PN-AAZ-967
56.410

A ten year plan for CATIE 1986-1996

July 1986

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TEN YEAR PLAN

FOR

CATIE

1986 — 1996

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ABSTRACT

CATIE'S Ten Year Plan considers the current and future context of agriculture in the region, the technical needs implied by the above in relation to technological developments, and the history and present situation of the Center. The comparative advantages of CATIE as a regional educational and research institution are examined. On the basis of this analysis, the Plan proposes a strategy for the next decade which defines CATIEs future size in terms of finance and manpower and also proposes program priorities. Finally, the organizational changes required to implement the Plan are discussed.

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SUMMARY

Agriculture, the backbone of Central America's economy, faces serious challenges. Because of both technical and institutional constraints, the production of food crops such as corn, beans, rice and cassava show yields often below average for developing countries. Export crops such as coffee, cacao, and bananas are plagued by new diseases and insect pests that both raise production costs and lower yields. Livestock activities, primarily beef cattle produced in the humid tropical lowlands, face severe nutritional and management problems. Crop diversification efforts lack appropriate knowledge and effectively validated technologies. Rapid population growth is encouraging an alarming rate of deforestation, 40% of the entire region in 35 years, leading to soil degradation which is exacerbated, by the absence of appropiate cultivation practices and conservation measures. On the other hand, population increases are raising the effective demand for food products. As the region develops economically demand can be expected to increase for new crops and for convenience foods.

This situation presents a major challenge to agricultural research institutions in the region. A number of national research systems are receiving support from loans from the World Bank and USAID. Nevertheless, lack of counterpart funds, weak budgets, low salaries and institutional discontinuities have led to national research programs having a limited impact to date. Universities lack both the resources and the tradition for research, and the private sector hardly, if at all, engages in research within the region. Several International Centers are conducting research on basic food crops in the region and

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have regional programs linking them directly to the national systems. Their impact, however, depends on what results the national systems disseminate.

The regional institution best endowed to carry out work in the fields of resource conservation and agricultural research and education is CATIE. This Center, located at Turrialba in Costa Rica, carries out research on crops, livestock and renewable natural resources; it provides training at both graduate and short course level; and it provides technical assistance to national programs.

Among the Center's strengths are its large team of professionals specialized in a wide range of disciplines in agricultural and natural resources, its regional mandate, its infrastructure and agreements, its relative independence, its experience, tradition and reputation. Current constraints include a low core budget with excessive reliance on project funding, insufficient internal coordination, lack of or insufficient use of supporting services and governance system limitations. Its main comparative advantages lie in its mandate which embraces a clientele in a group of small countries with many common characteristics, problems and potentials; its ability to integrate research, training and assistance to the specific needs of client countries; and its international status which enables it to hire staff and have facilities of a level usually not available to national programs.

The Plan proposes a future size target, drawing on several sources, of 260 professionals by 1996, of which 200 would be located at Turrialba. This would imply for the same year a budget of US$19.0

million (at 1986 prices) or of US$34.0 million (at 1996 prices). These figures represent a growth rate of budget during the plan period of 4.7% p.a and in professional staff of 4.3% p.a.. A physical development plan consistent with these targets has already been drawn up and is in the stage of partial implementation using a donor grant.

Total budget and manpower will be allocated thus: for research 50%; for training 40%; and for technical assistance 10%. Research supported by networks and training links will be conducted in Central America, but much of its findings will be applicable within a broader Latin American context. A selected number of long term priority areas have been identified and the overall research program will allocate specific resources to these areas in which specific research thrusts will be developed The Center will concentrate on obtaining results which will generate a defined impact in each priority area and in diffusing these results, particularly at the small farm level.

Training will have a Central American emphasis but will remain open to Latin America. The development of a regional training network with 25 universities represents an important innovation in the plan. Other innovations include expanding the graduate program to accomodate 300 students in a broader range of disciplines, developing a Ph.D. program, developing a M.S. in the management of agricultural research and development, initiating one-year specialist courses and offering a wide variety of short courses. Technical assistance will focus almost entirely upon Central America.

To implement the preceeding, CATIE will introduce changes seeking to strengthen its internal operation and make the Center attractive to

international donors. In order to give its Board of Directors more responsibility in managing the Center, membership will be broadened regionally and extended to include members from Latin American and major donor countries. Appointments to the Board will be for a 3 year period subject to one renewal. The Center will create a Technical Committee and an Academic Committee with members from the Board of Directors and, for the Academic Committee, also with representatives from the regional education network.

CATIE will create or strenghten key supporting units and services such as planning, communications and the computer unit. It will develop and implement management information services, a monitoring, and evaluation systems and program budgeting, in order to develop an effective concept of accountability. The Center will also develop a manpower policy structured to conform to its program priorities. CATIE will endeavour to broaden its sources of operational funding including sales of products and services, overheads, and contributions by regular and new donors. In particular, it will try to raise the core component of its budget from the current 33% to a target of 50%. It will seek to raise funding from all of the preceeding sources placing especial emphasis on the role of possible new donors.

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I INTRODUCTION

The Centro Agronomico Tropical de Investigacion y Enseñanza (CATIE) had its origins in 1942 when the Inter-American Institute of Agricutural Sciences (IICA) was founded and located at Turrialba in Costa Rica. IICA moved to San Jose in 1960 leaving behind its training and research activities in a subsidiary organization whose main function was post-graduate training, backstopped by research. In 1973 this latter institution became CATIE, an autonomous organization created through the medium of a contract between IICA and the Government of Costa Rica.

CATIE was given a clear mandate to shift its emphasis from teaching to research with a sharp focus toward solving the problems of the smaller farmer. Research was no longer to simply complement the post-graduate study program but was to assume a more active role, corresponding to the work carried out by national institutions, in order to better respond to the perceived needs of the region's countries.

CATIE was given the responsibility of:

- conducting research for generating technology that would solve the agricultural problems of the tropical areas of Latin America with particular emphasis in Central America and the Caribbean, and benefit mainly the small farmer;
- training professionals from Latin America and the Caribbean at different academic levels, in order to provide the

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specialists required by the countries to strengthen their national institutions and their agricultural development program; and

- providing technical cooperation services, especially to Central America and the Caribbean, working to strengthen national institutions and to assist the countries in executing their agricultural research, training and development programs.

Beginning in the mid 1970's, CATIE's increased it emphasis on research in order to respond to the needs of agricultural development. Its main areas of work were on crops such as coffee and cacao; silviculture; agroforestry; the development of farming systems methodologies which emphasised animal and crop production systems on small farms; and on developing conservation and utilization practices for renewable natural resources.

However, although relatively independent and undisturbed by public sector budgetary fluctuations, which often limit the activities of national agricultural research and training programs, CATIE has been restricted in its activities due to financial considerations. In recent years, CATIE has relied increasingly on donor-financed, project-oriented research which, in turn, has drawn heavily on existing facilities and core budget staff as counterpart contributions to the projects. This tendency has restricted CATIE's ability to provide the time, effort and stability of staff to maintain its own research programs and to adequately service the graduate and related short course programs.

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The situation reached a head in the early 1980's when CATIE encountered a budgetary crisis which necessitated severe austerity measures. In 1984 CATIE's Board of Directors appointed a new Director who was charged with both placing CATIE in a sound position and also with re-defining the long term role of the institution.

Following external consultant advice, new financial policies and practices were defined and are now being implemented. Equally important, a conscious decision was made to develop a ten year institutional and departmental plan which would seek to re-establish CATIE's leadership role as a regional center of excellence in training, research and outreach by reorienting CATIE to place equal importance on training and research; to lessen the heavy reliance on project-specific external funding; and to seek greater operational autonomy for the Center.

The need for such a plan was identified in a series of reports, published recently. These include an institutional analysis conducted by Cooper and Lybrand in 1983, project evaluation reports by the EEC (1984), IFAD (1985) and USAID (1985), and reviews of the Crop Production, Animal Production, Renewable Natural Resources and Training Departments carried out by external consultants on CATIE's behalf in late 1984. All of these reviews stressed the problems of uncertain funding, over-dependence on project funds and staff insecurity, and the need for a long term plan with prioritization of research activities, internal reorganization and closer linkages between the different technical departments.

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In addition to evaluation at the program level, CATIE has undertaken extensive consultations with officials of the countries with which it works and with officials of major donor and international organizations. This has included consultation between a CATIE team and representatives of 67 institutions concerned directly or indirectly with CATIE's program in 6 Central American countries. High level representatives of national agricultural sector policy, research and extension institutions from these countries and the Dominican Republic (which now subscribes to CATIE's core budget - El Salvador does not) also participated in November 1984 at a workshop to discuss the relationship between sector policies and agricultural research priorities, in order to define CATIE's role in this process.

This series of evaluations and consultations has been followed by the development of CATIE's first Ten Year Plan. The Plan attempts to capitalize on the extensive dialogue that has taken over the last two years and to define CATIE's future role, activities, organizational structure and financial status. The Plan is based on a ten year horizon rather than the more conventional one of five years because the multipurpose objectives of CATIE (training, research and technical assistance) militate against significant change in the short term.

The plan is presented here in six substantive chapters. The first (II) discusses the challenge facing agriculture in the region, both now and in the next decade. Chapter III discusses the research and training resources currently available in the region and their

achievements in the past decade. The following chapters describe the structure, programs and resources of CATIE and its past output (IV) and the Center's comparative advantages (V). Chapter V outlines the proposed strategy for CATIE and define its future role, its geographical area of influence and its future priorities for action. It then makes proposals regarding CATIE's future size, role, activities, and priorities. Finally, Chapter VI discusses the implications of implementing the proposed strategy in terms of organization, manpower and financial resources.

II THE CHALLENGE FACING REGIONAL AGRICULTURE

1. An Overview (1)

The countries in which CATIE is most actively involved (Central America and the Dominican Republic) cover 548,000 km2 and have a population of 31 million. They embrace a highly varied topography and a wide range of rainfall patterns and soil types. Ecologically, the region can be divided into four zones ranging from (almost temperate) highlands to humid tropical lowlands.

Agriculture has historically been the backbone of the economy. In 1980, it accounted for 26 percent of Central America's GDP, directly employed over 50 percent of its labor force, and traditional exports generated over 60 percent of the region's export earnings. A large portion of industrial employment (e.g. in food processing and textiles) also has backward linkages to the agricultural and natural resource sectors. As the economies of the region recover from the crisis of recent years and move towards a strategy of growth based on exports of non-traditional commodities to markets outside the region, and population growth and increases in income expand the demand for food, the agricultural sector is expected to maintain a significant role in the economy.

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(1) The data in this chapter exclude the Dominican Republic but the commentary is generally relevant to include it. Throughout this document most references to CATIEs work in Central America should be taken to include Dominican Republic.

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Basic Food Crops - Seventy five percent of the region's corn, beans and sorghum and 27 percent of its rice is grown by small producers who comprise 65 percent of the region's farmers. Yields are low, averaging 1.4 MT/ha in corn, 0.6 MT/ha in beans and 2.5 MT/ha in rice. These may be compared to all developing country averages for corn (1.9 MT/ha) and beans (0.9 MT/ha) during the same period.

Yields of tropical tuber crops, such as cassava,are also low averaging 6.0 MT/ha, although yields of less than 3.0 MT/ha are common in many humid tropical areas. While steady production gains over the past two decades have been made in corn, the region's staple food, yields have stagnated as have those for beans and sorghum. Among the reasons for this situation is the low quality of the production technology utilized; i.e. poor varieties and inadequate cultural and crop protection practices. Food crop production has not kept up with population growth in the region.

Export Crops - Traditional export commodities such as coffee, bananas, sugar and meat suffer from weak and/or stagnant demand and prices, while bananas and coffee, in particular, are plagued by new diseases and insects which are causing major production problems. For example, coffee pests (rust and bean borer) have sharply reduced yields and raised production costs in many areas, eroding the industry's competitiveness and forcing small farmers to abandon farming altogether. The banana industry, located in the region's humid tropical lowland areas, is plagued by a retrenchment of the major transnational companies in Central America (plantations are

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either being taken out of production or turned over to domestic producers) and by continuing problems with cost effective control of the crop's main disease, Black Sigatoka. Approximately $100 million is being spent annually in the region to combat this disease which is forcing many smaller plantain and banana growers out of production. Expansion of cacao production, another humid lowland crop, is limited by the threat of monilia pod rot. Within one year, it reduced total Costa Rican production by one half.

The livestock sector is characterized throughout the region by a low animal carrying capacity, generally less than one animal unit/ha. Meat exports are important for Honduras, Nicaragua, Costa Rica, Guatemala and Panama.

Livestock activities, primarily beef cattle production, utilize from 15-50 percent of the agricultural land in the region with much of the current deforestation ocurring as lands are converted to pasture in the humid tropical lowlands. Serious pasture, forage, nutritional and overall management problems are being encountered that limit efficient utilization of land resources for meat/dairy production destined for both internal consumption and export. In addition, increased production of monogastric livestock, such as swine, is limited by nutritional and management problems.

Level of Crop Diversification - Data on the extent of crop diversification efforts in the region are limited. Development of new cool weather crops for export, such as broccoli, is occuring in the higher elevations of Guatemala and Costa Rica. Melons, cucumber, and other crops suitable to lowland areas are being produced in

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Honduras, Guatemala and Costa Rica. Expansion of crops adapted to humid tropical lowland conditions such as macadamia, pejibaye, pineapple, ginger, coconut, black pepper and some citrus is occuring in Costa Rica, Guatemala and Honduras.

The adaptability of many crops is known from pilot plantings throughout the region. However, very little accurate data is available about their yields, cultural methods, varietal performance and seasonability, nor about plant disease constraints. Still less is known about the viability of some of these crops in the lowland humid tropics. Current knowledge will permit expanded production of some diversified crops, but diversification of extensive areas to these and other crops will require long-term commitments to research and development by knowledgeable agricultural professionals in order to generate and apply cost effective production technologies.

Natural Resource Base - Population expansion in the region (2.3 percent annually) has put tremendous pressure on natural resources. Land mismanagement is a particularly acute natural resource problem. High population densities in some areas of the region, combined with inequitable access to good lands, have resulted in attempts to intensively cultivate steep hillsides and other vulnerable lands, thus threatening rapid and permanent degradation of the very resource base that provides the livelihood of a large percentage of the rural population. These forces are responsible for an alarming rate of deforestation; in the last 35 years, 40 percent of the entire land base in the region has been deforested. Many of these land have been placed in annuel crops, for which they are unsuited, without

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utilizing cultivation practices and conservation measures to avoid erosion.

This process of upland destruction threatens the lowland tropics. For example the Transversal del Norte and Peten regions in Guatemala, the most densely deforested areas in that country, have begun to feel the pressure of modern exploitation. Soils in many parts of these areas are not suitable for sustained agriculture and may rapidly lose fertility unless devoted to forestry or agroforestry systems. Other areas require careful crop and livestock management and agronomic practices. Similar situations exist in the lowland tropical areas of Honduras, Costa Rica and Panama.

2. Current constraints to agricultural production

The salient characteristic of regional agriculture is an extremely low level of technology. This situation results in low land and labor productivity of both traditional and export crops. The limited amount of basic knowledge about how to most effectively and efficiently maintain the natural resource base results in continuing deterioration of land and water resources essential to a prosperous agriculture. Similarly, agricultural diversification is inhibited because little is known about the performance of new crops and enterprises in different areas of the region, and little of the existing new information is being applied. Increasing the generation of relevant new technology is critical to addressing the major constraints in agriculture.

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Historically the governments of the area looking for "quick results" have not committed themselves to long term research and development efforts nor provided necessary support activities to address the region's complex agricultural problems. Government plans have stressed the issues of food security, the balance of trade, the conservation of natural resources, and the need to increase and sustain small farm incomes to promote equity and employment. Development programs have focused on areas such as integrated rural development, crop diversification, and access to rural credit.

One of the major constraints to achieving these goals has been the fragility of local institutions. In general, there are a number of overlapping agencies with poor horizontal linkages. Planning and implementation are usually not well coordinated. The links between research, extension, credit and marketing are often tenous, to say the least.

Research policies, programs and staff almost invariably suffer from a lack of continuity, which disregards the long term nature of the research process. Research policies tend to be set by pressure groups or by scientists, often motivated more by peer recognition than by client needs.

The prime beneficiaries of research (the small farmers) tend to be poorly organized in terms of influencing research, except in the case of some export commodity groups. These small farmers frequently have to cope with poor soils, uncertain water supplies, traditional low-yielding varieties, high pre- and post-harvest losses, and they

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operate within the framework of a low input, risk aversion system. Imported technology is often inappropriate for their needs.

In such a context it is not easy to bring about major changes in productivity. To do so requires well thought out and sustained policies supported by appropriate institutional measures, including a long term commitment to developing the appropriate infrastructure, including the establishment of relevant policies for both manpower development and research programs.

For small countries with limited resources, such policies are not easy to either establish or implement, and for this reason the role of a regional organization can be of paramount importance, if correctly articulated and implemented, in the context of areas such as Central America or the Caribbean. However, regional organizations, regionally governed, may not necessarily be immune from the problems affecting the nations that make up the region, and this, perhaps, has acted as a constraint to the impact of many regional institution in the past, no only in Central America but worldwide.

3. Changing needs of the next decade

In setting priorities for research and training it is all too easy to fall into the trap of planning within the context of the current situation. Undoubtedly some problems are urgent and some may well remain so for many years hence, but a plan for ten years has to

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think beyond the current situation and to project a picture of the agricultural situation of the region a decade ahead.

This is not an easy task given the disappointing trends in production of the past decade and the fragility and instability of the markets for many of the regions' principal export crops. Nevertheless, irrespective of whether or not past trends in production continue or change in the future, there are several new factors that need to be considered when projecting the agricultural situation of the mid 1990's.

Paramount amongst these is the destruction of the forest lands which covered 90% of the land area 50 years ago, but only 20% today and, perhaps, 10% in 10 years time. Deforestation brings in its wake, erosion, flooding, changes in rainfall patterns, diminished supplies of fuelwood, etc. Land pressure generated by population increases means that government action, in areas such as land reform, is likely to be required to reduce the pace of deforestation and to prevent excessive fragmentation of farms. But four research priorities are clearly identifiable from this story. First, the need to increase the supply of wood for fuel and other purposes; second to develop agricultural systems for lowland grazing areas, which would seem to be the only alternative to forest lands in the realm of new areas for small farmers; third, to improve the management of deforested lands to conserve them and bring them back into some form of production; and fourth, the need to identify forest areas critical for sustained development.

Another major change that is likely to occur in the next decade is an alteration in the pattern of demand. The growth in the urban

population is currently about three times that of the rural population. This is likely to lead to a greater market demand for basic staples as the urban population increases from its present low level to become a significant part of the total population.

Changes in food consumption patterns are also predictable in that the increasing growth of the region's GDP is expected to lead to a selective increase in demand for commodities such as animal products (and also animal feed), fruits and vegetables, for all of which the demand elasticity is high.

The increasing industrialization of the region, leading to greater wealth, as well as the preference of higher income groups for convenience foods, should also lead to an accelerated growth in agro-industrial development, particularly in the food processing industry. This could lead to both a demand for new crops (especially fruits and vegetables) and to the introduction of much stricter criteria for quality control in marketed raw materials.

On the supply side changes can also be expected. Considerable efforts are being made to strengthen the national research systems and to increase the supply of trained agricultural specialists. By the mid 1990's the heavy investments currently being made in research, extension and training should be starting to show some impact on the generation and diffusion of improved technology.

The prospects for change would appear to be particularly promising in the area of basic food crops where the CGIAR Centers are now starting to generate a much broader range of germplasm with wide adaptability, high yields and improved disease resistance. With stronger national systems, the prospects for more widespreed farmer

utilization of such materials should be promising. Nevertheless this is unlikely to take place unless complementary actions are taken at the regional level in areas such as integrated pest management, mineral nutrition and the development of better systems for technology transfer. These tasks offer a specific challenge to an agency such as CATIE. A parallel challenge exists in the case of perennial crops, forestry (and fisheries) where there is no equivalent to the CGIAR system. Theses challenges must be met if the production trends of the last decade are to be improved and the food demands of the increasing regional population to be met.

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III AGRICULTURAL RESEARCH AND TRAINING IN THE REGION

1. The National Agricultural Research Systems (NARS)

All countries in the region have some form of national agricultural research systems (NARS). Table 1 shows their main features and those of CATIE. The latter, although of a different nature to the national systems, is better endowed with funds and staff. Three institutions resemble CATIE, in terms of their resources and relative autonomy: Panama's Agricultural Research Institute (IDIAP), Salvador's Agrarian Technology Center and its associated Livestock Development Center (CENTA and CDG), and Guatemala's Agricultural Science and Technology Institute (ICTA).

The other four institutions listed are parts of their respective Ministries of Agriculture. Limited automony and resources along with staff instability reduce their efficiency. These institutions are the Department of Agricultural Research (DIA) at the Research, Extension and Training Subsecretariat in the Dominican Republic; the General Director's Office for Agricultural Research in Nicaragua (DGIA); the Director's Office for Research of the Ministry of Agriculture in Costa Rica (DI-MAG); and the Department of Agricultural Research at the Secretariat for Natural Resources in Honduras (PNIA).

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Except in Nicaragua, no close coordination for planning and priority setting takes place between agricultural research and national economic planning or between agricultural and other research organizations. Good personal relations are largely responsible for the limited degree of duplication that occurs. Personal links are often a result of staff from national systems getting to know each other while undergoing graduate training or attending short courses at CATIE.

NARS' generally face a number of problems which restrict their effectiveness. Budgets are variable and unstable, and often insufficient. Demands or expectations for action in numerous areas result in resources and efforts being spread too thinly. And, finally, they face a high brain drain, due to low salaries and other work-related conditions, all of which generate research discontinuities.

Although CATIE is not involved directly in extension, its research on farming systems has boosted contacts with farmers and extension workers at national institutions. In this sense the most active institutions are those located in Guatemala -- the General Director's Offices for Agricultural Services and for Livestock Services -- and in Salvador the Director's Office for Extension and CENTA.

B. The International Agricultural Research Centers (IARCs)

Within the region several CGIAR centers (IARC's) project an important influence. CIMMYT has worked with corn, wheat and sorghum

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(with ICRISAT); CIAT with cassava, beans, rice and forages; and CIP with potatoes. The centers have contributed to the production of genetic materials, through the development and diffusion of research methodologies and through training and information for national systems. Usually the IARCs engage in basic research and crosses after which NARS, depending on their capabilities, carry out adaptive work and further selection.

Each of the three centers has a regional program in Central America which provides for a direct link to the NARS. Given the resources and capabilities of the IARCs, CATIE will need to carefully assess its potential role with the comodities covered by these centers in order to avoid duplication. On the other hand, the IARCs plan to move more upstream in their research. This will heighten the importance of CATIE's existing role of complementing the IARCs through strengthening the production systems research at the regional level in areas such as research on mineral nutrition and plant protection.

3. The Private Sector

Two forms of private organization are potentially relevant to research activities in the region. On the one hand, producer associations, especially of large producers, are begining to acquire significance in terms of the more applied phases of product-based research. This happens, or may occur, when producers are in a condition to capture an important part of the benefits generated by research and when mechanisms such as taxes operate to make funds available.

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The second form of private sector involvement relates to companies producing inputs such as fertilizer, pesticide and seed, where some adaptive research takes place at the regional level, particularly with respect to pesticides where there is an increasing trend for closer collaboration with the NARS.

Overall, the precise magnitude of private sector support for regional research remains unknown. It appears to be rather modest but to be increasing and to be likely to play an enhanced role in the future.

4. The Universities

A number of higher education centers in the region offer programs related to rural development and agricultural research. Such is the case at a number of schools of agronomy, biology, forestry and veterinary medicine. Their programs, however, have often failed to relate to the up-to-date needs and requirements of the region. Thus they display serious weaknesses of approach, curriculum and selection. Neither have universities been able to do much relevant research due to a lack of pertinent resources and traditions. In the absence of other change forces, the possibilities for improvement would appear to depend on joint cooperative efforts among institutions.

Between 1978 and 1988 CATIE had an agreement with the University of Costa Rica to operate its post-graduate program in Agricultural Sciences and Renewable Natural Resources, thus continuing the program initiated by IICA in 1946. Currently there are in the region over a

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thousand professionals who have carried out post-graduate studies at Turrialba and of whom over 950 obtained M.S. degrees.

Since 1984 there has been a significant change in policy with respect to the post-graduate program which now places major emphasis on the regional characteristics of CATIE's program and has stressed the role of education within this context.

With this in mind CATIE has established a regional network for cooperation in higher education in agricultural sciences and renewable natural resources. This program is designed to strengthen national institutions in higher education, facilitate inter-university cooperation and strengthen CATIE's own short and long term training materials. In this network the Center occupies a nodal point and serves as the executive secretariat. Coincidentally with this policy, USAID/ROCAP has provided important financial support for strengthening the scientific and academic programs of CATIE. This will enable CATIE to provide leadership to the network, which currently involves 34 higher education and research institutions of which 25 are universities.

The new educational policy of the Center, the network and the important resources provided by USAID will ensure CATIE a growing leadership in both teaching and research. The progressive increase in enrollment, beginning in 1986, will allow the number of trainees to be quadrupled during the next four years and, in the long term, will increase even further the number of post-graduate students, thus satisfying the growing demand from the countries of the region.

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5. IICA

CATIE was founded as the research branch of IICA. At present, however, IICA directs it efforts toward training and technical assistance in the region and throughout Central America. In this respect IICA operates through its branch offices in the countries and through technical support activities to Ministries of Agriculture and other organizations, including the NARS.

Because of their different responsibilities, IICA and CATIE complement rather than compete with each other. Through programs such as technology transfer, training, and rural development, IICA, with its continent-wide structure, helps diffuse CATIE's research outputs. Finally, IICA's representation on CATIE's Board of Directors helps insure coordination between both institutions.

6. Donor assistance for developing research institutions in the region

For a variety of reasons Central America has became a priority area for a number of important donor and funding agencies. Agricultural research is a component of this priority as is witnessed by USAID's support for CATIE and loans from the World Bank to the Costa Rican Ministry of Agriculture, and by USAID to ICTA in Guatemala. This support for agricultural research, which amounts to a total of close to US$100 million, seeks to remedy the institutional weaknesses discussed in chapter II, and would seem to be part of an increasing trend for outside support to the region.

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Nevertheless, results to date from loans to NARS appear to be rather limited. A major reason is that the NARS experience difficulties in concentrating their efforts in priority areas in sufficient force to show a clear impact. Also, the lack of counterpart funds hinders the implementation of loans. Nevertheless, in the long run these loans can be expected to lead to a substantial strengthening of the NARS in the region.

7. Achievements of the past decade

In spite of the breadth of agricultural research, development and training activities in the region, an examination of recent trends raises questions about the ability of the region to meet its future demands for the production of basic foods, industrial and export crops. For example, since 1979 total agricultural production in the region has been declining at 1.2 percent annually. Some crops, such as cotton, have suffered more severe declines. Central America's agriculture is beset by low yields, pest and disease problems and natural resource degradation.

Where growth in production has taken place, it has generally been market driven, particularly by export markets for commodities such as beef, coffee and sugar, which are mainly supplied by large farmers. But between 1974/76 and 1983 the only major commodity whose output increased at a more rapid rate than that the population was rice. Most of the increments in the production of corn, beans and maize arose from an increased area under the crop. Only for rice, sorghum and coffee were yields per unit area increased. In these

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cases these yield increases took place on crops which had been subjected to major research efforts in the region.

The impact of past training efforts is also hard to relate to changes in productivity. The region now contains a large number of well trained agriculturalists but it appears to be difficult to exploit their potential within the existing institutional framework.

Nevertheless, it is becoming more and more necessary to both increase agricultural productivity in the region and to intensify land use, because of rapid population growth, improved standards of living and progressive limitations to expanding agricultural land. At the same time it is essential that this be done without sacrificing the long term production capacity of the natural resources of the region.

Consequently, agricultural science and technology are becoming increasingly important in relation to natural resource utilization, since they promote economic development and are sources of wealth and well being. In this context a sustained and adequately funded agricutural research program that will create and use new scientific knowledge to generate appropriate technology must be seen as essential for the optimization of the productive activities of the region.

The next chapter examines the part that CATIE currently plays in technology generation and transfer prior to suggesting how a new strategy for CATIE might help to alter the sluggish growth of these two activities in the region.

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IV THE CURRENT ROLE OF CATIE

1. Organization and facilities

CATIE was organized as a non-profit making scientific and educational institition with the mandate to promote and stimulate research, training and technical cooperation in animal, crop and forestry production in the New World tropics especially those of Central America and the Caribbean. It has a strong research and training tradition which dates back over 40 years.

In 1983 CATIE underwent a reorganization designed to more effectively coordinate and implement its research and training activities (See Figure 1). The Center has a Board of Directors, comprised of six members, who function as its highest executive body. The Board is counseled by a Technical Advisory Council which advises the Board on policies and strategies in the fields of research, training and technology transfer, and by an Academic Council which advises on curriculum and relevant policies affecting the educational programs. CATIE's work program is implemented through four main operational departments supported by a department of administration and finance and several small support or service units.

CATIE's three research departments conduct research on a wide range of topics. Problem oriented research is undertaken on crops, livestock and renewable natural resources. In addition, CATIE sponsors disciplinary support research in several areas. Important supporting resources are the different laboratories, such as the Tissue Culture laboratory, where economically valuable species are

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propagated vegetatively, permitting the exchange of plant material with other regional and international research centers. The Soils Laboratory conducts chemical analyses of soil samples, making it possible to evaluate crop behaviour in the field. The Plant Genetic Resources Unit has gathered a wealth of genetic material of important traditional and exotic crops in the tropics, and includes a Seed Bank with refrigerated chambers for seed storage. A forest tree-species germplasm collection and distribution center has also been established.

CATIE's small farm production systems research program has been widely accepted and has significantly influenced the orientation of agricultural research in the region. The systems approach considers the farm production unit as a whole: the various interacting subsystems are developed in a defined ecological environment as influenced by particular socio-economic conditions. The research is directed toward identifying and attacking the critical limiting factors and to finding better systems that will permit increases in productivity.

Formal postgraduate education in the agricultural sciences began in 1946 at the Graduate School of the Inter-American Agricultural Sciences Institute (IICA) in Turrialba. Since 1973, when CATIE was established, it has continued offering an M.S. degree under an Agreement with the University of Costa Rica. The University establishes the student selection criteria, graduation requirements, and awards the degree in conjunction with CATIE. CATIE provides the staff and facilities for the graduate training program. Over the

years, CATIE and IICA's predecessor graduate program have trained over 900 students at the M.S. level and, since 1974, offered short-courses and seminars for approximately 4,500 individuals.

Recently the exclusive agreement with the University of Costa Rica has been terminated and CATIE has signed new agreements of a similar type involving 25 academic institutions in the region. It also has agreements that recognize its training programs with 15 overseas universities in 6 countries.

CATIE's central facility covers 1069 hectares of which 673 are utilized for research, training and commercial production. It also has a humid zone farm, some 60 km from Turrialba, which is used principally for research and training related to cocoa.

CATIE has over US$13 million in existing infrastructure, including staff/student housing and recreational facilities, a conference center, classrooms and administrative buildings, laboratories and greenhouses, germplasm storage and a computer center. It is also the location of the IICA managed Orton Memorial Library, housed in new premises and reputed to be the best agricultural library in Latin America.

2. Current Programs

GRADUATE STUDIES AND TRAINING

This department, newly established in 1985, is organized and structured with the objective of coordinating the Center's educational functions. Even though it has a parallel relationship

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with the technical departments, it has been created as a separate unit because the teaching activities of CATIE need to be a completely interdepartmental function based on the processes and products of the research carried out in each scientific department. The past departmental structure at CATIE was not ideal for coordinating the educational functions of the institution. The newly structured Department of Graduate Studies and Training represents a necessary step towards a more adequate organization in terms of long-term training policies and joint planning activities. The basic purpose of the department is to plan, support the execution, supervise and evaluate all of CATIE's actions directed towards the development of human resources, according to the educational objectives of the institution in terms of the needs of the region.

The department has five programs. The first of these is that of operating the M.S. posgraduate training program. This program currently graduates 30-35 students annually after a two year course which involves both course work and field research. The program has received support from the Governments of Holland and Germany since 1974, and the United Kingdom since 1979 and more recently from USAID/ROCAP. Currently the support from these four sources totals about US$450.000 per annum.

The second training program is that of short courses in specific crops, themes or disciplines. Some of these involve in-service training but most are concerned with training staff from national programs. Courses are both national and regional in nature, are conducted at Turrialba and elsewhere throughout the region and

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involve professionals and technicians with various levels of experience.

This program is currently supported by grants from the Kellog Foundation and from USAID/ROCAP which together provide the major part of the program's annual cost of US$500,000 which permits about 900 persons to undergo training each year.

The Graduate Studies and Training Department is currently working on the development of two new training programs. The first of these will involve follow-up activities with former trainees and the second, which is currently in preparation, will entail operating one year specialist nature for postgraduates.

The objective of the follow-up program is to maintain contact with former trainees in order to both continue helping them in their professional development and also to feed back from them to CATIE information relevant to its training programs. The new specialist program has as its goal the provision of individual training of a specialised mature that cannot be met by a standard post-graduate degree course.

The fifth program of the department deals with curriculum development and is designed to plan and implement actions necessary to improve CATIE's internal training capacity in the other four programs. This program is also a new activity for the department.

The overall training program is a prime recipient of a new grant from USAID which is designed to quadruple the number of entrants to the postgraduate program by providing a major expansion in new

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facilities (US$7 m) and funds for faculty expansion (US$6.5 m) over the period until 1993.

RENEWABLE NATURAL RESOURCES

The Renewable Natural Resources Department has four major programs all of which include activities in research, development and technical assistance. The personnel of all four programs contribute to CATIE's training program and to a joint activity in the generation and exchange of new information.

The oldest program is that of silviculture. This promotes and studies the management of natural tropical forests, both primary and secondary, as well as planting systems for fast growing and multiple use forest species. The program devotes particular emphasis to fuelwood, although recently multiple-use tree species have received increasing attention. This program receives most of its funding from a large project designed to study multiple use trees and is also supported by a long-standing donor project on forest management. Core budget and donor funds are used to support a research and teaching farm, and an important core budget activity is support for the Latin American Forest Seed Bank.

The second program is in agroforestry systems. This undertakes biological and socio-economic studies concerning systems that combine trees with annual crops and livestock. It includes research projects on nitrogen fixing trees, inventories of agroforestry practices and the study and evaluation of agroforestry systems. This program has been one of the pioneers in agroforestry worldwide, and CATIE is

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generally recognized as being at the forefront of regional activities in this field. The agroforestry activities are supported by 3 donor projects of modest size.

The third natural resources program focuses on the management of woodlands promotes the selection, establishment and management of national systems for protected woodland reserves. It seeks to conserve and maintain the production of wood, water and wildlife in a way that meets both socio-economic and ecological goals.

This program is unique in Latin America. Its graduate training, short courses, technical assistance and funding allow for linkages with both local research management institutions and with international conservation agencies. Although activities are concentrated in Costa Rica the program contributes to growth in the 9% of the region currently in protected areas.

The fourth research program has only recently become a major activity and concerns watershed management. It seeks to strengthen national capacity in this area, largely through technical assistance and training. Using the watershed as a unit of analysis, the program focuses on planning and integrated management for conservation and utilization in order to optimise watershed use. Two donor assisted projects make this the largest program operated by the department.

Teaching and training at all levels, including a number of short intensive courses, involve the staff of all four program areas. Normally 10-15% of the annual graduate student intake major in natural resources. All department staff are also involved in the

INFORAT information systems project which links CATIE with the outside world in the fields of information and documentation relating to renewable natural resources.

Teaching and information workloads fall particularly heavily on the core staff which numbered only 6 of the 53 staff on hand in February 1986. The situation is reflected in the budget for 1986 in which only 9% of the funds for the Renewable Natural Resources Department were derived from the core budget. The total budget of US$3.99 m was dominated by two large USAID assisted projects, watershed management (US$1.75 m) and multiple use trees (US$1.32 m) which together provided almost 80% of the department's revenue. Both projects have significant training and development components and cover very broad areas of activity which restrict the department's ability to conduct in-depth research. The major in-depth effort is probably in the agroforestry field where there is an IDRC supported project studying the nitrogen fixing ability of leguminous trees and where the department also cooperates closely in a related IDRC project managed by the animal production department.

ANIMAL PRODUCTION

The Animal Production Department currently operates four programs of which two are major research activities each comprising about 40% of the total departmental budget which totalled $672,000 in 1986.

The longest standing of these two programs is entitled "tropical cattle" and is concerned with improving the productivity of the dual

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purpose (meat and milk) cattle which are the most important component of the region's livestock industry in terms of CATIE's small farm clientele. The current productivity of these cattle is low and represents an inefficient utilization of local resources. The Animal Production Department seeks to remedy this by conducting research on the various components of the system which either directly or indirectly limit production. The research program embraces an integrated approach which involves work on genotype (cross breeding); nutrition (emphasizing pastures); adaptability; fertility; health; management; and the economics of production. The total budget for this program is US$249,000 all of which is derived from CATIE's core budget.

Closely related to this is the department's second major current program formerly entitled "the design and validation of production systems" but now renamed "pasture and forage utilization" since pastures and forages provide the base for ruminant nutrition in the region. The low current levels of ruminant production make it necessary to intensify research to optimize the use of the grassland resources. This is being carried out by an interdepartmental (with Natural Resources) and interdisciplinary project which emphasizes soil-plant-animal relationships and the use of browse. The program is currently supported in its entirety by two donor projects funded by USAID/ROCAP and IDRC to a total annual cost of US$255,000.

The third program of the Animal Production Department covers technical support, administrative and laboratory services and totals US$153,000, and the final program is a small one (US$14,000) covering

the department's activities in dairying. Overall the core component of the departments budget is 62%. This represents a much larger share than in the other two technical departments (15% in Crop Production, 9% in Natural Resources) and reflects the relative paucity of project funds attracted by the department in the recent past.

CROP PRODUCTION

The Crop Production Department also operates four programs, of which three have major research components. The largest program deals with annual crops and utilizes 47% of the 1986 budget, a further 21% goes into the perennial crops program both of these programs are supported in their entirety by project funds. The third program, covering the technical support, adminstration and laboratory services, utilizes 30% of the budget and is made up in equal parts of core and project funds, the latter being primarily for support for the germ plasm program and soil and tissue culture laboratories. The small fourth program (2% of the total) relates to the departments production activities on its two experiment farms one of which is planted in cacao.

The annual crops program with a 1986 budget of US$1.83 million works on a range of food crops and is dominated by a USAID/ROCAP project with a budget of US$1.72 million for an integrated pest management project in which about 75% of the activities are centered at CATIE with the residue divided amongst the five regional countries which participate in the project. The program also operates a small

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drought tolerance project funded by IDRC in Costa Rica and Honduras and an IFAD funded project in Panama.

The perennial crops program is characterised by the fact that five of its six project are funded by national institutions, four of them deal with cacao (where the department has a strong breeding program) and one with coffee. The residual project is one on farming systems supported by IDRC. Three of the cacao projects, covering a broad spectrum of cacao research, are funded by the Government of Panama and one project on cacao and the one on coffee are supported by the Costa Rican Government (with BID funding) and by a group of Governments (with USAID/ROCAP funding) respectively. All six projects are based at CATIE and the total budget for 1986 is US$820,000.

The program entitled "technical support" includes headquarters and laboratory services and a number of research activities and has a total budget of US$1.2 million. The research activities deal primarily with germ plasm and tissue culture and are located in the departments headquarters laboratory and germ plasm units. 8 small projects are supported by a range of donors including USAID, GTZ (Germany), IBPGR, IFAD, the Costa Rican Ministry of Agriculture and a group of Central American Governments.

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3. Human Resources

At the beginning of 1986, CATIE had a professional staff of 170, of which 60 were on international status and 110 were nationals. Of this total 39 had Ph.D's and 42 had M.S. degrees, 18 staff were seconded from donor agencies. Of the total staff, 81% were located at Turrialba and 19% in other locations. The total number of outposted staff (33) has remained fairly constant since 1980 but the number of Turrialba based staff has grown steadily each year and took a substantial jump from 119 in 1984 to 137 in early 1986.

Staff distribution by departments at the beginning of 1986 is shown in Table 2.

TABLE 2

PROFESSIONAL STAFF OF CATIE IN JANUARY 1986

	Core Funded	Project Funded	Total	Number in total which are Outposted	Ph.D.	M.S
Direction	12	-	12	3	2	4
Admin/Finance	9	-	9	-	-	1
Postgraduate/ Training	4	1	5	-	2	1
Ren. Nat. Res.	6	47	53	10	7	16
Animal Produc.	8	10	18	2	8	5
Crop production	11	62	73	18	20	15
TOTAL	50	120	170	33	39	42

4. Financial Resources

As a non-profit organization, CATIE's operational objective is to match income with expenses while placing what is possible into an operational reserve. In doing so, CATIE is able to maintain the research, training and technical outreach activities of the institution. Prior to 1982 CATIE continously fell short of that objective and was often forced to operate through deficit financing. The net result was an uncertain financial picture which threatened the ability of the institution to function effectively.

Beginning in 1981, CATIE placed top priority on improving its financial situation. A first step was to embark on an austerity program in which expenditures were reduced to a minimum while measures to control long-term costs more effectively were studied. In addition, consultant advice was taken , as a result of which the deficit of the early 1980's has been eliminated and a healthy operational reserve established (Table 3).

CATIE relies for its core budget, to meet basic operating expenses, on quota payments from member countries (totalling $300,000 per year), an annual contribution from IICA (currently US$1.0 million) and on project overheads. In addition, CATIE generates income from the sale of agricultural crops, rental of on-campus residences and seed bank sales. The farm income is somewhat unreliable because a significant percentage of it comes from export crops (coffee and sugar) for which world market prices fluctuate considerably.

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TABLE 3

CONSOLIDATED INCOME AND EXPENDITURE OF CATIE FOR 1980-1985.

	1980	1981	1982	1983	1984	1985
INCOME						
Core Income	2,992	2,872	2,558	2,706	3,508	4,382
Special Funds	4,996	4,467	5,377	5,461	5,934	6,563
TOTAL INCOME	7,988	7,339	7,935	8,167	9,442	10,945
EXPENSES						
Core Budget	3,883	2,185	2,053	2,654	3,502	4,307
Special Funds (projects)	4,996	4,467	5,377	5,461	5,934	6,563
TOTAL EXPENSES	8,879	6,652	7,430	8,145	9,436	10,870
Excess (Deficit) Income over Expenses	(891)	687	505	22	6	75
Beginning of Year (Deficit) Surplus	(108)	(1,062)	(375)	130	152	158
Auditor's Adjustment	(63)	--	--	--		
End of year Surplus (Deficit)	(1,062)	(375)	130	152	158	233

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As a consequence, CATIE does not have a fixed minimum, guaranteed annual core budget and must maintain tight control of its normal day to day operations. As part of its financial, accounting, and administrative organization, CATIE has suceeded in its efforts to lower these costs.

Currently, CATIE has 37 projects funded by international and national organizations at a total cost of approximately $44 million (81% of this is from USAID). These projects are spread over the longer-term throughout the research, training and technical outreach activities of the institution. CATIE's budget for 1986 is as follows:

TABLE 4

CATIE'S EXPENDITURE IN 1985

Activity	Core Budget	Projects	Productive Activities	Total
Governing Board	17	0	0	17
Administration	821	0	0	821
Adminis. & Finances	1641	0	278	1919
Crop Production Department	608	3240	77	3925
Animal Production Department	403	255	14	672
Ren. Nat. Resources Department	371	3615	0	3986
Postgraduate/Train. Department	182	479*	0	661
TOTAL	4043	7589	369	12001

*Excludes US$4 m. from USAID for capital development and staff recruitment

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5. Program Impact

In qualitative terms the most significant and easiest measured output from CATIE's activities lies in the training program. With a total output since its inception of over 800 M.S.'s and one of over 208 in the period 1976-1985, encompassing trainees from all Latin American countries, this program has played a big role in higher education in agriculture at the regional level. Graduates from the program have and do ocupy key positions up to Ministerial level in a number of countries. A recent survey indicated that about a third of recent CATIE graduates are in the academic field, a third in administrative positions in government and a third in research and development agencies.

The impact of the short course program is difficult to quantify, other than in terms of the demand and oversubscription of these courses. The value of CATIE's technical assistance role is likewise hard to define other than in terms of the very positive attitude towards it in the countries of the region.

In the area of research, CATIE is best known for its activities on the development of high-yielding and pest-resistant coffee varieties, monilia resistant cocoa varieties, crossbred criollo and imported meat/dairy cattle, and forestry and watershed management.

No hard data are available relating to the economic or financial returns from CATIE's research. Such data are hard to develop in the context of CATIE's activities, in that the Center has focused its

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research very heavily in recent years on developing farming systems methodologies for the national agricultural research systems of the region. A recent USAID evaluation report found that CATIE's work on methodology had been widely recognized and adopted by the national systems. However, farming systems research is so site specific that the impact of CATIE's efforts is not directly measurable at the farm level. It has, however, had a profound effect, generally regarded as positive, in terms of increasing the capacity of the national agencies in the region.

However, for the future, given the difficulty in effectively evaluating the impact of the training and technical assistance programs, it is clear that steps will need to be taken to give high priority to selecting research programs whose output and impact can be subjected to evaluation in economic terms. Unless this can be done it will be difficult for CATIE to justify a reputation as a Center of Excellence.

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V COMPARATIVE ADVANTAGES OF CATIE

As a starting point for identifying appropriate goals for the next decade this chapter sets out to examine the current strengths of CATIE and the areas where it faces constraints. This is done with a view to identifying what are the Center's comparative advantages so that these can be capitalized on in preparing the Ten Year Plan.

1. Strengths

The particular strengths of CATIE at the current time are:

a) Its regional mandate which permits it to take a broad overview of regional problems and potentials and to capitalize on a knowledge of cross country experiences.

b) Its established infrastructure and formal agreements with a large number of regional education and research institutions, as well as with international research, education and development agencies. This is manifested by the large number of staff financed by outside agencies and seconded to work at CATIE and is illustrative of the flexibility and strength of CATIE in attracting external support.

c) Its relative freedom from political and other pressure groups, such as commodity associations. This permits CATIE to make independent judgements relating to the use of its resources and it is, thereby, in a position to represent all social groups.

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d) CATIE is descended from an institution that was established over 40 years ago. Although it has been subjected to budgetary problems from time to time, it has a degree of long term stability that is not commonly found amongst research institutions in the Central American region.

e) Its regional mandate permits CATIE to perceive the research and training needs in a long term context that is seldom feasible in national institutions. This also permits CATIE to embark upon the longer term and 'upstream' research activities that national institutions are rarely in a position to undertake.

f) CATIE's well established reputation in the region places it in a strong position to act as the coordinator of multicountry activities such as the type of research networks that are becoming increasingly common in a number of commodity and disciplinary fields.

g) The size and breadth of disciplinary expertise possessed by the CATIE scientific staff far surpasses that of any of its six member countries and places CATIE in a strong position to act as a source of technical assistance to them.

h) CATIE's broadly based work in farming systems research during the past decade has been widely recognized by the countries of Central America, all of which have built the experiences gained by CATIE into their own research strategies. This has helped to establish good working relationships between CATIE scientistis and those in the national systems.

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i) In certain areas of research, particularly for perennial crops, such as cacao and coffee, CATIE is the only institution in the region with a major research program. Given the importance of these commodities to the regional economy, CATIE's specialized knowledge of them represents an important source of regional know-how. The same comment is also relevant in terms of agroforestry and conservation of natural resources.

j) CATIE is able to offer Latin American graduate students somewhat unique facilities in terms of access to library, experimental lands and a broadly based panel of thesis supervisors.

2. Constraints

CATIE is also faced with a number of constraints which it seeks constantly to overcome: amongst the most important of these are:

a) CATIE is highly dependent on the national systems for testing and validating its research findings at the farm level and for promoting their adoption. Many of the national systems are weak and lack stability and this constrains the potential impact of CATIE's research.

b) With regard to some food crops, CATIE's mandate might entail some duplication with that of the International Agricultural Research Centers (IARCs) who work both directly with national institutions and with their own regional networks. The IARCs are able to bring much greater resources to bear than can CATIE to their specific mandated crops. This means CATIE needs to evaluate carefully any

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work on basic food crops such as maize and beans, in order to ensure its efforts appropriately complement those of the IARCs.

c) CATIE's past work on farming systems, although widely recognized and with methodological findings that are well utilized by the national systems, has been largely restricted to cropping systems in which annual crops predominate. The multicommodity base of most of the small farm agriculture practiced in the region calls for a multicommodity approach to farming systems research. To date, CATIE has not been very successful in organizing research programs that transcend the boundaries of its three technical departments.

d) Nor does a close link yet exist within CATIE between support units and technical departments. CATIE's human resource capabilities in biometrics and computer science, laboratory services, information and publications are not yet optimized in their use by the research, training and technical assistance programs.

e) Part of the reason for this is the relative independence of each department and the lack of both central and departmental planning. Programs tend to develop on an ad hoc basis with frequent changes in orientation rather than against the background of sharply defined plans with clearly articulated objectives.

f) To some degree this situation has arisen from the shortage of core budget and the heavy dependence on project funding which, with its associated overhead, provides over 70% of CATIE's total income. This heavy reliance on project funding is a major contraint both

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in terms of programming and also from the standpoint of building up a strong human resource base.

g) Another disadvantage of the project approach is the tendency for projects, especially small ones, to be self contained, very specific and to restrict the use of their resources to the project, rather than sharing them with the institute as a whole. Whilst this may facilitate the achievement of project goals, it does little for building up CATIE's 'corporate memory' gained from the lessons of experience.

h) At the present time a problem also exists in so far as the degree of autonomy that exists in externally funded projects inhibits an effective coordination of closely related projects, even within the same technical department.

i) The project approach has, however, been the only way that CATIE has been able to operate an effective program given the breadth of its mandate and the limitation of its core resources. This has prevented any effective concentration in depth in the research program and has inhibited the possibility of prioritization.

j) Finally, one of the major problems faced by CATIE is the demands placed upon it by the governments of the region to provide technical assistance. Whilst the provision of such services is a mandated function of CATIE there is sometimes a tendency for such services to be requested with a frequency and at a level that makes it difficult for CATIE personnel to meet the demand whilst also fulfilling their other obligations.

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3. Comparative advantages

CATIE can thus be seen to be a relatively strong and stable organization, although inadequately funded, working mainly with those countries in which national institutions concerned with agricultural research, education and development tend to be beset with problems.

The principal comparative advantages that CATIE possesses, compared to other agencies working in the agricultural sector of the region are as follows:

First, CATIE's REGIONAL MANDATE means that its work is associated with a group of countries which have many common problems, characteristics and potentials and to which it has priviledged access by virtue of its governence. This enables CATIE to work very closely with the countries and with a much larger clientele than would otherwise be the case. This multi-country clientele also serves as an attractant to external donors who, for logistic reasons, often find it difficult to support effective programs in countries with small populations, but are prepared to finance them though an institution whose networking activities embrace a group of countries with a population of 32 million.

Second, the complexity of the farming systems practiced in the region and the importance of conserving the natural resources lend particular weight to the INTEGRATED STATUS of CATIEs programs and structure. Not only are there close links between research, training and technical assistance, but the programs are also multidisciplinary

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and embrace both production systems and resource conservation and management.

Third, CATIE's INTERNATIONAL STATUS gives it a degree of autonomy and stability and ready access to the international community. This enables CATIE to plan and implement programs on a longer term basis than is feasible in most national systems and to hire international personnel. This permits access to a broad range of high quality expertise.

Against this background the Ten-Year Plan presented in the next Chapter does not propose major overall changes in CATIE's mandate. It does, however, suggest a number of changes in the way that the mandate is carried out. These changes attempt to exploit the comparative advantages of CATIE in order to increase the effectiveness of the Center's work and impact.

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VI A FUTURE STRATEGY FOR CATIE

1. Defining the strategy

CATIE defines its goal as "to conduct research and training for the sustained and accelerated development of agriculture in its broadest sense, within the context of overall economic development". In meeting this goal CATIE seeks to serve the needs of its member countries through generating and effectively transfering to its prime clients, the national agricultural systems, technology which, whilst bringing about significant increases in both equity and production, will conserve the natural resources.

With respect to the role of technological change in the development process, CATIE recognizes that production is only one stage in a broader economic chain that also includes marketing and consumption. Within the production sector, technology is only one of many components, alongside others such as infrastructure, labor and credit. Consequently, the impact of technical change in agriculture will vary accordingly to its linkages to these other components and to their stage in the development process. All this points to the desirability of adopting a holistic perspective towards the role of technology in rural development.

Against this broad conceptual background CATIE has defined its strategic goal for the next decade as being "to capitalise on its comparative advantages in the region, through focusing its efforts in a clearly defined set of activities which will permit concentration in

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depth on specific identifiable priorities in a structured and clearly accountable program that will be kept under periodic review."

The implementation of such a strategy will require that CATIE:

a) maintain a continuous dialogue with its member countries in order to ensure that ongoing and planned programs are responsive to their needs. Such a dialogue will be reinforced by CATIEs plans to have permanent representatives in each country;

b) actively promote measures to strengthen national institutions in the fields of research, training and technical assistance;

c) strengthen its own human resource base to cope with its new focus;

d) broaden the base of its network activities in both research and training; and

e) capitalise on its integrated and multi-disciplinary systems approach, not only in research but in the way in which it interacts with the other components of agricultural research and development.

In defining its priorities for the future CATIE recognizes the need for the closure or reduction of less productive programs in order to focus its resources in selected areas. The selection of priority areas which meet the needs of the countries of the region will have to recognize commodity, disciplinary and farming systems programs in both education and research.

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The analysis provided in the earlier chapters of this document highlights the importance of CATIEs work being associated with the integrated planning of rural development and with the search for ways to allow the Center a role beyond that of a limited generation and transfer of technology.

The role of network approaches as a way of articulating institutional efforts (national, regional and international) deserves emphasizing. Organizing institutional networks (rather than product networks), rationalizes available resource use, focuses better on regional priorities, and makes the most of the comparative advantages of participating institutions. It offers the best instrument available for promoting the type of sustainable development that CATIE's policy seeks.

CATIE's rural development -focused research outlook also needs emphasizing. Like the networking approach, it offers another startegic way of insuring that CATIE' effort in research and training actually does promote the rural development process. This second approach involves two levels:

- One level takes CATIE's different activities and fits them together in a multidisciplinary effort (products, disciplines) for designing regional o area changes within the framework of requirements for a sustainable rural development . This begins with a view on rural development in pilot settings (watersheds, rural development projects) that feeds into a multidisciplinary action by CATIE. It will start from appropriate land use planning, one that recognizes space and time interactions, to

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design production alternatives that actually solve existing problems. At this level, technology generation emphasizes critical components of production systems while research also examines conditions for their transfer (through extrapolation and simulation models).

- The second level addresses the need for linkage with other development agencies (research, extension, planning, credit, marketing and others) so that new production alternatives may have an impact on rural development. CATIE is in a position to play a major role in aiding coordination among agricultural organizations of its member countries. Communication improves when two countries join with CATIE in planning their strategic development for the next ten years. Actually, the first consultative meeting with Member Countries (workshop-seminar on Policies for Agricultural Research and Development - November, 1984) attended by National Directors of Planning, Research and Extension agencies from these countries, suggested that these directors organize into national committees. CATIE would then consult with these on a regular basis as part of its effort to frame its activities within a rural development approach.

Both levels together anchor the Development of Integrated Production Systems (DIPS) program that CATIE seeks to establish as an improvement on the previous farming systems research approach and which institutionalizes a production system approach with a clear focus on development.

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In order to translate the preceeding into an operational strategy it is necessary to examine separately CATIEs activities in the fields of technical assistance, training and research.

CATIE's geographical mandate is not identical for each of these activities. It provides training, albeit with a Central American and Dominican Republic bias, for students from throughout Latin America. In contrast to this its technical assistance role is conducted almost entirely in Central America. Research activities are conducted only in Central America, although many of the findings are applicable to tropical Latin America as a whole.

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TECHNICAL ASSISTANCE

In regard to its potential role in technical assistance, CATIE will seek to ensure the best possible use of its limited resources by concentrating efforts in clearly necessary fields that may show a defined impact. With respect to Latin America as a whole, the Center recognizes that most countries already have relatively developed research and extension systems. In areas already covered by these systems CATIE will not provide technical assistance. On the other hand, the Center may be a unique repository of knowledge and skills in some fields of its natural resource programs where no comparable structures and experiences are available elsewhere in the continent. This is particularly relevant for some countries which have limited tropical zones and no capabilities in the management of tropical resources. Outside of fields where it may constitute a unique provider of know-how, CATIE will restrict its activities to Central America and the Dominican Republic. In order to avoid duplication with CARDI and other institutions, CATIE will not usually work in the english speaking countries of the Caribbean, unless specifically requested to do so and in cooperation with these institutions.

TRAINING

In strict contrast to the technical assistance program, the training strategy for the next decade proposes that the training program should continue to have a Latin American mandate. Plans to expand the size of this program, particularly for postgraduate training, will mean that CATIE is able to offer many more training opportunities. It is considered that such opportunities are likely to

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exceed the demand in Central America, and that the impact and effectiveness of the training program would be optimized by opening it up to all of Latin America, with particular preference being given to candidates from the tropics, since elsewhere this plan proposes that CATIE's research activities and teaching curriculum would concentrate on the tropics. Broadening the training program to include scientists from throughout Latin America is also important in the context of the Junta Interamericana being an important co-sponsor of CATIE.

RESEARCH

In the area of research, CATIE proposes that its activities will be conducted in the Central American region but it is anticipated that network links will be established and maintained with research institutions outside of this region.

The whole focus of the future research strategy is based upon a need to concentrate activities and resources as much as possible in a limited number of clearly identifiable priority areas in which CATIE will operate on a multidisciplinary basis. The plan proposes a continuation of the present policy whereby 75% of the scientific staff will be located at Turrialba, with the remainder based in other countries. From the management standpoint, as well as in the context of an in-depth philosophy, it is proposed that outposted research staff should be restricted to the six regional countries that provide support to CATIE. It is considered logistically impractical to base staff in other countries, either at the present time or in the foreseeable future.

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In terms of program content, CATIE's research will continue to stress that CATIE is not a development institution but is one that carries out research and training for development. It will seek to generate and transfer technology in the context of rural development by conducting research whose benefits can be used directly by farmers. Given the fact that most of the farmers, not only in Central America, but also in Latin America, are owners or tenants of very small land units who are short of capital, CATIE's research philosophy places considerable stress on minimizing costs for the risk-averting small farmer as well as on raising productivity. Future research will continue to utilize a farming systems approach with especial emphasis on components or areas critical for development.

CATIE's stability and resources permit it to take a long term viewpoint and this makes it possible for CATIE to take the lead regionally in some 'upstream' research, particularly in relation to certain perennial crops for which the only established research in the region is that conducted by CATIE.

With respect to the IARCs, CATIE does not conceive its role as being that of a relay station serving as an intermediary between the IARCs and the NARS, since a direct relationship exists between the two in many instances. Rather CATIE will establish a direct network relationship with the IARCs where this appears appropriate. On the other hand, research seeking both sustainable and fast development should address the need for new production and management designs suitable to the tropics and allowing for agricultural modernization within a framework stressing their integrated and national usage (new

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production systems that are highly productive while ecologically safe). This will require long term research of a basic nature. It will also call for joint efforts with institutions engaged in this kind of research such as universities in developed countries.

Indeed networking will be a prime thrust of CATIE's future research program in both its priority areas and elsewhere. The same applies to its educational network. It is clearly an area in which CATIE can capitalize on its training and conference facilities to offer a strong logistical backup to the research program.

Through the approach described above and the programs detailed later in this chapter, CATIE seeks to preserve its unique Inter-American character and to become a clearly visible entity as a Center of Excellence for research and training in its mandated tasks.

2. The future size of CATIE

In order to transfer the proposed strategy into a work program it is necessary to provide a target for the future size for CATIE, in terms of both professional staff and total budget. It is also necessary to define a core budget target. This is especially important because insufficient core budget, along with strong reliance on project funding, has proved to be a key institutional limitation in past years.

CATIE underwent a financial crisis in 1980 which was followed by a period of re-adjustment and re-organization. But since 1984 an aggressive policy of project development has led to a period of rapid growth. This uneven pattern of the past means that projections of future growth based on past trends need to be interpreted carefully;

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thus for planning purposes at CATIE other considerations have had to be taken into account in order to set some form of quantitative targets for 1996.

Such targets need to take into account the human, physical and financial resources likely to be required. This is fairly readily done in the case of physical resources where a master plan has already been drawn up for the next ten years. This plan postulates a capital development budget of US$21 million, one third of which has already been made available by a grant from USAID.

This physical plan also includes a manpower target of 200 professionals located at Turrialba in 1996. This number is based on a combination of trend analysis, training needs and planned physical resources. It represents a growth of approximately 4.3 percent per annum in professional manpower, starting in 1984. This is a much lower overall growth than that obtained in the period 1980 to 1986 but is one that is considered realistic for the period until 1996.

During recent years 20 to 30% of the total professional staff have been based away from Turrialba and the plan assumes that in future this percentage will be of same order of magnitude and that the total staff at the end of the plan period will be 200 at Turrialba and 60 outposted.

Within this total pool of 260 professionals the plan postulates that there will be a shift in balance between core and project staff making them equal in numbers (130) in 1996. This represents an increase from 1986 of 80 core funded and 10 project staff. This assumption is part

of a deliberate strategy to increase the core component of the human resource pool (Table 5). It implies that the major part of the growth of CATIE during the plan period will be attributable to a larger core budget with project funds only contributing marginally. Whilst such a growth in core will not be easy to achieve it is seen as a fundamental goal towards putting CATIE on a souder long term footing. A grant from USAID/ROCAP has already been provided to enable CATIE to obtain professional advice with respect to fund raising activities.

It is possible to use these manpower targets to help build up a budget target for 1996, since in recent years manpower has constituted about 58% of the total budget and this figure is expected to remain fairly constant in the future. Using current costs of CATIE staff of various categories, Table 6 indicates that personnel costs can be expected to double between 1984 and 1996 using the staffing pattern of Table 5. This implies a personnel budget of US$11 million in 1996. If this remains equivalent to 58% of the total 1996 budget the latter can be derived to be of the order of US$19 million (at current prices). This figure gives a reasonably good fit with an extrapolated trend of the last few years, during which time the budget has been growing at a fairly steady rate (disregarding a big rise in 1986 due to several large new projects).

TABLE 5

PROFESSIONAL STAFF OF CATIE 1980-1996

CATEGORY	1980	JAN 1984	JAN 1986	JAN 1996*
International	60	50	60	100
National	37	100	110	160
TOTAL	97	150	170	260
Core funded	24	40	50	130
Project funded	73	110	120	130
TOTAL	97	150	170	260
% at Turrialba	65	79	73	75

*Projected

TABLE 6

PERSONNEL COSTS AT CATIE 1980-1996
(Million US$)

	1980	1984	1986[1]	1996[2]	1996[3]
Total operating costs	8.9	9.4	12.0	19.0	34.0
Personnel costs (58% of total)	5.1	5.5	6.6	11.0	19.7
International Professional (at $45000 each)	2.0	2.2	2.7	4.5	8.1
National Professional (at $9000 each)	0.6	0.9	1.0	1.4	2.5
Support Staff/Consultants	2.5	2.4	2.9	5.1	9.1
Total Personnel Costs	5.1	5.5	6.6	11.0	19.7
Core Staff	2.3	2.4	2.8	5.5	9.8
Project Staff	2.8	3.1	3.8	5.5	9.8
TOTAL PERSONNEL COSTS	5.1	5.5	6.6	11.0	19.7

1 Estimated
2 Projected at 1986 prices
3 Projected at current prices asuming a 6% currency depreciation rate

TABLE 7

CONSOLIDATED INCOME OF CATIE 1980-1996
(Million US$)

	1980	1984	1986[1]	1996[2]	1996[3]
Secure core	2.3	2.9	3.0	7.8	14.0
Project overheads	0.7	0.6	1.0	1.7	3.0
Total core	3.0	3.5	4.0	9.5	17.0
Project income	5.0	5.9	8.0	9.5	17.0
Total income	8.0	9.4	12.0	19.0	34.0
Secure core as % total	29%	31%	33%	29%	41%

1 Estimate

2 Projection based on trend analysis for total income and target for core of an additional US$5 million, at 1986 prices

3 Same as previous projection but at current prices assuming a 6% currency depreciation

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In projecting the magnitude of the core contribution to the total budget in 1996 the Ten Year Plan sets a target of having 50% of total costs as being derived from core in 1996 as opposed to 33% in 1986 (Table 6). In terms of overall core this means that the secure core contribution will have to rise from US$3.0 m in 1986 to US$7.8 m in 1996 an increase of nearly US$5 m. In the above context secure core is defined as the IICA and country contributions, service charges and product sales. This income has to be separated from project overheads which can vary widely from year to year and are projected to grow only modestly in the plan period. Currently overheads average 9.5% on total project costs. This figure is well below the 18% that is normally provided to the CGIAR Centers. The 9.5% figure is due to the fact that certa in projects at CATIE do not provide any overheads. CATIE will endeavour to avoid participation in such projects in the future. An increase in the average overhead figure to 18% would almost double this component of the budget. But even this sum would not avoid a significant rise in the requirement for secure core in 1996.

In addition to the operational budget there is a requirement at CATIE for additional funding for capital development during the 10 years of the plan. This is spelt out in considerable detail in CATIE's physical development plan and in the architects drawings associated with it. The comprehensive physical development plan calls for a total investment of approximately US$21 million which is the sum necessary to upgrade all the facilities, including additional student accomodation and housing, so that CATIE will be able to adequately accomodate at Turrialba a professional staff of 200 plus 300 graduate students.

The first tranche of funding for the implementation of this plan has been provided in a USAID grant of 7 million dollars for the period 1985 to 1991. The funding mechanism is such that a potential exists for a second tranche of funding to be provided during the period commencing in 1992. Thus the operational proposals made earlier in this chapter are consistent with the potential for physical development.

3. The allocation of manpower resources

For the next decade a specific strategy is proposed for the allocation of manpower resources between research, training and technical assistance. In chapter VII a mechanism for implementing this strategy is indicated. The strategy proposed in the plan is that, after allowing for 15% of the total resources to be devoted to direction, administration and support functions (such as planning, information and communication services), the residual 85% of resources, both financial and human, would be allocated thus: research 50%, training 40%, technical assistance 10%.

In terms of man year equivalents available each year, these figures represent approximately 40 for administration and support, 110 for research, 88 for training and 22 for technical assistance (Table 8).

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TABLE 8

MANPOWER UTILIZATION PLANS FOR 1996

			(%)
Total professional staff		260	(100)
Direction, Administration and Support		40	(15)
Professional staff for research, training and Technical Asistance		220	
of which 50% input to research	110		(42)
40% input to training	88		(34)
10% input to technical assistance	22		(9)

TECHNICAL ASSISTANCE

The concept of a defined input to technical assistance activities represents an innovation at CATIE. It is based upon the fact that during recent years CATIE's research and training activities have been considerably disrupted by the repeated demands made on the Center to provide techncial assistance, often at short notice. The value of the services provided is not always apparent and once it is recognized that CATIE is mandated to provide technical assistance to its member governments it must also be recognized that recurrent calls for "fire brigade" visits do conflict with CATIE's being able to fulfill the other two components of its mandate, namely research and training. Without adequate inputs in these two fields CATIE is unlikely to meet its goal of excellence in either or both of them. The plan proposes that the Center provide technical assistance up to a ceiling,

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equivalent to 10% of the time of its scientific staff. This 10% ceiling on technical assistance refers only to the component formally allocated to it. Actually the real allocation will be larger. Many research projects, especially those outside of Turrialba, actually involve the provision of technical assistance under other names. Likewise, much training, especially short term training, amounts to technical assistance.

TRAINING

The second major program thrust is in training, where the proposed strategy seeks to build upon the existing strengths of CATIE while overcoming current weaknesses. The plan recognizes the need to ensure continuity and stability of teaching staff at CATIE, first in core teaching areas and courses required of all students, and to create a critical mass of teaching/research faculty in the specialized areas of the department. The strategy is to establish a strong base for the graduate program which would complement existing and future project financed research and personnel, allow for the gradual improvement of the quality of instruction, improve faculty-student contact in courses and, during the thesis preparation phase, provide an environment at CATIE that would stimulate the establishment of effective and substantive linkages with national and international agricultural research and educational institutions, and thus provide a base for a further expansion of the education program.

It also takes account of need to improve currently inadequate facilities and equipment that form an integral part of the graduate program, such as faculty and student housing, classroom and office

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space, laboratory equipment and field experiment stations. These improvements will complement research project activities and support the CATIE short-courses/specialization program.

A further goal of the Ten Year Plan is to improve the overall administration of the graduate and other training programs at CATIE in the areas of admissions, student life and alumni affairs.

During the period of the plan CATIE will seek to support the establishment and maintenance of linkages with national and international agricultural institutions which will enable the graduate program to benefit from the interchange of ideas on technology developments and emerging agricultural problems of the region. This networking approach, one of the innovations proposed by the plan, is discussed further ahead.

The proposed manpower allocation for training by the end of the plan is 88 man year equivalents per year of which 22 would be full time staff of the Training Department. The main thrust of this input is for the graduate training program, particularly the M.S program (and the proposed new Ph.D. program which is outlined later in this chapter). In the Ten Year Plan half of the training resources are allocated to graduate training and half to short courses and other activities (Table 9). Insofar as the graduate training program is concerned the plan has a target to 150 new trainees per annum by the end of the plan period. This target is linked to the Higher Education Project supported by USAID, which will provide much of the funds and facilities needed to meet this goal.

Within this framework, the 44 staff years devoted annually to raduate training represent a staff/student ratio of 1:6.8 which is considered appropriate in terms of a training program with a high thesis research element.

TABLE 9

TRAINING PROGRAM MANPOWER PLANS FOR 1996

Manpower available	88 man years[1]
of which: Half for short courses etc.	44 man years
Half for graduate program.	44 man years
Total number of postgraduate students on hand	300
Staff student ratio for graduate training	1:6.8

[1] Of which 22 (25%) would be personnel from the training program and 66 (7%%) would represent time allocations from CATIE staff in other departments.

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TABLE 10

RESEARCH PROGRAM MANPOWER PLANS FOR 1996

Total manpower available		110 man years
of which:	40% for Crop Production Department	44 man years
	30% for Natural Resources Department	33 man years
	30% for Animal Production Department	33 man years

RESEARCH

The third major program area is research, for which 110 man years equivalents are available (Table 10). There are three major departments undertaking research. It is planned to allocate 40% of the resources to the Crop Production Department and 30% each to the Animal Production and the Renewable Natural Resources Departments. This represents 44, 33 and 33 man year equivalents respectively.

These three departments have suffered in the past from a shortage of core staff (currently only 25 scientists-see Table 2) which has disrupted continuity and leadership in their research programs. The Ten Year Plan proposes that many of the 80 incremental core posts introduced during the Plan (Table 5) should be allocated to these three departments, which would contain 90 of the 130 core staff by 1996. The distribution between departments would be pro-rated according to the size of the departments, namely 36 to Crop production and 27 each to the other two departments. Of the 220 scientists in the three

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departments 88 would be in Crop Production and 66 each in the other two.

With 50% of the resources being allocated to research the respective departmental inputs to research would be equivalent to 44, 33 and 33 man years equivalents annually. Research time would be monitored against these goals as explained later in chapter VII.

A major innovation proposed in the plan for the research program is that a specific part of the total research effort would be assigned to a select number of long term, in-depth research programs. It is intended that each of these programs would have sufficient manpower to permit a large enough effort to be made to enable broad multidisciplinary teams to tackle these priority areas in depth.

The additional workload would be met by the proposed build up in staff and would not necessarily be at the expense of existing programs, although some of these might need to be reduced in scale. However, the broad based nature of the training program necessitates that CATIE retain competence on a very broad front, even though research in depth is only feasible in selected areas.

4. The priorities for action

This section discusses operational priorities for the next ten years. In training this involves expanding the graduate program to 300 students and several new activities to diversify it: a doctoral program in the second quinquennium, an M.S. in the management of agricultural research and development, courses on agricultural development problems in priority areas, and one-year specialist

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courses. It also involves a new stress on networking. In research it includes, the definition of selected priority, in-depth areas in which the Center proposes to concentrate its research efforts. In technical assistance it involves providing guidance to the countries on request whilst at the same time not doing this in a way that disrupts research and training commitments.

TRAINING DEPARTMENT

The training program has recently redefined its short term goals in response to an exhaustive external review. It has proposed that it build up the number of new M.S. trainees from the current 35 to 150 per year by the end of the plan, that it introduce a one-year course in specialist training, that it expand its short term course program and that it introduce measures to maintain links and provide further education for former M.S. trainees.

Besides new training activities, this program introduces, as a major innovation, an emphasis on networking. Thus it will develop the newly agreed upon academic network bringing together 25 regional universities with which CATIE will play a central role. Through this network the Center will broaden the scope of both its training and its research. CATIE also has agreements with 15 universities outside of the region and this will increase the scope of the training program even further.

In the longer term, for the Ten Year Plan, CATIE proposes two additional training activities. The first is to upgrade the M.S training to Ph.D. level, commencing in year five of the plan. This

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will necessitate extensive consultations to define which institution (possibly CATIE itself) awards the degree. But given the size of the staff (especially those at the Ph.D. level) already present at CATIE, the excellence of the library facilities and the extensive lands available for field research, it would appear to be essential to upgrade to the Ph.D. level if the use of CATIE's resources is to be optimized in the interest of the region. Thus the Plan sets a target for CATIE to graduate a total of 30 Ph.D.'s by 1996.

The second innovative approach proposed for the training program is related to the broadening of its scope to include M.S's majoring in new activities such as socio-economic and rural development. In addition a new M.S. in the management of agricultural research and development programs (hopefully doing this in conjunction with IICA). Currently many CATIE graduate trainees are involved part or full time in administration even before they come to CATIE, and within five years of completing their M.S. virtually all of them are involved, to a significant part of their time, in administration.

Innumerable reports have identified institutional fragility and poor management as key constraints to agricultural development in the region. This will not be corrected purely by training more scientific specialists to the M.S. or even the Ph.D. level. But the situation could be helped by providing a year of higher agricultural training followed, not by a thesis year, but by a year of course work and case study to conclude with an M.S in the administration and management of agricultural research and development.

Taking advantage of CATIEs past research experience the M.S. would stress a farming systems approach in order to show how technology

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generation and transfer fit into the broader process of development and relate to it. Such a program will take time to develop and it is proposed that it should not be initiated until the second quinquennium of the the Ten Year Plan. By this time CATIE is expected to have developed much more expertise in areas such as planning, evaluation, management of financial and information systems, computer use, communication, etc., all of which are adjuncts to the proposed new research strategy (see Chapter VII).

In addition, two other initiatives will complement the above. First, CATIE's regular curricula for the M.S. and Ph.D. level will include at least one required course on research management and the possibility of credits through other optional course or case study programs. Second, CATIE will endeavour to offer at least once a year, a short intensive course or seminar on specific management related problems.

A clear innovation throughout all training will involve its articulation with research and with the institutional goal of aiding development. Thus training courses will include components on the nature of agricultural development using a farming systems approach as a conceptual means for linking technology generation and transfer with development. The various programs, especially at the graduate level, will include at least one course on development and agricultural systems.

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TECHNICAL DEPARTMENTS

The introduction of priority, in-depth programs by the technical departments is perhaps the biggest overall innovation proposed in the Ten Year Plan. It is suggested that these priority areas be discrete and well defined and that they should have quantifiable objectives which can be readily evaluated. As a guideline it is proposed that about 50% of the research working in each major program of the technical departments should be allocated to the priority areas.

The priority areas list does not include farming systems research as a priority area in itself. A clarification is in order here: CATIE considers its farming systems program as a primary resource and activity since its approach and methodology permeate the whole of the research, training and technical assistance activities. In this sense it has the nature of a priority program although not one included in the formally designated research areas as such. These areas are components for research, although regarded by CATIE within the context of production systems in the region.

CROP PRODUCTION DEPARTMENT

The departments future program will focus in 3 areas:

1. Crops where <u>high technology</u> is required - coffee, cacao and plantains. These three crops are the priority area topics in this program and CATIE will assign a specific team of it. The first two are areas where CATIE has considerable experience and are important export crops in the region. Plantains are an important food crop with an export potential. Research on these 3 crops will range from genetic

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improvement through to the components of production systems and will utilize 50% of the department's core resources.

2. Crops where complementary technology is needed--these consist of basic food crops such as rice, corn, beans, sorghum and cassava. The International Agricultural Research Centers are actively engaged in research on these crops, but their emphasis is mainly on genetic improvement whereas CATIE identifies its role as that of conducting complementary research in areas such as plant protection and soils, in order to facilitate the introduction and diffusion of improved genetic material in the region. This program is expected to utilise 25% of the departments core resources. Because of its breadth and the need to serve the region in the wide range of commodities it will concentrate efforts on critical components such as soils, plant protection, and the use of agroecological information for technology transfer.

3. Crops where some basic technology is needed - these are mainly fruits and vegetables, especially ones that may have an export potential. CATIE possesses a sizeable Germ Plasm Bank for these commodities and for both them and perennial crops has an active tissue culture program. It is anticipated that during the decade this program will move in the direction of biotechnology with particular emphasis on the use of non-conventional breeding techniques for perennials. Thus the 25% of resources utilized by this program, which is seen as a priority area in itself, will serve the coffee, cacao and platano programs as well as being concerned with hitherto largely neglected fruits and vegetables.

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ANIMAL PRODUCTION DEPARTMENT

This department's future program which has already been operationalized,has two major and two minor thrusts with the first two containing priority activities which utilize about half ot the total staff program:

1. Pastures and forages. This is a multidisciplinary program which will include studies on agronomy; disease and pest resistence; nutritive value; germplasm; and seed production and processing. The program, which will utilize 40% of the department's resources will also devote efforts to developing better systems of pasture management in order to evaluate the productivity of pastures in terms of animal production.

2. Tropical cattle. This ongoing program is based on studies of dual purpose cattle whose importance in the region has been noted in Chapter IV. Future activities will include work on genetic improvement with emphasis on milk and meat production; developing feeding systems which optimise the use of local resources of low opportunity cost; improving reproductive efficiency; developing herd health systems and improving techniques for processing and utilizing milk and meat. Overall this program will utilize 40% of the department's resources.

3. Swine production. The third program, a new one, will utilize 10% of the department's resources and will be concerned with swine production. Its main theme will be on the identification and evaluation of local feed sources that can substitute for imported

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products. Supporting activities will include research on genetic improvement; health packages and management systems.

4. Sheep and goat production. This new program, also utilizing 10% of the department's resources will focus on forage and browse utilization for sheep and goats. Like the swine program it will involve a range of supporting activities including genetic improvement and evaluation; environmental adaptation; the development of health packages; improvement of production systems; and improving techniques for the processing of caprine and ovine products and by-products.

DEPARTMENT OF RENEWABLE NATURAL RESOURCES

The department has identified 3 major interlocking program areas.

1. Agroforestry and multiple use trees. This program which is expected to use 50% of the departments research resources will place its emphasis on the development of sustainable production systems through multiple use trees and agroforestry associations. The program will unite previously separated activities in silviculture and agroforestry and will have close links with the Crop and Animal Production Departments. It will form the main thrust of the future work in the department.

2. Environemtal planning and management. This program, utilizing 35% of the departments research resources, will seek to insure sustainable and viable production from ecologically fragile areas. It will try to develop integrated systems for production and management to generate new techniques for planning and managing watersheds and protected areas, and to evaluate their socioeconomic, environmental and

institutional impacts. The area will integrate work on watersheds and wildlands.

3. Natural forest silviculture. This area will use 15% of the DRNR's core budget. It will emphasize the silviculture and management of secondary forests, as well as of primary forests to a lesser degree, with the goal of studying their ecology for sustained economic use. The area will integrate work on silviculture, wildlands and watersheds.

5. Some patterns of change

The Ten Year Plan has attempted to quantify both its financial and manpower targets and also its work program allocations in order to move towards a stronger system of evaluation and accountability. The detailed figures presented at this stage serve as broad guidelines and will need to be regularly reviewed. It is, however, useful to examine these figures in terms of the current programs to gain an idea of the type of changes that they represent. This is done in Table 11.

The table indicates that the relatively low current core budget is used primarily for overheads and very few funds are available from core for research. The effects of 3 specific large projects (in annual crops, silviculture and resource management) are highlighted in the table with respect to the overall resource allocation program and, by implication, this stresses the need for a lesser dependence on project funds if a defined strategy is to be followed.

In manpower terms the plan implies a major increase in the training effort which will be assisted by project funds recently granted from USAID/ROCAP (but not shown in the Table). It also

indicates much greater stress on the agroforestry program and in all animal production programs, including the two new ones. In contrast to this, relatively less emphasis than at present is proposed in annual crops, agroforestry and resource management through the development of a more balanced program strategy, with additional core funds being used for this purpose. The final columm of the table suggests that a critical mass of manpower should be available, even allowing for technical assistance and training activities, in each of the priority areas.

TABLE 11

CURRENT BUDGET AND MANPOWER UTILIZATION AND PROPOSED MANPOWER ALLOCATION IN 1996

Department/Program	BUDGET 1986 CORE %	BUDGET 1986 TOTAL %	PROFESSIONAL MANPOWER 1986 %	PROFESSIONAL MANPOWER 1986 All man-yrs	PROFESSIONAL MANPOWER 1996 %	PROFESSIONAL MANPOWER 1996 All man-yrs	PROFESSIONAL MANPOWER 1996 Res. man yrs
DIRECTION/ADMIN.	61	23	12	21	15	40	--
CROP PRODUCTION	15	33	43	73	30	78	44
Annual	(5)	(17)			(8)	(20)	11
Perennial	(5)	(8)			(15)	(39)	12
Basic	(5)	(8)			(8)	(20)	
ANIMAL PRODUCTION	10	6	11	18	23	60	33
Pastures	(0)	(3)			(9)	(24)	13
Bovines	(10)	(3)			(9)	(24)	13
Swine	(0)	(0)			(2)	(6)	4
Sheep/goats	(0)	(0)			(2)	(6)	3
NATURAL RESOURCES	9	33	31	53	23	60	33
Silviculture	(3)	(14)			(7)	(18)	10
Agroforestry	(1)	(3)			(8)	(21)	11
Res. Mangt.	(3)	(16)			(8)	(21)	11
TRAINING	5	6	3	5	9	22	--
TOTAL	100	100	100	170	100	260	

Note: Methodology in Appendix.

APPENDIX

METHODOLOGY OF TABLE 11

a. The first two columns derived from the 1986 budget and the following two refer to professional staff at the beginning of 1986.

b. The total of 260 man-years is a target for 1996. Of these 15% are assumed to be involved in managerial and administrative responsibilities. The remaining 220 are split up among research (50% = 110), training (40% = 88) and technical assistance (10% = 22). All technical asistance and 75% of the teaching load is assumed based in the three technical departments. This would imply 198 man-years in these departments by 1996.

c. Allocation among departments was assumed to be 40% = 78 for Crop Production, 30% = 60 for Animal Production and 30% = 60 for DRNR. Internally within each department, these amounts were then allocated among programs using projected target percentages for core budget use in 1996.

d. The last column applies the above procedure to the 100 man-years for research.

VII. IMPLICATIONS OF IMPLEMENTING THE STRATEGY

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1. Introduction

The last chapter has sought to show how CATIE will direct and scale its activities during the next 10 years. Proposals include emphasis on long term, in-depth, quality research on priority subjects and the development of the graduate program. In order to bring about the proposed changes certain new measures will have to be adapted. In particular there will be a need for access to additional sources of funds for new governance arrangements capable of supporting the new mandate; for the strengthening of certain support activities at headquarters; and for a system of management that introduces the concept of accountability. This chapter considers the new measures cited above and necessary for the proposed changes.

2. Governance

COUNCIL OF DIRECTORS

The current composition of the Board includes the Minister of Agriculture from Costa Rica, IICA's Director General , the Director of CATIE (ex-officio secretary), a representative from a country member of the Inter-American Board of Agriculture (IABA), one from outside of Central America, and two representatives drawn from two member countries of CATIE---rotated on a biyearly basis. This restricted composition clearly hinders the Center in projecting itself to important funding sources. On the other hand, the fact that Board memebers are appointed on the basis of the post that they hold and that appointments are only for one year terms means that many Board members

do not remain long enough to become sufficiently aquainted with the institution to make a knowlegeable contribution to it.

Recently this year, a proposed ammendment to CATIE's chapter has been initially approved. The new Council of Directors shall be composed of one representative from each country of the Central American Isthmus and the Caribbean that are regular members of CATIE, two representatives of IICA, one representative of the IABA, and three non voting specialists in agricultural or related sciences, designated by the Council. The Director General of CATIE shall be the ex-officio secretary of the Council. All members, except for the representative of the IABA shall hold their positions for three-year terms which may be renewed for an additional two years.

In order to insure accesss by CATIE to potential international donors and funding sources, it would prove helpful that representatives or appointees from major countries in this regard be able to contribute to policymaking for the Center. The ammendment currently under way appears to accept this view by including appointed specialist members. Member countries and their representatives will be formally requested to designate as Council members only outstanding individuals from the fields of research, graduate training or science and technology management. Neverless, within the scope of the plan but further ahead, the above will not exclude the possibility of further steps in this direction, should future evaluations recommend so.

TECHNICAL COMMITTEE

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The current Technical Advisory Council, does not function well and suffers from two serious disadvantages. First, its membership is based on political rather than technical considerations; second, it lacks any real responsibility in management. The ammendment proposes to replace it with a technical committee composed of 5 member from the Council of Directors including two of the three specialists. CATIE's General Director will be its ex-officio secretary.

The Technical Committee's mandate would be similar to that of the Program Committees of the CGIAR Centers. Its main responsibilities will be to examine the degree to which policies and strategies set by the Council for research and technology transfer are met.

ACADEMIC COMMITTEE

For similar reasons a new Academic Committee will replace, the current Academic Council. This Committee will have two kinds of members: first, three members of the Council of Directors, and, second, other representatives, to be described in a By law. As with the Technical Committee, its main responsibilites will include monitoring, evaluating and advising the Council of Directors and the Director on training program, goals and targets aside from other assigned duties.

3. Support Units

Implementing the Plan will require certain important changes in CATIE's structure. In particular, it will be necessary to develop strong support units in the areas of planning and evaluation,

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communications and computer use. This proposal entails some degree of centralization which is proposed in the context of the findings of a number of recent evaluations which have suggested that the degree of autonomy possessed by the technical departments has acted as an impediment to past progress. It is proposed that these support units respond directly to the Director and/or his Deputies.

REINFORCING THE DIRECTOR's OFFICE

The interdepartmental nature of a number of the priority areas identified for future research calls for a higher degree of direction and coordination from a level above of that of individual departments. A possibility that will be explored involves creating the position of Deputy Director for Research. The position would be filled by an outstanding scientist with managerial capabilities who would be entrusted with aiding the Director in coordinating and managing the entire research enterprise at CATIE. This would not in any way infringe upon the technical direction of scientific activities but would mean that the Deputy Director for Research play an active rol in ensuring that program activities are consistent with plan priorities.

PLANNING AND EVALUATION

Another proposed change involves creating a Planning and Evaluation Unit attached to it. This will be a small unit with the prime task of ensuring that top management be provided with up-to-date information regarding the implementation, progress and performance of CATIE in terms of its Ten Year plan. This unit will also be charged

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with updating the plan every 3 years and, in the nineth year of the plan, with preparing a draft for a new Plan.

These activities will require cooperation with the Administration and with the Computer Unit in developing appropriate information packages relating to the planning, monitoring and evaluation functions. The Planning Unit will also have the task of screening project proposals, both those initiated by donors and also ones developed by CATIE's technical departments. Screening mechanisms are necessary to ensure that project proposals are consistent with the Ten-Year-Plan and its priorities. Projects that are inconsistent with the objectives of the plan will need to be modified or rejected and will not be accepted in future purely for their overhead component.

COMMUNICATIONS

A new central Communications Unit responsible directly to the Director is considered essential to strengthen both the quality and the quantity of CATIE's information and communications outputs, on the one hand, and its permanent links with users and associated institutions, as well as, internally, among all its operational units, on the other hand.. One of the prime means of servicing CATIE's client countries (not only in Central America but also in other Latin American countries who support CATIE through the IABA/IICA contribution) is by providing them with appropriate information. This requires a structured communication's policy with appropriate and up to date high quality media.

CATIE will undertake the production of media and supporting materials for instructional purposes both for its graduate programs and for training professionals, technicians and extension workers. It will emphasize regional programs with a broad coverage that seek to improve production practices among small and medium sized farmers. Other activities will include monitoring and evaluating communication activities and materials in order that assessment of their impact and efficiency may provide feedback into new design and production efforts.

There is also a need for CATIE scientists to publish formal papers in peer review journals. Material for internal publication will be submitted to a central Editorial Committee and the Communications Unit will have the task of editing centrally all materials for publication. This is considered necessary to upgrade the quality of publications and to ensure more selectivity. Particular emphasis will be given to raising both the number and the quality of publications by CATIE staff in 'Turrialba', a readily accesible journal which already has an international reputation and which will be jointly edited with IICA.

COMPUTER USE

During the Plan CATIE will give particular attention to developing management information systems. While much information might be gathered and processed using microcomputers, the Computer Unite will be charged with organizing and supporting the necessary technical build up as well as with consolidating and integrating its results. The Computer Unit will guide and support the process of regularly producing information on CATIE's resources, particularly in terms of manpower and finance, with respect to availabily and current status. It will also develop systems for producing regular status reports on both projects

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and programs. CATIE will endeavour to be at the forefront of technology with respect to management information systems for research and training. It is considered essential that this task be treated as a high priority in order that the necessary in-house expertise may be developed so that CATIE can embark upon its plan of offering training in agricultural administration and management during the second half of the plan period.

This will not be the only task of the Computer Unit. It will also be responsible for providing overall advice in relation to CATIE's computer strategy. CATIE presently has a main frame computer which has permitted the Center to carry out a range of many requirements for information and processing. Without ignoring the, perhaps, permanent need for a main frame, in order to integrate information and have greater capability, CATIE urgently needs to benefit from recent developments in microcomputers which offer greatly expanded capabilities and applications at low costs. The Center has recently acquired about 30 microcomputers and is well on the way to being at the forefront of microcomputer use in the region. The nature of the program of this Unit suggests that it should report directly to the Deputy Director (Administration).

PRODUCTION SYSTEMS (DIPS)

In recent years CATIE has been developing an integrated approach to regional problems and, specially, through its capabilities in production systems. The best way of consolidating these resources is presently under study and eventually they might become a supporting unit for institutionalizing CATIE's multidisciplinary and integrated

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approach. This year the Center has taken a step towards such institutionalization by creating the Program Development of Integrated Production Systems (DIPS). The program will carry out joint activities with technical departments and help to implement the concept, discussed in previous chapters, of research focused on rural development.

4. Program Budgeting

Reference has already been made to the need for developing appropriate management information systems as an essential part of the new strategy. A key feature of such systems will involve refining and developing the concept of program budgeting already partially implemented, whereby a close link is established between the budget and the program of work, and the latter is tied in closely with the plan targets. This will also make it possible to introduce the concept of accountability in terms of programs and scientists in relation to CATIEs goals.

An important stage in this process will be that all professional staff will be expected to record their inputs to different activities. Thus the Research Director's office will be able to maintain an up-to-date summary of the distribution of the CATIE work efforts in relation to those proposed in the strategy put forward in Chapter VI of this report. This is considered to be essential in order to properly monitor the inputs to the various programs.

Another area in which a more rigid system will be imposed relates to research protocols. Before any research is embarked upon during the plan period it will be based upon a protocol that has been endorsed by a biometrician in the Computer Unit and also by a socio-economist in the appropriate technical department. Where or when such centralized

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endorsements are not feasible or practical, the Research Director's office will specify an alternate but equivalent procedure. Thus, before the leader for any research project receives a budget for the project it will have to be cleared for both its methodological soundness and its socio-economic relevance.

It is also intended that changes will be made within the area of research leadership. In this context all projects will, in future, be specifically designated to a department and the project leader, irrespective of the source of funding of the project, will be strictly accountable to the leader of the technical department in which the project is located. The leader of each technical department will be expected either to take personnel leadership or to allocate leadership of each of the priority areas in his department. Thus, even if several projects supported by different donors are associated with a specific research priority area, there will be one person in the department who has overall charge of coordinating research activities in that priority area.

This will also mean that when staff from different departments are working together on one priority area the designated leader for that priority area will have decision making authority regarding the technical programs of all of the scientists working in that area, irrespective of which department is leading it. This will entail the gradual introduction of the concept of program leadership, parallel to the existing one of project leadership. This approach seeks to

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introduce a considerable degree of responsibility without in any way diminishing the roles of the heads of the technical departments.

The same treatment will apply to farming systems projects which involve several departments but where a single one has the largest role. Where the role of each department is fairly balanced, the project might be assigned to the systems unit (or department) with a coordinator accountable to the systems head.

The plan postulates that by the mid 1990's there will be some 60 CATIE staff outposted in countries of the region. It has already been found practical to appoint a country leader in countries with a large CATIE field program and this policy will be continued. Insofar as is possible, country leaders or representatives will work in close collaboration with IICA and, where possible, this will be done by sharing resources without in any way diminishing CATIE's autonomy. The Center will designate a coordinator responsible for all of its operational linkages with IICA in the region.

5. Human Resources

The implementation of the plan will necessitate the development of a structured manpower development policy at CATIE. Future recruitment will pay particular attention to the fact that most CATIE professionals will be required to participate in training as well as in research and technical assistance activities. This will obviously require a different pattern of work for each post but future recruitment will take account of the need for balanced strengths in all areas in which CATIE has training responsibilities. In order to do this, both new and

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existing staff will require clear job descriptions which lay out all of the responsibilities in the incumbents field of activity even though this may present problems in the case of some project staff.

Wherever possible all staff, including project staff, will have some teaching responsibilities. This should not present too many problems since nearly every project has a training element and it should be feasible for project staff to return to Turrialba periodically to present course material.

Another way in which research and training activities will be linked closely in the future is through focusing thesis topics, wherever possible, on CATIE's selected areas of priority research. This will become particularly important as CATIE upgrades the M.S. training program to a Ph.D. level.

The physical development plan makes specific proposals for the provision of housing for visiting scientists. CATIE will endeavour to attract both post-doctorals and scientists on sabbaticals to spend extended durations at CATIE, particularly where such persons are prepared to work on programs related to the priority topics or to contribute to relevant basic research in areas where CATIE's own personal resources are limited.

Reference has already been made to the proposed development of a policy in which priority activities are built-up on a program focus and to the fact that program leaders should have a fair measure of authority in leading research programs. All research activities, including both program and project research, will be subjected to

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annual performance monitoring and evaluation. This will include a review of both cost and time inputs and also of outputs, including publications. These monitoring activities will be coordinated by the Research Director and will be conducted at an annual review in which the Program Committee of the Board will be invited to participate. From time to time, external program reviews will also be undertaken as at present.

6. Financial resources

The plan calls for CATIE's operational budget to rise from its current level of about US$12 million to US$19 million (at 1986 prices) by 1996. It postulates that this rise will take place gradually and that there will be a concurrent rise in the project budget component of the total budget from its present level of 8 million dollars to 9.5 million dollars by 1996. A larger project budget is feasible but is not considered desirable within the context of maintaining balanced development between core and project budgets.

In chapter VI of this report stress has been given to the need for CATIE to increase the size of its secure core budget from the current level of US$3.0 m to one of at least US$7.8 million, by 1996, this requires an extra $4.8 million of core funds.

An examination of the sources of the current core budget indicates that there are five possiblities for bringing about the above change:

1. Increasing revenue from crop sales. This is considered to be an unreliable source of additional revenue since sales are mainly from export crops which sell in volatile markets where long term

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price increases are questionable. Furthermore, the high standard of husbandry practiced on CATIE's commercial farm lands is such that significant increases in productivity are unlikely. A possible option here will involve exploring new productive activities.

2. Increasing the income from services. This is potentially an additional source of revenue as it is related to the project portfolio and as the project budget increases in size the incremental demand for services is also likely to increase. However, services represent a relatively modest portion of the total budget, and the increased revenue from this source is unlikely to be much more than US$250,000 annually at the most, by 1996.

3. Increasing the level of project overheads. Currently project overheads are of the order of 9.5% of total project costs. This is much less than the 18% that is normally provided to the CGIAR Centers. The latter figure has been used in the plan because CATIE will endeavour to avoid participation in the future projects which offer lower overheads.

4. Increasing the revenue from existing core donors. Presently IICA contributes US$1 million per annum and the 6 supporting countries each provide US$50,000 per annum. Were these contributions to be raised to US$ 500,000, the additional revenue provided would meet over half of the expected core shortfall of US$5 million in 1996. The gap would be closed completely if the six country contributions were increased to US$850,000 each per annum.

However, given the economic situation of the member countries, this would appear to be an unrealistic supposition.

5. Identifying new sources of funding, such as donor agencies. This is a new possibility and its potential remains unknown. Funds have been provided in a recent USAID loan to enable CATIE to seek professional assistance in fund raising. Clearly this will be a priority for the immediate future. It has, however, to be recognized that the existing system of governance of CATIE is unlikely to be conducive to seeking additional core funding from donor agencies. It is for this reason that the plan proposed to enlarge the Board of Directors in a way that would make sizeable subscribers to the core budget, other than IICA and the member countries, have a voice in policy making at CATIE.

The most reasonable solution should allow for increases through all of the preceeding possibilities. The Center will concentrate attention and effort on each of them.

7. Physical Resources

Plans for physical development have been prepared, as already noted, in association with the USAID/ROCAP higher education project. These cover most of CATIE's capital development requirements during the plan period. The first tranche of funding for this development has already been granted.