasing population, an institution such as CATIE is strongly needed if the continuity of efforts, toward increasing food production and protection of resources, is going to be provided.

To accomplish this, the Center needs increasing budget support in order to establish a permanent team of able professionals in the different areas and programs.

The Programs needing support are described below. The needed personnel and the corresponding budget are also indicated.

## BACKGROUND INFORMATION

The six countries of the Central American Isthmus confront increasing problems in the use of these resources as a consequence of their improper management.

Production of wood and other forest products is now at a critical point. While the demand for forest products increases every day, there is a significant decrease in the extent of natural forests. It has been calculated that for the Central American region from 300 to 350,000 hectares of natural forest are felled every year, while reforestation amounts to only a few thousand hectares, often with unsuitable species. The tremendous decrease in natural forest, both coniferous and broadleaved, is the result of the activities of the small farmer, because he is the main user of the marginal soils now under natural forest.

The inclusion of trees among annual and/or perennial crops or pasture (agro-silvo-pastoral systems) deserves special attention. Farmers have been using these systems for a long time. However, there is a need to quantify more precisely the advantages and disadvantages of the systems; to find out how to increase crop yield while maintaining or increasing soil productivity.

The countries of the isthmus have started forestry production and protection programs but they require adequate technical assistance for their efforts to be properly directed. There is also an increasing perception of the need to train personnel at different levels for the integration of forestry with animal and crop production.

The demand for training national personnel is high, and the national institutions need further support in their training activities at all levels to maintain their efforts in research and technology transfer towards providing the farmers with alternatives to improve their standard of living.

## STRATEGY

The Program seeks solutions to the forest problems of the countries which incorporate benefits for the great majority of producers. The Program uses an interdisciplinary approach through research projects on forest production with fast growing species; silvicultural systems to manage secondary forests; intensification of production in areas adequate for agricultural production; associations of various components including forests on soils with limitations on sustained production. Activities also include studies on the utilization of watersheds in areas where the resources have to be protected to ensure permanent use of more productive lands such as those dedicated to crops or livestock production.

Fast growing species and those little used at present are being studied for their productive capacity as well as their properties and industrial use.

Training is considered a fundamental tool to promote the methodologies developed in order to reach the target population. For this, a considerable number of professionals are being trained through the Program's staff to extrapolate and multiply the Center's efforts. Personnel from national institutions, who are involved in research, extension and education, are being trained through a Graduate Program and short-term training activities. Using different training methods, the target population will be increased in the future.

In response to the need for trained personnel and the demand from the countries, the Program offers courses at various levels including the graduate Program and intensive in-service training and short courses using the facilities of the Center and those of national institutions. The purpose is to strengthen the institutions' capacity to conduct their own research, to produce technologies for their areas, for transfer by their own personnel.

## MAIN LINES OF ACTION

### A. "AGROFORESTRY SYSTEMS"

#### Importance and Justification

Combinations of trees and annual crops or trees and pasture cover a considerable amount of land in the Central American region.

Preliminary research in Costa Rica indicates that there is growing use of certain forest species with coffee and cocoa and "jaul" (*Alnus acuminata*) in grazing areas of the highlands. There is abundant empirical experience on these associations (though variable, depending on the source of information) which has not been either evaluated or quantified scientifically.

It is assumed that the combination of trees with crops and/or pastures benefits the farmer by increasing the income per unit area, providing organic matter contributing to the recycling of nutrients, improving soil structure and the micro-climate, etc. It has been shown that the addition of the forest component has allowed the use of marginal land, of low productivity, thus increasing food production.

There exists a number of problems resulting from the interaction of crops, animals and trees that may be partially overcome by improving management. There is a very urgent need to study the most suitable techniques applicable to each system.

#### Objectives

- a.- To study and develop cropping systems capable of integrating forestry and agriculture as well as animals as a basis for the

proper management of tropical soils under sustained yield to the benefit of the small and medium-size farmers.

- b.- To study and evaluate agroforestry techniques traditionally used in some areas of the humid tropics in relation to ecological, economic and social aspects.
- c.- To identify potential areas for the production of firewood and charcoal within the countries of the Central American Isthmus, and to generate technology to increase sources of energy based on forest species.
- d.- To use the experience derived from research to train the personnel of the national institutions of the Isthmus.

### Methodology

In the initial stage the following steps are to be taken:

- 1.- Data gathering on agro-silvo-pastoral systems in use, to identify factors limiting the systems, and to test the factors under field conditions.
- 2.- Promotion in the countries of the use of successful systems.
- 3.- Measurement of survival of forest species, rate of growth, changes in soil properties, palatability of forest forage and the nutrient balance within the system.
- 4.- Exchange of knowledge with other international organizations presently working on agroforestry systems.
- 5.- Establishment of adequate mechanisms to disseminate satisfactory practices for the benefit of small farmers in Costa Rica as well as in the other countries of the Isthmus.

### B. "WOOD PRODUCTION"

#### Importance and Justification

Forest destruction within the Central American Isthmus is an accelerating process. Natural forests have supplied the basic needs of wood and wood products. The remnants are now located in areas of difficult access to the rural population.

Although there exists little information on production and consumption of firewood and charcoal (because the products do not reach the market where they could be registered), it is known that the increase in oil prices reduces the possibilities of the rural population to use fossil fuel energy. Consequently, the vast majority of this population reverts to firewood and charcoal obtained

on the farms for its sources of energy. This demand, added to the significant increase in population, increases the probability of eliminating the natural forest and consequently the source of energy for this part of the population.

On the other hand, the humid areas of Central America are suitable for the generation of forest products for local consumption and, eventually, for export. Background information shows that even though the mixed, heterogeneous forest of the humid areas is difficult to manage for sustained yield, the secondary forest behaves differently. Pine plantations, for instance, could produce 10 to 20 times more commercial timber/hectare/year than some natural forests as has been shown in Turrialba.

These points justify intensive research for the most suitable species to be planted in the area, and within it, the most suitable for different local conditions. There is also an urgent need for selected varieties, to supply the energy needs of the small and medium-size farmers. There is at present abundant demand for such species in numerous areas of the region, including areas where associations of trees with annual crops and pastures predominate.

#### Objectives

- a.- To evaluate the behaviour of fast growing species in selected plantations of the Central American Isthmus to study the limiting factors.
- b.- To produce reproductive material of varieties selected from species adapted to the ecological and socioeconomic conditions of the farmers.
- c.- To design techniques for the management of natural forest, especially the secondary forests.
- d.- To identify critical and potentially critical areas for firewood and charcoal production within the six countries of the Isthmus.
- e.- To identify and evaluate experiments and practices already existing in the region, related to firewood and charcoal production.
- f.- To develop methodologies to determine the energy consumption in rural communities.
- g.- To design technologies for a better forest fire control and of fire as a management tool.

#### Methodology

To reach these objectives, work in different fields is carried out simultaneously.

- 1.- Genetic improvement through establishment of experiments under varied ecological conditions; plus trees are selected for sources

of seed, and vegetative propagation is used. The most economic and biologically suitable systems for plantations are determined. Regimes for thinning and pruning of fast growing species are also studied.

- 2.- In critical areas, the mechanism of production and consumption of low cost energy are determined. Trends for the future are determined. Limitations either from the biological or socioeconomic points of view are studied. Parallel with this, an inventory of experiments with fast growing species is carried out.
- 3.- Information obtained constitutes the basis for the development of methodologies to determine energy consumption in rural communities. Research is done on the viability of establishing plantations of promising species in individual farms, community plantations and for the small rural industry.
- 4.- Experiments are carried out on management of natural forests, trying different types of openings to optimize production for continuous yield and considering the biological and socioeconomic factors found in the rural areas.
- 5.- New uses for wood and improvement of current use are being sought through different methods. Experiments are carried out to avoid destructive fires and to use fire as a management tool.
- 6.- Derived data will be transferred through different training activities and means of communication.

#### "WATERSHED AND WILDLAND MANAGEMENT"

##### Importance and Justification

Most of the forest felled every year is located on steep sloped areas, with high rainfall, infertile soils; poor sites in general. The productive potential of such areas is easily destroyed. These areas are generally protective watersheds on which the agricultural and livestock production of the region may depend, as does the continuity of water supply to lowlands and adjacent areas. Fishing in rivers, lakes and even along the coasts could be influenced by these watersheds. Their proper management is thus critical for all the rural population as well as for the urban. Small and medium-size farmers are also negatively influenced by the destruction of these forests and the ensuing consequences on the watershed.

The proper management of these watersheds should be based on the careful analysis of ecological, social and economic factors and must benefit the rural population in the short and long-run. This fact has been recognized by all the countries within the Central American Isthmus which are spending considerable efforts to obtain the rational use of watersheds and wildlands.

The lack of methodologies to plan properly the watersheds and wildlands is one of the recognized deficiencies. Linked to this, there is a lack of

trained personnel as well as of sufficient applied research for the development of appropriate management techniques.

Thus there is plenty of justification for more intensive action at the regional level, to design and evaluate methodologies and technologies, and to plan and implement management projects for watersheds and wildlands. The final and more important objectives should be to strengthen the actions of each country in better use of their resources.

#### Objectives

- a.- To help the countries to program the use of land that has limitations regarding agricultural and forestry production, by designing management systems offering the most advantages for the rural community.
- b.- To cooperate with the countries of the region to design a methodology for elaborating inventories to show the actual situation and the managerial ability to handle watershed and wildland systems, and to formulate a strategy for such management at the national and regional levels.
- c.- To design models and techniques for management based on research and to validate them in pilot projects under different socioeconomic and ecological conditions.
- d.- To promote better communication, documentation and regional cooperation for watershed and wildland management.

#### Methodology

The main strategy consists in the formation of interdisciplinary teams of personnel to plan and implement activities in the following areas:

- 1.- To design methodologies to conduct inventories and to develop a regional strategy for the management of watersheds and wildlands of importance for the rural development of the Central American Isthmus.
- 2.- To elaborate a strategy and a national plan to manage a system of watersheds and wildlands in each of the countries of the Isthmus.
- 3.- To select a group of watersheds and wildlands distributed within the countries and to establish basic research experiments.
- 4.- To determine the importance of the cloud forests on the water regimes of the watershed and the role of the forest cover on agroforestry and silvo-pastoral systems.
- 5.- To elaborate, apply and evaluate for each pilot project, management plans, technological packages and applied research.

- 6.- To carry out different training and education activities at the regional level for teachers and professionals and to promote communication, documentation and regional cooperation.
- 7.- To provide technical assistance to the countries in all the elements of the management process, planning, policies and legislation, education, etc.

## ACTIVITIES OF THE PROGRAM NEEDED SUPPORT

The strengthening of the Program necessary to carry out and fully implement its objectives and to achieve the goals within the main lines of action mentioned above, will concentrate on the following activities:

- a) research, jointly carried out with the countries, in the main lines of the Programs,
- b) support for research and extension personnel of the national institutions to carry out their own programs,
- c) support for research, training and technical cooperation activities presently carried out by CATIE's staff.

Support for these activities is needed to ensure that the national institutions will be able to implement their own programs in the future; to train their staff, following CATIE's philosophy, to identify and evaluate problems, to assign priorities in decision making, and to make sure resources and efforts will be directly channelled toward the development plans of each individual country. To do this, CATIE needs to increase the number of basic staff to provide the additional support needed to carry out cooperative activities among researchers and extension specialists, and to backstop projects related to CATIE's research objectives which are all to be based on a common goal, improving the living conditions of small farmers. Once the needed support is obtained, CATIE's position and credibility, gained by projecting its efforts toward the countries, by working with the staff of the national institutions, and with the farmers, will permit the Center to project further its influence and actions at the regional and national levels. The regional action of the Center will avoid overlapping of efforts among countries with the consequent saving of human and monetary resources, and will be independent of political fluctuations.

## JUSTIFICATION

The goals already achieved by the Program individually and by all CATIE's activities using a multidisciplinary approach regarding farming systems, should be considered as sufficient to justify the request for funding to support basic staff requirements.

Most of the research results obtained from the main lines of the Program will be applicable within the next five or ten years. It then becomes obvious that there is a need for adequate human and physical resources to guarantee stability of CATIE's projections, the validity of its research and the adjustment of the methodologies developed, as well as to provide permanent assistance to the national staff of the countries.

There is an obvious need to learn more about Natural Resources systems; on their role in the farm and ways to increase efficiency in the use of management practices and inputs. This has to be done if we are going to protect our environment from destruction, and if we are going to strengthen the economy of the countries with the use of high value agricultural products, and if we are going to help in energy requirements.

Activities carried out through the Program enable CATIE to produce suitable alternatives for the region through extrapolating research results from one site to other similar areas, avoiding then the duplication and waste of efforts and other limited resources, by providing proper coordination among researcher and extension agents of the different national institutions.

The projection given to the Center through its innovative approach to development, applied during the last few years, has created an increasing demand on the services of the present personnel. The support provided by the Governments of the area constitutes an honor for the Center, but also an additional challenge and responsibility for the institution.

It is the intention of the Program, as well as that of CATIE in general, not to stretch its existent manpower beyond the point of reasonable efficiency. To further extend activities and to better support present operations, the Program and the whole Center must have solid support of a highly qualified staff. Additional and stable budget support is needed to achieve the required staff, acquire the needed equipment and obtain research inputs.

#### HUMAN RESOURCES NEEDED

To continue efforts already initiated, there is a need for the Senior Staff presented in Table 1. This staff will consist of high level professionals in the various disciplines of Natural Renewable Resources.

The staff will be located at Turrialba headquarters and will cooperate more closely with the national institutions; a considerable number will be located in each country.

The total number of required personnel has been strategically distributed over the years to respond strictly to activities having priority and to complement the actual staff of CATIE and that of the national institutions. To determine the needs, both CATIE's personnel and national staff were considered.

Requirements for the first year call for a Silviculturist and a Specialist in Watershed Management, who will coordinate and support the

activities of the Specialist in Wildland Management and will reinforce this line of research within the Program. CATIE will be asked to support, in the next five years, several watershed and wildland management projects, some of which have already started. The Silviculturist will principally carry out applied research on fast-growing species, useful for the small farmers, especially regarding production of firewood, forage, and construction material.

The second year will require the services of a Specialist in Land Use and Soil Conservation, a Specialist in Agroforestry, a researcher in Watershed Management, a Specialist in energy problems (firewood production) and a Forestry Geneticist. The idea is to reinforce areas where the national institutions show most deficiencies. A Training Coordinator will also be required. Most Program activities, even those directly related to research, imply some training actions. Added to this, the Program carries out teaching at the Graduate level as well as through short courses, seminars, workshops, and in-service training at headquarters and in the countries. These specialists will complement the personnel of the Program and will help in the long-term projection of the activities in their respective fields.

Plans for the third year contemplate the addition of a Specialist in Forest Protection. Thousands of hectares of valuable forests are lost annually because of fires, insects and diseases. These losses could be avoided if planning is done in advance to take preventive measures. At the present time, there is only one specialist in this field in Central America.

The growing need for Information and Documentation regarding natural renewable resources in tropical America, in general, and particularly in the Central American Isthmus, which will result in avoiding duplication of efforts, necessitates the addition of a Specialist in this field.

These positions, representing the required permanent staff for the Program, will be necessary to conduct research, training and technical assistance according to the projected and increasing needs of the countries.

Junior staff, as well as general support personnel for research and training to increase the efficiency of the Senior Program Staff, is included in the proposal. Funds are also requested to cover operational costs, since that part of the present costs are being covered by special projects.

#### REQUIRED BUDGET

A three-year budget has been prepared to indicate the projection proposed for this period which will be necessary to meet the personnel requirements to cope properly with present and future demands for CATIE's assistance.

In Tables 1-7, the total and additional budgets needed by the Program are shown. Personnel, material and equipment are also included. The Tables also show an analysis of the present and proposed budgets for three years.

Table 1 indicates the total Program Senior Staff and additional staff funding required. There are 7 required for the first year (2 additional) and 15 for the third year, representing 10 new positions. All personnel costs include benefits and allowances, as well as social security costs.

Table 2 shows personnel costs, support personnel costs, as well as other support costs.

The total contribution requested for the first year amounts to US\$247,900; and for the three-year period, it comes to US\$1,472,200 (Table 3).

The proposed situation (Table 4), regarding the percentage of the total Program resources, represents a change from 12 to 21 percent for the first year.

Regarding the impact of the additional resources on the total income for the first year (Table 7), it only represents two percent.

**TABLE Nº 1. CATIE, NATURAL RENEWABLE RESOURCES PROGRAM. REQUIRED BASIC PROFESSIONAL STAFF AND COSTS FOR THE NEXT THREE YEARS.**

(THOUSANDS OF 1980 US DOLLARS)

POSITION	Academic Level	First Year	Second Year	Third Year	Total
1. Program Head	PhD.	41.0	44.0	46.0	131.0
2. Silviculturist (specialist in forest soils)	PhD.	34.0	38.0	40.0	112.0
3. Specialist in wildland management	M.S.	34.0	38.0	40.0	112.0
4. Silviculturist (management of primary and secondary forest)	PhD.	34.0	38.0	40.0	112.0
5. Associate researcher in agroforestry	M.S.	25.0	36.0	38.0	99.0
6. Specialist in watershed management	PhD/M.S.	38.0	40.0	42.0	120.0
7. Silviculturist (fast-growing species)	M.S.	27.0	38.0	40.0	105.0
8. Specialist in land use and soil conservation	PhD./M.S.		45.0	38.0	83.0
9. Training Coordinator	M.S.		45.0	38.0	83.0
10. Research assistant in agroforestry	M.S.		43.0	36.0	79.0
11. Research assistant in watershed management	M.S.		43.0	36.0	79.0
12. Specialist in energy problems (firewood)	PhD.		45.0	38.0	83.0
13. Forestry geneticist	M.S.		43.0	36.0	79.0
14. Specialist in forest protection	M.S.			45.0	45.0
15. Documentalist in forestry	PhD/M.S.			45.0	45.0
ADDITIONAL FUNDING REQUIRED		(65.0)	(342.0)	(394.0)	(801.0)
TOTAL BASIC PROFESSIONAL STAFF COSTS		233.0	536.0	598.0	1.367.0
TOTAL SENIOR STAFF POSITIONS		7	13	15	

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TABLE N<sup>o</sup> 2. CATIE, NATURAL RENEWABLE RESOURCES PROGRAM. SUPPORTING COST OF BASIC PROFESSIONAL STAFF, FOR THE NEXT THREE YEARS.

(THOUSANDS OF 1980 US DOLLARS)

Description	First Year	Second Year	Third Year	Total
PERSONNEL	103.8	143.6	210.4	457.8
TRAVEL AND PERDIEM COSTS	46.9	42.0	48.0	136.9
EQUIPMENT AND COMMODITIES	41.5	48.0	41.0	130.5
COMMUNICATION COSTS	21.8	22.0	26.3	70.1
MAINTENANCE & OPERATION COSTS	22.7	30.1	39.1	99.9
SPECIFIC INPUTS	13.0	21.0	33.0	67.0
ADMINISTRATIVE AND LOGISTIC SUPPORT	20.0	30.0	40.0	90.0
GENERAL COSTS	6.0	--	--	6.0
TOTAL STAFF SUPPORT COSTS	275.7	336.7	437.8	1.050.2

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TABLE N<sup>o</sup> 3. CATIE, NATURAL RENEWABLE RESOURCES PROGRAM. SUMMARY OF PROJECTED BASIC COSTS, BY CATEGORY AND SOURCE, FOR THE NEXT THREE YEARS.

(THOUSANDS OF 1980 US DOLLARS)

Description	First Year	Second Year	Third Year	Total
BREAKDOWN BY CATEGORY				
1. Senior staff costs	233.0	536.0	598.0	1.367.0
2. Staff support costs	275.7	336.7	437.8	1.050.2
TOTAL	508.7	872.7	1.035.8	2.417.2
BREAKDOWN BY SOURCE				
1. CATIE available resources	260.8	312.9	371.3	945.0
2. Additional resources required	247.9	559.8	664.5	1.472.2
TOTAL	508.7	872.7	1.035.8	2.417.2

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**TABLE Nº 4. CATIE, NATURAL RENEWABLE RESOURCES PROGRAM. TOTAL PROGRAM RESOURCES; PRESENT AND PROPOSED SITUATIONS, FOR THE NEXT THREE YEARS.**

(THOUSANDS OF 1980 US DOLLARS)

DESCRIPTION	First Year		Second Year		Third Year		Total	
	US\$000	%	US\$000	%	US\$000	%	US\$000	%
<b>PRESENT SITUATION</b>								
1. Basic activities-CATIE resources	260.8	12	312.9	12	371.3	12	945.0	12
2. Contracts and specific agreements	1.886.6	88	2.248.5	88	2.666.8	88	6.741.9	88
<b>TOTAL</b>	<b>2.147.4</b>	<b>100</b>	<b>2.561.4</b>	<b>100</b>	<b>3.038.1</b>	<b>100</b>	<b>7.686.9</b>	<b>100</b>
<b>PROPOSED SITUATION</b>								
1. Basic activities-CATIE+additional	508.7	21	872.7	28	1.035.8	28	2.417.2	26
2. Contracts and specific agreements	1.886.6	79	2.248.5	72	2.666.8	72	6.801.9	74
<b>TOTAL</b>	<b>2.395.3</b>	<b>100</b>	<b>3.121.2</b>	<b>100</b>	<b>3.702.6</b>	<b>100</b>	<b>9.219.1</b>	<b>100</b>

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**TABLE Nº 5. CATIE, NATURAL RENEWABLE RESOURCES PROGRAM. RELATIONSHIP BETWEEN BASIC RESOURCES AND FUNDING FROM SPECIAL PROJECTS; PRESENT AND PROPOSED.**

(THOUSANDS OF 1980 US DOLLARS)

Description	PRESENT		PROPOSED	
	US\$000	%	US\$000	%
1. Gross basic income	2.897.6	29	3.145.5	30
2. Contracts and agreements	7.170.7	71	7.170.7	70
<b>TOTAL</b>	<b>1.068.3</b>	<b>100</b>	<b>10.316.2</b>	<b>100</b>

**TABLE N<sup>o</sup> 6. CATIE, NATURAL RENEWABLE RESOURCES PROGRAM. REQUESTED ADDITIONAL FUNDING EXPRESSED AS A PERCENTAGE OF TOTAL BASIC BUDGET FOR 1980.**

(THOUSANDS OF 1980 US DOLLARS)

Description	US\$000	%
1. CATIE available gross basic income	2.897.6	92
2. Additional Program resources required	247.9	8
<b>TOTAL</b>	<b>3.145.5</b>	<b>100</b>

**TABLE N<sup>o</sup> 7. CATIE, NATURAL RENEWABLE RESOURCES PROGRAM. REQUESTED ADDITIONAL FUNDING EXPRESSED AS A PERCENTAGE OF CATIE'S TOTAL BUDGET for 1980.**

(THOUSANDS OF 1980 US DOLLARS)

Description	US\$000	%
1. CATIE total 1980 available income	10.068.3	98
2. Additional Program resources required	247.9	2
<b>TOTAL</b>	<b>10.316.2</b>	<b>100</b>

TABLE N<sup>o</sup> 8 . CATIE, GLOBAL BUDGET SUMMARY 1980.

(THOUSANDS OF 1980 US DOLLARS)

Description	US\$000
1. Direction	101.7
2. Technical Coordination	155.3
3. Programs	
3.1 Annual Crops	2.704.8
3.2 Perennial Plants	516.8
3.3 Animal Production	2.129.3
3.4 Natural Renewable Resources	2.147.4
4. Technical support units	916.8
5. Administration and services	593.4
6. Farm operations	371.8
7. General costs	431.0
<b>TOTAL</b>	<b>10.068.3</b>