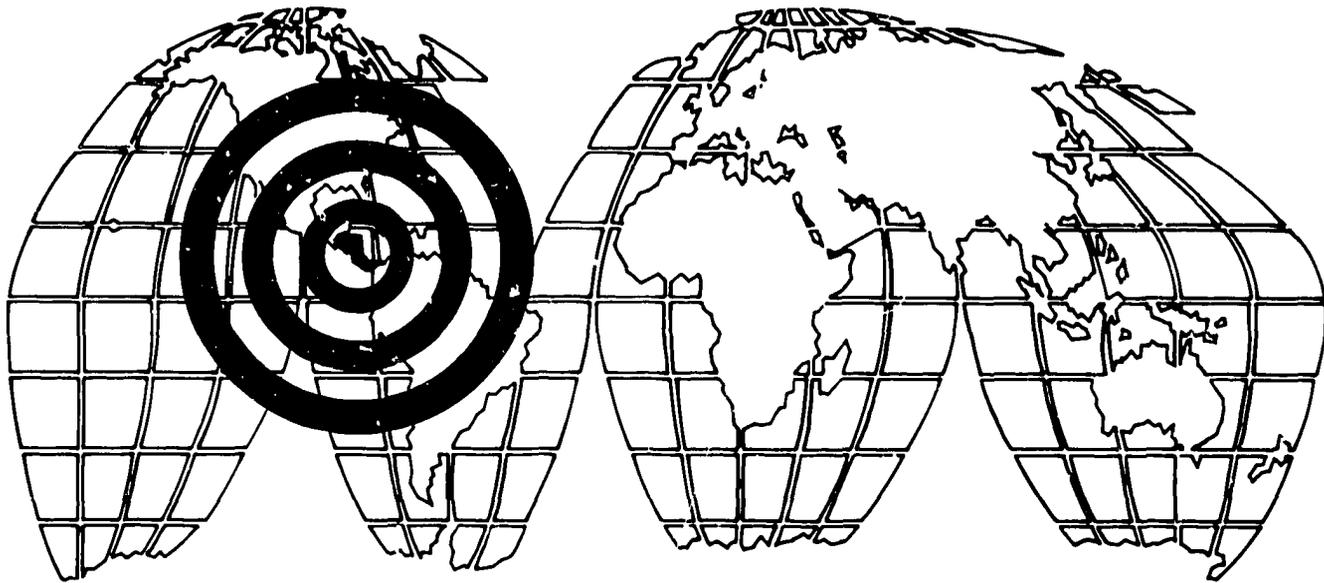


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A.I.D. Project Impact Evaluation Report No. 14

Central America: Small-Farmer Cropping Systems



December 1980

Agency for International Development

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(continued inside back cover)

CENTRAL AMERICA: SMALL FARMER CROPPING SYSTEMS

Centro Agronómico Tropical de Investigación y Enseñanza (CATIE)
(Center for Tropical Agricultural Research and Training)

with A.I.D.'s

Regional Office for Central American Programs (ROCAP)

PROJECT IMPACT EVALUATION NO. 14

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December 1980

The views and interpretations expressed in this report are those of the authors and should not be attributed to the Agency for International Development.

EXECUTIVE SUMMARY

During the ferment of the early 1970's when development analysts and foreign aid policy makers were raising fundamental questions about who benefits from economic growth in the LDCs, about what development really means, and about how the world was to feed itself, small-holder agriculturalists in the Third World came in for special attention. Several studies reached the same major conclusions: (1) In most of the Third World, the small holders are producing the majority of the nations' food crops. (2) Their traditional farming practices have been little affected by improvements in agricultural technology. (3) They and their landless or near landless rural neighbors are not benefitting from the general economic growth of their societies. (4) To meet rising global food demand, the small holders must increase their production largely through better agricultural technology and more efficient use of their limited resource endowments.

These studies also generally agreed that if the poor small-holder households could produce more at fair market prices, not only would they benefit more, but labor intensive production systems would also provide more work opportunities for the growing numbers of underemployed rural poor.

The logic of this analysis is at the heart of the Small Farmer Cropping Systems research project evaluated in this report. The project's strategy emerged from the concern of AID officers in the Latin America Bureau/Washington and in AID's Regional Office for Central American Programs (ROCAP) in Guatemala for precisely these issues. They found a small group of agricultural scientists at the Center for Tropical Agricultural Research and Training (CATIE) at Turriabla, Costa Rica who had initiated experiments to increase the production of the traditional multicropping systems of Central America's millions of small-holder farmers. CATIE crop scientists recognized that these small-holders represented nearly half of the area's population and although they farmed less than 30% of the area's arable land, they produced some 70% of its staple food supplies. Most of these holdings were ten acres or smaller and were planted to traditional basic products, such as corn, beans, cassava, and potatoes, in combinations of multicrop systems suited to the varied ecologies of the area. Few of these small farmers had benefitted from the agricultural technologies that most larger mono-crop producers had adopted with considerable success by using advanced inputs and sophisticated knowledge of the market on large-scale farms.

The objective of this project was to develop a capacity at CATIE to understand and improve the total farming system of these small holders. The strategy was to build at CATIE a cadre of agricultural scientists from several disciplines who would work with national agricultural institutions in Central America to conduct collaborative cropping systems research with the small producers on their farms, throughout the region. As improved cropping alternatives were developed, it was expected that the national institutions would further verify the potential for increased production and income gains and then extensively disseminate the results to small farmers throughout the country.

This evaluation shows that the project has accomplished its basic objective. In a short five year period, 1975-79, this small \$1.6 million

grant has helped to produce a powerful capacity to bring agricultural research to the small farmer's fields. It provided the incentives for building a new interdisciplinary approach for understanding small-farm multicrop systems and for testing agronomically sound alternatives for improving those systems. It brought the agricultural scientists from their research station to the peasant farmers and has begun to stimulate corresponding interest and commitments from national agricultural institutions in all of the Central American republics as well as substantial interest and program support from the international donor community. CATIE's work has captured the attention of many in the great international agricultural research centers.

It is too soon for such an innovative and short-lived experiment in agricultural research to have wide-scale impact on large numbers of small-farm households in the region. But the potential for such impact within the decade of the 1980's has been established. The promise from this institutional capacity building project is a bright spot in AID's search for effective means of reaching those millions of truly small farmers whose limited agricultural resource base is not only their only hope for prosperity, dignity and development but also the entire area's best hope for avoiding great scarcity in basic food staples in coming years.

The evaluation was based on three weeks of intensive field interviews conducted in January-February 1980 in Guatemala, Costa Rica, Honduras and Nicaragua, with regional and bilateral AID mission staff, CATIE agricultural scientists, as well as personnel of national agricultural institutions, and with members of small-farm households in each of these countries. Field work was complemented by international telephone interviews with other donor personnel and by numerous written and personal secondary sources in AID Washington.

The evaluation concludes that the project's impact on CATIE has been profound and lasting, to the long-term benefit of small-holder agriculture in Central America. The expanded research capacity of CATIE for performing collaborative, on-farm systems work with national organizations throughout the region is already producing the rapid adoption of a new production alternative in Nicaragua. As more of its work is verified for other ecological zones in Central America and the increased productive potential is demonstrated on a scale wider than initial pilot tests, we expect to see similar dissemination of results in future years. To prove this potential for impact on the ultimate beneficiaries, the team recommends that a follow-up evaluation be conducted in 1983-1984. By then, the promise evident from this first stage effort should be flourishing on hundreds of farms in the region through higher yields from new cropping systems developed through CATIE's research initiatives.

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PREFACE

In February 1980 a six person team evaluated the Small Farmer Cropping Systems research project (SFCS) funded by AID's Regional Office for Central American Programs (ROCAP) and carried out by the Center for Tropical Agricultural Research and Training (CATIE) located in Turrialba, Costa Rica. The primary objective of the SFCS project was to create a coordinated regional research approach for improving the cropping systems of small farmers in Central America. CATIE was to accomplish this objective through carrying out multicropping systems research at a central experiment station in Costa Rica and through on-farm research activities with a small number of selected farmers in five Central American countries.¹

To conduct the impact evaluation the team included two Central Americans --a soils scientist and a rural sociologist--and four AID professionals-- an agricultural economist, an anthropologist, a political scientist, and a senior general development officer. All AID team members spoke Spanish and had worked in Latin America previously.

To arrive at its findings, the team looked at secondary source data and also interviewed 8 of the 12 SFCS staff, a total of 15 CATIE staff, 5 senior staff members of the Interamerican Institute of Agricultural Sciences (IICA) and some 45 key members of national, regional and international institutions. In addition, the team interviewed 15 AID officers from five missions including ROCAP. They also conducted on-farm interviews with 28 (37%) of 75 participating small farmers and other members of the farm households. Team members visited four countries --Guatemala, Costa Rica, Honduras and Nicaragua-- and more than eight provinces and districts within these countries. They spent a week preparing for the field research and several weeks analyzing their findings and preparing this report. Because of time and travel limitations, the team was unable to visit either El Salvador or Panama. This was particularly regrettable in the Salvadorean case since all reports indicated that the project was especially effective there.

Before departing for the field, the team participated in a workshop and then prepared a matrix which included areas of project impact and kinds of impacts for assessment. Once in the field, the team refined the matrix and prepared a series of open-ended questions to be asked during interviews. After interviews were completed, the team analyzed their field notes together and developed a consensus on the significance of the responses. They buttressed the interview data and direct field observations with secondary source data on CATIE, the SFCS experiments, and research studies produced. (See Appendix A on Methodology for detailed discussion).

¹ Guatemala, Costa Rica, Honduras, El Salvador, and Nicaragua. A sixth participant, Panama, was later added to the project.

A Note on Evaluation Objectives

Evaluating the impact of agricultural research is particularly difficult. The payoff to research in terms of production and incomes may take a decade or more. If one waits this long, however, there arises the analytic problem of attribution--of all the changes noticed over a decade, which one can really be attributed to a specific amount of research? The problem is even greater in the case of the Small Farm Cropping Systems Project, which is not only recently completed, but has as its aims the development of new methodological organizational capabilities, rather than the creation and dissemination of a particular technological improvement.

While it is too early to assess the "ultimate" impact of this project, one can ask about what difference this project has made--on the implementing institution, on the way research is carried out, on other national and international institutions, and on the small farmers who have participated thus far. One can also make a preliminary assessment of the potential of this type of research for producing improved technological alternatives appropriate to small farmers. Unlike other evaluations oriented to problems of implementation, this involves going beyond the explicitly stated objectives of the project.

ACKNOWLEDGEMENTS

Although the evaluation team is solely responsible for the contents of this report, we are deeply indebted to numerous people who provided generously of their time to assist us in the process of its preparation.

We are particularly indebted to the staff of ROCAP both in Guatemala and in San Jose. Mr. Robert Hechman, Acting Mission Director and Mr. Donald Feister SFCs project manager, provided extensive background information and, particularly important, facilitated our visits throughout the region. Both Robert McCullough and Jim Murphrey made our comings and goings from San Jose as efficient and pleasant as possible with secretarial help, local transport, and unreserved hospitality.

Our stay at Turrialba was filled with stimulating and candid interchange with all of the staff and with the unstinting hospitality of the CATIE administration. We owe special thanks to the Director, Dr. Santiago Fonseca and his Deputies, Dr. Eduardo Locatelli and Dr. Héctor Muñoz for their preparations for our visit and their attention to all of our information requirements and our physical needs. Above all, the team must acknowledge the intellectual and human qualities of the outstanding staff of agricultural scientists associated with the Small Farmer Cropping Systems project who provided us, both in our field visits throughout Central America and in our interviews at Turrialba, an understanding of and appreciation for the dynamic program with which they were associated. Particularly we would thank Pedro Oñoro, Head of the Annual Crops Program and Raul Moreno, former SFCs project director; the field scientists which included Aníbal Palencia, Nicaragua; Donald Kass, Guatemala; Robert Hart, Nicolas Mateo and Nery Mayorga, Honduras; as well as Miguel Holle, Nora Solano and Carlos Burgos scientists based at CATIE.

The Mission Directors and AID mission staff in Tegucigalpa, Guatemala, Managua and especially in San Jose helped with our in-country field visits and facilitated our interviews with host-country officials. And in each of the countries we found the fullest cooperation and frank expression of views from both senior officials and field staffs of the participating agencies: the Secretariat of Natural Resources (SRN) in Honduras; the Institute of Agricultural Science and Technology (ICTA) in Guatemala; the Ministry of Agriculture of Costa Rica and the Ministry of Agricultural Development in Nicaragua. In Honduras, we benefited from the special field knowledge of Orlando Hernandez, a local social psychologist and in Guatemala we had similar support from Rolando Duarte, an anthropologist from the Central American Nutrition Institute (INCAP) who joined in our field work.

We also benefitted greatly from our visits with the personnel of the Inter-american Institute of Agricultural Sciences (IICA). Our special thanks to Jose Emilio Araujo, IICA Director and his colleagues Malcolm McDonald and Gilberto Paez for their hospitality and extensive knowledge.

Certainly our deepest appreciation and long lasting respect goes to the small-farm households of Central America. From these kind people, we received the generosity of their tables, a night of shelter under their roof, and an understanding of the joys and hardships of drawing their life substance and the food for thousands of others from their modest but cherished lands.

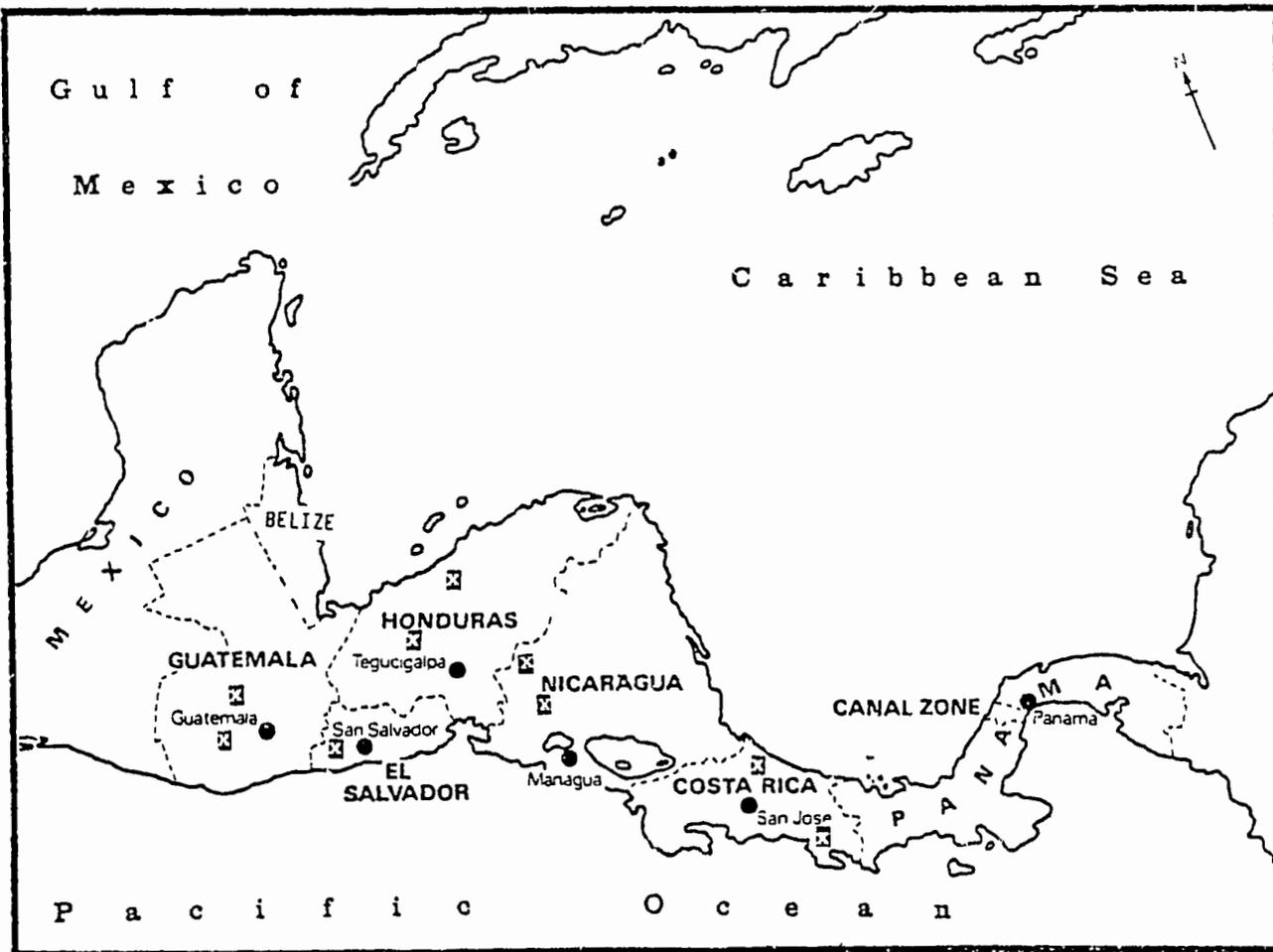
PROJECT DATA SHEET

1. Location: Central American Regional. Administered by AID's Regional Office for Central American Programs (ROCAP). Specific countries participating: Guatemala, Honduras, El Salvador, Costa Rica, Nicaragua, and Panama.
2. Project title: Small Farm Cropping Systems
3. Project number: 596-0064
4. Project implementation: FY 1975 - FY 1979
5. Project funding: AID \$1,663,000 (Grant) Substantial contributions in money, personnel, vehicles, office space, facilities and contact accounting services were made directly and indirectly by CATIE (the implementing institution), the Interamerican Institute of Agricultural Sciences (IICA), and the research institutions of the participating countries.
6. Implementation Arrangement: Project Agreement between the Center for Tropical Agriculture Research and Training (CATIE) and AID's Regional Office for Central American Programs (ROCAP). Subsequent agreements were made between CATIE and each national agricultural research organization to support on-farm research in the participating country.

MAP OF CENTRAL AMERICA

☒ Indicates sites of the Small Farmer Cropping Systems Project.

Each project site included several small farms on which experiments were conducted.



.. SETTING

The Problem: Agricultural Research and the Small Farmer

It is now widely recognized that solving the world's food crisis will require programs of research and development which benefit the vast number of relatively small scale producers in the developing countries. Farming small plots of relatively marginal land, and with little access to improved means of production, distribution and consumption, these small farm families often supply the bulk of an area's food supply.

In Central America, for example, where population growth is expected to double food requirements by the year 2000, more than 70 percent of the staple foods are produced by these small scale systems of agriculture, even though they occupy only 30 percent of the cultivable land. Almost half the population of Central America, some 8 million people, are members of rural households that farm 4 hectares (10 acres) or less. Another 2 million people belong to families that farm 4 to 35 hectares.

While the urgent need to develop improved technology appropriate to small scale agriculture has been recognized for some time, efforts to do so have been hampered by a lack of the necessary research and development tools. The traditional tools of agricultural research in the United States have developed in the context of very different agricultural systems. These have been characterized, for example, by: abundant land of high quality; a temperate climate with adequate rainfall; massive industrial and commercial expansion; an educated rural population; rural access to capital, credit and a variety of service industries; cheap petrochemical sources of energy; attractive off-farm employment opportunities for rural labor; farmer access to important political and economic institutions sensitive to the requirements of the rural sector; and large scale government support for a decentralized system of research and extension. To service the needs of this agricultural system, powerful and highly specialized research tools have been fashioned. This specialized toolkit is particularly suited to crafting solutions to the biochemical and engineering problems of capital intensive agriculture. Research is normally focused on some particular aspect of one crop, for example, genetic research on a disease resistant variety.

This type of research has produced the much heralded green revolution. However, the small producers of Central America have benefited little from these advances in agricultural technology. Benefits have gone principally to the larger farmers who have access to the capital and information required to utilize the improved seed varieties, fertilizers, herbicides and pesticides involved in the new technologies. These farmers tend to be highly commercialized and mechanized producers of single crops often oriented to international markets.

The small farm households that produce most of the region's food, however, manage a different sort of agricultural system. They are usually more isolated, working relatively marginal lands carved from steep volcanic hillsides or from humid tropical undergrowth. Instead of producing a single crop for sale in the market, they produce a variety of crops, often in combinations in the same field, for household consumption as well as for market. Their stake in the harvest goes beyond profitability to family survival. Many of these cropping systems have been developed over cen-

turies to get the most out of very small holdings while at the same time reducing the risks from blight, rot, drought or pests through the ecological diversity of the plants cultivated.

If technological improvements are to increase the productive efficiency of these small farmers, they must be designed for and adapted to the special needs and constraints of small farm systems. The Small Farm Cropping Systems Project was an initial attempt to develop the research tools and institutional capacity to accomplish these tasks. This report attempts to assess the impact of that project.

II. THE SMALL FARMER CROPPING SYSTEMS PROJECT: DESCRIPTION

History: An Idea Evolves

Recognizing the opportunity that this challenge presents, a small group of agricultural scientists in the Tropical Crops and Soils Department of the Center for Tropical Agricultural Research and Training (CATIE) at Turrialba, Costa Rica, began in 1973 to experiment with improvements upon the traditional peasant multicropping system.

Earlier they had made a survey of Central American agriculture which led them to the following conclusions: 1) most of the basic food staples, beans and corn in particular, were produced by small farmers whose average farm unit was less than 5 hectares; 2) most of the beans and corn produced were cultivated using multicropping rather than single cropping techniques; and 3) the agricultural technologies produced by international, regional or national research centers did not reach the small farmers who were using traditional, low-input technologies.

As a first action, these scientists initiated an experiment on plots at CATIE's Turrialba station in order to test the productive potential of various crop systems in combinations of five main crops: corn, beans, cassava, rice and sweet potatoes. As they experimented and became more familiar with other similar research, such as Richard Bradfield's farming systems research at the International Rice Research Institute (IRRI) in the Philippines, they recognized the great varieties in, and complexities of, the multicropping systems that small farmers employed. They realized that the approach required a range of expertise that only an interdisciplinary research group could provide. It also required opportunities to work off the research station and on the peasant farms in the widely different ecological zones of Central America in order to test the alternative systems under actual growing conditions.

During this period, AID agriculture officers in the Washington Latin American Bureau and in the Regional Office for Central American Programs (ROCAP) had developed a keen interest in formulating a research strategy for understanding and improving small farmer cropping systems. Until then, the principal analogous work that had been done was that of Bradfield in the Philippines. None had been attempted in the Americas. Therefore, when in 1974 CATIE proposed holding a regional conference to explore the dynamics and possibilities for cropping systems research, AID/ROCAP, under the leadership of Donald Feister, its senior agriculturalist, warmly supported

the activity. Following the conference AID and CATIE formalized the Small Farmer Cropping Systems Project (SFCS) which was approved for 1.6 million dollars in grant funds to CATIE to be executed during 1975-79.

The purpose of the evaluation summarized in this report was to determine the impact that this project has had. The evaluation team recognized that this was a unique agricultural research activity. CATIE was not being charged with the task of developing a new bean, corn or casava variety. Rather it was taking on the task of developing a different research approach for understanding and improving the highly varied small farm cropping practices of the region. This would require innovative interdisciplinary collaboration, and a bold proposal to do the research on working farms throughout Central America with the support and cooperation of national institutions in five different countries. The evaluation team needed to learn if this project had indeed created a capacity and demonstrated the potential it promised. Most important, the evaluation team wanted to know that, if given the time necessary for validating and packaging research results obtained in this initial project, it showed the potential of increasing the production from small farms and improving the incomes of peasant cultivators.

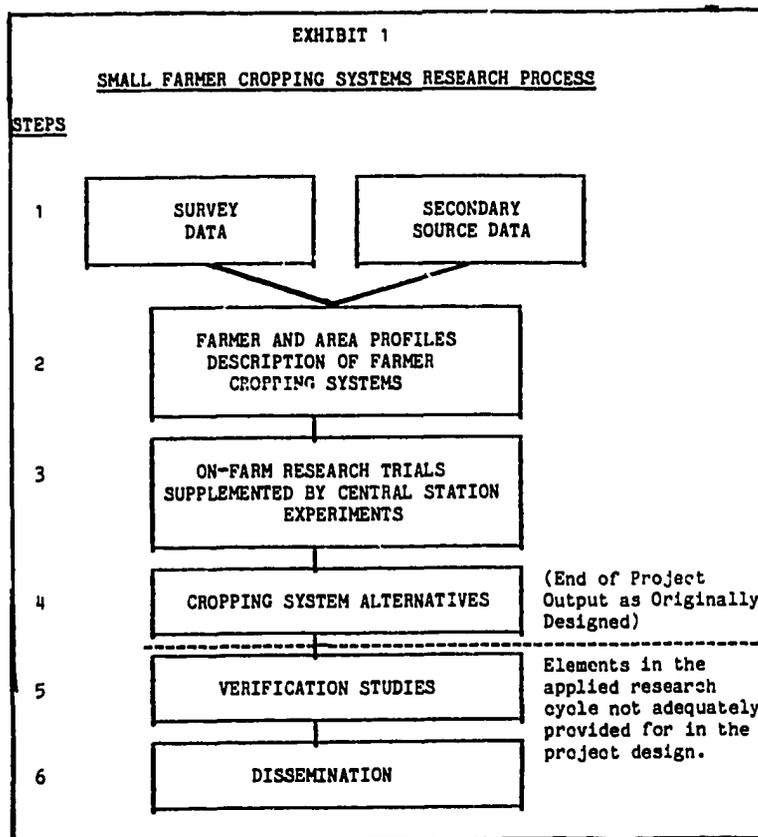
Objectives and Approach: Focusing the Idea

The primary purpose of the project was to create a coordinated regional research approach for increasing the productivity and incomes of small farmers in Central America through improved cropping systems. CATIE was to accomplish this objective through multicropping systems research carried out in the fields of small farmers in five Central American countries (Costa Rica, Nicaragua, Honduras, El Salvador, and Guatemala). To do this, CATIE had to reach agreement with each participating country on a program of activities including close collaboration with a national institution. The in-country research process was to include 1) the design and implementation of surveys of small farmer characteristics and practices; 2) the use of these materials to compile profiles of target area farmers and their farming practices; 3) the design and implementation of on-farm research to increase small farmers' yields through making marginal changes in existing farmer practices; 4) the development of alternatives and ten area-specific recommendations by the end of the project period.

It should be clear that the researchers did not expect to have any significant impact on a large number of small farmers within the limited 4 to 5 year period of this project. They recognized that a ten-year lag normally takes place between investments in agricultural research and measurable impact on farmers. They hoped to get a new research process started but did not propose to complete the adaptation cycle through larger-scale dissemination/verification efforts with the national institutions. This was a realistic assessment of the possible. One must remember that, at this time, no one knew much about how to do this kind of research. With hindsight, however, it was, in the team's judgement, the major short-coming in this innovative project design. But to have carried through the logic to include extensive verification and dissemination work, which is the province of the national institutions, would have required as much as twice the AID

funding and a six to eight year project authorization. At the time, AID procedures only allowed for five year projects.

Beyond the development of on-farm research in five countries, however, were some broader goals. By implementing the project, CATIE's capacity to do small-farm cropping systems research would be enhanced and the institution as well as the frames of reference of its researchers and students might be improved in the process. In 1974 neither the CATIE researchers nor other agricultural scientists knew exactly how to develop a useful small farm systems research process. CATIE researchers would have to learn in the country settings where research activities would take place. The process might also influence national institutions in other Central American countries as well.



Effectiveness: Translating the Idea into a Reality

In actual practice the project accomplished most of its explicit objectives, although not without some difficulty. Agreements were signed almost immediately between CATIE and the governments of Costa Rica, Nicaragua and Honduras (1975) and work proceeded rapidly. However, although agreements were signed with the governments of El Salvador and Guatemala in 1976, work did not begin until 1977 in the former country, and 1978 in the latter, because of misunderstandings between CATIE and the participating institutions. Furthermore, political tensions resulted in slowdowns in the work in El Salvador. Surprisingly, in spite of the Nicaraguan revolution, the new project made headway there and exceeded all expectations. By 1977, on-farm research had yielded what appeared to be two cropping system alternatives which increased yields dramatically. In 1978 and '79, in the midst of bloody fighting during the revolution, the alternatives were verified with a larger group of farmers. By 1980, the new revolutionary government of Nicaragua took an active interest in disseminating the new alternatives to small farmers in the Matagalpa and Esteli areas through an organization called PROCAMPO which was part of the Ministry of Agricultural Development (MIDA).

Project effectiveness was, however, hampered by other factors. On the institutional side, for example, the SFCS project put an early strain on CATIE's limited core staff and funds to meet the counterpart contributions required by the AID/ROCAP project. Consequently, with accelerating demand for CATIE's services and additional projects with other donors, the administration was unable to build a solid cash reserve fund or meet cyclical cash flow problems. Moreover, the short-term funding of the SFCS project made recruitment of desirable professional staff difficult. In addition, the project was hampered because the original project agreement did not specify the exact nature of the 10 area specific recommendations which were to result from the on-farm research in the five Central American countries participating in the project. By the end of the project ROCAP conceived of these as 10 specifically detailed "technical packages." Each tech-pack was to describe a cropping system alternative in a specific ecological area which was more productive than the existing farmer system. It was ROCAP's intention that these products would be extendable by national institutions to analogous ecological areas. Although CATIE researchers did produce the tech-packs, they viewed them as "alternatives" for improving specific cropping systems and felt that it was premature to recommend them for uncritical acceptance and general dissemination.

The project did produce a series of important impacts on CATIE and its faculty and students, on national and international institutions, and on the farmers who participated with CATIE researchers in on-farm trials. Because of the SFCS project's perceived success by both AID/ROCAP and CATIE, a follow on "production systems" project was authorized in 1979, which included not only annual crops, but perennial crops and animals as well.

The order of this paper follows the logic of what is essentially an institutional capacity-building activity. Therefore, we first look at CATIE itself, then at the national and international institutions cooperating with CATIE or influenced by it, and only last do we discuss the ultimate potential beneficiaries, the small farmers themselves. Our reasons for conducting extensive interviews with the farmers was not so much to determine the immediate beneficial impact of the project upon them--it was clearly recognized that in this research effort it was premature to expect much--but rather to better assess the potential of this significant new research approach and of CATIE's role in fostering it. We will not only document the accomplishment of project objectives, but look beyond them as well.

II. IMPACTS AND DISCUSSION

Although the explicit objective of the project was to "create a coordinated regional research approach for improving the cropping systems of small farmers in Central America," the project helped to alter CATIE as an institution, especially the staff and students in the Annual Crops Program. (See Exhibit 2 following.)

IMPACTS ON CATIE AS A RESEARCH AND TRAINING INSTITUTION

Before the SFCS project was funded CATIE's research was largely in the area of soils, monocrop cultures and animal production. Work took place

EXHIBIT 2

IMPACT PROFILE OF S.F.C.S. PROJECT ON CATIE

CATIE Before: 1973/74

CATIE After: 1979

Budget: \$1,408,000

Budget: \$7,979,000.00

Staff: 34 professionals: 22 core, 12 special projects.

Staff: 80 professionals: 25 core, 55 in special projects.

Institutional Membership: University of Costa Rica, Government of Costa Rica, IICA.

Institutional Membership: Those of 1973/74 plus, Governments of Honduras, Guatemala, Nicaragua, Panama with prospects of El Salvador and the Dominican Republic in 1980.

Orientation: Research on the extension station at Turrialba in Tropical Agriculture--soils, plants and animal product lines. Beginnings of cropping systems work on CATIE plots at Turrialba along with some conceptual systems modeling.

Orientation: Project supported field work in different ecological zones in all 5 Central American countries plus Panama. Twelve scientists permanently assigned in country exclusively engaged in small farmer, on-farm, cropping and production systems applied research.

Role Concept: CATIE's work was dominated by tropical agricultural scientists interested in plants, animals and their productivity, products and characteristics under the conditions of the humid tropics. As one CATIE scientist put it "The Center's research activities started in the scientist's mind and then to test it in the controlled laboratory environment of the station."

Role Concept: CATIE's work is dominated in most aspects of institutional activity by a new and pervasive concern with the small farmer and his system of production. As the same CATIE scientist put it in contrast to the former orientation: "Now CATIE scientists start by trying to understand what is in the small producer's mind by interacting with him, observing his production system and his problems then to design with him promising alternatives to increase his efficiency, productivity and income."

Training: Teaching was concentrated on the MS degree program jointly with University of Costa Rica based largely on class work plus thesis research at Turrialba. Some short courses and seminars on special tropical agriculture subjects. Conducted one regional seminar on farming (cropping) systems research -- the state of the art and the initial work at CATIE. Only 7 faculty members listed systems as an area of teaching interest and only 1 formal course was offered in the MS program on systems.

Training: CATIE has graduated over 30 MS students who did thesis research on aspects of small farmer cropping systems. A major three-month intensive seminar on "Agro-systems" for the professionals is now offered. It has provided short courses, seminars or component training for graduate students in farming systems for approximately 400 professionals from all over the Americas. Fourteen faculty members now list systems as a teaching field. Four formal courses on systems are offered in the MS program. In 1980 alone 18 short courses were offered on systems subjects.

Disciplinary Focus: Traditional approach to research and training tasks along disciplinary or product lines: soils, entomology, horticulture, etc.

Disciplinary Focus: Although requiring technical proficiency from MS students in a traditional discipline, CATIE has developed a strong interdisciplinary element in most training to encourage multidisciplinary problem analysis in cropping/production systems and their corresponding solutions.

Staff worked by disciplines as individuals or collaboratively within their disciplines on larger research tasks..

Staff tends to seek cross interdisciplinary approach to research in a systems context.

Regional Environment: Relatively stable Isthmian governments, each (with exception of El Salvador work with the University of Florida and the multicropping work of ICTA in Guatemala) were pursuing what little research they were doing largely on monocultures based on trials of genetic material produced by the international centers (CIAT, CIMMYT, CIP, IARI, etc.).

Regional Institutional Environment: Highly unstable political conditions with rapid change-over in both political and technical leadership in the national agricultural research, training and extension institutions. CATIE has become a center of institutional stability with a thin but continuing support capacity to the national institutions for supporting the small farmer orientation through basic and applied research and training.

almost entirely at the experiment station in Turrialba. The SFCS project allowed CATIE researchers, particularly those in the tropical crops and soils department (later changed to the annual crops department) to work in different ecological zones in all of Central America. Twelve scientists were engaged on a full-time basis on SFCS research in the participating countries. The project altered the role concepts of many of the faculty, the content of teaching, training and research and the academic organization of the institution.

Impact on CATIE Professional Staff

Underlying significant change in a training and research institution is the change in expectations that faculty have of themselves, their jobs and each other. The rigors of implementing the SFCS project forced the researchers themselves to alter their ideas on a deeply personal level. One researcher expressed the SFCS team members' attitudes well:

"Much of what I learned about agriculture and poor farmers during my graduate work in the United States was thrown into doubt. I was taught that Third World farmers were irrational and tradition bound and that they needed to change their attitudes. My role in the change process was to be quite indirect. Problems were to be brought to me at the research station and I was to conduct experiments under conditions of rigorous control. If the rigorous conditions could not be met, the research wasn't worth doing.

The past four years have taught me a great deal. Instead of staying on the research station, I learned that I needed to go to the farmers and learn from them. I learned that small farmers make plenty of mistakes but they are not basically irrational. They have very good reasons for doing much of what they do. We know farmers better now and they have changed us. We know that we can still maintain a fair level of experimental control in on-farm research while getting the benefits of interacting with the farmer at the same time."

The SFCS staff recognized the need for interdisciplinary efforts. They also noted the difficulties as well. For example, occasionally each scientist would do his work on a survey or experiment in the absence of the others. This is encouraged by the structure of the specialized sciences, which provide few rewards for interdisciplinary research. At times, therefore, the project looked like a series of discrete pieces completed separately rather than as the product of an interdisciplinary team. Moreover, they noted the need for more social science analysis to provide knowledge of social conditions, vital to the understanding of farming practices and of a farm household's readiness to adopt changes to these practices. While important strides have been made, much remains to be learned about the who, what, when, where, why and how of interdisciplinary research.

As a final adjustment, researchers found that they had to learn to be more flexible and to play multiple roles. This appeared to be particularly crucial to the success of field staff. The more successful field staff learned how to be more than simply researchers. They had to operate in a rapidly changing political environment. Because they could not always call on disciplinary specialists to solve particular problems, they needed to

know a little of everything and to switch from the role of researcher to that of change agent, from political strategist to organizational alliance builder, or to friend and member of the farm family.

Teaching and Training

As the SFCS team members carried out the project, they also began to alter CATIE's approach to teaching and training. They translated their insights from the SFCS process into new farming system courses which were introduced into CATIE's curriculum. For example, before 1974 only one farming systems course was taught in the graduate program. By 1980, four graduate level courses were offered. In 1974, there were no short-course training activities in farming systems. By 1979, 18 of the 53 short courses offered were on small-scale farming systems. Furthermore, by 1980, 39% of the entering graduate class had declared their major field as annual crops-- a specialization with a heavy concentration in farming systems, making annual crops the largest major for students. Finally, during the same period the number of faculty with a farm systems area of concentration grew from seven to fourteen.

Certain features of the farming systems approach did not, however, penetrate the curriculum. For example, students still have little exposure to rural sociology, anthropology or the social sciences which would enhance their awareness of the division of labor in rural households, off-farm employment opportunities, local cultural and social life, and other factors critical to rural farm practices. Furthermore, they have no exposure to farm management and rural household budgeting which might serve as integrating concepts in a curriculum dealing with small farmer systems. In addition, it would be useful to provide exposure to agricultural sector management which would place the small farmer in the context of the national and regional economy. CATIE management recognizes the need for and is working to develop these next steps.

Impacts on the Academic Organization of CATIE

The internal organization was initially structured along traditional disciplinary lines, e.g. soils, horticulture, and entomology. During the course of the project, the organization was restructured along production lines-- annual crops, perennial crops, forestry and animals. This change, according to CATIE's management, was partially influenced by the SCFS project's emphasis on interdisciplinary work.

Farming systems as an integrating concept did have its impact in the annual and perennial crops areas. However, some areas of the school such as animal production remained relatively untouched by mixed and multicrop farming systems ideas. For example, in 1979 and 1980 no students from the animal production major took the key course on farming systems, even though small farmers certainly integrate livestock and poultry into their own mixed and multicrop systems. This problem has been recognized and animal production has been included in the follow-on project.

Before the end of the project, changes were made both in CATIE's top management and in the project management. At the time of this evaluation, tensions among the staff were still evident as a result of these changes. But the sense of the team was that the SCFS project and its farming systems

approach, although contributing to the growth conditions that influenced the need for change, also were providing the dynamic around which the conflicts could be resolved into greater common purpose and more complete staff harmony.

The SFCS Research Approach

The annual crops staff has moved away from traditional experiment station-based agricultural research toward the on-farm approach.

However, there are some difficulties which dilute the ultimate impact of SFCS as used at CATIE. The relationship between the central experiment and in-country on-farm research was not fully developed. The central experiment, developed before the SFCS project, was initiated by CATIE scientists to test the viability of multicropping research. Although it was not incorporated into the project proposal, it was used to train project staff. It was also used in various training seminars and demonstrations for non-staff trainees and visitors.

During the in-country research, farmers were selected without explicit criteria. Sometimes farmers were included in studies because they were accessible, at other times because their lands had a particular soil characteristic, and at still other times because they were farmer leaders. Consistent or at least explicit selection strategies would make research results more comparable and reliable.

Competing Explanations of Impacts on CATIE

The SFCS project played a substantial role in changing the orientation of CATIE but other factors contributed as well. For example, interest in systems research was part of an emerging worldwide trend in the early 1970's. Furthermore, during this same period a rising tide of interest in small-farm systems was running through the international agricultural research centers. At the same time, the Central American governments began to pay more attention to the needs and potential of the small-holders in the region. CATIE could not have changed alone without these supporting trends in the overall environment. Undoubtedly, the SFCS project served as an important catalyst for some of these changes.

On balance, it is clear that the SFCS project had a powerful impact on CATIE and on its becoming a dynamic force for innovative, small-farmer oriented agricultural research. Its international influence in this field is extending, not only throughout Central America, but well beyond.

IMPACT ON NATIONAL, REGIONAL AND INTERNATIONAL INSTITUTIONS

CATIE's Expanded Function in the Region

In order to accomplish its objective of "encouraging an integrated approach to small farm research in Central America", CATIE's role in the region had to change. Although in 1973 its students were drawn from all over Central America, CATIE carried out no off-site research. The Turrialba center was supported, at that time, solely by IICA and the Government of Costa Rica. Today, SFCS research is carried out in all of the Central

American countries and Panama in collaboration with national institutions. The regional association of agricultural professionals (PCCMCA) regularly devotes part of its annual meetings to review of papers on SFCS research. CATIE continues to draw students from all over the region and now offers a substantial number of short courses as well.

Impact on National Institutions⁵

Although CATIE's activities in the region have expanded greatly, its impact on national institutions has been uneven. On the one hand, close relationships were established with institutions in Nicaragua, El Salvador and Guatemala. The collaborative experience has not only helped shape views of researchers in those countries, but has altered the viewpoints of CATIE staff as well. On the other hand, CATIE has had less impact on agricultural institutions in Honduras and Costa Rica.

Differences in country settings help to explain this contrast. CATIE's work had greatest impact where host-country institutions and donors had made substantial economic and political commitments to improving small farm systems. The SFCS staff found it easy to negotiate cooperative agreements in Nicaragua. There the national research organization, INTA, was just beginning to define its approach and welcomed the SFCS methodology and CATIE's support. In Costa Rica and Honduras agreements were forthcoming, but the established institutions in agricultural research and extension were more passive in their collaboration, less interested in changing their traditional orientation. In Guatemala and El Salvador, however, the research institutions (ICTA and SENTA), had initiated research on small farmer agriculture. They were reluctant, initially, to have CATIE's involvement through the SFCS project. But later, as CATIE developed a supportive stance with these institutions, agreements were made for collaboration and in both countries the work went well to the mutual benefit of the national institutions and to CATIE.

Although CATIE gained early access in Costa Rica and Honduras, it never was able to generate interest among agricultural professionals who were committed largely to traditional monocrop research. In Costa Rica, no consistent CATIE strategy emerged, partially because no country resident was appointed to manage the in-country research (a contrast with all of the other SFCS country research efforts). As a result, CATIE worked in relative isolation and its findings were largely ignored, despite the efforts of individual researchers.

In Nicaragua, however, CATIE capitalized on its early access to build a program with strong impact on national institutions. Anibal Palencia, a highly innovative CATIE country resident, and a creative USAID mission rural development officer, David Bathrick, built an alliance which helped the SFCS project perform research for INTA and INVIERNO, a multipurpose regional rural development organization. In Nicaragua, major support was also received from the IDRC and the central team at CATIE, who made numerous site visits. The

⁵ (Appendices D-G provide country-by-country details for the summary comments in this section.)

relationships between CATIE and government staff became so good that the SFCS project survived the revolution and is being integrated into the activities of the New Ministry of Agricultural Development (MIDA).

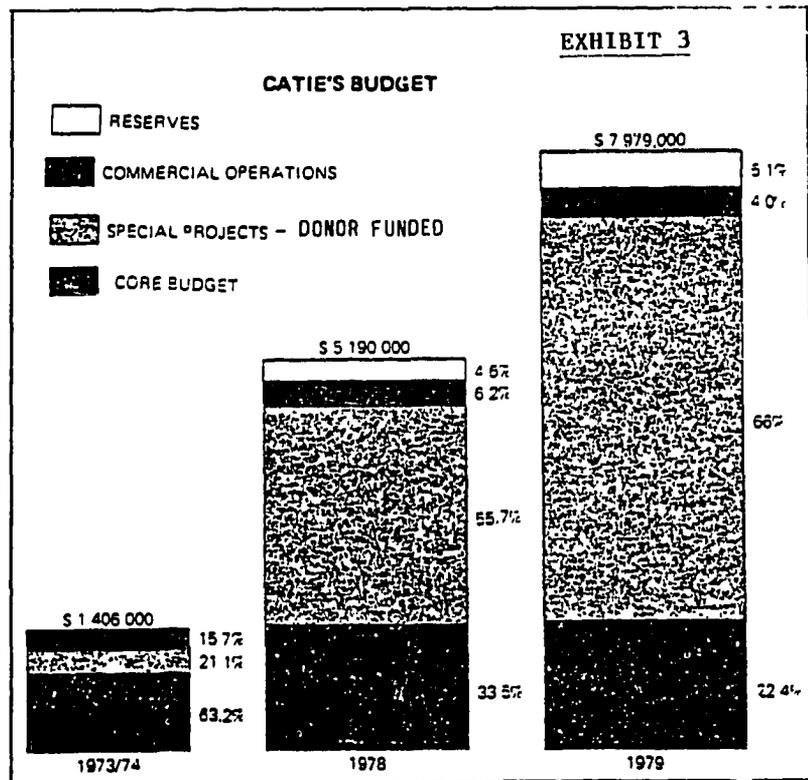
Resource Commitments from Other Donors

The CATIE staff believe that the SFCS project was important in attracting support for related activities from other donors. Sixteen projects, initiated after the SFCS project began, brought CATIE over five million dollars in additional resources for related small farm activities. Representatives of donor agencies such as IDRC and the Kellogg Foundation, mentioned that the success of the SFCS project provided them with incentives to give CATIE additional resources.

Often these additional resources enabled CATIE to strengthen the SFCS project. For example, in Nicaragua Kellogg Foundation grants to IDRC helped the CATIE team to carry out a verification study with thirty farmers in the Esteli area in conjunction with a similar SFCS-funded study in the Matagalpa area. The Kellogg Foundation grants also enabled CATIE to give short courses on small farmer cropping systems using materials developed from the SFCS project. It is largely these additional resource commitments which explain CATIE's resource growth (see Exhibit 3).

While, as a consequence of our interviews with other donors, we confirmed CATIE's claim that this AID project led to substantial additional support from other sources, we also learned that donor coordination was weak. The total effort is fragmented by the project-by-project approach to gaining donor support. We found little evidence of efforts by donors or by CATIE to coordinate the support effort.

AID's own project approach tends to exacerbate this condition. It is to CATIE's credit that there is not more duplication; it is also to their credit that they made a strong, if unsuccessful, effort to join the Consultative Group for International Agricultural Research (CGIAR) as an international center. Had they been able to do so, this would have qualified them for the same regular support that the international donor community provides to each qualifying institution.



Impact on AID

CATIE's work supported by the SFCS project is widely known and utilized in AID Washington. When USAID missions in Panama and Honduras requested assistance in developing projects in agricultural research and small farm production, they were referred by the Bureau for Latin America and the Caribbean (LAC) to CATIE for technical assistance in developing their projects. A senior Rural Development officer in LAC/DR pointed out that, as a result of this project on-farm research with small farmers is now accepted in the LAC Bureau. Also, when the Development Support Bureau began to design a centrally-funded project aimed at synthesizing farming systems research and developing adaptation methodologies, CATIE was one of the first models to be examined. The methodology developed at CATIE through the SFCS project has been selected as one of two special cases for the project. Additionally, when AID was recently requested by the White House to explore ways of increasing assistance to national agricultural research efforts, the CATIE experience was immediately suggested as an important avenue to explore.

International Recognition

By 1980, CATIE's work in Central America received increasing recognition in international agricultural circles. For example, in 1976, the Technical Advisory Committee (TAC) of the CGIAR conducted a review of farming systems research centers. Their report noted that some of the most interesting work internationally was being done at CATIE. Another study by the International Agricultural Development Service, done for AID and the World Bank, described CATIE's proven ability to work with small farmers and recommended further utilization of the process.

Follow-up--The Missing Element

The constraints imposed by USAID's four to five year project cycle did not encourage a fully integrated SFCS research process by linking useful research results to verification and dissemination stages. Instead the project was designed to stop at the research output stage that could be completed in the five year project period. However, in Nicaragua where the work moved so rapidly and was so successful, the CATIE staff performed verification studies in 1978 and 1979. Moreover, the CATIE team involved Nicaraguan government officials and farmers in the verification trials. This elicited such a high level of interest that in 1980 PROCAMPO, part of the Ministry of Agricultural Development, began dissemination of a "sorghum-bean multicropping alternative" which appeared to be successful during the verification process. (See Nicaragua country report, Appendix D.)

Competing Explanations of Impact on National, Regional and International Institutions

The timing and early entry of AID into the SFCS research area appears to have been critical in permitting CATIE to make its own unique contribution to strengthening SFCS research capacity at the regional and national level. It is essential to recognize, however, that the Central American environment had become supportive of SFCS research as part of a global trend. Research on small farmer agriculture was already underway at ICTA in

Guatemala and at SENTA in El Salvador with AID assistance through the University of Florida. International donors and three Central American governments had already begun to have an interest in the approach. CATIE helped crystalize and mobilize this interest through its work on small farmer cropping systems.

IMPACT ON SMALL FARMERS

It was not the objective of this project to improve levels of living for large numbers of small farmers. Rather, they hoped to develop a research capacity the products of which would be used by national agencies to produce such improvements. Nonetheless, the project involved more than 75 farmers in countries visited by the evaluation team and had substantial impact on some of them.

Number and Type of Farmers Interviewed

The evaluation team interviewed 28 (37%) of the 75 participating farmers in four countries and more than eight geographic areas. Members also visited some six neighboring farmers who knew of the work. (See Country Appendices D-G for detailed information and Appendix A for information about the evaluation methodology). The farmers interviewed in all settings except Costa Rica had average to poor quality land holdings in the 1-5 hectare range. In general, these farm families had few possessions, no indoor plumbing or running water, and primarily drew their livelihood from working their small holdings. There were some notable exceptions: one farmer who had five hectares of good land also had a fleet of buses and a store. Many other farmers had multiple activities: one had a small butcher shed and sold meat two days a week; another helped recharge auto batteries; another hired himself and his oxen out to neighbors; another worked primarily as a carpenter and yet another had left his fields to the family to work while taking work himself as a banana hand.

Participation and Knowledge

There were substantial differences in what farmers knew about the project and in how involved they were. In Nicaragua, and to a lesser extent Guatemala, farmers interviewed had both high levels of participation in and knowledge of the project. For example, several farmers interviewed in Nicaragua and Guatemala could draw their own cropping patterns on the ground with a stick and show how the SFCS experiment was different than their own farming practice. Where Nicaraguan farmers tried a "sorghum-bean" system instead of simply beans, they mentioned benefits of the new system such as: natural fence-like qualities of sorghum to serve as a windbreak, reduction of water evaporation from beans, and control of erosion. Most of all, however, Nicaraguan farmers liked the risk-averting property of the two-crop "sorghum-bean SFCS alternative". Those in Esteli noted that their neighbors, who planted only beans in 1979, lost almost all of their crop to slugs. They themselves lost much of their bean crop but harvested sorghum successfully.

In contrast, most of the farmers interviewed in Costa Rica and Honduras could not state the purposes of the on-farm experiments or their results.

Few could describe how the SFCS experiments differed from their own farming practices. Only 4 of 17 interviewed said they had been asked for opinions about the projects at the inception or during the trials. This is due to the fact that research in Costa Rica was the most purely agronomic - e.g., focused on such problems as slope and mineral content of certain soils.

Adoption

Because SFCS research was only at a preliminary stage, the evaluation team could only ask participating farmers if they would try the alternatives demonstrated by CATIE during the next year. In Guatemala and Nicaragua 10 of 13 farmers interviewed said they would do so. In contrast only 3 of 17 interviewed in Costa Rica and Honduras said they would do so. Some of the reasons for lack of willingness to adopt were: lack of understanding of the approach, input constraints (i.e. no labor), and uncertainty of markets. Also, in some areas, CATIE staff had a pretty good idea of what would constitute useful improvements, while in other areas more preliminary research was needed.

Although the team saw evidence that some neighbors of CATIE small farmer project participants had spontaneously accepted CATIE's alternative farming practices, team members were unable to develop systematic information about informal adoption.

Yields

Substantial increases in yields for participating farmers were shown in all of the SFCS research settings but Guatemala (which had only operated for a year). In Nicaragua, where verification trials were used for the sorghum-bean alternative in 1979, yields (Kg/Hectare) were less than for the experimental alternative but more than for the original alternatives used by the farmers. The evaluation team found the yield data impressive but was concerned that the increases recorded were due at least partially to problems in the study design. (See Appendix C on production data). The team also was concerned that the Government of Nicaragua, justifiably anxious to increase production after destruction during the revolution, had moved to begin to disseminate the sorghum-bean alternative in the Esteli/Matagalpa area before the results of the verification studies had been thoroughly analyzed.

Explanations of Differences in Impact on Farmers

In some areas, the researchers had some clear ideas of what would constitute an appropriate improvement on the existing systems; in other cases they needed to do more preliminary investigations. In some areas the researchers were working in a context of large scale government and donor economic and political support for improving small farm agriculture; in other areas they encountered relative indifference. In the former, the team noticed substantial impact even from this preliminary effort; in the latter, relatively little impact. CATIE could have little control over these circumstances.

There are three other aspects of the research process which can be controlled by CATIE and which may influence the potential for impact of

research results. The first is the difference between doing "research with small farmers" as opposed to doing "research on small farms." In the former case there is active participation and involvement of the farmers in the research and large amounts of interaction between farmer and researcher. In the latter case, the ethos of the experiment station is brought to the small farm and little effort is made to enlist farmer participation and involvement. The latter approach may in fact be appropriate for the more basic types of agronomic research, but this issue of alternative research procedures should be more explicitly thought about.

The second aspect concerns the selection criteria for small farmer participants. Participant selection seems in some cases to have been relatively haphazard. Little time was allowed for this in the project design and farmers often had to be found in a hurry in order not to miss that year's planting cycle. The result is that many farmers are not "typical" in any systematic way and this may in the future restrict the applicability of research results.

The third aspect of the research process which could be substantially improved is in the integration of micro-economic and sociocultural science in the research process. While some survey research and case studies of high quality were done, they do not seem to have been adequately related to on-farm research design and implementation. No anthropologist or rural sociologist of a stature comparable to the agricultural scientists was included on the staff. It is the team's view that research design and implementation, as well as the upcoming tasks of verification and dissemination, can be substantially improved by including more analysis of the non-agronomic aspects of the small farm systems such as domestic division of labor, off-farm employment, the developmental cycle of the domestic groups, and access to markets and credit.

In conclusion, the evaluation team feels that the SFCS project had important and positive impacts on CATIE, on institutions in the region, and even on some of the participating farmers. The project not only provided CATIE the opportunities to develop the potential of the approach, but also the opportunity to identify and deal with some of its problems. With appropriate adjustments in the methodology and the strategy, SFCS work is replicable and should make a significant contribution to improving levels of living for the rural poor.

IV. SUMMARY OF CONCLUSIONS AND LESSONS LEARNED

CONCLUSIONS

1. The SFCS Project was authorized at a critical time and thus played a vital role in helping CATIE transform itself from a traditional agricultural research and graduate training institution, focused primarily on monocrop research, to one with a demonstrated capacity for small farm systems reasearch.
2. CATIE demonstrated that this new methodology can produce important information about small-holder agriculture and can improve multi-cropping technology for increasing small-farm production.
3. The SFCS approach helped t researchers away from the experiment station to on-farm settings where they learned a great deal about small farmers and their complex problems. This experience produced a profound respect for the small farmers and a conviction of the need for interdisciplinary research on their form of agriculture. This is reflected through most of the institution in the new research activities as well as in the teaching program.
4. The SFCS project enabled CATIE to make a substantial contribution to a more integrated approach to SFCS research in the region. CATIE as a result has established agreements with and is conducting on-farm work in all of the Isthmian states and also has initiated an agreement with the Dominican Republic. Critical linkages to national institutions were established and joint research conducted. SFCS experiments are regularly discussed in regional professional circles. The SFCS work helped to attract an additional 5 million dollars from other donors for related activity at CATIE. Finally, the work brought CATIE and SFCS research additional international recognition.
5. Although not designed for large-scale farmer adoption, SFCS did influence some of the 75 participating farmers. Where researchers interacted with farmers and carried through from experimentation to verification and dissemination, and where national institutions took an active role, the participating farmers showed a great deal of knowledge and interest in the projects. Most said that they would try to use the experimental methods in their own fields during the next year using their own resources.
6. The SFCS project (with appropriate changes) is both replicable and sustainable, and can serve as a powerful tool for assisting small farmers.

LESSONS LEARNED

1. To maximize potential impact on small farmers, development projects for agricultural research into farming systems should be designed to include the full cycle of research through both verification and dissemination. To provide for this full cycle, AID and other donors should allow for 6 to 8 year project authorizations in small-farm research programs.

2. It is difficult to obtain and sustain a holistic, interdisciplinary focus within a highly trained disciplinary research and training institution, but to do so across all participating disciplines is critical in the farming systems approach. There is no doubt that the annual and perennial crops programs at CATIE made tremendous strides in embracing the holistic, interdisciplinary approach, although the social science and farm management elements were not fully provided in the mix.
3. There is a substantial difference between the needs of doing research on small farms and doing research with the active interest and participation of small farmers. The former may well inform the agricultural scientist about agronomic issues but only the latter is likely to both educate the scientist about how the small-farmer household economy works and the farmer about new agricultural options that will fit within that economy.
4. The SFCS methodology, though highly promising as a research and production improvement strategy for small farmers practicing multicrop, mixed farming systems, can be improved with greater attention to some key elements:
 - more explicit and consistent criteria for selecting the farm households for on-farm trials would provide a sounder basis for subsequent generalizations about applicability of results;
 - where central station experiments are used their relationship to the on-farm experiments should be more carefully articulated; and
 - more attention should be given to the non-agronomic elements (such as input constraints, market analysis, household and area labor availabilities by season) in the planning of research, the analyses of constraints to production, and the implementation of research, verification and dissemination programs.
5. Maximum collaboration and information sharing should be sought among related projects and programs. There is no doubt that both CATIE and IICA tried to use information and resources from several programs to support the SFCS activities. Yet it is equally clear that more could have been done. As the number of regional projects at CATIE multiplies from numerous funding sources and with lead responsibility spread through the institution's departments, this concern for total program collaboration and synergism will have to become an increasing concern of senior management at the institution, as well as of the donor institutions working with CATIE.
6. CATIE's experience in Nicaragua provides, as one example, innovative suggestions for shortening time lags between initial experimentation and ultimate impacts on small farmers. By selecting farmers for experiments who met both agronomic requirements of the research as well as community leadership requirements, CATIE helped forge a natural linkage between research and later verification and dissemination activities.

APPENDIX A
EVALUATION METHODOLOGY

IMPACT EVALUATION METHODOLOGY USED BY THE AID PROJECT TEAMMETHODOLOGYResearch Objectives

The SFCS project designers' primary objective was to create "a coordinated regional research approach for improving the cropping systems of small farmers in Central America". In an effort to assess how well the SFCS project accomplished this objective, the evaluation team studied three impact areas: the impact of the project on national and regional institutions and their research in Central America; the institutional impact of the project on CATIE, and its own research and teaching orientation and on other organizations including AID; and the impact of the project on its small farmer participants.

Overall Research Strategy

Because the SFCS project designers developed no pre-set impact measures when the project began and collected no systematic information about impacts during the project period, the evaluation team was at a disadvantage. The team had to create impact measures after the fact, and then reconstruct a profile of the preproject situation at CATIE as well as the state of research in the region based on interviews and secondary source data. This type of "ex post facto" research is subject to two major limitations. First, if the profile created of the institution (CATIE) and of research activities in the region during the preproject period is inaccurate, then the findings about changes during the project period will be misleading. Second, even if reconstructed profiles are accurate and the situation at CATIE and in the region is very different today, these differences may not be due to the project, but rather to outside events.

To try to overcome the limitations of "ex post facto" research, the team used two devices. First, they cross-compared CATIE staff recollections with those of key informants outside of CATIE and with secondary source material. Second, they listed a series of alternate explanations for why changes took place during the project period.

In order to arrive at its findings, the team interviewed 8 of the 12 SFCS professional staff, a total of 15 CATIE scientists and administrators, 5 senior officers of IICA, and some 45 key members of national, regional and international institutions. In addition the team interviewed 15 AID officers from five Missions including ROCAP. They also interviewed 28 (37%) of the 75 farmers participating in the project in Costa Rica, Honduras, Nicaragua, and Guatemala, plus at least six neighbors to the farmer-participants.

Data Collection Format

Given limited time, the large number of countries to be visited, and the differences in the kinds of interviews to be conducted, the team agreed

that no pre-set standardized questionnaires could be developed. Instead they elected to develop a common general framework which delineated the key impact areas and general open-ended questions about each impact area. Before departure to the field, the team participated in a workshop and then prepared a general matrix of key open-ended questions and impact areas. Once in the field and being joined by their local collaborators--a Costa Rican sociologist and an IICA agricultural scientist--they refined the matrix and developed an interview packet which included impact areas and detailed open-ended questions. Each team member used this interview packet as the source for his interview questions. After interviews were completed, the team analyzed their field notes together and developed similar analysis of responses to the open-ended questions. They buttressed their interview data with secondary source data on CATIE, the SFCS experiments, and the research studies.

Field Interviews

All four AID/W team members participated in two days of interviews at ROCAP/Guatemala and in a half-day exchange of views with USAID/San Jose's senior staff and rural development personnel. Joined by local collaborators, the full team then discussed the project with IICA's San Jose headquarters personnel and proceeded to Turrialba. After three days of inquiry at CATIE plus brief visits to the experimental plots at the center and a field visit to a nearby farmer, the team divided into two groups of three each to visit Costa Rica field sites with participating farmers (See Costa Rica country report). Thereafter the team returned to Turrialba to revise its general interview packet before dividing into the three country teams of two evaluators each plus a CATIE SFCS scientist. Each country team (see separate reports on Nicaragua, Guatemala, and Honduras) spent a week interviewing national institution staff members and, with them, visiting the participating farmers and members of their households on their land. They also interviewed AID Mission personnel in each country.

Analysis and Report Drafting

During the final week, the team reassembled in San Jose to conduct supplementary interviews at IICA, with San Jose based ROCAP advisors, and with CATIE staff and then to deliberate on their findings. Time permitted only a final half-day of debriefing on general findings for ROCAP, CATIE and IICA personnel at Turrialba.

Final analysis plus some data checking awaited the AID/W team's return to Washington where this report was prepared.

Final Report

Drafts of the report were reviewed by ROCAP, CATIE and IICA for accuracy of material and for comment on findings. Colleagues in AID/W provided criticisms and suggestions. This process resulted in several iterations of

the report. Although the evaluation team valued each of the contributions, whether substantive or editorial, the final document is solely the responsibility of the authors, including any errors or omissions that may have escaped our eyes before its printing.

APPENDIX B
IMPACT OF THE PROJECT
ON CATIE AND
ON OTHER ORGANIZATIONS

APPENDIX B

IMPACT OF THE SMALL FARMER CROPPING SYSTEMS PROJECT ON CATIE AS AN
INSTITUTION, ON AID, AND ON OTHER ORGANIZATIONS

General Impact on CATIE

The central purpose of the Small Farmer Cropping Systems project was to orient CATIE's research and graduate training toward the problems and needs of the small farmers of Central America by building its capacity to understand and then improve upon indigenous production systems.

Until this project was initiated, systematic and scientific agricultural research in the Americas was not oriented toward the small producers of the region. It focused on improving the productive potential of specific crop lines through breeding programs, and through soils, pest, weed and climatological investigation. Such research purported to be essentially neutral as to the scale of farming of its ultimate users. In reality, the primary users of the research output tended to be the larger, mono-culture producers with more capital and with ready access to the newest and more promising plant materials, seeds, chemical agents and, of equal importance, with access to and knowledge of the product market.

Yet in the Central American isthmus some 8,000,000 people, nearly half of the total population in the six isthmian countries, are members of rural households that work agricultural landholdings of less than 4 hectares (8 acres). An additional 2,000,000 rural people live on holdings of 4 to 35 hectares. Although these lands represent less than 30% of the area under agricultural production, the people who work them provide more than 70% of the staple foods consumed in the region. In the main their farming practices are attuned to the high risk nature of their survival enterprise: most often these marginal lands, carved from steep volcanic hill-sides or from humid tropical overgrowth, are farmed with a mixture of crops -- corn, beans, wheat, yucca, potatoes, and some vegetables. At best, a small surplus above the household's subsistence needs is marketed. In bad years, the household survives even if one or more of the crops in their system should be lost to blight, drought, rot, pests, or "bad luck." These systems of cultivation are the products of centuries of natural adaptation of native crop varieties to the human and natural environment of the farmers. Often they are intricate and even elegant mixes that attempt to maximize the fragile resource endowments of human labor working with sunlight, soil, moisture and the plants themselves to meet the subsistence needs of the household while minimizing the risk of total failure and consequent want or even starvation.

It would not be fair to say that, before 1971 the Central American Agricultural research and extension establishment was unconcerned and uncommitted to improving the lot of this vital sector of rural society. However, it is fair to say that their methods for assisting were traditional mono-culture approaches based on experiments on research stations

far from these farms and on extension services whose limited outreach capacity attempted to deliver the research findings by exhortation and occasionally by demonstration of one or more of the mono-culture developments.

The research and graduate training center at Turrialba, which had become CATIE in 1973, was oriented toward the traditional approach. It had distinguished itself in research on coffee, cocoa and other cultures of the humid tropics and as a graduate training center for agronomists. Beginning in 1970, the Interamerican Institute of Agricultural Sciences (IICA) reviewed the state of agricultural research and training in the Americas. It concluded that, given the growth of the great international research centers at CIMMYT in Mexico, CIP in Peru, CIAT in Columbia, IRRI in the Philippines, and others, as well as the growth of national research and agricultural training institutions around the hemisphere, it was time to modify or discontinue its own separate work at Turrialba. At first, it considered "turning over" the facilities to the Government of Costa Rica to form a national center. After detailed negotiations and deliberation the decision was reached to create a joint center with IICA and the Government of Costa Rica with the intention of extending its outreach to Central America and the Caribbean. At the time, it appeared that the traditional orientation toward tropical mono-cultures and graduate agronomist training would continue. Initially it did.

By 1973, however, a small group of Turrialba scientists had become intensely interested in the complex fabric of the small farm systems of the region. They conducted a survey of Central American agriculture which led them to conclude that:

- most basic food staples--particularly beans and corn--were produced by small farmers whose average farm unit was less than 5 hectares;
- most of the beans and corn produced were cultivated using multicropping rather than single cropping techniques; and
- improvements in agricultural technology, produced by international, regional or national research centers, did not reach the small farmers, who were using traditional low input practices in their cropping systems.

They also began to experiment on plots at CATIE with variations in these systems to see if they might not improve production through incremental modifications such as introducing new rowing patterns, new varieties of older cultivations, different intermixtures of traditional crops, or altering the sequences of multi-crop patterns. This work was done with five main crops: rice, corn, beans, casava, and sweet potatoes. Though working only at Turrialba on the CATIE plots, they began to think in terms of the several ecological zones of the isthmus and the systems adapted to each that would require scientific examination by several agricultural disciplines and would need supporting linkages to the IICA soils, climatic and other data

resources. In 1974, with warm support from ROCAP's Agricultural Development Officer, Donald Feister, CATIE conducted a regional seminar to view and discuss this initial work. Out of it came a jointly developed proposal for an AID-supported research project on Small Farmer Cropping Systems. The project was approved by AID for \$1.6 million to be executed by CATIE in 1975-79.

There is no doubt among the evaluators that the project has achieved its central purpose. Its impact on CATIE has been profound, in some respects even revolutionary. In other respects the impact has barely begun to surface. Following is a summary of those institutional impact areas.

Institutional Orientation

Although CATIE is a relatively new organization, it grew from an established institutional framework. Its site and buildings at Turrialba, Costa Rica, comprised the first headquarters of the Interamerican Institute of Agricultural Sciences (IICA), created in 1942. In 1960, when IICA moved its offices to San Jose, Turrialba continued to serve as the Institute's training and research center until, thirteen years later, CATIE's new charter was approved. Even then, most of its staff and its sponsors thought of it in terms of the traditional role it had played but reoriented toward Costa Rica and the Central American states plus the Caribbean area. Talk about small farmers and their systems as a priority for research was new when the AID project was approved in 1974. Yet the philosophy, in the four to five years following, has successfully permeated the major part of the institution's thinking. There is no doubt that the SFCS project was a most significant influence in that change. On a policy level the new direction is now institutional doctrine. It was clearly and eloquently stated by the CATIE Director in his speech on the occasion of the celebration of Turrialba's twenty-fifth anniversary:

Present technology, in general, has been developed for farmers who have the economic resources to implement it. This technology is aimed at maximization of yields, a strategy requiring application of high levels of inputs at appropriate times. It requires economic resources, as well as certain level of education, to adapt it. This predicament becomes worse, and even more complicated, when an attempt is made to apply to the small farms of the tropical zones, a technology generated in the temperate zone and geared to the economy of the developed countries. It is obvious that basic, in-depth studies of technologies appropriate to the small farmer are needed, keeping in mind his limitations - to mention a few - land, inputs and education.

We must acknowledge the interest of the international community in agricultural research as expressed through the creation and support of various international centers. These centers occupy a definite place and play an important role in certain stages of

research. They were responsible for the dramatic increases in wheat and rice production, what is known as the "Green Revolution". But despite these impressive endeavors, the technology generated has not spread to the great mass of farmers, and despite the bold efforts of these centers, hunger and malnutrition persist. Food reserves fell in 1973 to the alarming level of a world crisis, overshadowed only by the energy crisis due to the latter's great economic impact.

CATIE, through its regional projection, has been responsible for stimulating or strengthening research work on production systems in the countries of the Isthmus, especially in the area of annual crops for the small farmer. This type of research requires a change of viewpoint. In this approach, research activities are interdisciplinary and oriented directly toward the farmer. This differs from the traditional method of research conducted in separate disciplines at the experimental station.

One of the factors contributing most decisively to strengthening the Center, and to developing its own unique character, is the emphasis on research as the major element in generating an appropriate technology for the small farmer. CATIE's emphasis on research as its main function is greatly enhanced by its orientation toward production systems, thereby identifying it internationally as having a defined potential, and as being different from other centers. This is complemented by CATIE's unique and advantageous position among the regional and international centers of having the related disciplines of agricultural, and forestry production under the same roof.

Research has thus become the framework for the basis of CATIE's work, and its main function, oriented toward production systems, is to generate adequate technology for the small farmer.¹

Operational Orientation

CATIE's new small farmer systems orientation significantly impacted on the operations of the agricultural scientists associated with the institution's annual crops program. To understand how different crops would be better cultivated together within alternative systems, agricultural scientists specialized in certain crops --corn, wheat, yucca, beans-- and in entomology, soils and fertilizers and herbicides, developed an interdisciplinary approach to the task. The evaluation team's interviews with CATIE's scientists confirmed that this was a major breakthrough directly related to the execution of the project. However, we did find that the interdisciplinary only marginally included social scientists such as anthropologists and economists during the base-line survey stage and even less during field research. The consequence, as is noted elsewhere, was a neglect of many important decisions facing rural households such as alter-

¹ Published in Activities at Turrialba, Vol. 6 No. 4, October - December, 1978 pp. 3-4.

native uses of labor, the division of labor within the household, and such other important factors as the market opportunities for alternative products, credit availability and relative costs of inputs (seeds, fertilizers, pesticides, etc.) to the farm. The interdisciplinary orientation among the agronomic scientists within the annual crops division was solid, but, for the other essential disciplines, were only marginal to the enterprise. Moreover, it was equally clear from our interviews that the scientists outside the annual crops program, in livestock, forestry and natural resources, had not yet accepted the interdisciplinary approach. This is understandable since the SFCS project concentrated on annual crops. But the follow-on AID/CATIE project, just initiated at the time of our visits, goes further to support production systems thus incorporating animals, forage, trees and tree crops into the farm systems research, for a more complete rural household systems perspective. It is reasonable to assume that this will broaden the interdisciplinary orientation at CATIE beyond the annual crops, primarily agronomist, boundaries. It is hoped that social scientists will be so incorporated into the enterprise as to create a fuller and more comprehensive interdisciplinary capacity.

Methodology

Although the SFCS project grew out of the initial work at CATIE, it went well beyond it. The initial method was to simulate, on a small plot at the Turrialba research station, several mixes of crop systems and then to conduct controlled experiments with incremental changes to the system aimed at increasing total production. The early idea was to develop systems packages or technical packages (tech-packs), the results of which had been carefully tested under the controlled conditions of the station, and then extend them to the farmers with analogous soil and climatic environments.

The AID/CATIE project recognized that this interesting start was missing two major elements: the critical factor of the small farmer himself and his thinking about and working of the system plus the growing conditions of the different ecological zones found throughout Central America. Therefore, the project called for a transport of the methodology away from the station to the plots of the small farmers throughout the Isthmus. Baseline socio-economic and agronomic surveys were conducted in the target areas of participating countries. And once participating farmers were selected (see the country reports for details), the scientists began to work the research methodology on small plots within the holding.

It was clear from our interviews that to a greater or lesser degree, the participating farmers were little consulted about the trials to be tested on their holdings. In the majority of cases, the methodology of controlled scientific research at Turrialba had simply been transported from the research station to another place. The scientist was fully in charge. The farmer was little or not at all involved. He was an interested observer, sometimes contributing labor to the plot, sometimes benefitting from the dialogues with the scientists and from the subsequent harvest.

From the point of view of many agronomic scientists reasonable standards of validity and reliability required such an approach. From an AID management perspective this methodology provided a quantifiable output, eight to ten carefully tested tech-packs ready for validation and extension by national institutions to analogous ecological zones of the Isthmus. Indeed, that output expectation was incorporated into the project paper.

The debate around this issue was continuing at the time of the evaluation team's visits. Several CATIE scientists had become convinced that the inclusion of the farmer in the research on systems had to allow for his preferences, his work behavior, and his total household and farm management. Thus a set number of tech-packs was a constraint on developing more open-ended alternative systems that could be described, analysed and used for further adaptive work. They resisted the idea of producing easy-to-transfer models for analogous ecological zones precisely because of the individuality of the households and their farming practices.

The team concluded that both sides of this debate had merit. We concluded that the output objective of tech-packs was an excellent discipline for the researchers (most admitted it as being so) in forming a time and product boundary to the research effort and a framework for documenting and analyzing the results of the trials. Yet it ran the risk of justifying the selection of passive participants and therefore excluding one of the most important elements (in the minds of many the most important element) of the farmer's household resource and farm system management as an essential factor to be observed and understood through the research. Our conclusion is that, under the new production system project (SFPS), both methods should be pursued.

The impact on CATIE of pursuing the interdisciplinary testing of cropping systems on farmers' land has been profound. It has reinforced a broad commitment to the small producer, and a desire for greater understanding of his world. But without a methodology that includes the analysis of the farm household's management of the system and its interactions with the total socio-economic environment as part of the effort, the applicability and replicability of the agronomic findings will be dubious. The whole-system concept of the SFCS and the SFPS research is clearly violated and, to an extent, invalidated, when the vital human role in the system is not also systematically observed, analysed and factored into the assessment of production alternatives of what, where, how, by and for whom.

Organization and Staff

During the SFCS project's execution and, in large part because of it, the CATIE staff grew from 34 professionals to 80. AID funding supported a small portion of that growth (12) and the rest represents expansion to meet new demands from other funding sources attracted to CATIE largely by the new small farm systems orientation.

To better deal with this growth in both the research portfolio and in special training activities, CATIE did effect one reorganization in 1978. However, the concentration of most SFCS work remained in the Annual Crops Program. The reorganization failed to create a genuine cross cutting, on-going capacity to access and manage technical resources across other organization lines (Perennials, Animal Production, and Renewable Resources). The problem is even more apparent under the new SFPS project which requires such a capacity to cut across CATIE's organization structure to accomplish the project's objectives than it was in the SFCS project. The most glaring organizational and scientific resource gap, however, lies in CATIE's failure to include a clear place within the organization for the behavioral sciences. CATIE has no permanent staff capacity for socio-economic analysis. The one permanent staff economist is not sufficient to the task. Clearly a socio-anthropological research capacity within the "interdiscipline" that CATIE is trying to form is essential to meet that commitment. Hopefully, this deficiency will soon be remedied; we were assured that it would be. But we were not convinced that management had yet come to terms with the issue of how to turn its predominately disciplinary organization structure into an interdisciplinary operational matrix.

Financial Management

When the SFCS project began, CATIE's annual budget was only \$1,406,000 (1973/74). The year the project ended (1979), the budget had grown to nearly \$8,000,000. Much of this growth was due to special donor funding attracted to it because of the institution's new orientation and its perceived promise for developmental initiatives in Central America.

Yet, the SFCS project put an early strain on CATIE's limited core staff and funds to meet the counterpart required by the AID/ROCAP project. Consequently, with accelerating demand for CATIE's services and additional projects with other donors, the administration has not been able to build a solid cash reserve fund to meet cyclical cash flow problems, nor has it given adequate attention --until recently-- to the need to strengthen its core funding as a proportion of the total budget. Currently the core budget accounts for approximately 20% of operations with nearly 70% coming from special project funds. This results in a tendency toward periodic financial crisis and staff insecurity caused by a lack of reasonable guarantees of tenure beyond the life of the short term projects. Short of a major improvement in the core budget through increases in membership quotas (IICA, University of Costa Rica, Government of Costa Rica, and other state members), a major long-term non specific program support grant, or a sale of assets to establish a working capital reserve (none of which seems likely), CATIE and the major international donors --including AID-- should consider other alternatives. Among them would be substantial initial advances against new projects, and a more appropriate administrative overhead formula to include capital and cash reserve requirements. Donor agreements should be longer-term, from 6 to 10 years, so that key scientific staff could be recruited with reasonable security of tenure and a

more complete research, verification, dissemination cycle incorporated into project design.

Management of Field Operations and Relations with IICA

Before the signing of the AID/CATIE agreement to undertake the Cropping Systems project, CATIE's future appeared to be tied to the Turrialba station with its links to IICA as an Interamerican research and training center and with the University of Costa Rica under its graduate agricultural education program. This project was the vehicle for propelling it toward field activities in all of Central America. Through it CATIE learned how to operate a field staff jointly with IICA country offices as the project evolved. It can now provide timely and effective logistical support to that staff. The project made that possible. It is now an integral part of CATIE/IICA operations with their collaborative field operations in all six of the Isthmian states. It is quite likely that, without the resources and the region-wide farmer outreach concept of this activity, CATIE would be today much as it was in 1974: without the potent field research capacity and influence of a regional institution and without the well-managed joint operations mode for support from IICA.

The difference is illustrated by the fact that it took nearly three years under the 1975 SFCS project to get agreement among the five Central American States to collaborate in the activity. Yet it took only 60 days to get all six of the Isthmian states to agree to the 1979 Small Farmer Production Systems project, the AID supported follow-on to SFCS.

The evaluation team does feel that CATIE and IICA do need further work to improve their joint management at the field level. But each is aware of the opportunities to do so, and improvements in communications, division of labor and joint operations are planned.

Teaching and Training: Evidence of Project Impact

There was substantially more training on cropping systems at CATIE in 1979 than there was before the SFCS project was initiated in 1974. In 1974, only one "systems" related course (3% of all courses) was offered in the Master's Program. By 1979, however, four courses (9%) listed in the CATIE catalogue were rated by key informants as being related in some way to farming systems concepts. Moreover, in 1974 no short courses were offered on cropping or production systems; but in 1980, 18 farming systems courses were conducted. Finally, out of a faculty of 40 in 1974, only seven had an area of concentration in systems, but by 1979, 14 of 63 professors listed farming systems as one of their areas of concentration. Such empirical data points serve as a loose form of validation for the more general comments of CATIE staff about how farming systems thinking had influenced teaching at CATIE.

The specialization in the CATIE Master's Program with the most direct utilization of farming systems thinking is the Annual Crops Program. By

1980 a majority of the short courses offered by the Annual Crops faculty were related to systems and a course in "Systems of Agricultural Production" had been incorporated into the Master's Program. Furthermore, in 1979 the number of students (12) entering CATIE in the Annual Crops Program for the first time surpassed the previous lead program, Animal Production (10). This meant that 39% of the 1979-81 CATIE entering students had an area of concentration in Annual Crops, while only 32% had an area of concentration in Animal Production. Since staff funded by ROCAP's SFCP Program performed much of the systems work within the Annual Crops Program, one can argue that the SFCP Program is substantially responsible for the increased emphasis on systems training. It must be noted, however, that interest in small farmer cropping and production systems has increased world-wide during the same period. This is seen in the growing volume of farming systems literature, like Richard Harwood's book on Small Farm Development and in publications of the international research centers. Thus, the influence of the ROCAP-funded SFCS program on CATIE must be weighed in light of such other factors.

How Far Has Systems Thinking Penetrated the Curriculum?

Many of our informants argued that while farming systems thinking has had a substantial impact on CATIE as an institution, such thinking is by no means predominant. In fact, they argue that the Masters and Training Course offerings are still oriented along disciplinary lines (perennial crops, annual crops, animal production, and renewable natural resources). They believe that the impact has been greatest in the Annual Crops Program and least in the Animal Production Program, while intermediate level impacts have taken place in the Perennial Crops and Renewable Natural Resources Programs.

Some of the more formal data support these assertions. For instance, if one analyzes the student composition of Dr. Robert Hart's course in "Systems of Agricultural Production", one finds that 50% of the students in 1979, and 67% in 1980, came from the Annual Crops Program (See Table 4). In contrast, no students concentrating in Animal Production took the course in either of the years it was offered. At the same time, the number of systems-related courses identified in the 1978-79 Master's Program was highest for the Tropical Crops Program (Annual and Perennial Crops combined) and lowest for Animal Production. Finally, in the area of short courses, Annual Crops offered the highest proportion of their training courses in systems-related areas. Animal Production short courses in systems-related areas, as a proportion of their total training courses, scored third out of the four programs.

While the data might actually overstate the degree of separation of animal production activities from other activities at the Institute, they do raise question about the kind of role that Animal Production Program faculty and students will play in the new AID-supported small farmer production systems project. Will the animal component of this new activity be treated within the whole-farm system? There is cause for concern.

Farm Management and Small Rural-Household Budgeting

The evaluation team has concluded that a practical integrating focus is needed in the CATIE curriculum and in its systems research. The concept of interdisciplinary team work on agronomic aspects of the research and its applications is a laudatory advance. But there is need for a means of operationalizing the products in the context of the small-farm household's world. Our recommendation to CATIE and to ROCAP collaborators is that a training module on farm management and small rural-household budgeting should be developed, based on careful case work with farmers now participating in CATIE systems research. One approach to this is demonstrated in the record keeping systems developed with small farmers by Dr. John K. Hatch in several Latin American countries.² This simplified system of input-output budgeting, coupled with analysis by behavioral and economic social scientists of labor usage by farm households plus market analysis, could be combined to provide the beginning of a powerful focal orientation to the production and cropping systems approach. It could also serve CATIE as the means for further drawing together across the boundaries of its product-line oriented organization the essential pieces to develop the theoretical and applied material needed. To this emphasis could be added a broad rural sector management perspective so that systems students and scientists would be reminded of the larger context into which the small rural households of Central America must make decisions that link backward and forward within the rural sector in their societies.

THE IMPACT OF CATIE/ROCAP SFCS PROJECT ON OTHER ORGANIZATIONS

CATIE and the International Agricultural Research Community

There are a number of indicators of the international recognition that the SFCS project has brought to CATIE. For example, in 1976 the Technical Advisory Committee (TAC) of the Consultative Group on International Agricultural Research (CGIAR) conducted a review of Farming Systems Research at the international agricultural research centers. The CGIAR recognized that a critical part of the solution of the world's food problem lies in increasing the production of the many millions of small farms in the developing countries. They noted, however, that little research had been devoted nationally or internationally to the intensification of these small farm systems. Most research had been focused on single crop or animal production in relative isolation from other components of farming systems. Though this review focused on the work of the international centers, the report mentions that some of the most interesting corrective work was going on at CATIE. A section of the 1976 report is devoted to describing the AID-supported activity at CATIE.

Another indicator of the impact which this project has had on CATIE's position in the international community is a recent study by the

² John K. Hatch, Rural Development Services, Ann Arbor, Michigan.

International Agricultural Development Service (IADS) under contract to the World Bank. The purpose of the study was to develop recommendations to strengthen agricultural research and farmer advisory services in Central America and Panama. The study makes many recommendations. Of all the recommendations, six were identified for special attention by the countries in the region and external assistance agencies. Of these six special recommendations three involved CATIE. In them, CATIE was recommended because of its proven ability to work with small farmers as demonstrated through the Small Farm Cropping Systems Project.

These examples reflect the kind of impact that AID has sought to achieve. By supporting an experimental and relatively untried "new" approach to agricultural research on small farm development, widespread attention and partial emulation and support is being gained from other donor organizations.

Support From Other Donors to CATIE

The staff at CATIE has pointed out that the SFCS project has been very important in attracting support from other donors for related activities. In a review of their current project portfolio, we identified sixteen small-farmer related projects with a total value of \$5,390,810. They are listed in the table at the end of this Appendix.

In addition to these projects, CATIE is currently negotiating with a variety of bilateral agencies (Germany, the Netherlands, United Kingdom, Canada) and international agencies (OAS, IDB, the World Bank). One such discussion would lead to funding for a small farmer project between CATIE and the government of Honduras.

Dr. Ed Webber, of the Canadian International Development Research Center (IDRC) in Bogota, Colombia, confirmed that the SFCS project played a central, if not exclusive, role in the development of three IDRC-funded projects.

The team also contacted Dr. Robert C. Kramer of the Kellogg Foundation, who confirmed that during his visit to CATIE as Kellogg's Agricultural Program officer for Latin America, the senior staff of CATIE had emphasized the work done and capabilities developed through the project. His favorable review of these activities played a central role in Kellogg's decision to approve a 1.1 million dollar Technology Transfer grant for training Central American agricultural research and extension personnel.

CATIE's claim was further substantiated by other IDRC staff members. Dr. Carol Vlassoff, at IDRC headquarters in Ottawa, Canada, made inquiries on behalf of the evaluation team to confirm that CATIE had used their SFCS work in arguing their case for IDRC support for improving small farm production systems in Honduras, for a similar project in Nicaragua, and for a regional semi-arid food crops project. She also pointed out that Dr. Mateo, the CATIE resident SFCS scientist (in Honduras) had helped develop a bilateral project to be supported there by IDRC with CATIE support.

Impact on AID/Washington

CATIE's work in the SFCS project has become widely known in AID Washington. When USAID missions in Panama and Honduras requested assistance in developing projects in agricultural research and small farm production, they were referred by the Bureau for Latin America and the Caribbean (LAC) to CATIE for technical assistance in project design. Richard Hughes, Rural Development officer in LAC/DR, pointed out that as a result of this project, on-farm research with small farmers is now accepted in the LAC Bureau and in both the Agriculture and the Rural Development Offices of the Development Support Bureau (DSB). "They have been sensitized to it and see it as a good approach." When a Development Support Bureau centrally funded project aimed at synthesizing farming systems research and development methodologies began to be designed, CATIE was one of the first places visited. Its methodology has been selected as one of two special case studies for the world-wide DSB applied research project. Finally, when AID was recently requested by the White House to explore ways of increasing assistance to national agricultural research efforts, CATIE was immediately suggested as an important example of innovative approaches to examine.

<u>DONOR</u>	<u>TIME</u>	<u>AMOUNT OF SUPPORT</u>	<u>BRIEF DESCRIPTION OF PROJECT</u>
1. UK, (ODA)	1976-78	\$ 50,000	Study of role of insects in food production system.
2. CIP (Int'l Potato Cent.)	1976-80	\$ 320,000	Adapt potato varieties for tropical lowland small farm cropping systems
3. Oregon State/ IPPG (Int'l Plant Protection Cent.)	1976-79	\$ 180,000	Develop alternative disease management strategies for Central American small farmers
4. Peace Corps/ Action	1976-in-definite	\$ 50,000/year	Provide Peace Corps Volunteers to assist CATIE
5. Canada IDRC (Int'l Development and Research Cent.)	1976-79	\$ 475,000 Canadian	Milk and meat production for small farmers using residues of harvests
6. Canada IDRC	1978-80	\$ 120,710 Canadian	Applied research on small farm cropping systems in Honduras
7. Canada IDRC	1978-79	\$ 120,900 Canadian	Applied research on small farm cropping systems in Nicaragua
8. OAS (Org. of Am. Sts.)	1978-79	\$ 125,000	Cropping systems research component of Western Honduras integrated regional development project
9. Honduras INA (Instituto Nacional Agrario)	1978-79	\$ 20,000	Improved cacao hybrid seeds for small farmers in Honduras
10. Peace Corps/ Corps/Action	1977-83	\$ 350,000	Technical assistance to strengthen small farm cropping systems work at CATIE
11. USA, IBM	1979-81	\$ 60,000	Training and human resource development for small farm production systems research
12. USA Kellogg Foundation	1979-83	\$1,114,000	Institutional development of National Research and Extension agencies in six Central American countries. Focused on training and tech.
13. (EEC) European Econ. Community	1978-80	\$ 570,000	Rural Development Pilot project. Small farm production research and technology transfer
14. IED, Interamerican Devel. Bank	1979-82	\$1,650,000	Applied research on milk production for small farmers of Central America
15. OAS	1978-79	\$ 23,900	Small farm production system research in Honduras
16. Canada IDRC	1978-82	\$ 161,300 Canadian	Applied research on drought-resistant food crops for small farms in semi-arid regions of Central America
TOTAL		\$5,390,810	

APPENDIX C
EVALUATION OF CATIE'S PRODUCTION DATA

APPENDIX C

EVALUATION OF CATIE'S PRODUCTION DATABaseline Data

Baseline information on farms and farmers for the areas participating in the farming systems program were broad in scope and deep in detail. Information gathered on each area included soils and climate characteristics, pests and diseases, crops, general geographic information, markets and marketing, and anthropological information on the farm families. Both available secondary information from censuses and special surveys and direct field surveys were used in data collection and analysis. Special consultancy reports were developed on each major data element, methodology established and reviewed, and procedural guidelines developed to assist future researchers in selection of areas, conducting initial diagnostic studies, identification of production constraints, designing experiments and selection of alternative production schemes.

An Evolving Art

This work as well as subsequent efforts to assess the economic potential for the alternative systems tested represent a forward step in production data collection and analysis. This is new and unfamiliar terrain for most agricultural economists. Although some criticisms are made here along with some suggestions for further work, CATIE must be credited for its efforts in the base line surveys and in the scientific measurement of the results from the cropping experiments. This art will further evolve as more research on cropping and production systems requires the use of alternative methods for both agronomic and economic measurement.

Need for Marketing Data

Perhaps the weakest data element was the collection and use of marketing information. While extensive studies were carried out under a special grant from DS/AGR, the relationship of these studies to selection of farms and crop enterprises was tenuous. Price and cost information were generated and used in ex post evaluations of net income effects of alternative crops, but the information was not used to determine the cropping alternatives or to select research sites. Attention to market analysis was apparently added into the project somewhat belatedly, and then only as an ad hoc activity supported by outside funds. Furthermore, review of the new follow-on project in production systems indicates that market analysis still occupies a somewhat tenuous position in the project design.

It is strongly recommended that demand analysis be thoroughly integrated into the baseline analysis employed in the Production Systems project. Two sets of studies should be especially emphasized. First, price analysis for each crop tested should include a thorough investigation of variability over time with careful estimation of risk functions based on

price variability. Second, the size of expected demand for prospective crop alternatives must be projected to estimate long term expected average prices for calculating expected net returns to farmers.

Data on Field Trials

Agronomic practices for traditional and alternative cropping alternatives were recorded in great detail, estimating hours of labor per practice over time and total investment in purchased inputs. Thus, quantitative differences in labor use and application of purchased inputs were measured for each alternative tested and compared directly to the farmers traditional practices. Cost differences were thus calculated directly by comparing actual data for the trial farm.

Using this methodology, the economic implications were impressive. However, as CATIE notes, the limited size of test plots and the short time frames covered by the experiment make generalizations impossible at this point.

A major methodological problem that warrants further examination is in the economic analysis of traditional versus alternative practices in that the parameters for the traditional practice were estimated from survey data for the area as a whole, while data for the alternative were taken only from the farms participating in the research. Error of an indeterminate magnitude could have resulted from attempting to compare cooperators' data with averages for the zone. Cooperators may have been better managers than average, soils may have been significantly different than the zonal average, or rainfall patterns may have deviated from the norm for collaborating farms. In short, paired comparisons of yields and costs may be preferable as pairing could eliminate error arising from such uncontrolled variables.

Another practice that bears careful examination is that of estimating factor prices and product prices on the basis of data for only one month: factor/product prices could be temporarily distorted, seasonal changes in price relatives may not have been accounted for, and temporary shifts in either supply or demand in local markets could distort the monthly average price relative to longer-term norms.

However, the rather high percentage increases in net returns calculated for the alternative practices signal the need to view them as indicative. Additional years of experimental results on much more extensive applications as well as alternative methods of analysis are required before reliable estimates of economic benefits can be computed.

Labor Costs to Individual Households

In this context, more attention needs to be given to the analysis of the labor factor in calculating not only costs of alternative systems but in

calculating its elasticity. The alternative opportunities in the off-farm labor market require greater attention in order to determine labor's availability and at what factor cost. Behavioral scientists point out that economic assumptions frequently fail to take into account the social costs and benefits to the household system that alternative uses of labor involve at various points in the household's developmental cycle. This involves a better understanding of the sex-role and age-group division of labor in the household, the availability of outside-hire or barter labor, and how alternative human activities at certain seasons affect these availabilities.

Benefit/Cost Calculus for Farming Systems Research

Farming systems research would appear to be quite costly per unit of research activity undertaken, given that highly trained scientists work with a limited number of on-farm trials. However, the quality and immediate applicability of the results may be much higher than under traditional experimentation/extension systems. For example, improved feedback between farmer and researcher may eliminate errors in identification of truly useful research activities. Furthermore, conducting the research on collaborating farms should improve the adaptability of the research results as some adaptive trial and error action would already have been done before farmers actually adopt the recommended practice. In short, higher absolute costs may be more than compensated by quicker, more relevant or adoptable results.

The true internal rate of return to investment in farming systems research probably depends primarily on the degree to which the time between experiment and farmer adoption can be reduced by improved precision in identification of farmers' requirements. Two primary elements would contribute to the benefit stream generated by farming systems research. First, innovations that "fit" the farmers socio-economic system could be generated through collaborating more readily than through traditional research, demonstration, extension system, enabling in effect a combining of some research and extension "steps" into a single research/demonstration step. Diffusion of results is thus theoretically enhanced by improved "relevancy" of the research trial itself, and the demonstration effect of carrying out research in collaboration with selected farmers in an area.

It is too early in the project to measure adoption rates so no attempt can be made to generate benefit/cost information. It is recommended that data be gathered on adoption rates over the next few years and that this information be applied to improved estimates of changes in yields and net returns to alternative systems toward generating benefit-cost estimates.

APPENDIX D
NICARAGUA COUNTRY REPORT

APPENDIX D

CATIE EVALUATION TEAM

NICARAGUA COUNTRY REPORT

- I. LESSONS LEARNED FROM THE CATIE EXPERIENCE IN NICARAGUA 1976-79
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 - D. Impact of the SFCS Methodology on the Researchers, Farmers, and on CATIE
 - A Flexible Research Approach
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I. LESSONS LEARNED FROM THE CATIE EXPERIENCE IN NICARAGUA 1976-79

1. The small farmer cropping systems (SFCS) methodology used in Nicaragua helped produce two cropping systems alternatives (maize-common bean relay and sorghum-common bean system) which produced higher yields and income in on-farm experimental plots than traditional alternatives. Preliminary analysis of small scale efforts at verification of these results with larger groups of farmers in the Matagalpa (15 farmers in 1979) and Esteli (18 farmers in 1979) areas reveal lower yields than in the experimental plots but higher than in the traditional alternatives.

2. While the SFCS methodology generated productive cropping alternatives at the experimental level which maintained their validity during preliminary verification efforts, the methodology appeared to serve an additional very important function. The SFCS methodology helped to break down some of the traditional barriers which separate agricultural researchers from small farmers. The SFCS approach helped to move researchers away from the experiment station and from research on single crops, to on farm settings where they would learn in great detail about small farmers and their problems. The alternatives generated and the detailed knowledge of small farmer systems compiled are substantially different from the results of more traditional agricultural research. In fact, the SFCS methodology appears to require a substantial change in the agricultural researcher's frame of reference.

3. While the SFCS approach helps agricultural researchers gain new insights about farmers and their problems, there is still a substantial difference between doing research on small farms and doing research with the active interest and participation of small farmers. The SFCS methodology does not insure that researchers will involve farmers in the process, or that they will learn as a result of experience. Thus under the worst circumstances the linkage between research, verification, and dissemination may never take place. For example, in the San Isidro del General area of Costa Rica, the researchers learned a great deal about small farm practices. However, the farmers interviewer had little idea what the researchers were doing on their land. They could not repeat the objectives of the experiments and had not adopted most of the agricultural practices demonstrated. In contrast, in Nicaragua the farmers interviewed were well aware of the purposes of the experiments. They could describe both the experiments and verification efforts in detail and many were going to use the new methods in the next planting season. There are a number of plausible explanations for this difference:

- a. In Costa Rica the researchers may have been more interested in establishing basic information about agronomic conditions in developing cropping alternatives for small farmers. (Some agricultural researchers argue that during this preliminary research stage farmers may understand little because researchers are working on initial experiments which are hard to describe.)
- b. The Nicaraguan CATIE team may have built their cropping alternative experiments more carefully upon the specific problem farmers said they had. They may also have tied their experiments more closely to recognizable current practices of farmers in the area.
- c. The researchers in Nicaragua may have worked to involve the farmers more intimately in the experimental efforts and their purposes.
- d. The charisma of the team leader and team member's ability to communicate with farmers might have made a substantial difference.
- e. Nicaraguan team members appeared to be pursuing a research-verification-dissemination strategy instead of a research only strategy.
- f. Experiments were designed with agronomic variables in mind but farmer participants were selected on the basis of other criteria as well. For example, many farmer participant fincas (large farms) not only were representative of the appropriate agronomic conditions, but the farmers themselves were sometimes chosen because they were community leaders or innovators who might help in later dissemination efforts.
- g. Unanticipated environmental conditions worked in favor of the researchers and their cropping alternatives. For example, an infestation of slugs during the September-December 1979 planting season (2nd crop) destroyed much of the bean crop of small farmers in the Esteli area. Farmers participating in the verification of the sorghum-bean alternative, believed that they lost less of their bean crop than their neighbors, and that in addition they harvested a successful sorghum crop that their neighbors did not have. Thus, many farmers interviewed believed they had powerful personal evidence of the utility and risk averting characteristics of the sorghum-bean alternative. Preliminary analysis of rather incomplete production data supports this assertion.
- h. Because multiple organizations (INTA, INVIERNO and the Banco Nacional) worked in the same area as CATIE, farmers appeared to be more used to using technical assistance than in some of CATIE's older country projects.

In addition, some general conditions may have facilitated all work in Nicaragua:

- a. In Nicaragua CATIE worked with two relatively new national organizations (INTA and INVIERNO). Because these organizations were without set patterns or rituals and because they were searching for viable programs and approaches, CATIE may have had more collaborative support in Nicaragua than it got from the more well established organizations in Costa Rica, Guatemala and Honduras.
- b. Other donor organizations to the IDRC contributed substantially to making the Nicaragua through funding and staff assistance.
- c. CATIE may have been able to catalyze its Nicaragua problem quickly because it deployed more resources for initial base line surveys and experimental work than in some of the other countries. CATIE felt that Nicaragua's close proximity to Costa Rica made it easier to drive from Turrialba, Costa Rica to the sites in Nicaragua than to the other Central American sites. Thus, the CATIE central staff contributed substantial time and effort.
- d. Because of the political situation the Government of Nicaragua defined the area where CATIE worked as a high impact area. They cleared many of the bureaucratic roadblocks more quickly than might occur in a less politically critical situation.

4. The Nicaraguan project team's conscious effort to link experimentation to verification and dissemination may provide a few innovative suggestions for shortening the time lag between initial experimentation and ultimate impact on a larger group of farmers. By selecting farmers for experiments who met both the agronomic requirements of the research as well as community leadership requirements, the Nicaraguan team helped forge a strong natural link between research and verification and dissemination in the community. The researchers capitalized on the high status of community leaders which lent the experiments credibility and generated interest. Furthermore, the leaders themselves helped generate interest and commitment of individuals in the community to participate in the verification stage.

5. Linking research more closely to verification and dissemination is not without its dangers. For example, the revolution in Nicaragua disrupted the formal verification stage for the two cropping alternatives in both 1978 and 1979. Several times team members wisely chose not to risk their lives to help initiate planting and later to collect data. Thus, formal verification of the alternatives was never fully completed.

Fears of large-scale shortages of basic grains in the post revolutionary period have led the staff of one of the Rural Development Ministry (MIDA) field offices to attempt to disseminate the sorghum-bean alternative even though it has not been carefully verified. Difficulties may be encountered.

6. The Nicaragua CATIE experience helps to bring out one major conceptual problem of the SFCS methodology. While the SFCS approach provides powerful information about small farmer's fincas as systems, there has been little attempt in the CATIE project to make detailed studies of the relationship of crop alternative proposed for the finca to the market system. Under the worst of circumstances, cropping system alternatives could be disseminated widely without considering whether the crops involved have sufficient markets. For example, in Nicaragua, the sorghum-bean alternative is being disseminated without serious study of the market limitations or demand requirements. Because Nicaragua is expected to have shortages in basic grains during the 1980 planting season, the failure to study the sorghum-bean marketing climate may cause few significant problems. Such a failure in other countries could result in actual income loss to farmers.

7. As the Nicaraguan government moves to serve both small farmers and to organize landless groups in asentimientos (collective production activities), the SFC methodology faces a challenge. It has proved useful in Nicaragua for farmers in the 3 to 10 manzana group. Might it be useful as well in making asentimientos more productive? How useful is it with farmers with less than 3 manzanas of land? While their productivity may increase, improvements in levels of living may be more severely constrained by structural factors such as lack of land.

II. REVIEW OF CATIE PROJECT IMPACTS IN NICARAGUA 1976-80

A. General Overview

From the moment one sets foot in Nicaragua in 1980 it is impossible to forget that a revolution has taken place. Sculpture-like configurations of twisted steel along the highway from Augusto Cesar Sandino Airport to Managua serve as a reminder that the area once contained much of Managua's light industry. Fields of rubble in Masaya, Matagalpa, and Esteli have replaced the central markets. Salt is hard to get and everyone has their own story about the revolution and its aftermath. Signs and posters from the Frente Nacional de Liberacion Sandinista are everywhere.

Given the situation it is hard to imagine that the CATIE project in small farmer cropping systems (SFCS) would have had much impact during these turbulent years. In fact, bloody fighting with heavy casualties and damage to infrastructure took place in the Matagalpa-Esteli area where the major project efforts were concentrated. Yet to the surprise of our evaluation team, the project appeared to have functioned effectively during this period of intense change. Many of its institutional relationships in Nicaragua have been maintained, particularly at the field level. In fact it is about to embark on a joint effort with a government agency field office to disseminate one of its alternatives in the Matagalpa-Esteli area. It was apparent to our team that the project had a series of unusual impacts. But before we review these impacts it would be useful to describe the project's general focus and objectives.

CATIE's SFCS effort in Nicaragua contains a set of loosely defined steps (see Exhibit 1) which lead from initial base line surveys to the diffusion of technical information to farmers. Some of these steps are: 1) design and implementation of surveys and secondary data collection; 2) use of these materials to compile profiles of target area farmers and their farming practices and environments; 3) design and implementation of on farm research; 4) development of alternatives for small farmers; 5) testing the validity of the alternatives with larger groups of farmers (verification); and 6) dissemination of the alternatives through national institutions.

The initial SFCS project proposed for Nicaragua attempted to accomplish only the first four of those steps in this process. These objectives were accomplished quickly and the team attempted to carry out steps five and six (verification and dissemination activities) as well. Briefly, a project agreement between the Nicaraguan Ministry of Agriculture and CATIE was signed in October of 1975. A national advisory committee was developed in 1976 to oversee the project and set policy. Baseline studies were completed during 1976. Small farm experiments were carried out in 1976-77. Two cropping system alternatives were proposed in 1977 (Maize-bean and sorghum-bean). A series of important institutional relations were developed throughout the period. Informal verification activities took place in the Matagalpa area in 1978 and in the Matagalpa and Esteli areas in 1979. In spite of the disruptions of the revolution, the project seemed to have some unusual impacts. Let us look at some of these impacts in more detail.

B. Impact on Farmers

General

Impact on farmer participants in the CATIE Nicaragua project appeared to be more substantial than in the other country projects. A larger group of farmers was involved. They participated more actively in the project beyond simply contributing their labor. They appeared to be the most knowledgeable about the purposes of the experiment and verification trials than any of the other CATIE country project group farmers. The majority of the farmers interviewed were very favorably impressed with the new cropping system alternative used by CATIE and most were planning to use it. Finally, while the yields per hectare for the sorghum and frijol alternative were not as high for farmers during the verification trials as during the experimental trials, they were substantially higher than for the farmer's usual alternatives.

Number and Type of Farmers

Because the CATIE Nicaragua project completed both experimental and verification activities, they worked with a larger group of farmers in 1979 (33) than the other country projects. Initially, they performed on farm experiments with 6 farmers in the Matagalpa area and in 1978 undertook verification activities with 25 farmers in the same location. In 1979 verification activities were undertaken with 33 farmers from the Matagalpa area and 18 from Esteli (see Exhibits 2-4). The average size of land holding for the verification group was 5 manzanas or around 3.5 hectares.

Due to limited time and travel difficulties, it was possible to conduct depth interviews (of one to two hours in length) with only 24% of those farmers participating in the 1979 verification exercise (8 of 33). Two of the farmers had 4 to 10 manzana farms and the other six had less than 4 manzanas. The average farm size for the group interviewed was 4 manzanas or roughly 2.9 hectares (slightly smaller on an average than those in the verification group). Both the farmers we interviewed and the farmers in the verification group had average holdings well below the 7.5 hectare average for the Esteli area where 36% of the farmers had farms of less than 2.1 hectares and another 36% had between 2.1 and 5.6 hectares (see Exhibit 5).

Farmer Participation in the Project

The CATIE team relied on a unique strategy of selecting farmers based partly on agronomic variables and partly on their reputation in the community as leaders and innovators. They consciously assumed that research, verifica-

tion, and dissemination were interrelated activities and that they could strengthen these linkages by gaining participation from farmer leaders who might later help in the verification and dissemination process. Farmer leaders were identified during the initial large-scale survey process undertaken in the study areas.

Although the staff relied on an area diagnostic survey to gain knowledge of farming systems in the area, they worked in depth with 6 farmers to identify some of their problems and concerns. Based on their discussions, the researchers designed on-farm trials with the six farmers. Although farmers were not given a major role in selecting alternatives for experimentation, the alternatives and their pros and cons were discussed. Farmers provided their labor and were involved in all phases of the experiments and verification trials. One staff member virtually lived nearby during the planting and harvest season in 1978 and 1979 and both he and the farmers reported that their relations were excellent.

Farmer participation in the verification strategy, particularly in Matagalpa, was based on active assistance of farmer leaders. Staff asked leaders to identify two to three key individuals in a series of areas around Matagalpa who might want to participate in a verification trial. These people were asked to come to a meeting to discuss the project. CATIE's representative said he made a strategic mistake by not informing the leaders that he needed farmers with less than 10 manzanas of land (7 hectares) and with certain agronomic characteristics. However, once the criteria were cleared up, farmers were then selected for verification activities.

Knowledge and Adoption

All farmers interviewed had a high degree of knowledge about the experiments and verification trials they participated in. They were able to describe their own cropping systems in detail and then show how the experiments and trials differed from their own ways of doing things. They described what they perceived to be some of the benefits of the sorghum-frijol system such as: natural fence-like qualities of sorghum to serve as a wind break, reduction of water evaporation from beans, and control of erosion. Most important to all, however, seemed to be the risk averting property of planting sorghum-frijol instead of simply frijol in the second planting period. Those in the Esteli area noted that their neighbors in 1979 who planted only bean lost almost all of their crop to slugs. In contrast, they lost much of their crop of bean but harvested sorghum successfully.

All of the 8 farmers felt that the sorghum-bean alternative was useful to avert risk and increase yields in spite of higher input costs. Six of the 8 farmers said they would use the system next time in their second planting (September-December 1980). One said he would try vegetable crops instead and another did not think it was worth planting beans in his area again. In addition to accepting or rejecting the formal sorghum-frijol alternative, all 8 farmers had adopted at least some new practices (such as fertilizer use) during the study period which they said they had learned from the researchers.

Yields

The experimental alternatives for maize and bean, and sorghum and bean presented by CATIE reported substantial increase in yields (KG/hectare) and in income generated for the maize-bean alternative and the sorghum-bean alternative when compared to current practice (see Exhibit 6).

Although data was collected on the 1978 and 1979 verification trials, it was incomplete due to the war. From the existing data for the Matagalpa area, however, it is possible to look at the KG/Hectare yields for sorghum and bean for the 1979 second planting season. The data show that while the yields (KG/Hectare) are less than in the experimental alternative, they are still higher than for the original alternative used by the farmers (see Exhibit 6). Full income data was not available.

C. Impact on National and International Institutions

General

Assessment of the impact of the CATIE program on national institutions in Nicaragua presented special problems. For example, although CATIE's resident, Anibal Palencia, reported that he had developed good relationships with field, middle, and upper echelons in both the Nicaraguan Institute of Agricultural Technology (INTA) and the Institute for Farmer Improvement (INVIERNO), most upper and middle level public servants fled the country or were replaced in 1979 after General Anastasio Somoza D. left the country. At the same time, the top level leadership at IICA, where CATIE staff had their office, as well as those at the USAID mission and IDRC (the Canadian Development Foundation) were also replaced after the revolution. Thus, it was necessary to reconstruct the evidence of institutional impacts from "organizational survivors," members of the new government and officials outside of Nicaragua who had worked previously with the program.

In general, it appears that the CATIE program in Nicaragua had more profound and sustained impact on Nicaraguan institutions than the other CATIE country projects. Formal relationships with Nicaraguan institutions were

developed more quickly and actual collaborative work began almost immediately. CATIE appeared to shape the way both INTA and INVIERNO thought about agricultural research in CATIE's target region. The three organizations collaboratively carried out diagnostic surveys and INTA and INVIERNO to help implement verification and dissemination efforts. Both INTA, INVIERNO and international organizations like IDRC helped provide staff and limited resources at different times during the project's life. Finally, unlike many of the other country situations, the local USAID Mission took an active interest in the project, tried to help integrate its activities into the Mission agricultural strategy, and in several key instances, used leverage to help CATIE develop crucial relationships with other AID-funded organizations. Let's look at some of the information about institutional impacts in more detail.

Formal Agreements and Relationships

The legitimacy of the CATIE program in Nicaragua was formally established in October of 1975, through an agreement between CATIE and the Nicaraguan Ministry of Agriculture. The Nicaraguan agreement was the first to be signed outside of Costa Rica and established the basis for CATIE's future formal relations with INTA. Work with INTA began almost immediately.

In 1976, Anibal Palencia, CATIE's resident for Nicaragua from 1976-79 formed a National Advisory Committee made up of officials from Nicaragua's major agricultural sector institutions. Since none of the committee members presently reside in Nicaragua, it was difficult to establish any clear picture of the activities of the committee. Anibal Palencia reported that the committee helped to set overall policy for CATIE work in Nicaragua, to help determine the target areas for project emphasis (Matagalpa-Esteli), and to suggest the formal contact with INTA.

Coordinated Research with National Organizations

CATIE helped perform the small farm cropping systems research for the Matagalpa-Esteli area from 1976 to the present in conjunction with INTA. INTA personnel helped carry out a CATIE survey of the Matagalpa area. During the four year period from 1976-79 CATIE's institutional point of contact changed within INTA. At first CATIE activities were related to a subunit of the Basic Grains Division of INTA (see Exhibit 7 for organization chart). Later, the relationship was specifically with the Division of Regional Investigation with a specific focus on the Matagalpa-Esteli area. Finally, the CATIE team mobilized their resources to fill a gap in small farm systems research in the Matagalpa-Esteli area for two of the major organizations working there (INTA

and INVIERNO, the Banco Nacional did not collaborate directly). This was done through a new organization called PIAPA which provided research information to both INTA and INVIERNO.

CATIE began to have contact with all levels of INVIERNO staff in 1977 and ultimately helped focus INVIERNO's extension work through its research efforts. INVIERNO staff participated along with CATIE and INTA in the implementation of the diagnostic survey of the Esteli area in 1978.

Dissemination of CATIE Findings by National Organizations

Staff and former INTA and INVIERNO employees both indicated that CATIE formed relationships with INTA field agents and INVIERNO change agents (agentes de cambio) to provide field days which included information about some of the cropping alternatives developed through the program.

Allocation of National and International Program Resources to CATIE's Program

INTA directly assigned a staff member to the CATIE project. That staff member, Filamon Diaz, played a major role in setting up the field experiments, contacting the farmers, collecting the data and evaluating the results. At the same time in 1978-79 the Canadian Development Foundation (IDRC) helped pay the salaries of two technical staff to carry out the verification of CATIE alternatives for sorghum-bean in the Esteli area. Anibal Palencia coordinated the team and maintained a high level of cohesion until he left in 1979. Even in the absence of the resident in 1980, the group continues to carry out its activities.

Role of the Nicaragua USAID Mission

The USAID rural development officers during the project period reported that they were favorably impressed with the CATIE project and its leadership. Initially, one RDO had difficulties establishing working relationships with the CATIE team leader because he had to work through the Director of the IICA office first. However, once a clear line of communication was established between the RDO and the CATIE Resident, a collaborative relationship developed. The RDO began to see the utility of the SFCS approach for research in the target area where two other organizations (INTA and INVIERNO) with bilateral aid mission funds were working. When it appeared that several officials within INTA were blocking CATIE's ability to perform a research function for both INVIERNO and INTA, the RDO and the CATIE Resident worked out a strategy which gave CATIE a role in a new organization called PIAPA, which would perform research for both INTA and INVIERNO.

Sustainability in a Revolutionary Situation

CATIE's relationship to Nicaraguan organizations at the field level in Matagalpa and Esteli were broad enough to insure some continued ties to specific people even though public sector priorities in agriculture and the service delivery organizations have been totally reorganized (see Exhibit 8 for organization chart). CATIE's strongest relationships are with the field office of PROCAMPO (formerly INVIERNO) in the Matagalpa-Esteli area. PROCAMPO, a department in the new Ministry of Agricultural Development (MIDA) has the specific charge to work with small farmers to increase production, expand cooperation through the development of cooperatives, and to encourage collective production where possible. The PROCAMPO field office staff is designing and carrying out field days with farmers to disseminate information about the CATIE developed sorghum-bean alternative. CATIE staff are playing backup roles. Additional evidence of sustainability is also available. INTA continues to assign one staff member to CATIE and has been approached to assign an additional person.

Future relations with INTA are unclear since its functions have been severely restricted during its incorporation into MIDA (see Exhibit 7).

CATIE, like all outside organizations with programs in Nicaragua, faces a critical set of problems. It must adapt itself to new government policies and priorities in the post revolutionary period. It must also create a new set of relationships with middle and upper level staff in newly emerging and highly fluid Nicaraguan national organizations. CATIE's effort to readjust its role will be easier than for many organizations. Its contacts at the field level remain in place and may well serve as a springboard for the new upper and middle level relationships.

D. Impact of the SFCS Methodology on the Researchers, Farmers and on CATIE

A Flexible Research Approach

Observation of the researchers and discussions with them and farmers indicated that SFCS research required a more flexible attitude toward research design than would normally be permitted in traditional agricultural research. For example, traditional agricultural researchers usually wait for problems to be brought to them and then conduct research on experiment stations without exploration of the broader social or cultural context which generated the problem. In contrast, the SFCS researchers went directly to farm settings, performed diagnoses and tried to determine what the problems might be and what their environmental context was. Second, the traditional agricultural

performed diagnoses and tried to determine what the problems might be and what their environmental context was. Second, the traditional agricultural researcher uses an empirical approach to help maximize the effect of experimental variables while all extraneous factors including his own behavior are rigorously controlled. While the SFCS researchers in Nicaragua had an interest in control, they could not exclude the influence of a less controllable environment. Furthermore, they hoped that farmer learning was taking place during the experimentation. Thus, they were willing to opt for less control in return for greater realism. Finally, the traditional researcher hopes for valid and reliable studies with a high degree of experimental replicability. In contrast, the SFCS researcher in Nicaragua hoped for as much validity and reliability as possible but more for replicability by farmers. Thus, the approaches had to be altered or at least adjusted to make them useful to farmers. Farmers were not selected randomly but rather because they were leaders and might influence other farmers.

These features might be considered characteristics of the flexible research attitude we observed in Nicaragua. It is impossible to say that they are impacts which changed the researchers as a result of using the methodology. It is equally plausible that those involved with the Nicaragua project had these attitudes toward research before the project began and gravitated to the project as a result of their attitudes.

The Ability to Play Multiple Roles

Another set of researcher characteristics which we noticed was the ability of the Nicaragua CATIE team members to play multiple roles. Because they had to operate in a rapidly changing environment and because they could not call on disciplinary specialists to solve their problems, they appeared to be able to do a little of everything and also to switch roles from that of experimental researcher to social change agent, to political strategist and organizational alliance builder, as the situation dictated. Again it is impossible to say whether the researchers learned these behaviors as a result of the experience, or whether they brought these skills to the experience. However, it is useful to think about the importance of these kinds of skills when team members are being recruited.

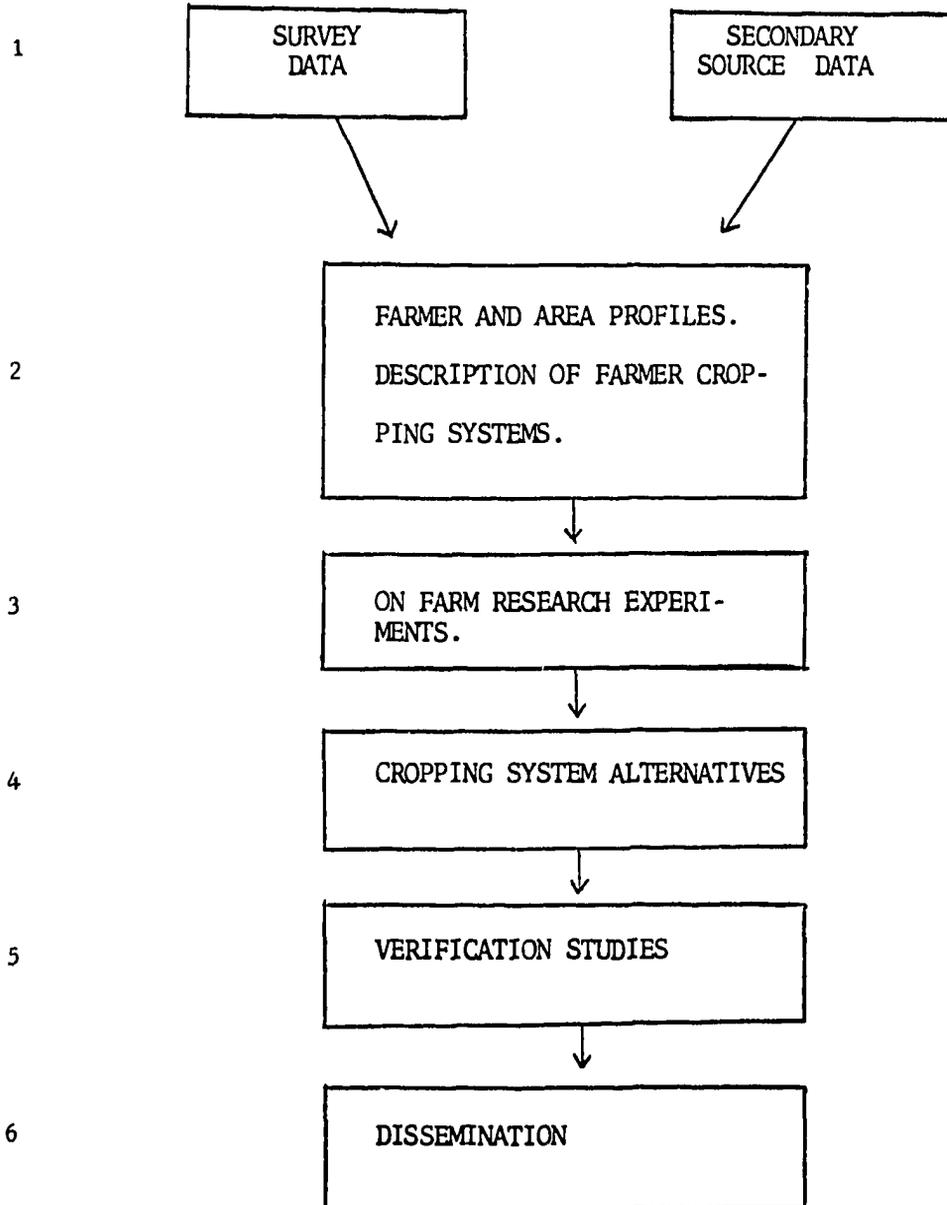
Impact on CATIE

It is unclear what the impact of the more flexible approach required for SFCS research in Nicaragua will be on central CATIE staff. If the institution itself moves back toward more structured disciplinary and empirical approaches

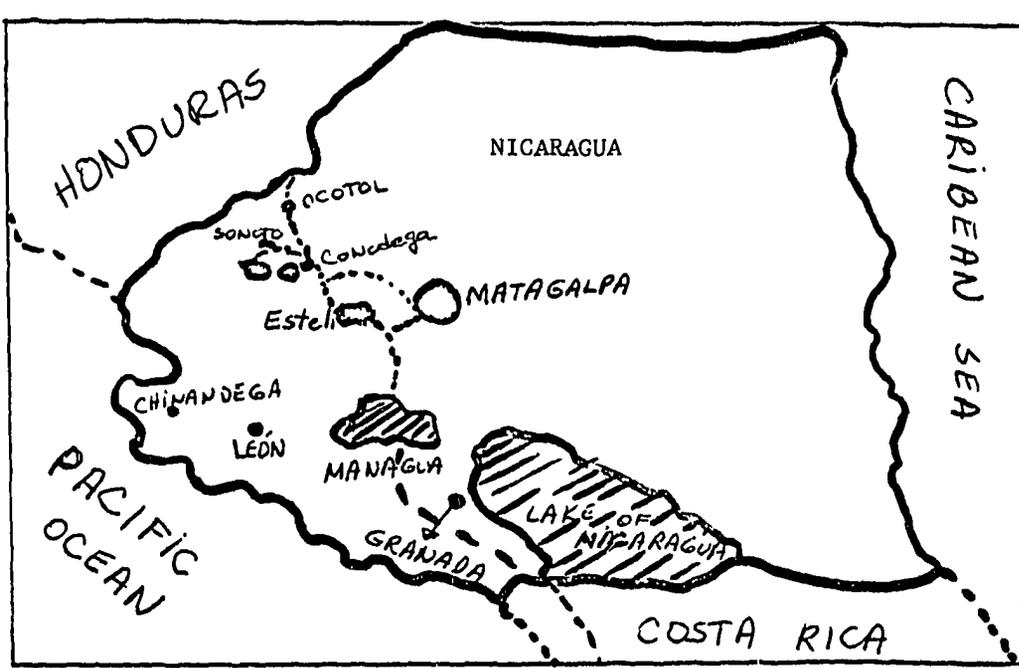
for future field activities and activities at CATIE then the impact of the Nicaragua and other country experiences might be judged as minimal. However, it is clear that CATIE's Nicaragua experience with SFCS research might serve as a model for other country projects where the primary object is to choose between research, verification and dissemination of information useful to improving the productivity and levels of living of small farmers.

SMALL FARMER CROPPING SYSTEMS RESEARCH PROCESS

STEPS



MAP OF NICARAGUA



CATIE PROJECT SITE AREAS O

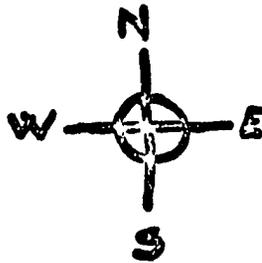
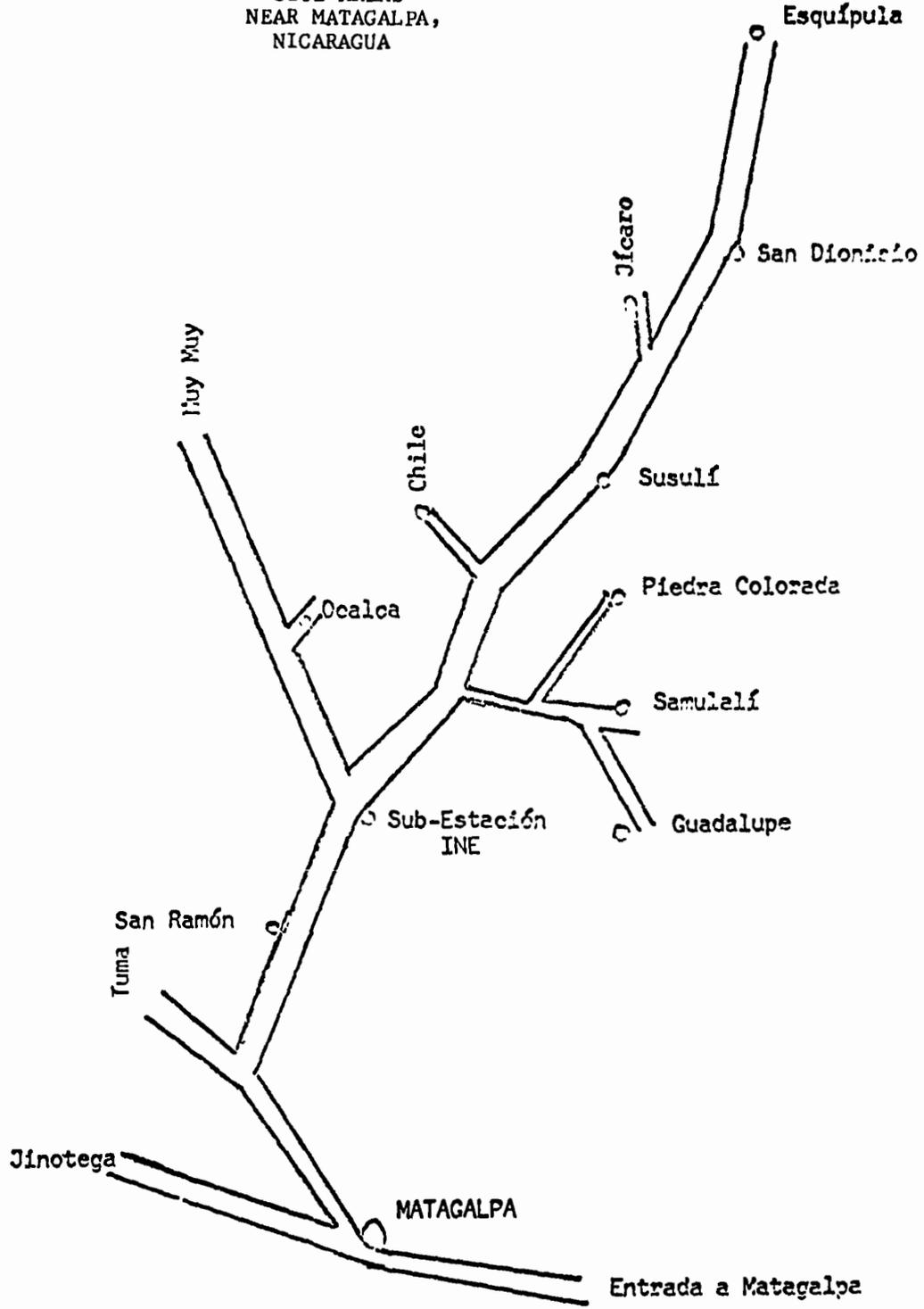


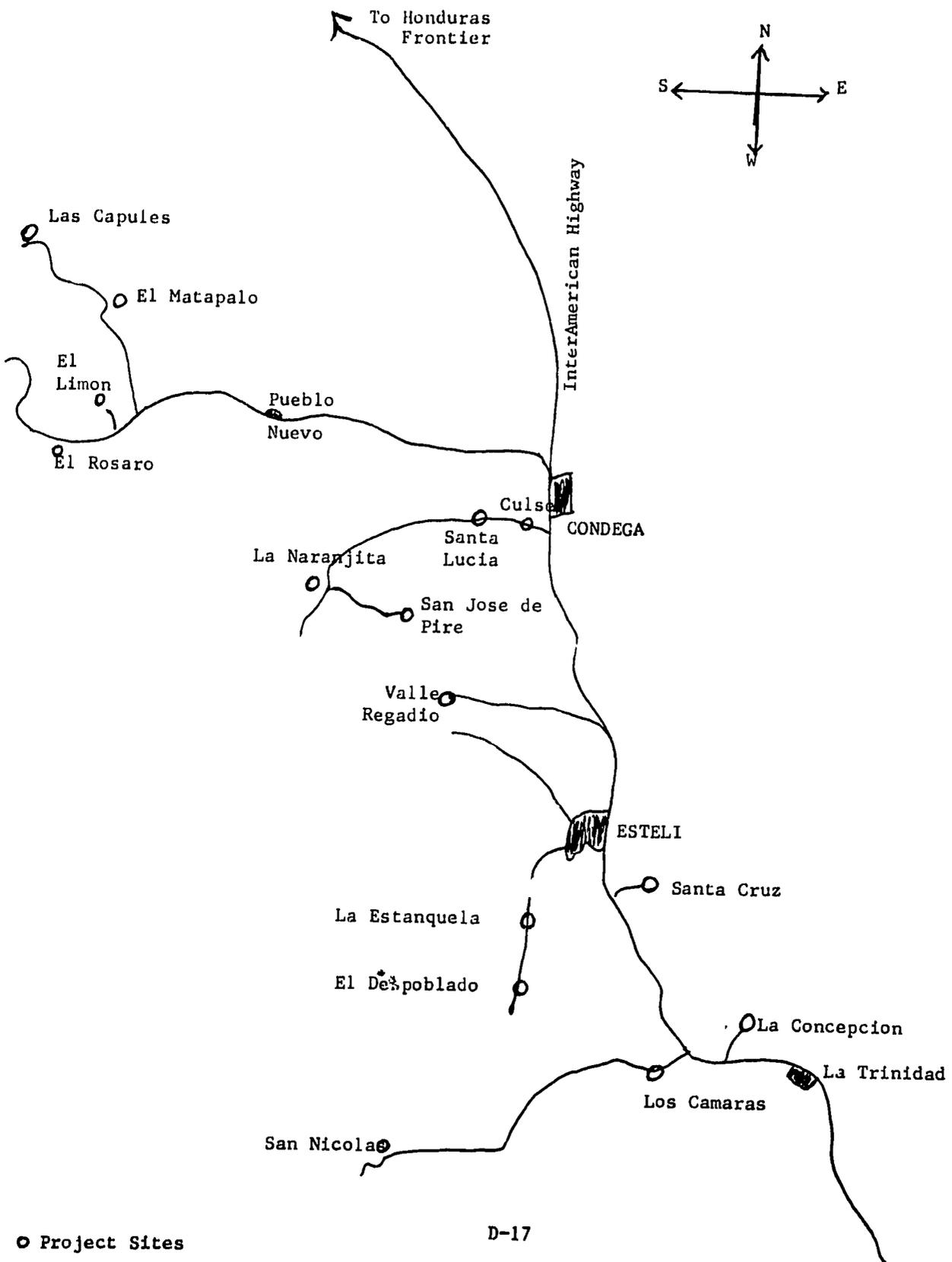
EXHIBIT 3

MAP OF CATIE
VERIFICATION
SITE AREAS
NEAR MATEGALPA,
NICARAGUA



○ Verification Sites

EXHIBIT 4
 MAP OF CATIE VERIFICATION
 SITES NEAR
 ESTELI, NICARAGUA
 1979



○ Project Sites

EXHIBIT 5
 Size of Agricultural Holdings in
 the Esteli Area Compared
 to Average Size of
 Holdings of CATIE Project
 Participants

<u>CATIE Esteli Survey 1978</u>		<u>1979 CATIE Verification Trial Participants</u>		<u>1980 Size of Holdings of CATIE Verification Trial Participants Interviewed by Evaluation Team</u>
<u>Size of Holding</u>	<u>No. of Farmers</u>	<u>%</u>		
0 - 2.1. Ha.	32	36%		
2.1 - 5.6	32	36%	33 farmers with an average holding of 3.5 hectares	8 farmers with an average holding of 2.8 hectares
5.6 - 10.5	9	10%		
above 10.5	<u>15</u>	<u>18%</u>		
Total	88	100%		

EXHIBIT 6

COMPARISON OF PRODUCTIVITY AND COSTS OF TRADITIONAL VS. ALTERNATIVE CROPPING SYSTEMS IN NICARAGUA

	<u>TRADITIONAL SYSTEM</u>	<u>ALTERNATIVE SYSTEMS</u>	<u>VERIFICATION STUDY</u>
	<u>Maize - bean</u>	<u>Maize - bean</u>	<u>OF ALTERNATIVES</u>
Maize KG/Hectare	2500 KG/H	5200 KG/H	
Bean KG/Hectare	552 KG/H	1000 KG/H	
Value of Production	554.24 CA\$ ¹	1098.00 CA\$	NO DATA
Cost of Production	407.54 CA\$	517.00 CA\$	
Net Income per Hectare	146.70 CA\$	580.73 CA\$	

	<u>TRADITIONAL BEAN SYSTEM IN SECOND CROP²</u>	<u>SORGHUM-BEAN ALTERNATIVE IN SECOND CROP³</u>	<u>VERIFICATION STUDY DATA MATAGALPA AREA, SECOND CROP⁴</u>
Bean KG/Hectare	650 KG/H	809 KG/H	529 KG/H ⁵
Sorghum KG/Hectare	----	840 KG/H	710 KG/H
Value of Production	Not available by 3 separate planting	Not available by 3 separate planting	Not available
Cost of Production	"	"	"
Net Income per Hectare	"	"	"

D-19

- (1) CA\$ = US Dollar
- (2) Second crop occurs from September-December
- (3) Data on alternative costs exists for first and second crops only.
- (4) Study in 1979 with 15 farmers in Samulali area near Matagalpa.
- (5) These figures are average (mean) yields of KG/H for the 15 members of the Verification study group. The range of (KG/H) yields for beans was between 21 KG/H and 1083 KG/H and the group median was 584 KG/H. The range of (KG/H) yields for sorghum was between 282 KG/H and 1666 KG/H and the group median was 758 KG/H. The closeness of mean and medians in both cases indicates rather normal distributions.

EXHIBIT 7

CHART OF CATIE PROJECT RELATIONS WITH THE NICARAGUAN INSTITUTE OF AGRICULTURAL TECHNOLOGY (INTA) AND THE INSTITUTE OF FARMER IMPROVEMENT (INVIERNO).

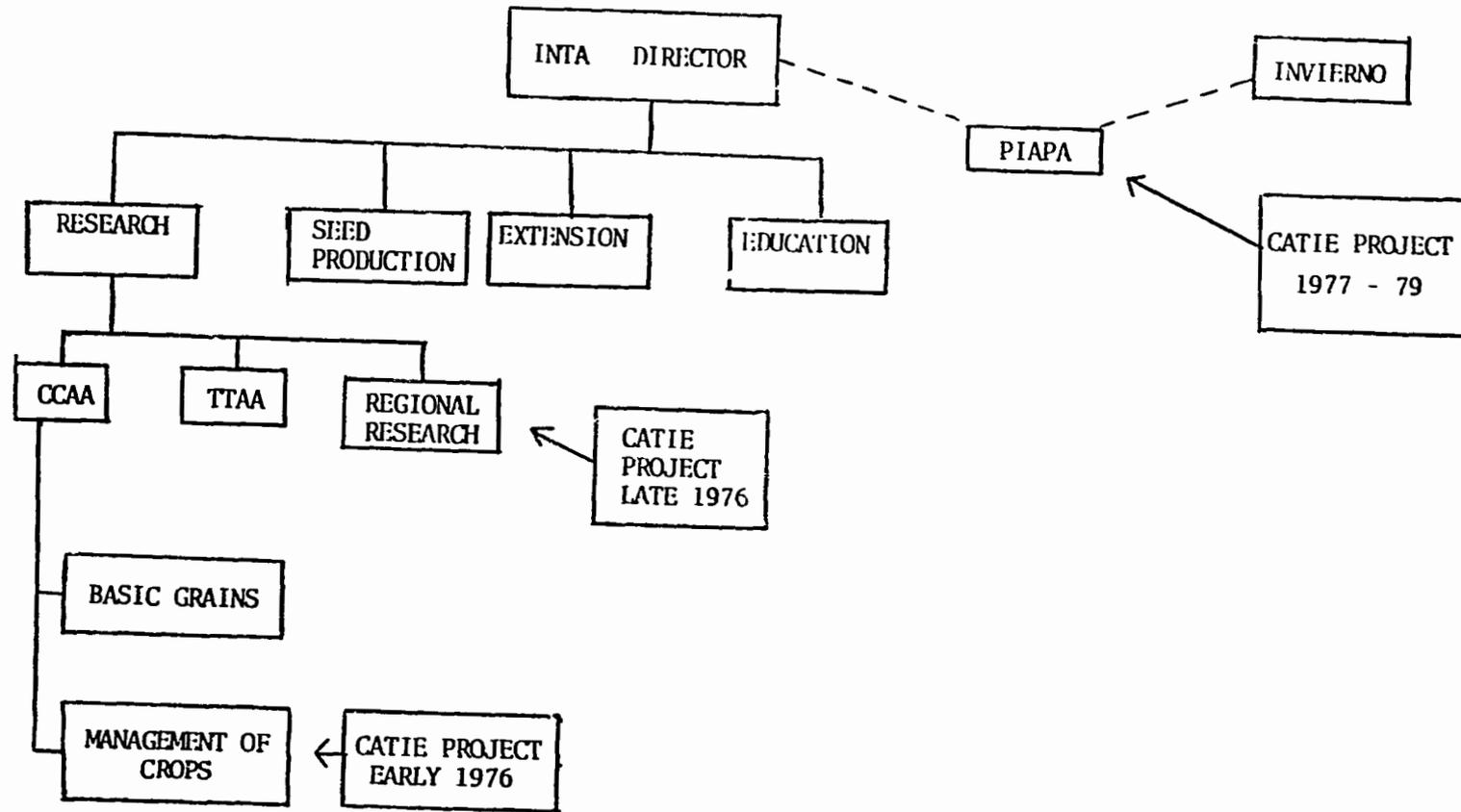
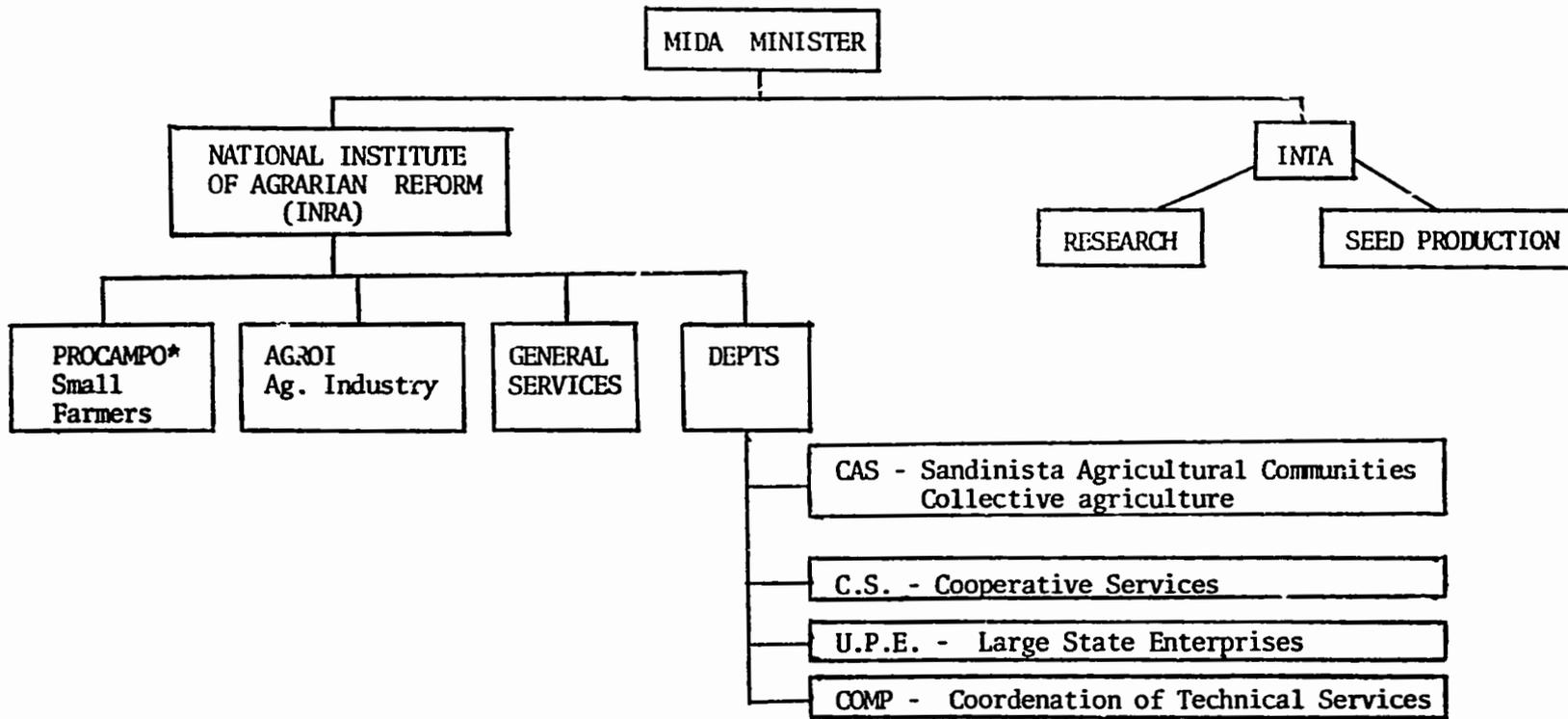


EXHIBIT 8
 ORGANIZATION CHART
 MIDA (Ministry of Agricultural Development)



I-21

* Formerly INVIERNO - now has responsibility for small farmer programs.

APPENDIX E
GUATEMALA COUNTRY REPORT

GUATEMALA COUNTRY REPORT

Review of CATIE Project Impacts in Guatemala

A. Project Setting

The mountainous terrain of tropical Guatemala has helped create a patchwork of ecological diversity, ranging from humid tropics to dry temperate. Most of the six million people are Indians. Most of the Indians are poor and rural. Many of them are small farmers (less than two hectares).

As in many developing countries, life is harsh for most rural Guatemalans, with great inequalities in resources and opportunities. In Guatemala, 87 percent of the farmers live on 18 percent of the land. These 500,000 families, about half the country's population, not only feed themselves but produce most of the basic food grains to feed the rest of the country as well.

The staple of the Guatemalan diet is maize. Acreage planted in corn is 10 times larger than acreage planted in the second largest crop, beans. Sorghum, wheat and rice are also grown. The best agricultural land is used to produce high-value export products such as coffee, sugar, cotton, cattle and bananas. Most of these farms are large, owned by the wealthy.

CATIE, under the Small Farm Cropping Systems Project (SFCS), has worked with small farmers in close cooperation with the Guatemalan Institute of Agricultural Science and Technology (ICTA). ICTA is a relatively new organization (founded in 1973) which has national responsibility for generating and promoting the use of science and technology within the agricultural sector. Although CATIE and ICTA signed a "memorandum of understanding" in November, 1976, field experiments by a CATIE resident scientist only got off to a slow start in February, 1978. Not until December, 1979, did Guatemala offer CATIE continuing institutional support.

Most of the research undertaken by the CATIE scientist, Dr. Donald Kass, in Guatemala has been concentrated in the Central Highlands, in the region of Chimaltenango, designated Region V by ICTA. Dr. Kass, has worked principally with small farmers in the "municipalities" of Santiago Sacatepequez, Tecpan, Zaragoza, Comalapa, Chimaltenango, and Santa Cruz Balanya.

Most of the small farmers in this area are Indian and speak various dialects of Cakchiquel. Much of the region has been in continuous maize cultivation for the last thousand years. Increasingly, over the last century, small farmers have intensified and diversified their production strategies in response to population pressure and the demands of nearby national and regional market centers.

The CATIE research focused on corn and bean systems mixed with horticultural crops using two research strategies. One focused on an analysis of alternative production systems, using eleven different crops planted in sequence, monoculture, or in rotation with maize. The other research strategy focused on particular components of the systems (e.g., crops, insect and disease control, varieties, weed control, fertilizer) and alternate management strategies for dealing with them. For example, spatial and chronological arrangements were varied for eleven crops; four varieties of maize, climbing bean, wheat and peas were compared; maize density was altered in a variety of ways; and a study was made of the magnesium requirements of potato and cauliflower.

The SFCS project was only active for 15 months in Guatemala, yet activity continues under the subsequent Small Farm Production Systems project.

B. Evaluation Methodology - A Note

Two team members, Hobgood and Johnson, along with Guatemalan anthropologist, Lic. Rolando Duarte, spent the week of February 11 in Guatemala. Five of the six municipalities where research involving CATIE was done were visited. We were able to talk at some length (one to four hours) with six small farmers who had participated in the research. In five cases, we were able to speak to some members of their families. We talked with a few non-participants. Given the short time the project had been operating, we did not pursue non-participants further.

Approximately half of our time was spent interviewing staff people in relevant organizations. In Region V, we interviewed local ICTA employees, Dr. Kass's counterparts on the Technology Assessment Team (Equipo de Prueba de Tecnologia); the ICTA Director for Region V, Ing. Ricardo del Valle; field staff of the extension service (DIGESA); and the field staff of a Swiss Evangelical Voluntary Organization working in the area. In Guatemala City we met with: the Director of ICTA; Ing. Carlos Ramirez; ICTA Technical Director, Ing. Ramiro Ortiz; the USAID Mission Director, Deputy Mission Director and Rural Development Officer, and senior officials of the Interamerican Development Bank.

C. Impact on Small Farmers

Fifteen months is a very short time for an agricultural research activity. Evidence of major impact on a substantial number of farmers was not an objective of the project and little evidence of such impact was encountered. The team wished to talk with small farmer participants to:

1. verify that research on small farms had been done;
2. get some sense of how the farmers participated in the research;
3. see if they understood it;

4. learn how representative the farmers were with whom the CATIE staff was working;
5. observe the interaction between scientist and small farmer; and
6. inquire about the potential of such research producing usable alternatives worth verifying and disseminating.

We had the pleasure of speaking with six farmers who had participated in the research: Anastasio, Fernando, Enrique, Jorge, Gabino, and Pedro. All of them, including the families of five of the farmers, were most hospitable and helpful. They tolerated with great dignity our uncivilized pace and awkward questions, and we thank them.

All the farmers had small landholdings ranging in size from one to three hectares. They were selected pretty much at random shortly after the arrival of Dr. Kass. They seem quite representative of small farmers in the area. Only two of them are located on a paved road. They all produced primarily for family subsistence and secondarily for the market. One produces only for the subsistence requirements of an extended family. The others produce for market as well, one almost exclusively. All have some animals--a few chickens, a hog or two, a goat, some sheep. Two have one or two oxen for traction. Only one has a horse. Their families represent a broad range of points in the developmental cycle of families: two are young with very young children; three are middle aged; and one is at the end of a cycle, with the children all placed and providing for the family's cash requirements.

All of the farmers participated in the experiments by providing land and some labor. None participated in the initial identification of problems to be researched, but three have influenced the type of subsequent research done. All could explain something of the experimental work done on their plots. Only one was really quite indifferent while three were very enthusiastic and could describe experimental work in great detail.

Interaction between these small farmers and the research scientist has been intense. Kass lives near them, visits them weekly and has become an intimate part of their lives. He participates not only in their joint research efforts but in such things as:

1. the larger production and marketing system (e.g., talking about the results of the previous harvest, problems with the present harvest, plans for future planting, and various marketing opportunities);
2. their health problems (e.g., securing medical attention for family members);
3. their off-farm activities (e.g., arranging employment and housing for farmers' relatives);

4. intimate family matters (e.g., being consulted on possible marriage plans).

Such intense interaction has some obvious benefits. To the small farmers it provides a constant source of useful advice on a wide range of agricultural and marketing problems and a one-man social services agency. To the scientist it insures small farmer cooperation. Three of the farmers we talked to made the point that Kass was "family", "their land was his" and so on. (There are practical limits, of course. One farmer, taking advantage of an unusually high, short-term fluctuation in prices, harvested a research plot before the results could be analyzed.)

Such a close personal association with the farmers also allows the scientist to learn about the extraordinary agronomic and socio-economic complexity of the context in which particular crops and cropping systems are placed. This includes much that may not be revealed by ex ante survey research. Even during our direct interviews, many of the yes/no answers we received regarding, for example, off-farm work by family members, labor exchange, and participation of women in agricultural work were inaccurate. The scientist could recall past observations which the farmers considered "exceptions".

Moreover, this broad participation also continually informs the scientist of the methodological limitations of purely agronomic approaches to cropping systems research where most of the limits on production are non-agronomic. It allows the scientist to get beyond the "crops and critters" components of systems to some of the complexities of rural social life. Interesting work being done on vegetables, for example, may be fine for farmers like Anistasio of Santiago Scatepequez. Here a Swiss evangelical group has developed a vegetable processing and marketing plant, stabilizing prices for broccoli, snow peas and cauliflower. He also has an active cooperative to provide him with such inputs as fertilizer and pesticides. But it may not help Enrique of Zaragoza, who cannot afford to harvest his beautiful crop of cabbage because of seasonally failed demand. (Cabbage prices can vary by as much as 600 percent.)

Intense participation also allows one to discover the contradiction between the "good" farmer who does poorly and the "bad" farmer who does well. The yields of Jorge, who does relatively poorly for himself and his family, on experimental and non-experimental plots are among the very highest in the small farmer sample. Gabino and family produce only one-half to one-third the yield of Jorge but do much better managing their whole social and material environment in terms of family labor, labor exchange, and marketing opportunities. Finally, there is Fernando, the very image of the old "traditional" Indian farmer, who refused to intensify production on his small plot to produce for the market at all. Again, the explanation for his agricultural behavior lies outside the cropping system. His family is mature. The off-farm income

of his son and son-in-law provide the extended family of six adults and three children with cash requirements and enough surplus to be among the first in their mud-walled, tin-roofed "neighborhood" to have electricity and their own television.

Based on growing knowledge of these systems and their rationality, research is being focused on alternatives in the existing maize-based system and on system-management issues rather than on new genetic varieties. Even this short-lived research experience has been useful to some small farmers. Anastasio, for example, had never thought of planting cabbage with his corn. He has now seen the results of doing so and can now do it, if he so desires. Furthermore, the resident ICTA staff person took local farmers to view the research and some of them plan to try it. Enrique, whose cabbage may rot in the field, is not too interested in most vegetables, but is interested in producing a new variety of the nutritious broad bean, a challenge to the scientist because this crop has been neglected in basic research to date. And both farmer and scientist are learning what things cannot be done. Peas, for example, are a real problem given the extraordinary pod-opening abilities of a local bird species not at all bothered by scarecrows. Other research focused productively on farm-management alternatives involved in the timing of fertilizer applications, spacing of plants and varying their combinations and sequencing to produce higher yields.

While only two years of research have been completed, some cropping alternatives, such as maize and potatoes, have been favorably reviewed by the farmers who worked with them. Yield increases have been demonstrated for a variety of vegetable and maize combinations and farmers seem ready and willing to produce them if some market stability were insured. Good working relationships have been developed between the farm families and both CATIE and ICTA staff. The SFCS project has had substantial positive impacts, given the fact that it involved a very preliminary and small effort (one scientist) over a short period of time (15 months). Effective research was done on small farms with limited small-farmer participation.

Interaction between scientist and farm families was warm, free flowing and substantive. Most farmers understood a good bit about the research being conducted. Their occasional lack of interest was very reasonable--most of the research did not apply to their specific and immediate concerns. However, frequent interaction with the CATIE scientist allowed them to use his expertise on things which did interest them. The participating farmers were quite representative of the small farmers in the area and the research has shown its potential for producing alternatives worth verifying and, perhaps, disseminating.

D. Impact at the level of National Institutions

At first glance, Guatemala should have provided the perfect institutional environment for CATIE's SFCS project. In 1970, the government

substantially reorganized the public agricultural sector. Within the Ministry of Agriculture there was established the semiautonomous Institute of Agricultural Science and Technology (ICTA) in 1973.

Like CATIE, ICTA was a new and enthusiastic research organization dedicated to the development and testing of new technologies by doing applied research in the field, working directly with farmers. Substantial support was given ICTA by the donor community, principally by the Rockefeller Foundation but including A.I.D. ICTA had developed its own type of systems strategy based on: (1) taking the best available technologies developed at the International centers and other centers of public and private research; (2) doing testing and adaptive research at experiment stations; (3) further testing them on the farm and getting feedback from farmers; and (4) transferring them to farmers through various public and private organizations.

Although an ICTA/CATIE memorandum of understanding was signed in November 1976, the CATIE resident scientist only began work in 1978. It was not until December, 1979, that Guatemala became a supporting member of CATIE. Why the delay?

As the project began, there was some sense in ICTA that "they were doing it already"; e.g., they were using systems approaches to work directly with small farmers. They had developed their own "survey" methodology, a quick "Sondeo", or site inspection, by an interdisciplinary team followed by a more-detailed "Registro de finca" farm inventory. This contrasted with CATIE's initial baseline study, which was a more systematic and thorough survey. As Ing. Carlos Ramirez, current Director of ICTA, put it, they were a "bit illegal" at the beginning until they could be fit into ICTA's organization and activities.

After an initial "no start" in 1976 followed by a slow start in 1978, relations between the two organizations have constantly improved. CATIE is now seen at various levels within ICTA as an important resource that very much supplements, rather than duplicates, ICTA's work. They understand and in some areas are adopting CATIE's systems approach which bases research planning and the development of alternative technologies on systems already being used by small farmers. ICTA has up to now focused on adopting technologies developed elsewhere to local conditions. They are also interested in the research results from CATIE experiments with alternative ways of managing associated crops.

ICTA Technical Director, Ramiro Ortiz, attributes to Kass's research a major role in moving work in Region V toward systems of associated crops research and development. He has also asked Kass to help develop the central statistical program of ICTA.

CATIE, we were told, is also an important resource for high-level technical assistance and training. Several researchers from CATIE have

worked and consulted in Guatemala. ICTA sends people to short courses, meetings and occasionally for long-term training. A number of people pointed out that these were people ICTA could not afford to hire. The salary structure of ICTA is such that it has trouble keeping the people it does have (25 percent of the technical staff was lost to private industry in the last year). We were also told that CATIE may provide an element of stability and continuity in applied research. As a Regional Institution, it is somewhat distant from national-level politics which in Central America can shift rather dramatically. This may be important since other donors have pulled out following a recent change in government and ICTA is in the midst of a number of organizational uncertainties.

One continuing source of contention between ICfA and CATIE/ROCAP is the research location. ICTA's priority was for work in the Central Highlands and they have insisted that it be done there. ROCAP and CATIE would rather work in the lowlands which are ecologically more like other parts of Central America. ICTA has rejected a CATIE request to have its scientist divide his time between two regions on the theory that his work would be too dispersed to be productive. They did, however, offer to accept a second CATIE scientist to work full time in Jutiapa.

Over the course of the project, CATIE and ICTA began to learn how to work together. Institutional pride, orientation to different centers of gravity in the donor community, the insecurity of "new" institutions, methodological differences and different priorities led to years of delay. A flaw of the project was the early assumption that solid inter-institutional relationships could be rapidly developed. This judgemental error influenced the pace of project activity not only in Guatemala but in Costa Rica as well.

E. Impact on the International Donors

The senior officers of USAID/Guatemala were uncertain, from their observations, as to how much the short-lived SFCS relationship between CATIE and ICTA had affected ICTA's approach to cropping-systems research. However, their sense was that the CATIE project had been a positive reinforcement to ICTA's small-farmer orientation. All agreed that CATIE's resident scientist, Dr. Kass, had brought a dynamism and dedication to the association. Moreover, they felt that the positive reinforcement to ICTA was carrying through with the new CATIE project on Small Farmer Production Systems. Their judgements about the positive impact of the SFCS project were more in terms of the CATIE/ICTA institutional support links than they were specific to the project's research objectives.

The resident officers of the Interamerican Development Bank were not familiar with the SFCS project.

In conclusion, given the initial delays as well as the brevity of CATIE's work with ICTA under the SFCS project, it has had remarkably positive results in Guatemala. The effective working relationships between CATIE's resident scientist and the field offices of both ICTA and DIGESA were noteworthy. The unusually intense, interactive relationship between Dr. Kass and the small-farmer participants in the research was yielding significant insights into the interrelatedness of agronomic work on alternative cropping systems, on the one hand, and the larger socio-economic realities of the Guatemalan small-farm family, on the other. It was clear, however, that the latter insights were not being systematically captured as were the findings from the agronomic experiments. Moreover, the need for thorough market surveys related to specific experimental crops was apparent.

ICTA personnel manifest a general enthusiasm for the CATIE connection. Not only did they welcome the on-going contributions from Dr. Kass and his technical reinforcement to ICTA field researchers, but they particularly appreciated on-going access to the wide range of scientific talent based at Turrialba and the periodic training opportunities available there. The Director of ICTA's Region V believes that the CATIE approach to cropping systems has already led his agronomic staff toward a similar methodology as an improvement over ICTA's earlier work. In spite of this, the evaluation team was uncertain about ICTA's plan to systematically follow the SFCS work with a full program to verify and disseminate the most promising of the tested alternatives. On the other hand, it was apparent that the field staff in the extension service, DIGESA, was eager to do so. They were restive in their primary role of farm credit advisors and looked toward CATIE's work with ICTA as a possible break-through that would draw them increasingly into the action through more "field day"-type demonstrations of the better cropping systems alternatives.

F. Lessons Learned from the CATIE experience in Guatemala, 1976-80

1. Establishing institutional linkages and collaborative relationships requires a lot of time, effort, patience, persistence, and skill which must be allowed for in project design, suggesting a need for improved social analysis of institutional issues.
2. Intense participation between scientist and small farmer is both possible and useful. It counters some of the limitations of the cropping systems methodology which ignores many specific non-agronomic constraints on agricultural production. The interaction provides the researcher with some important data on the larger farming system and socio-economic system of which the cropping system is part.

3. The analysis of constraints on agricultural production is critical for efficient research planning and design. Many of these constraints are non-agronomic, such as market access, transportation, extreme price fluctuations, stable access to inputs, seasonal fluctuations in labor supply, land tenure, access to credit, government pricing policy, etc. These variables are inadequately dealt with in CATIE's cropping systems methodology, particularly as it effects research planning and small farmer selection.
4. Small farmer receptivity to innovation, experimentation and willingness to participate in research will be influenced by the development cycle of his or her domestic group (e.g., new household with infant, household with small children, household with older children planning marriages, mature household with children already married and planning inheritance strategy).

APPEND X F
HONDURAS COUNTRY REPORT

Review of Project Impacts in Honduras 1975-79.

A. General Overview

CATIE's initial effort in Honduras began in 1975 through a working agreement (December 1975) signed by the Secretary of Natural Resources and CATIE to carry out research on agricultural production systems for small farmers.

By decision of the then Minister of Agriculture, Ing. Leonardo Callejas, the Northern Region of the country (Region #3) was assigned as the region where the CATIE Project would start operations.

At that time, Ing. J. Williams was the Director of the Northern Region and Dr. Robert Hart was appointed as the CATIE's resident scientist with his office in the Secretaria de Recursos Naturales (SRN), San Pedro Sula. Dr. Hart remained in that position from February 1976 to June 1978 at which time he was moved to CATIE's main headquarters in Turrialba, Costa Rica. Dr. Rafael de Lucia took over Dr. Hart's position on July 1978 and remained until late 1979 when he resigned his position with CATIE. Dr. Nicolas Mateo succeeded Dr. de Lucia in September 1979 and was assigned to Comayagua, the central unit of Programas Nacional de Investigacion Agropecuoria (PNIA). He currently advises PNIA under the CATIE Production Systems project.

The present evaluation largely addresses project impacts arising from Dr. Hart's advisory period.

The National Team originally assigned to the Project by the Director of Region #3 was comprised of Ing. Walterio Caceres of the Guaymas Experiment Station and Agronomist Nery Mayorga of the Extension Service. Later in the process Ing. Arnoldo Paz, also from the Guaymas Experiment Station, succeeded Ing. Caceres until late 1977 when he resigned. Agronomist Mayorga remained in the project until its termination in June 1979.

Project activities through June 1979 were concentrated mainly at four sites. These were:

1. Yojoa, 50 kms. south of San Pedro Sula,
2. Agua Sucia, 30 kms. West of San Pedro Sula,
3. Cuyamel, 120 kms. Northwest of San Pedro Sula, and
4. Guaymas Experiment Station, 50 kms. east of San Pedro Sula.

It is important to note that at the time Dr. de Lucia took over Dr. Hart's position the headquarters for the project was moved from San Pedro Sula to the Central Research Unit at Comayagua. However, the four above-mentioned sites were maintained as the main research sites.

The four sites selected by the project in the Northern Region clearly conformed to a typical gradient of rainfall, with Guaymas and Agua Sucia being at the extremes of the gradient (high and low rainfall respectively), and Cuyamel and Yojoa falling in an intermediate range (medium/high and medium/low rainfall, respectively). From the standpoint of temperature, all sites can be described as hot. Impressions of the Guaymas Experiment Station will be given separately, as it does not conform to a typical farm site. Typical farming systems and the nature of the experiments carried out are in each of the four areas are discussed in the following paragraphs.

Yojoa

Corn is the cash crop for small farmers in the area, while rice, beans (phaseolus) and ayote (squash) are grown in rather small plots or land patches cultivated mainly for family consumption. In the latter case, ayote is normally intercropped with corn.

The average size of farm owned by farmers interviewed was about 3.5 manzanas (2.4 Has). Under the local production system corn for sale is grown in monoculture as is rice. Fertilizers are normally used for both crops.

Research trials undertaken in this area included variations in spatial arrangements of corn and rice, testing of sorghum and beans (Vigna spp.) as possible new alternative crops, intercropping of corn and beans, and testing fertilizer.

Cuyamel

Rice is the cash crop for the area while others grown, such as corn, beans, sweet potatoes, cassava and plaintain, are mainly for family consumption. Some cacao is also grown to supplement cash income. The average farm size is about 10 manzanas (7 hectares).

Research projects dealt mainly with various spatial arrangements for corn and rice (intercropped vs. monocultures); corn and beans (Vigna spp.); corn and velvet beans; corn and cassava (intercropped vs. monocultures); and corn and pipian (squash).

A remarkable fact observed in this zone was the use of velvet bean, which grows wild, as green manure, for weed control, and as a source of organic matter. It is also possibly a source of nitrogen through symbiotic fixation.

Normally farmers grow their food crops in monocultures, are aware of the use of fertilizers and use chemicals for weed and insect control. CIMMYT possibly has had an influence on the adoption of some of these practices, as some of these farmers had already cooperated with CIMMYT in their trails.

Agua Sucia

Corn is the principal cash crop in the area along with watermelon and other melons. Tomatoes supplement cash income to a lesser degree. Research trials included spatial arrangements of corn and tomatoes, sweet pepper, sorghum and beans (Vigna spp.). The latter three crops were tested mainly as possible new alternatives. Farmers in the area were the smallest in the project, averaging about 2.5 manzanas (1.75 hectares). The area also was found to be the most marginal in terms of climatic conditions in that continuous and prolonged droughts during most of the research period damaged the experiments almost totally.

In all three areas participant farmers were selected by the researcher and the extension agent, and later advised either in groups or individually about the purposes of the research trials to be conducted on their land. They did not participate in the design of the trials, their involvement being mainly in caring for the plots, carrying out tasks such as planting, weeding, and harvesting. Their involvement was typically enlisted upon request of the researcher who would pay in cash for the job on the basis of estimated time involved. Discussions of ongoing research between researchers and farmers were held at various times.

The trials basically involved comparison between local seed varieties as well as local agricultural practices and improved varieties and alternative practices.

In every site it was evident that a close relationship developed between the researcher and the farmer (Hart in Yojoa and Nery in Cuyamel and Agua Sucia). However, it was evident that not all farmers were acquainted with ongoing work in the other selected sites within their own community, nor did outside farmers typically know much about the research going on in the area.

The Guaymas Experiment Station

The station occupies an area of about 240 hectares devoted partially to various types of traditional trials. Priority is given to corn, rice, soybeans and cassava (monocultures). CATIE's SFCS project carried out some trials dealing with spatial arrangements of corn and rice, corn and pipian, corn and cassava, corn and beans (Vigna spp.), and a variety trials with beans (Vigna spp.). These experiments and their results have been reported in the annual reports of the Station. However, as in the case of the on-farm research, the real impact of the CATIE activity appears to be very low. At the termination of the project the research methods introduced by CATIE were not continued, nor were they actively promoted, nor is the information generated being used extensively by researchers in this regional agricultural development station.

B. Impact on Farmers

General

It is too early to judge whether the project has had a lasting impact on production and net farm income. Estimation of the ultimate impact on small-farmer well-being must await accumulation of data from verification trials and estimates of diffusion rates for the new technologies introduced. However, certain important conclusions regarding adoption rates, farmer cooperation in the research and indications of potential changes in crop yields can be gleaned from the on-farm interviews conducted during this evaluation and from published studies of technical, economic, and social results of the project.

Number and Type of Farmers

Annex 1 summarizes the major results of the interviews. Thirteen farmers participated in the effort. Eight of these were interviewed and two additional farmer-neighbors were added to provide some indication of diffusion tendencies.

Farm size varied greatly among the three areas, averaging four manzanas (one manzana equals 0.7 hectares) in Yojoa, eight in Cuyamel and only two in Agua Sucia. Family size tended to be positively correlated with the size of farms. Farmer's in Yojoa were loosely associated as a community, having been beneficiaries of a recent agrarian reform. Although they made decisions independently, and marketed their produce independently, they cooperated with their neighbors in some farm activities such as plowing and harvesting. The nominal community head or leader, Lauro Gutierrez, was interviewed.

Farmers in Yojoa can be characterized as smaller, poorer, and less advanced technologically than the national norm. They had an advantage over farmers in the Agua Sucia area in that rainfall was greater and less variable in Yojoa. Farmers in Cuyamel were larger and more progressive than the national norm and rainfall there was the most favorable of the three zones observed.

Farmer Participation in the Project

Dr. Hart and his national counterpart, Mr. Nery, selected farmers partly as being representative of typical farmers as identified by the baseline studies but largely through Mr. Nery's personal knowledge of the farmers gained through many years of extension work in the region. Thus the farmers finally selected cannot be considered to be strictly representative of farmers of the region. Moreover, some, such as Lauro and Jose, were selected because they were leaders while others, such as Sebastian, were selected because they were innovators.

All farmers except two of the very smallest in Agua Sucia participated in the project by contributing labor to the experimental plots. All were compensated, either in cash on an hourly basis or in kind (gifts of fertilizer or seeds, etc.). The smaller, poorer farmers were paid a cash wage while larger, more progressive farmers accepted gifts of inputs from time to time in exchange for their labor.

Only two of the ten farmers interviewed participated significantly and consistently in decisions regarding crop combinations to be tried, practices, and the like. Sebastian (Yojoa) and Marcelino (Cuyamel) were outstanding in their enthusiasm, intelligence, and willingness to innovate or take risks. It was apparent that their direct participation as collaborators significantly affected the researcher's choice of practices and crop combinations, and that their observations over the course of the trials tempered the conclusions and recommendations derived from the research. Most other farmers participated only passively, contributing labor upon demand and observing the results of the experiments. It was clear that most participants only vaguely understood the nature of the experiments and the research process. All, however, took away information about two or three practices that would have been sufficient to induce adoption of such practices, had other conditions been favorable.

Two farmers in the Cuyamel area identified a traditional practice, cultivation of a wild bean to provide fertilizer and weed control in maize, that will be incorporated into future research trials and further adapted if successful. This is an example of an important potential benefit of direct farmer participation, feedback not only of problem identification but solutions as well.

Knowledge and Adoption

Farmer understanding of the research goals and results ranged from good (including close collaboration on a partnership basis on the part of two progressive farmers) to poor. The degree of knowledge depended primarily on the presence or absence of an innovator's mentality. Farmers that were progressive and risk-taking innovators jumped in with both feet, working with the researcher, contributing their own ideas, and interacting on a weekly basis with the researcher on virtually all phases of the research. The average farmer, however, contributed his labor but only vaguely understood the purpose of the research, research methods used, and overall results. However, all farmers indicated an understanding and willingness to try at least one non-traditional practice growing directly out of the research.

Only three of the ten farmers actually adopted a recommended practice (several practices in one case). These farmers were those already identified as close collaborators, innovators, and apparent risk takers. However, the

remaining farmers, outside of those in the Agua Sucia area, indicated a desire to adopt at least one practice generated by the research project. The reasons they didn't adopt the practice or practices ranged from unavailability of seeds (second crop of beans in Yojoa) to lack of credit (Cuyamel).

A tentative conclusion regarding knowledge and adoption which has implications for design of future research/extension programs for small farmers, is that a larger "extension" element than was initially present in the Honduras case may be desirable in order to induce improved farmer participation and adoption of results. Apparently only progressive or exceptional farmers take immediate advantage of the researcher's knowledge and the research results on his farm. Put another way, it is concluded that including change agents (specially trained researcher, extension persons) in the day to day operations of the trials would probably pay off in terms of the "added value of knowledge imparted". Average farmers may only respond to people especially trained as change agents. Highly trained, research scientist's are not generally skilled at understanding the farmer and his practices or relaying results to him so require assistance from such trained change agents in order to maximize the impact of the on-farm research trials on farmers' behavior.

Yields

Completed agronomic and economic analyses were published only for the Yojoa area for maize + pipian, maize + beans and cowpeas vs. beans. In all cases experimental yields were significantly higher than the farmer's traditional practices. However, in the economic analysis of alternatives for the yojoa training, experimental yields were compared to baseline averages, not directly to cooperator's yields, thereby possibly introducing an upward bias in the yields from experimental results relative to yields from traditional farm practices.

General impressions gained from interviewing farmers were that many practices tested in the on-farm research contributed to an increase in yields that could be readily observed by the farmers. That is, without actually measuring precise changes farmers judged that these practices improved yields. At least some trials then were perceived by most farmers to have significantly increased yields.

As indicated above, several of the more innovative, risk-taking farmers were willing to adopt the best of the new practices immediately, without waiting for further verification. However, average or poorer farmers obviously would require verification, additional extension work, and perhaps proof that marketing services, credit, and the like were to be readily available. In short, yields apparently were improved in the best of the alternatives tried, but the results were not sufficiently dramatic to stimulate widespread interest in trying the practices.

C. Impact on National and International Organizations

General

CATIE established formal relationships with the regional research leadership in Northern Honduras but the resident CATIE researcher obtained only nominal contact with working-level research and extension units. CATIE thus in effect planned and executed its on-farm trials with only minimal direct involvement of local research personnel. This minimal level of involvement of national research personnel seems to have been the policy of the Honduras institutions. Consequently the methodology of systems research was never fully adopted by the Northern Regional research units and the extension service had virtually no involvement in building a longer-lasting link between extension activities and the new on-farm systems research methodology. When the CATIE resident left in 1978 little institutional follow-up on the part of the Ministry of Natural Resources (SRN) occurred. There was no system in place for beginning to modify the traditional research and extension dichotomy nor did the research leadership indicate any plans for modifying traditional research methods.

In short, the weak institutional links and lack of significant changes in institutional behavior owed in part to the low level of rapport with middle-level research and extension units. More importantly, CATIE researchers were not successful in involving these units directly in the program. Local-level assistance in the project was provided but this assistance was purposely separated organizationally from the other Honduran research and extension units. Honduras institutions were apparently reluctant to give full support to the new research methodologies, contributing to the slow rate of impact on these institutions.

Impact on National Level Institutions

The Head of the National Research Program (PNIA), of the Secretaria de Recursos Naturales (SRN), Dr. Mario Contreras, was the highest officer interviewed by this evaluation team. This branch of the SRN is the main contact between CATIE and the SRN. Also, official personnel of the SRN were interviewed at the Regional levels as the SRN has created a regionalized system in order to adapt the system to the political divisions created under the current government. The country is divided into seven regions. Under the system adopted by the SRN, each Regional Director of the SRN makes most technical and administrative decisions concerning his own region. Thus, the officials in the Northern Region (#3) and the Central Region (#2) interviewed were key persons in ascertaining the degree of institutional impact of the CATIE project.

The national-level leadership indicated that the greatest impact and influence of CATIE had been through its research approach and in its support for the PNIA in its efforts to delineate their new policies and strategies

for undertaking on-farm agricultural research. These efforts are still in the process of being consolidated and the national leadership expressed hope that both CATIE and ICTA (Instituto de Ciencia Y Tecnologia Agropecuaria) of Guatemala would continue advising them on systems research methodology. It should be noted however, that official rhetoric at the national level and observed fact in the field appear to be somewhat at odds. The researchers in the Northern Region (#3) have apparently rejected the on-farm systems research approach. Research at the Comayagua Center, while utilizing on-farm trials, employs single-crop techniques only, so it must be concluded that the impact of CATIE's small-farm systems methodology is still problematical in the Honduras case. However, it is also true that single crop systems are more important in the Comayagua region than in the three northern sub-regions reviewed in this evaluation, thus justifying somewhat more attention to single crop systems.

CATIE itself, outside of the USAID small-farm systems research project, appears to have had an important impact on the national institution (SRN) through training of national personnel, both in service and through short courses, seminars and other training modes.

At the sub-national level (region) there are two contrasting situations. First, are the conditions associated with the development of the project while it was linked to the Northern Region (1976-1978). Second, are the conditions currently prevalent under the new policies of PNIA, the Central Research Unit in Comayagua, and the new AID-supported Small-Farm Production Systems project.

In the first case it is clearly evident that the impact of the project at the institutional level was low owing mainly to lack of proper coordination between the project and the regional research program. There was close communication between Hart and the former Regional Director, who gave full support to the project right from the beginning. This support was made clear by the assignment to the project of two technicians, one from the research station and one from the extension service. However, communication between the Regional Director and the research staff was weak so that poor connections developed between the CATIE project and the research program as a whole. Furthermore, there is currently a lack of knowledge by present officers at the regional level in San Pedro Sula of the final results achieved by the project in the region. No final reports nor oral presentations were made at the time of closing the project in the region. All in all, the present research program in the Northern Region appears not to have been influenced much by CATIE's work. Clearly the power of the regional Director and his apparent unwillingness to fully integrate the CATIE approach was a significant impediment to project impact on research methodologies used by the Northern Regional Research Station.

There seems to have been some indirect influence on the research program of the Northern Region in that the regional office follows the policies issued by the PNIA towards the performance of research at the farm level. However, research and technical assistance is directed toward those farmers

having benefitted from the Agrarian Reform, or those who are organized into groups, almost completely disregarding the individual farmers that had been the target of the CATIE on-farm research program.

The question remains whether or not the project has had an impact on the development of new research programs in the Central area, (Comayagua) where Ministry priorities are apparently being directed. The answer is: Probably not. In fact, according to the head of the Central Unit, the results obtained by the project in the Northern Region have not been evaluated; nor are the researchers there fully acquainted with the ecological characteristics of the sites there involved; nor with the validity of their findings; nor do they believe they can afford the risk involved using the tech-packs produced (three tech-packs were produced by the project) at the Yojca site.

D. A Note on CATIE's Current Programs in Honduras

What then are the current links between CATIE and PNIA? What is CATIE's present role? According to Dr. Rosales, Head of Research in the Comayagua Region, the mandate of the national research plan is to pursue research in food crops and vegetables. To undertake this job seven projects have been developed in four regions:

- Beans in the Danli region
- Ajonjoli in the Choluteca region
- Soybeans, vegetables, maizes precoces and highland corn in the Comayagua region
- Rice and tropical corn in the Northern region.

How should the research be performed? It is up to each Region to decide on the topics and strategies to carry out research. It is also a mandate to provide technical assistance to farmers who benefitted from the Agrarian Reform. Therefore, low priority or no priority at all is given to individual farmers. While the research goals or targets of PNIA and CATIE are not closely matched, the research methodology being followed by PNIA is close to CATIE's farming systems methodology.

The current CATIE representative is acting as an advisor to the PNIA programs rather than following the somewhat independent research program which characterized earlier CATIE efforts. This would seem to indicate a healthy adaptation to the Honduran policy environment and should lead to more effective institutionalization of CATIE farming system methods.

E. Some Recommendations Specific to the Honduras Case

The fragile nature of institutional development in international technical assistance efforts was clearly evident in the Honduras case. The departure of two key people, Dr. Robert Hart and Mr. Nery Mayorga, extension specialist assigned to the zone to work with Hart, had a severe negative effect on the

institutional process. Upon the team's arrival a full crop year had passed with virtually no contact with farmers and researchers alike by CATIE scientists. Worse, the key person at the farmer level left the project in September 1979, allowing no follow-up to two years of research effort.

It is clear that two years is a very short time, given that contacts had to be carefully cultivated after a lengthy selection process. The upper echelon's of the SRN had enthusiastic words for small farmer systems research and we were assured that steps were being taken to introduce the systems methodology into their regional agricultural research system. However, the San Pedro Sula region has returned almost completely to the crop-oriented "traditional" approach that has become so comfortable to administrators and scientists alike. The new regional director, Mr. Juan Jose Osorto, was emphatic in favoring an approach similar to that being proposed by CATIE. However, his scientists were resisting adoption of such methodology, probably because they had not been closely involved with the CATIE project in its early years. Moreover, crop-oriented "programs" in corn, soybeans, etc., carrying the major financial resources coming in from foreign donors, definitely shape the research strategy of this regional station.

Two things could be done to revive the project and its activities in the San Pedro Sula region assuming that the Northern Regional Director were in agreement. First, Dr. Hart with the help of the new CATIE representative, Mr. Nicolas Mateo, should prepare a final report on project activities (Memoria) and present a seminar to scientists, extensionists and administrators. Second, serious effort should be made to re-direct the SRN's priorities toward this region. SRN has, according to Mr. Mateo, insisted that CATIE concentrate all efforts under the new Farm Production System Project in the Comayagua and Esperanza regions. Excluding the San Pedro Sula Region (3) from follow-on activities will result in losing virtually all the investment in cropping systems research made by CATIE since 1977 in Honduras. The first recommendation would complete CATIE's obligation to the SRN and stimulate renewed interest in cropping systems research at that regional station. The latter recommendation should be done to salvage the basic objectives of "proving" the farming systems research methodology.

As is described elsewhere in this report, the potential impact of such research on farmer well-being cannot be ascertained from the Honduras data. Dr. Hart's departure and what followed left the question in the air because two years is not nearly enough time to prove anything in such a complex undertaking. It should be emphasized that the marginal benefits of adding at least two more years of experience to the program at San Pedro Sula (The Northern Region) are certain to be many times greater than the marginal costs, including marginal political costs to CATIE. Thus, valuable data on institutional dynamics and on potential farm-level impacts of the farming systems approach would be generated by redirecting some of CATIE's current efforts to the Northern Region.

F. Tentative Conclusions Regarding the Farming Systems Methodology

CATIE's approach to farming systems research in Northern Honduras during 1976-78 while generating much useful data on research methods and farming systems, failed to reach its objectives on several counts. First, it did not lead to a lasting change in Honduran research and extension institutions probably because Honduran institutions were not willing to facilitate close collaboration between the CATIE advisors and local, middle-level researchers. Second, a related shortcoming was the apparently overly intensive application of scientific talent to a limited number of research sites. It would probably have been more cost effective to have spread the principal researcher's energies over more trials by utilizing lower-level research assistants, extension specialists, and extension agents more imaginatively. Such use of national research and extension personnel may have enhanced the CATIE advisor's effectiveness and also contributed to positive change on the part of the Honduran research institutions.

The latter conclusion tacitly assumes that the principal investigator can capture all relevant feedback from farmers and the on-farm trials by placing himself one-step removed from day-to-day contact with the farmers and the on-farm research plots. That is, it is assumed that the scientist can organize his assistants in a way that will not jeopardize the very important benefits to be derived from close contact with the farmer and his ecological milieu. The Nicaraguan experience reported elsewhere in these annexes would seem to support the efficacy of this assumption. It is apparent from that analysis that the critical feedback element was more than adequately captured, even though the CATIE investigator/advisor "delegated" much direct management of the research to collaborators and assistants. This tentative conclusion should be further analyzed in some depth as it is critical to the efficacy of the whole methodological approach.

ANNEX 1

Summary of Farmer Interviews, Honduras

Farmer and Region**	Land (Mzas)	Family Size	Participation			Knowledge Level	Adoption	Yields
			Labor	Decision	Other			
Yojoa 1	3½	6	Yes	Yes	-	Good - knows exp., understands goals etc	Yes - Innovator	Convinced that inter-crop good for yields, tree crops
2	2	7	Yes	No	-	50/50 Picked up something. Became "case" study.	No - Liked beans but no seed was available.	Extensive information in a case study
3	2	5	Yes	No	-	Good - compared several comb, fíjol, rice, maize tree crops.	No - Observed no change in yields except rice. No capital for tree crops Resists change.	Rice yields higher but no change in other crops
4	8	6	Yes	No	-	Poor - didn't understand why fertilizer wasn't used on the "control" plots	No - Liked beans but no seed was available. No market for Ayote.	Bean yields better than traditional levels
Cuyamel 5	14 (10 cultivable)	12 (3 children grown)	Yes	Yes	Feed back use of wild beans as fertilizer.	Good - knew yield differences, labor use differences, etc Had running water and cultivated garden ornamentals	Yes - Yucca and maize. Pineapple is an innovator	Higher Mixed crops also labor saving
6	4 (works off farm)	5 (1s a leader)	Yes	No	Wild beans as fertilizer	Good - knew performance of beans/maize vs. yucca/maize.	Yes - Adopted rice and intend to try yucca/maize in May, (primavera). Fíjol/maize in the Fall.	Labor saving Higher yields from double beans
7	8	10	Yes	No	Observed results with good accuracy.	Good - could draw trials in dirt and explain what was going on.	No - Credit unavailable Liked beans and fertilizer but not mixed crops.	Definitely higher but lack of credit inhibits adoption Official credit in hands of unreliable agent.
Agua Sucia 8	3	5	Yes	No	none	50/50. understood that masillo was ok for drought. Tomatoes/watermelon profitable of cash crops	No - Drought. intends to try masillo next year	No - Drought
9	1½	?	No	No	none	Poor - not observant Lacked motivation	No - Results poor and Lacked motivation.	No - drought
10	7	old/single	No	No	none	Poor - Lacked motivation	No - Results poor	No - Drought

*Exp. Farms totaled 13 the total number interviewed was 10 (8 exp. and 2 neighbors)

**Each number represents an individual farmer.

APPENDIX G
COSTA RICA COUNTRY REPORT

APPENDIX G

CATIE EVALUATION TEAM

COSTA RICA COUNTRY REPORT

- I. LESSONS LEARNED FROM THE CATIE EXPERIENCE IN COSTA RICA 1975-79
- II. REVIEW OF CATIE PROJECT IMPACTS IN COSTA RICA 1975-79
 - A. General Overview
 - B. Impact on Farmers
 - General
 - Number and Type of Farmers
 - Farmer Participation
 - Knowledge and Adoption
 - Yields
 - C. Impact on National and International Institutions
 - General
 - Formal Arrangements and Relations
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 - Participation
 - Coordinated Research and Strategy
 - Dissemination
 - D. Impact of the Use of the SFCS Methodology on Researchers and CATIE

I. LESSONS LEARNED FROM THE CATIE EXPERIENCE IN COSTA RICA 1975-79

- A. The small farmer cropping system project (SFCS) in Costa Rica provided CATIE staff with opportunities to develop approaches which they later utilized in other Central American countries. The project staff learned how to conduct central and field experiments on multiple cropping alternatives as well as community baseline surveys and depth family case studies. The project produced four cropping systems alternatives which provide better yields than existing small farmer practices in Costa Rica test areas.
- B. While the SFCS project gave the CATIE Costa Rica staff significant opportunities to learn more about small farm practices, the methodology provided no insurance that participating farmers or implementing agencies would learn anything from the research experience. For example, although four of the ten cropping system alternatives generated by the project were developed for Costa Rica, the participating farmers had little actual knowledge about the alternatives developed on their land and showed little interest in adopting the alternatives. The implementing agencies in the regions where CATIE worked had little actual contact with the projects and had limited interest in testing or disseminating CATIE's alternatives.
- C. The failure to generate institutional and farmer interest in the Costa Rica project may have been due to a number of factors:
 - 1. The research in Costa Rica may have been designed to gather important baseline information which might ultimately be used to generate new experiments on cropping alternatives. Thus, at such an initial research stage it might have been extremely difficult to communicate study purposes to participating farmers.
 - 2. The Costa Rican CATIE staff viewed the formal on farm agricultural research phase as highly distinct from verification and dissemination activities. Thus, they may not have seen the strategic value of involving farmers and agencies actively in the research process as a means of providing realism, generating learning and gaining commitment.
 - 3. CATIE appointed no Costa Rica country resident (as it did in the other Central American countries) to take primary responsibility for strategy design and implementation. Thus, the strategy with the agencies and farmers was fragmented and ad hoc in nature.
 - 4. The National agricultural research and implementing agencies were well established. They had their own clear research and extension strategies. Their target groups were not necessarily small

farmers. CATIE in Costa Rica neither adapted its own approach to the existing agency strategies nor successfully sold the positive features of its own unique approach.

5. At the field level, in one of CATIE's two target areas (San Isidro del General), the regional office of the Ministry of Agriculture carried out only extension activities (not research). The CATIE team never developed a conscious strategy to relate its work to the felt needs of the regional office or to the research function which was managed by the Ministry in the capital city. In the other target area (Guapiles and Guacimo) research was carried on separately from the Los Diamantes Experiment station with little active attempt at collaboration.
6. The SFCS approach employed in Costa Rica did not include the use of marketing surveys or demand analysis once cropping alternatives were developed. Under the worst of circumstances, small farmers might use CATIE's alternatives to increase their production, only to discover that they were unable to sell their products.
7. The Costa Rican project provided a forum for learning about the values and limitations of central experiments on multiple cropping vs. on farm trials. Researches were able to successfully show in the controlled central experiment that yields for a number of multiple cropping alternatives were higher than for single crops. The central experiment also served as a site for performing specialized backup work to create changes in plant characteristics shown to be necessary in on farm trials and also to generate ideas which could be successfully tested in on farm trials.

However, it was also discovered that the agronomic conditions at the central experiment site were too limited to be representative of the field test areas. Thus, some of the successful experiments from the central site had limited utility field test areas.

II. REVIEW OF CATIE PROJECT IMPACTS IN COSTA RICA 1975-80

A. General Overview

Costa Rica presents a rich environment for evaluation of the impacts of the SFCS project. It not only provides the home of the project, the CATIE Agricultural school in Turrialba, Costa Rica (See Exhibit 1 for map), but was also the setting for the central SFCS experiment, and two major on farm research sites (San Isidro del General, and the Guacimo, Pococi, Guapiles area).

It is undeniable that the project's impacts in Costa Rica were substantial. For example, from 1975-80, CATIE as an institution underwent a major change in its research, teaching, and training orientation which can partially be attributed to the SFCS project (See Report on Project Impacts on CATIE). The project in Costa Rica provided a tremendous learning environment for staff. They carried out community surveys, case studies, and field experiments, and utilized know how from these experiences in the other country settings.

However, Costa Rica was also the site of least impact on participating farmers and national institutions. For a variety of reasons a series of critical linkages were never really nurtured. But before we examine impacts in more detail, let us review project chronology.

It is useful to think of the SFCS effort in Costa Rica as containing a set of loosely defined steps (See Exhibit 2) which lead from initial analysis to the diffusion of information to farmers. Some of these steps are: 1) design and implementation of surveys and secondary data collection; 2) use of these materials to compile profiles of target area farmers and their farming practices; 3) design and implementation of on farm research; 4) development of alternatives for small farmers; 5) testing the validity of the alternatives with larger groups of farmers (verification); and 6) dissemination of the alternatives through national institutions.

The SFCS project in Costa Rica attempted to accomplish only the first four of these steps. Briefly, the project agreement between the Ministry of Agriculture and CATIE was signed in September of 1975 and a national committee of University and Ministry officials was developed shortly thereafter. Initial surveys and case studies were conducted in 1976 and 1977, and participating farmers were identified. Actual experiments were conducted in project sites during 1977-79 and alternatives were developed and presented at the end of 1979. Work at the central experiment continued throughout the project period. Let's look at some of the impacts.

B. Impact on Farmers

General

In Costa Rica the CATIE team attempted to learn about small farm practices, to carry out on farm trials and develop some alternatives on an experimental basis which provided better yields and income than existing farmer practices. These basic steps were accomplished and the team did come up with four cropping alternatives which were more productive than those currently in use. While the team's primary objective was not impact on large numbers of small farmers, it is interesting to review some of the impacts the project had on the small farmers who participated in the program.

The actual impact on the farmers interviewed by the evaluation team was among the lowest on any of CATIE's country projects. The number of farmers involved (20) was smaller than in some of the other sites. Their participation in the projects was usually limited to their labor (i.e., they did the work). They received either in kind or other payments for their efforts. They most often knew little about the experiments conducted on their land and were not able to describe their purpose or the outcomes. Only one farmer actually adopted one of the alternatives proposed, while most adopted some specific practice like the use of a particular kind of fertilizer. The Costa Rica setting provided some of the most interesting information on the reasons for non-adoption. Some of the most frequent reasons for non-adoption were: lack of real understanding of the alternative proposed, lack of inputs such as labor and lack of confidence that the alternatives had a market.

The low level of impact on the participating farmers could well have been a function of the kind of approach taken by the researchers. By failing to involve the farmers more actively in the process the researchers may well have lost a vital opportunity to begin to assess the validity of the alternatives proposed on criteria other than strictly agronomic ones (i.e., lack of inputs, markets, or cultural inappropriateness). Let's look at the impacts on farmers in more detail.

Number and Type of Farmers

The Costa Rica project involved twenty farmers (six in the San Isidro area, six in Guacimo and eight in Guspiles).

Because of the limitation of time and the large number of sites the evaluation team divided into two groups. One group interviewed five

of the six farmers in the San Isidro area and the other group visited two of the fourteen farmers in the Guacimo-Guapiles area and two of their neighbors. A total of 35 % of the participating farmers were interviewed. Farmers' land holdings ranged from twenty hectares to less than four. Within the San Isidro area, land size and quality varied considerably. One farmer had more than ten hectares of rich flat land next to a paved road, while others has less than four hectares of land in separate parcels, some of which were on steep hillsides. The farmers in the Guapiles-Guacimo area all had twenty hectares of rich flat land.

Although most made their living exclusively from farming, some of the farmers had alternate sources of non-farm income. One was a butcher. Another was a small contractor who repaired bridges. One farmer owned six buses and a store.

Participation

The team employed no consistent strategy in farmer selection. Some of the farmers in San Isidro were selected because of the soil characteristics of their land. Others were selected because they were close to the road. Some were suggested by the extension service.

All farmers participated by providing their labor. They were provided in kind payments such as fertilizer or insecticide and were allowed to keep the crops. However, in contrast to other settings like Nicaragua, they did not actively participate in problem solving about the experiments or in discussions about the results.

Knowledge

Farmer knowledge of the purposes and outcomes of the experimental trials was extremely low. In the San Isidro area, for example, none of the farmers could explain what had been done on their land. In fact one farmer told us that he had become furious when a Peace Corp volunteer assigned to the project had removed half grown ears of corn from the experimental plot. The farmer had no idea what the volunteer was doing. Researchers told us later that the corn was needed for a study of insect control.

Adoption

None of the farmers interviewed in the San Isidro area had adopted the formal alternatives presented for that area, and only one farmer in the Guapiles-Guacimo area did so. For example, although CATIE suggested an alternative which included the introduction of cowpeas planted with corn for the San Isidro area, farmers interviewed did

not mention it and had to be reminded that the alternative had been tried on their land. Instead, farmers were more likely to adopt one or two new specific practices such as fertilizer or insecticide use.

Yields and Income

The Costa Rica project produced four cropping system alternatives which were reported to increase yields and income substantially and an experimental level (see CATIE Final Report on Small Farmer Cropping Systems for Central America 1979). The alternatives were not subjected to verification with a larger group of farmers. One cannot help but wonder, given the low levels of adoption by farmers in the experimental group, whether the alternatives were technically but not more generally feasible given other factors such as lack of markets, or scarcity of inputs such as labor.

C. Impact on National and International Institutions

General

Although the project agreement between the Costa Rican Ministry of Agriculture and CATIE was the first to be signed, and a high level National Committee with appropriate Ministry of Agriculture representation was set up quickly to oversee the project; CATIE's impact on Costa Rican national institutions was minimal. In the Guapiles-Guacimo area project researchers reported that Ministry of Agriculture staff at the regional office and extension station had little interest in and knowledge about the project. Interviews with Ministry staff confirmed this. Furthermore there was little evidence of incorporation of the multiple cropping ideas in experiments at the station. In the San Isidro area key ministry staff in the Los Diamantes regional office had a high degree of knowledge about CATIE's activities in the area. They were favorably impressed with the work of the team, but had not actively participated in the experiments and had no plans to run verification tests since the office was primarily devoted to extension. CATIE staff reported that ministry interest in the San Isidro area was minimal.

Some of the possible reasons for low impact on national institutions were: 1) Project staff decided not to appoint a CATIE resident since the institution was already located in Costa Rica. This may have contributed to the lack of explicit strategy for institutional arrangements; 2) staff may have felt that their project was primarily of a research nature and that relationships with national institutions would not be critical until they had some proven cropping alternatives to disseminate; 3) Costa Rican national institutions had clear

research and extension strategies and were not committed to research for small farmers; 4) the CATIE team neither sold the benefits of their strategy to national institutions nor altered them to fit the objectives of national institutions. Thus, their work continued independently.

In contrast to the Nicaraguan situation where the Aid Mission incorporated CATIE's activities into its bilateral aid strategy for rural development, the AID RDO's who had been in Costa Rica during 1975-80 seemed unaware of the project. Current mission officials, however, had favorable impressions of CATIE's new production systems project and had heard that the top level Ministry of Agriculture functionaries had begun to take a more active interest in the project. Let's explore some to these areas in more detail.

Organizations and Formal Agreements

The project's primary relationships were with the Ministry of Agriculture on a national level. The formal project agreement was signed in October 1975. A national committee was set up with appropriate top level Ministry representation (the head of agronomy, the subdirector of research, the vice minister of agriculture, the director of extension, and key officials from the regional offices where the project was to work).

Knowledge About the Project

Officials interviewed at the San Isidro site exhibited a high level of knowledge about the project and what it did. This high level of knowledge was not exhibited during similar interviews in the Guapiles-Guacimo area.

Participation

Officials at the regional level played no role in helping CATIE carry out its research activities. They did not provide the group with staff or other resources to help them carry on their work.

Coordinated Research and Strategy

In neither the San Isidro nor the Guapiles-Guacimo area did the CATIE group impact the way research was done by ministry functionaries. In the Guapiles-Guacimo area the priorities were for primarily monocrop research directed to groups other than small farmers. Much of the research was devoted to export crops like bananas. CATIE's research took place independent of the Los Diamantes research station and findings did not seem to be incorporated into activities in that area.

In contrast, the functionaries at the regional office of the Ministry of Agriculture in the San Isidro area did attend meetings where the results of CATIE's research were discussed. Since the regional office in the area played no research function, CATIE had no impact on the way research was performed there.

Dissemination of Findings

There was no evidence that Ministry officials at either the Central or Field level were about to do studies to verify the validity of the alternative cropping systems CATIE had proposed or that they had an interest in disseminating the information through their extensionists.

D. Impact of the Use of the SFCS Methodology on Researchers and CATIE

Although the use of the SFCS methodology helped the researchers learn a great deal about small farmers, they maintained "professional distance" which kept the farmers from learning a great deal about the actual experiments from them. Thus, the use of the methodology in the Costa Rica setting made it look a great deal more like research on small farms rather than research with small farmers. Clearly the farmers did learn something and found their interactions with the researchers to be quite positive. However, the learning that farmers gained often appeared to be outside of the context of the specific experiments. For example, one farmer was provided with data on input costs for a sorghum crop that we wanted to plant, and others got lots of specific answers to questions that they had about their own systems. The researchers often went out of their way on an informal basis to help farmers with their own specific problems.

Although the formal steps in the SFCS process were performed (see Exhibit 1) it is not clear that the information from one step was used to make informed decisions in the next steps. For instance, although a lot of useful information about small farmers was collected in the baseline surveys, farmer selection for on farm trials seemed to bear little clear relationship to the surveys.

Use of the methodology did provide an environment for learning about the value and costs of central experiment vs. on farm trials. The central experiment was used to initially test the comparative yields of various multiple cropping vs. single crop systems. Problems which occurred during on farm trials were sometimes resolved through special studies in the central experiment, and ideas for kinds of on farm trials sometimes came from the central experiment. However, certain limitations were noted as well. The agronomic conditions at

the central experiment were too limited to make their results applicable to the full range of on farm sites. The central experiment, however, served as an arena for training researchers and also exposing visitors to SFCS research practices..

EXHIBIT 1

MAP OF COSTA RICA

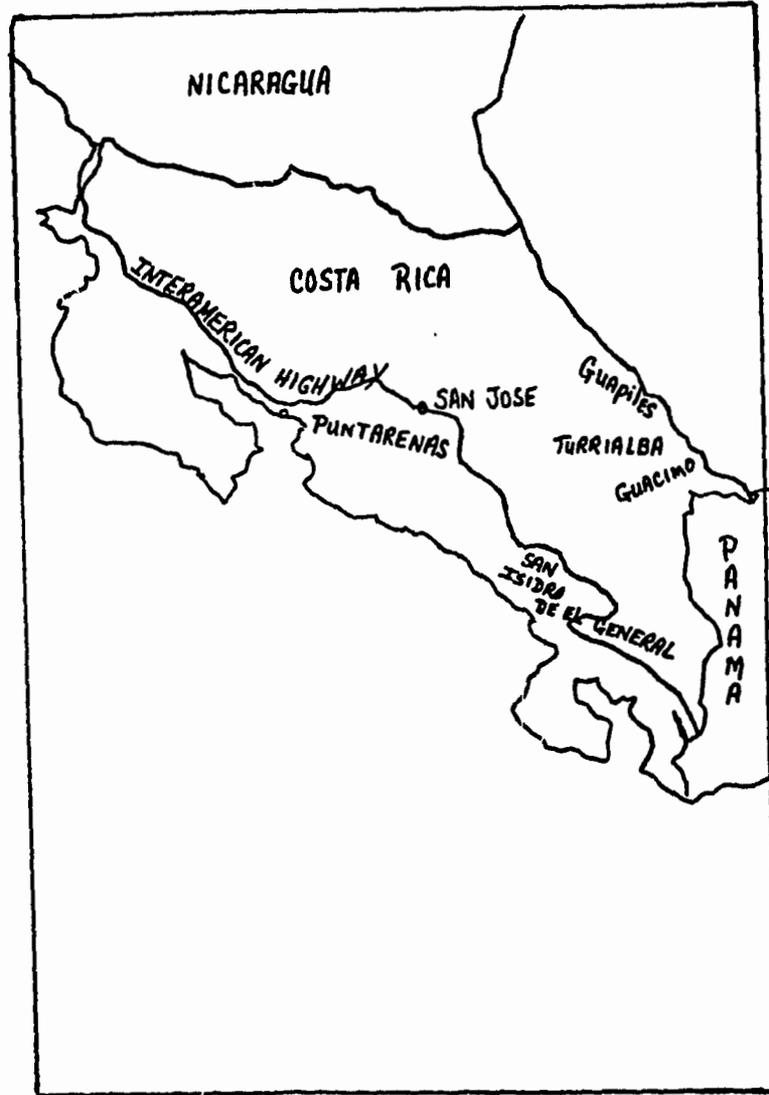
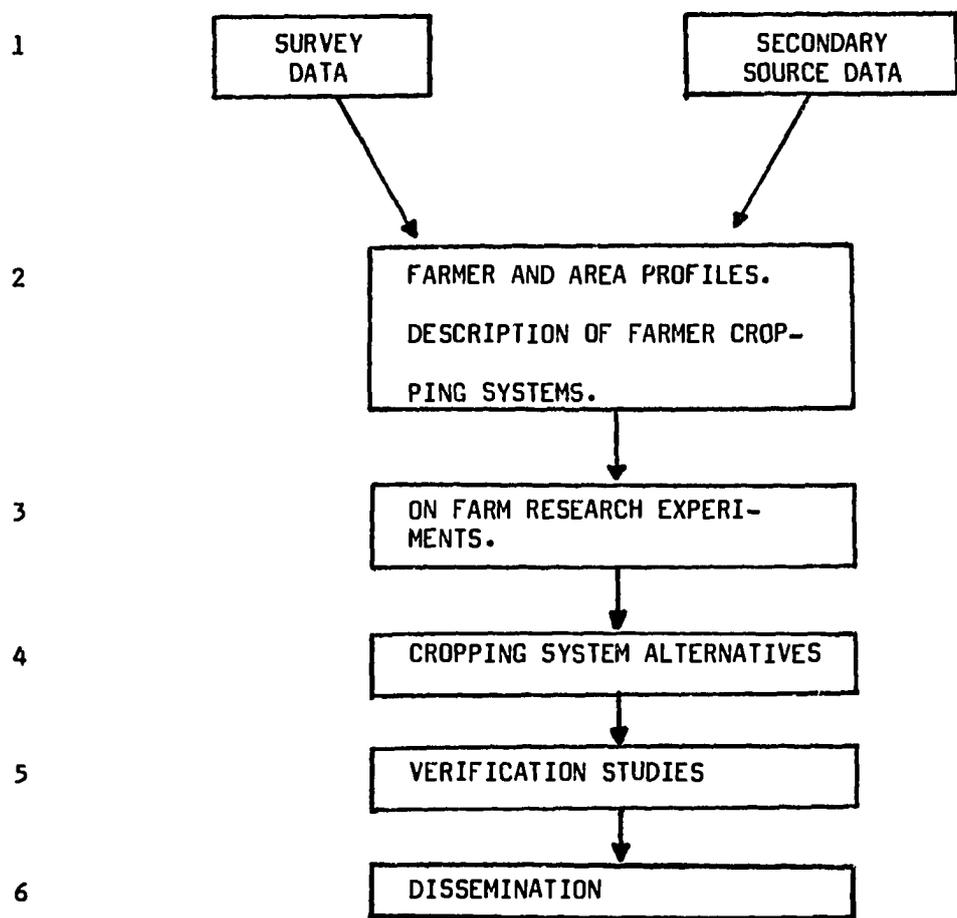


EXHIBIT 2

SMALL FARMER CROPPING SYSTEMS RESEARCH PROCESS

STEPS



SPECIAL STUDIES

- No. 1: The Socio-Economic Context of Fuelwood Use in Small Rural Communities (August 1980)
- No. 2: Water Supply and Diarrhea: Guatemala Revisited (August 1980)
- No. 3: Rural Water Projects in Tanzania: Technical, Social, and Administrative Issues (November 1980)

PROGRAM DESIGN AND EVALUATION METHODS

Manager's Guide to Data Collection (November 1979)

