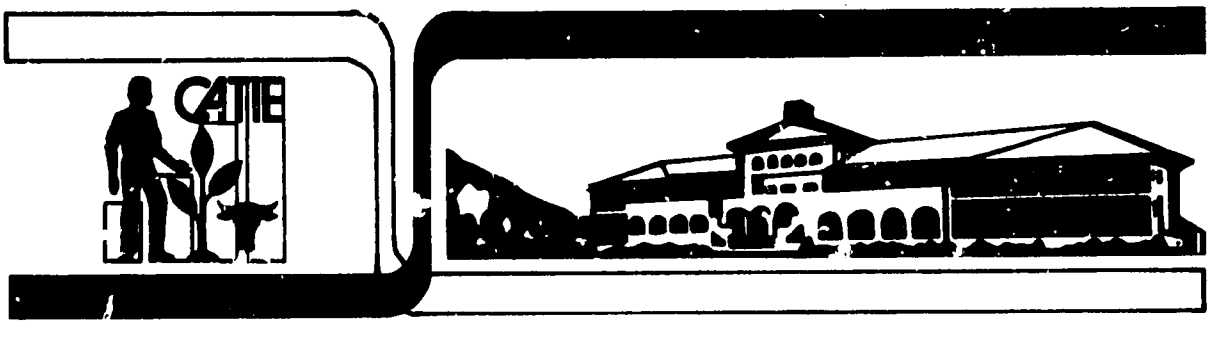
CATIE

TROPICAL AGRICULTURAL RESEARCH AND TRAINING CENTER

STRATEGIES FOR A JOINT EFFORT

to help small farmers of
the Central American Isthmus
to increase agricultural production.



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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 CATIE'S PROGRAMS

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 Center has the privilege of having the basic areas of production, Animal Production, Annual Crops, Perennial Plants, and Natural Renewable Resources, to carry out research, training and technical cooperation activities to benefit small farmers. CATIE's Programs have a regional projection, use a common methodology and have the same goals. They work on a number of research lines to solve major production problems.

Development of Crops, Animal, Perennial Plants, and Agroforestry systems are the main targets. Work on methodologies to parameterize areas to allow for extrapolation of results is also done. Natural resources are considered from the micro-level point of view by studying fast-growing species adapted to the area as well as regarding agroforestry systems.

From the macro-level, watershed management is considered on a regional basis. Milk, beef, dual animal production systems and small animals are also target subjects.

Training and technical assistance, on both a long and short-term basis, are implemented by all the Programs.

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 Programs needing support:

The strengthening of the Programs, necessary to carry out and fully implement their objectives and to achieve the goals within their 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 Programs.

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 increassing 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 57 by the third year, of which 21 will be financed by CATIE's budget and 36 will require extra funding.

The total contribution requested comes to US$7,631.900. The additional resources impact on the total income for the first year represents an eight 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 poeple 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 per cent 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 national

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 activitites.

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 strengthening 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 CATIE'S PROGRAMS

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 extablish 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.

THE PROGRAMS:

ANNUAL CROPS

The food deficit in the Central American Isthmus has posed the challenge of increasing land productivity as well as incorporating new land into production. About 75 percent of the food production of the area is in hands of farmers located on holdings of less than 35 hectares and a large proportion of basic grains are produced in multi-species crop associations. The Annual Crops Program is concentrating its efforts on improving traditional cropping systems in accordance with the socioeconomic conditions of the small farmer by using an interdisciplinary approach, and by working on farmers' land in all the countries of the Isthmus.

From the biological point of view, research is directed toward the measurement of crop response to controllable and uncontrollable factors. Adaptation of species and varieties to environmental conditions, management, and soils as well as to different cropping systems is determined and alternatives are generated and made available to the farmers. Socioeconomic factors influencing the existence, permanence and adoption of cropping systems are considered, and factors limiting production and adoption of technologies that could increase production are defined.

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 toward providing the farmers with alternatives to improve their standard of living.

MAIN LINES OF ACTION

A) "Development and improvement of cropping systems for small farmers in specific environments"

Importance and justification

Approximately 94 percent of the farms in Central America are under 35 hectares. These farms produce about 70 percent of the total food consumed in the area. Small farms occupy much of the land used for food crops. These crops are grown using a technology that requires little capital, which is normally unavailable. Most of the farm activities are dependent on family labor, chemicals and machinery are seldom used, and production systems are based on low energy consumption and on a very efficient use of this energy.

These farmers are normally located far from important markets and their farms have poor soils or have some important limiting factors to production. In many instances, the climatic conditions create a high-risk environment for crop production. Because of these factors, the use of higher technology is less suitable than the technology presently used by the farmers. The systems used by the farmer must be identified to be able to improve or to produce alternatives. The con-

ditions under which small farmers produce food crops, their crop production systems and their management practices are beginning to be understood. Their production systems, however, include a number of complex interrelations. Because of this complexity, a systems methodology must be developed.

Appropriate low cost and low risk technology which allows the farmer to more efficiently use his scarce resources and increase his income must be generated. The capacity to do cropping systems research in the countries is also necessary as one step toward the regionalization of agricultural research.

B) "Development of methodologies to increase the geographic area for which cropping systems alternatives can be recommended"

Importance and justification

One characteristic of agriculture is its dependence on climate, soils, and socioeconomic conditions. While marketing is also a factor affecting the type of crops chosen by the farmers, small farmers have little influence on market decisions.

The environmental variability within the Central American countries impairs the progress of agriculture in that it makes it difficult to extrapolate results between geographic areas. Site-specific research and experimentation is necessary; however, the results of this type of research can not be directly transferred to other areas.

To increase the geographic impact of agricultural research a better knowledge of the environments of Central America and of the response of different cropping systems to these environments is necessary. This requires the gathering and organization of all available information for each area within the region. Climatic and soil information and its agricultural implications is one of the first needs. This knowledge can be used to determine representativity of specific sites and will allow the selection of agriculturally important areas within the region. All this information will allow the objective selection of research sites.

Climatic data from the six countries is currently available; however, some of the data is unreliable. Most of this information was gathered for statistical purposes and has not yet been analyzed to determine its usefulness for agricultural purposes. Good information on soil classification is available for El Salvador, Nicaragua, and Honduras. Data are also available on chemical soil properties although correlation with crop response has not been determined.

C) "Analysis of cropping systems behavior and their response to environment and management factors"

Importance and justification

In order to generate and transfer cropping systems recommendations between geographic areas, the environment, the system, and the environment-systems relationship must be understood. Only fragmentary information is presently available regarding climatology, soils and ecology. Some data are available from experiments where crop response was measured as management factors were changed.

In designing new cropping systems, it is necessary to find out how the system behaves in a specific environment and how the system responds to the combined or individual effect of a factor or group of factors.

The purpose of this line of research is to develop the ability to design cropping systems management practices for environments whose physical and biotic characteristics are known. Since it is not possible to test all possible cropping systems and management in combination with every climate and soil, some guiding principles and relationship between environmental factors and systems response are necessary. These principles will permit inferences about systems not previously tried in the area and increase the likelihood of adoption by farmers.

ANIMAL PRODUCTION

In the tropics, where plant proteins are lacking some essential aminoacids, animal protein, because of its high biological value, should be an important component of the human diet. However, in developing countries, animal protein is not a significant component of the daily diet and although animals are grown on small and medium-size farms, the available technology for increasing their production is not within reach because it has been developed under a different framework.

The emphasis of CATIE on livestock research, especially from the viewpoint of milk production, is based on the fact that 80 percent of small and medium-size farms hold 60.7 percent of the bovine population in Central America. The available resources on farms which can be used most by animals are high in fiber, low in protein content, and unsuitable for human consumption. Better utilization of these resources could increase milk production and contribute to an improved diet of rural families.

Considering the aforementioned situation, the Program intensifies research to determine practical production systems which, within the tropical environment, more efficiently utilize the available resources of small and medium-size farms, thus increasing animal production and productivity.

Small ruminants, swine and poultry are also important components of the small farm. However, their contribution to the overall enterprise has not yet been determined. The energetic and protein requirements of these species should be studied, as well as their genetic potential, and proper management has to be established so as to be included as a productive component in the whole farming system.

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 toward providing the farmers with alternatives to improve their standard of living.

MAIN LINES OF ACTION

a) "Development of specialized milk production systems"

Importance and justification

The Central American region continues to experience a high increase in rate of population growth; consequently, there is an increasing need for milk and dairy products which calls for frequent and abundant importations of these products. This occurs in spite of the exceptional ecological conditions for milk production existing in many areas of the region. Parallel to this, the demand for agricultural land is constantly increasing.

Regional studies indicate that from 25 to 65 percent of the milk produced in the area comes from small farms (less than 35 hectares), and results of case studies in the area show the importance of the animal component in the farm picture. Sampled farms have from 30 to 50 percent of the land in permanent pasture, and livestock produce 10 to 17 percent of the family income.

However, though there is a deficiency in the region, investigation in milk production has not received special attention within the research programs of the area.

Because the Central American countries, importers of milk and dairy products, have rapid demographic growth, and consequently an ever increasing demand for dairy products, and because of the need to improve the small farmers' living conditions, there is plenty justification for a research program and the application of research results in milk production systems for small farmers.

B) "Development of beef production systems"

Importance and justification

Beef production in the Central American Isthmus plays a very important role in the economy of the countries. However, this type of production has been linked to extensive systems, low in productivity.

One of the most important problems affecting beef production in tropical areas is the extreme seasonal variation in forage production. As forage is the basis for livestock feeding in the area, the results are low growth rates and poor fertility.

The use of by-products, such as molasses and culled bananas, as well as intensifying the use of the most abundant resource, grass, could result important improvements in beef production. Some of the practical results obtained show the additive effect of using molasses with grazing, providing increases of 30 percent over grazing alone. When grass availability decreases.

C) "Development of dual purpose production systems"

Importance and justification

Depending on the farm, most or all the potentially nutritional resources for livestock are high in fiber and low in protein. Of the domestic species the ruminant is the best suited to utilize fiber and to accept non-protein nitrogen as feed source to be transformed into protein of high biological value, apt for human consumption.

Bovines are found in most of the small and medium-size forms in the Central American Isthmus and a large part of the total population is small farms. These farmers generally obtain milk from the cows even if they are not strictly of the dairy type. Milk is generally consumed on the farm where it is produced and consequently could be used directly in improving the diet of the rural family.

Research on animal production in the past has focussed on developing technologies to improve either milk or beef production. However some of these technologies are associated with high management requirements and high use of inputs, frequently out of reach of the small farmer. Consequently he has not benefited from such technology.

D) "Development of small animals production systems for small farmers"

Importance and justification

Small animals constitute an important and ever present element within the small farm. Their main role is to provide for the family diet, but they also play an economic role within the farm. According to statistics of the area, about 98 percent of the swine of the area is produced in family type exploitations, as well as 75 percent of the poultry and 100 percent of the bovines and caprines. The way they are managed results in very low yields providing an inefficient use of the feed resources produced on the farm.

The competition with humans for food and the scarce availability of it are reasons for the limited production of these species in some of the

countries. This is also responsible for the decreasing numbers in other countries, such as in the case of sheep in Guatemala. Commercial poultry and swine production use high technology in contrast to that used by the small farmers. The extrapolation of technology has often failed because of the different socio-economic conditions surrounding small farmers.

To increase production of small animals, the development of the adequate technology, adapted to the environment and to the needs of the farmers is a must. Such technology will result in increasing production to supply the family consumption as well as to produce an excess to be sold in the local markets. It should be noted that research on these lines has been negligible or non-existant in tropical countries.

PERENNIAL PLANTS

Perennial plants constitute an important part of the production systems used in the countries of the Isthmus and are a reliable source of income for small farmers. In many cases perennial plants are the main crop, in others they are part of the production system. The most frequent perennial plants are: coffee, cocoa, sugarcane, peach palm, fruit trees, and some forest species. The latter in agroforestry systems provide shade, animal feed, fence posts, construction materials and at the same time serves as an energy source for the small farmer.

Although very little information about the role of perennials within the farm is available, it is known that in certain areas they achieve vital importance and have very diverse uses. It is common to find on small farms the association of perennial and semi-perennial and annual crops, such as in the case of a forest species with coffee or cocoa, plaintain, or an annual crop. This provides initial shade and protection as well as cash income from the annual crop grown during the establishment of the cocoa or coffee. Later on, the forest species will provide the permanent shade.

Even though these systems are common in the area, there is no information available on agroforestry or other systems, which will make possible to evaluate the contribution of the perennial species to the production system. Also, relatively little is known of the role perennials play in general, in the farming systems and economy of small farmers.

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

MAIN LINES OF ACTION

A) Development of cocoa production systems

Importance and justification

Cocoa production is a very important component in the agricultural base of the Central American Isthmus. The area devoted to the crop varies according to the country; in Costa Rica there are about 27,000 hectares of cocoa while in Nicaragua, Panamá, and Guatemala, as reported in 1973, the range is from 2-3000 hectares. In Honduras cocoa production is a relatively new enterprise and presently only 800 hectares are under production.

Information available in Costa Rica indicates that most of the production is in the hands of small farmers. A number of factors affect the productivity of small farmers. Among them, diseases, low genetic potential and poor management of the crop, are the most important in affecting production. In addition, an uncertain market has also contributed to low yields.

The most important needs are therefore, a search for resistant, early maturing, and high yielding genetic material; improvement of management practices, ranging from fast and economic establishment methods and plantation renewal to processing of the final product.

Because cocoa is a crop needing shade all the time, it is necessary to research mixed cropping systems with species that, besides providing shade and nutrients to the soil, will result in food, fruits, wood for different uses, and in the general improvement of the small farmers' economy.

B) Coffee production systems

Importance and justification

Coffee represents a large and significant proportion of all exports in El Salvador, Guatemala, Costa Rica, Honduras, Panamá and Mexico and utilizes 35 percent of the available hand labor. Consequently, coffee production plays a decisive role in the above-mentioned countries. There exists however, large differences in yields among the different countries mainly because of differences in the level of technology applied, the management of the systems used for shading, and in the use of some of the inputs.

To improve the value and productivity of this crop it is necessary to improve yields through better management practices and efficient disease control. One of the most important diseases is coffee rust (Hemileia vastatrix). In November 1976, Hemileia appeared in Nicaragua, menacing, consequently, the whole Central American region, since most of the plantations are based on genetic material susceptible to the rust. The demage that this disease could cause could have very negative effects on the economy of particular countries, as well as on the region. In the last few years, adequate technology for product-

ion has been developed that, if used, could help to diminish the effect of coffee rust and of Hypothenemus hampei, another important problem, also present in the area.

The countries of the Central American Isthmus and Mexico with the cooperation of the Inter-American Institute of Agricultural Sciences (IICA), "Organismo Internacional Regional de Sanidad Agropecuaria" (OIRSA), and CATIE, created a program (PROMECAFE) with the aim of studying the situation in each of the producing areas in order to develop the necessary technology, as well as the new varieties with high yielding and rust resistance characteristics, which are needed to improve production. CATIE plays a pivotal role in this program.

C) Multiple Cropping Perennial Plants Systems

Importance and justification

Systems of mixed perennial plants help to protect soil from erosion and provide shade for other crops, and animals grazing in the area. They also contribute to the energy supply through firewood, charcoal,and some of the trees included in the systems can be used for wild and domestic animal feed. They can also be used as a source of food for man others will produce fine woods for different uses.

Very little is known about these systems even though they have been traditionally used in cocoa and coffee production systems. Cocoa and coffee plantations are established agricultural systems and most times combine one or more shade producing tree species. Some species of Erythina and Inga are commonly used as permanent shade for cocoa and coffee; however, very little information is available on the use of perennial crops in conjuction with cacao or coffee and their specific economic contribution.

A preliminary study of the prevalent systems indicates that there are several combinations presently used and that there exist several possibilities for different combinations with perennial plants, annual crops and forestry species. These systems, besides providing cash income, will protect the soil and watersheds, resulting in a more rational use of the natural resources.

NATURAL RENEWABLE RESOURCES

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 de-

crease 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 (agrosilvo-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 farmer with technologies to improve the use and conservation of the natural resources.

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.

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 possibilites of the rural population to use fossil fuel energy. Consequently, the vast majority of this population reverts to firewood and charcoal obtained on the farm 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 substained 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.

C) "Watershed and wildland management"

Importance and justification

Most of the forest felled every year are located in steep slope 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 benefi the rural population in the short and long-term. 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 deficiences. 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 objective should be to strengthen the actions of each country in better use of their resources.

STRATEGY OF THE PROGRAMS

A common set of goals require a single type of action. The goal to help small farmers -the action:

a) work through a highly trained multidisciplinary team,

b) involve the farmer at the implementation level,

c) work at the farm level, within its constraints,

d) with a regional scope,

e) work in close cooperation with staff of the national institutions,

f) to develop technologies, to train personnel and to help transfer adequate technologies.

METHODOLOGY

Although in different biological and geographical areas, all the Programs carry out their work to accomplish their goals through:

a) initial surveys to learn about systems used by the farmers, and limiting factors affecting production,

b) diagnosis of the situation in each specific area,

c) design of alternatives based on survey and diagnosis,

d) validation of the alternatives designed at the farm level, with the farmer and staff of the national institutions cooperating,

e) extrapolation to other areas of similar biological and socio-economic characteristics.

This methodology implies the participation of the staff of the national institutions from the planning stages. The idea is to transfer technologies as well as methodologies, the latter being needed for the continuation of actions aimed at developing their own rural communities.

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 toward providing the farmerswith alternatives to improve their standard of living.

ACTIVITIES OF THE PROGRAMS NEEDING SUPPORT

The strengthening of the Programs, necessary to carry out and fully implement their 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, on 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 channeled 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 the 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 Programs 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 for the main lines of the Programs 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 annual Crops, Perennial Plants Natural Resources and Animal Production systems; 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 to cope with the challenge of doubling food amplies before the end of this decade, 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 such as coffee, cocoa and fruits.

Activities carried out through the Programs 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.

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.

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 Programs as well as that of CATIE's 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 Programs and the whole Center must have the solid support of a highly qualified staff. Additional and stable budget support is needed to hire 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 the Programs.

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

The total number of 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.

The personnel listed with their corresponding specialty in Tables 1-4 of the Appendix is the ideal number needed to accomplish the common goal of the national institutions and CATIE to improve the small farmer's way of life.

The specialists requested will complement the personnel of the Programs, and will also interpret the needs of the countries and help in the long-term projection of the activities in their respective fields.

These positions requested represent the permanent staff which will be necessary to conduct research and to provide 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.

Costs pertaining infrastructure, such as office remodeling and small working facilities, are also included.

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.

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

Table 1 indicates total staff needs. There are 33 specialists required for the first year. Of these 33, 21 are staff already financed by CATIE's budget and 12 additional staff members will require extra funding. The number of personnel will reach a total of 57 by the third year, of which 21 will be financed by CATIE's budget and 36 will require extra funding.

Tables 1-4 of the Appendix show total and additional staff funding required by the Programs.

The total contribution requested for the first year amounts to US$1,953,500; and for the three-year period, it comes to US$7,631,900 (Table 4).

The proposed situation (Table 5), regarding the percentage of the total Programs resources, represents a change from 16 to 33 percent for the first year. Regarding the impact of the additional resources on the total income for the first year (Table 8), it represents 16 percent.

TABLE Nº 1. CATIE, TOTAL BASIC PROFESSIONAL STAFF AND COSTS FOR THE NEXT THREE YEARS.

(THOUSANDS OF 1980 US DOLLARS)

PROGRAMS	FIRST YEAR		SECOND YEAR		THIRD YEAR		TOTAL	
	Number of Positions	Cost	Number of Positions	Cost	Number of Positions	Cost	Number of Positions	Cost
1. ANNUAL CROPS	11	377.0	15	605.0	17	689.0	17	1.671.0
2. ANIMAL PRODUCTION	9	345.0	14	576.0	14	608.0	14	1.529.0
3. NATURAL RENEW. RES.	7	233.0	13	536.0	15	598.0	15	1.367.0
4. PERENNIAL PLANTS	6	183.6	9	298.5	11	395.0	11	877.1
TOTAL	33	1.138.6	51	2.015.5	57	2.290.0	57	5.444.1

TABLE NR 2. CATIE, SUPPORTING COSTS OF BASIC PROFESSIONAL STAFF, FOR THE NEXT THREE YEARS.

(THOUSANDS OF 1980 US DOLLARS)

YEAR	US$
1. FIRST	2.007.0
2. SECOND	2.092.3
3. THIRD	2.255.9
TOTAL	6.355.2

TABLE Nº 3. CATIE, SUMMARY OF REQUIRED BASIC PROFESSIONAL STAFF AND SUPPORTING COSTS FOR THE NEXT THREE YEARS.

(THOUSANDS OF 1980 US DOLLARS)

Description	First Year	Second Year	Third Year	Total
1. Professional staff	1.138.6	2.015.5	2.290.0	5.444.1
2. Supporting costs				
.1. Personnel	683.1	941.9	1.120.4	2.745.4
.2. Travel and Perdiem costs	172.5	216.0	231.9	620.4
.3. Equipment and commodities	374.5	217.7	113.8	678.9
.4. Communication costs	71.2	79.0	89.8	240.0
.5. Maintenance and operation costs	153.5	104.6	118.1	376.2
.6. Specific inputs	148.9	175.2	209.5	533.6
.7. Administrative and logistic support	296.4	328.9	362.4	987.7
.8. General cost	134.0	29.0	10.0	173.0
TOTAL COSTS	3.145.6	4.107.8	4.545.9	11.799.3

TABLE Nº 4. CATIE, 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	1.138.6	2.015.5	2.290.0	5.444.1
2. Staff support costs	2.007.0	2.092.3	2.255.9	6.355.2
TOTAL	3.145.6	4.107.8	4.545.9	11.799.3
BREAKDOWN BY SOURCE				
1. CATIE available resources	1.192.1	1.378.8	1.593.5	4.164.4
2. Additional resources required	1.953.5	2.729.0	2.949.4	7.634.9
TOTAL	3.145.6	4.107.8	4.545.9	11.799.3

TABLE Nº 5. CATIE, TOTAL RESOURCES; PRESENT AND PROPOSED SITUATION.

(THOUSANDS OF 1980 US DOLLARS)

Description	First Year		Second Year		Third Year		Total	
	US$000	%	US$000	%	US$000	%	US$000	%
PRESENT SITUATION								
1. Basic activities-CATIE resources	1.192.1	16	1.378.8	16	1.593.5	16	4.164.4	16
2. Contracts and specific agreements	6.306.2	84	7.173.3	84	8.257.1	84	21.736.6	84
TOTAL	7.498.3	100	8.552.1	100	9.850.6	100	25.907.0	100
PROPOSED SITUATION								
1. Basic activities-CATIE+Additional	3.145.6	33	4.107.8	36	4.545.9	36	11.799.3	35
2. Contracts and specific agreements	6.306.2	67	7.173.3	64	8.257.1	64	21.736.6	65
TOTAL	9.451.8	100	11.281.1	100	12.803.0	100	33.535.9	100

TABLE Nº 6. CATIE, RELATIONSHIP BETWEEN BASIC RESOURCES AND FUNDING FROM SPECIAL PROJECTS, PRESENT AND PROPOSED FOR 1980.

(THOUSANDS OF 1980 US DOLLARS)

Description	PRESENT		PROPOSED	
	US$000	%	US$000	%
1. Gross basic income	2.897.6	29	4.851.1	40
2. Contracts and agreements	7.170.7	71	7.170.7	60
TOTAL	10.068.3	100	12.021.8	100

TABLE Nº 7. CATIE, 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	60
2. Additional resources required	1.953.5	40
TOTAL	4.851.1	100

TABLE Nº 8. CATIE, 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 available income	10.068.3	84
2. Additional resources required	1.953.5	16
TOTAL	12.021.8	100

TABLE Nº 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
TOTAL	10.068.3

TABLE Nª 9. 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
TOTAL	10.068.3

TABLE Nº 1. CATIE, ANNUAL CROPS PROGRAM. REQUIRED BASIC PROFFESIONAL 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. Plant Physiologist	PhD.	35.0	37.0	39.0	111.0
3. Plant Pathologist	PhD.	38.0	41.0	43.0	122.0
4. Cropping Systems Specialist	PhD.	36.0	38.0	40.0	114.0
5. Crop Systems Breeder	PhD.	38.0	40.0	42.0	120.0
6. Associate Plant Breeder	M.S.	36.0	39.0	41.0.	116.0
7. Soil Management Specialist	PhD.	37.0	40.0	42.0	119.0
8. Horticulturist	PhD.	34.0	38.0	40.0	112.0
9. Crop Production Specialist	PhD.	30.0	38.0	40.0	108.0
10. Crops Systems Specialist	PhD.	27.0	38.0	40.0	105.0
11. Farm Management Specialist	M.S.	25.0	36.0	38.0	99.0
12. Soil Fertility Specialist	PhD.		45.0	38.0	83.0
13. Associate Training Officer	M.S.		43.0	36.0	79.0
14. Agronomist	M.S.		43.0	36.0	79.0
15. Plant Protection Specialist	PhD.		45.0	38.0	83.0
16. Agricultural Economist	PhD/M.S.			45.0	45.0
17. Crop Physiologist	PhD.			45.0	45.0
ADDITIONAL FUNDING REQUIRED		(116.0)	(326.0)	(396.0)	(838.0)
TOTAL BASIC PROFESSIONAL STAFF COSTS		377.0	605.0	689.0	1.671.0
TOTAL SENIOR STAFF POSITIONS		11	15	17	

TABLE Nº 1. CATIE, ANIMAL PRODUCTION 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.	44.0	47.0	50.0	141.0
2. Animal Breeder	PhD.	41.0	44.0	47.0	132.0
3. Animal Nutritionist	PhD.	41.0	44.0	47.0	132.0
4. Animal Nutritionist	PhD.	41.0	44.0	47.0	132.0
5. Agrostologist	PhD.	38.0	41.0	44.0	123.0
6. Animal Production (Rumiant)	PhD.	35.0	38.0	41.0	114.0
7. Animal Production (Non rumiant)	PhD.	35.0	38.0	41.0	114.0
8. Animal Nutritionist (Non rumiant)	PhD.	35.0	38.0	41.0	114.0
9. Agrostologist	PhD.	35.0	38.0	41.0	114.0
10. Animal Breeding (Non rumiant)	PhD.	--	38.0	41.0	79.0
11. Training Coordinator	M.S.	--	43.0	36.0	79.0
12. Systemologist	PhD.	--	44.0	47.0	91.0
13. Veterinary-Physiology	PhD.	--	41.0	44.0	85.0
14. Economist	PhD.	--	38.0	41.0	79.0
ADDITIONAL FUNDING REQUIRED		(140.0)	(356.0)	(373.0)	(869.0
TOTAL SENIOR STAFF COSTS		345.0	576.0	608.0	1.529.0
TOTAL SENIOR STAFF POSITIONS		9	14	14	

TABLE Nº 1. CATIE, PERENNIAL PLANTS 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. Head of Program	PhD.	36.0	40.0	44.0	120.0
2. Agronomist	Ing.Agr.	13.6	15.0	17.0	45.6
3. Research Assistant	Ing.Agr.	15.0	16.5	18.0	49.5
4. Anthropologyst	M.S.	15.0	18.0	21.0	54.0
5. Agricultural Economist	PhD/M.S.	34.0	40.0	42.0	116.0
6. Horticulturalist	PhD/M.S.	34.0	40.0	42.0	116.0
7. Training Coordinator	M.S.	36.0	39.0	41.0	116.0
8. Agro-Climatologist	PhD.		45.0	40.0	85.0
9. Cropping System Specialist	PhD.		45.0	40.0	85.0
10. Specialist in Crop protection	PhD.			45.0	45.0
11. Soils specialist	PhD.			45.0	45.0
ADDITIONAL FUNDING REQUIRED		(70.0)	(169.0)	(253.0)	(492.0)
TOTAL BASIC PROFESSIONAL STAFF COSTS		183.6	298.5	395.0	877.1
TOTAL SENIOR STAFF POSITIONS		6	8	11	

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 secundary 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	