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EVALUATION REPORT
CATIE SMALL FARM
PRODUCTION SYSTEMS

Project Funded by ROCAP, Project 596-0083

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INTRODUCTION AND EXECUTIVE SUMMARY

CATIE - The Centro Agronomico Tropical de Investigacion y Ensenanza - was founded in 1973. It is located in Turrialba, Costa Rica and has projects in each of the countries of the Isthmus of Central America as well as in the Dominican Republic. One of its first projects was a cropping systems research project (CSRP) which was funded by ROCAP. ROCAP also participated in personnel recruitment for the project. CSRP sites were in Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua. Each country joined the CSRP on different dates.

As the name implies the CSRP effort focused on crop combinations and rotations. A distinct product of the CSRP, however, was the development of the initial steps of a farming systems research (FSR) methodology. Thus, with the influence of ROCAP the CSRP led to the development of the Small Farm Production Systems Project (SFPSP - ROCAP Project 596-0083). The SFPSP started in 1980 and field work, after one extension, ended in June, 1985. Panama joined the SFPSP effort in 1980. The SFPSP was to refine and finalize the methodology developed under the CSRP. It was also intended that the methodology be applied to production technology. Recommendations for improved crop, livestock and mixed production systems were to be made. CATIE was also to instruct personnel of the various national institutions in the methodology. These requirements as well as the others that ROCAP included in the project were generally fulfilled by CATIE.

In order to accomplish the goals ROCAP originally agreed to fund the SFPSP through September, 1983. The date was extended and

additional funds provided (under Amendments 4 and 5) so that $8,000,000 were provided. ROCAP maintained close enough contact with the CATIE staff so as to remain well-informed and fairly flexible as regards the project. This was beneficial because, in part, CATIE via the project entered new territory--a farming systems methodology had not yet been clearly defined at the initiation of the SFPSP. The CSRP project helped to define that methodology for CATIE, other institutions and practitioners. Important aspects of the methodology, however, had not been defined or widely accepted when the SFPSP was in the design stage.

One of the most salient methodological points that came out of the cropping systems project was the necessity to conduct on-farm research on a variety of research sites. CATIE, a fairly small organization which had been highly centralized, could not conduct such research without the support of the national institutions. The structure of the research, and in some cases research-extension, institutions varies throughout the region. A short review of these institutions in Costa Rica, El Salvador, Guatemala, Honduras, and Panama follows.

Costa Rica. Until early 1985 research and extension were separate entities under the Ministry of Agriculture (MAG). Research is presently divided into crop and livestock units. The union of research and extension had no impact on the SFPSP as it occurred just before field activites ceased. CATIE field staff worked tenuously with personnel from the Los Diamantes experiment station. The project sites were in Guacimo (for maiz and yuca under crop and mixed systems and swine under mixed systems). In addition, project sites in San

Isidro and Puriscal were abandoned because of lack of cooperation from MAG. Because of a reorganization of MAG which seeks to combine research and extension for crop and animal production and because of the concern and knowledge of upper and mid-level management of MAG, farming systems research and extension will probably continue in Costa Rica.

El Salvador. Crop research and extension are combined in El Salvador under CENTA, an autonomuous entity of the Ministry of Agriculture (MAG). CENTA has experienced some difficulty because of the political as well as military situation in El Salvador. It has, however, managed to combine effectively the two functions. CENTA has accepted the farming systems methodology and has a unit to perform validation and transfer. Animal research and extension is conducted by the appropriate Direccion of the MAG. Historically it has been concerned with animal health, rather than production, problems. The SFPSP has worked with these entities in Jocoro, and Tejutla (work in La Trompina was abandoned in 1980) for work in crop (maize, sorghum and several legumes) systems and animal (cattle) systems which evolved into mixed (cattle and silage) systems. Under CENTA the future of farming systems seems bright. No such statement can be made for animal production.

Guatemala. ICTA is the Guatemalan agricultural research institute. It did only limited livestock-related work previous to the CATIE-ROCAP SFPSP. For a variety of reasons the horticultural and agronomic aspects of the project were of limited impact while the

cattle component has had good success. Extension for livestock is conducted by DIGESEPE. ICTA and DIGESEPE have a good working relationship even though this has not always been the case. The prognosis for the continuation of farming systems work in Guatemala is excellent.

Honduras. The Secretaria de Recursos Naturales (SRN) performs the functions of a ministry of agriculture. Crop research and extension are separated from livestock research and extension. For each commodity group, however, research and extension work together in regional offices. The SFPSP operated in the Comayagua Valley. Work has been in mixed (cattle and sorghum), crop (rice and corn-sorghum) and animal (cattle and forage) systems. The situation regarding crops was much more favorable because of the national personnel involved. In addition, support for animal and mixed systems from CATIE was very weak. If resources are forthcoming the farming systems methodology will probably spread in Honduras as regards crop production. It is possible, but less likely, that such will occur in the area of livestock production.

Panama. IDIAP conducts crop and livestock research in Panama. IDIAP is an autonomous institute of the Ministry of Agriculture (MIDA). From 1968 until early 1985 there was no government agency responsible for extension. SENEAGRO--Servicio Nacional de Extension Agropecuaria-- is now responsible for extension. It is part of the MIDA. IDIAP is regionalized. The CATIE-ROCAP project operated in the central and western regions. The project was more successful in the

latter. Work was done on rice production (under crop systems) in bot regions while work on cattle (under animal systems) was performed in the western region. IDIAP and SENEAGRO presently have a poor relationship (similar to what happened in Guatemala between ICTA and the extension agencies?). Farming systems research and extension can be conducted successfully under the present organization of IDIAP. I IDIAP can expand its staff or if the IDIAP-SENEAGRO relationship were improved the prognosis for farming systms research in Panama would be excellent.

CATIE. As described above the SFPS project has its origins in a cropping systems project which was headed by the Crops Department. Thus the Crops Department had a five year lead compared to the Livestock Department in defining a role in an FSR project. This difference was apparent through much of the SFPSP. During the first two years of the project personnel in the Livestock Department spent much time trying to define the role of the department in the project. (This situation was aggravated by the fact that there was no overall project manager, but a project coordinator in each of the two departments.) Soon after the Livestock Department defined its role, it experienced an administrative change which practically halted all work in support of the animal production systems effort in Turrialba by the Livestock Department. In addition CATIE is funded along project lines. Thus, much of the staff is not permanent and CATIE does not retain all the experience earned from a specific project. For these reasons our prognosis for continued FSR/E work at CATIE is

pessimistic unless the training and staffing recommendations we present are followed.

The concepts of farming systems research have changed over time. The evaluation team members have witnessed these changes and, in some instances have participated in creating them. In addition, they have watched (and some have participated in) farming systems research at CATIE evolve to its present form. It must be remembered that farming systems concepts at large and at CATIE are still evolving. The search for a paradigm has been intense and changes have been rapid. Yet the work in terms of research and extension must move forward.

This evaluation team strongly feels that the CATIE program, in general terms had a positive influence on the national institution with which it interacted. Specifically, the interaction of CATIE personnel on a day to day basis and through other activities such as short courses has stimulated thinking of the host country counterparts. Despite differences of opinion in regard to methodology used, the CATIE program provided resources to the host country institutions and initiated the practice of working on-farm. In most cases this had not been done previously to any great extent.

Because of the effort that was made by CATIE, the countries that participated in the CATIE-ROCAP farming systems project are now better able to run their national farming systems research and extension project. Despite this we feel that CATIE staff has become isolated from developments in FSR/E. Among the evidence of the isolation are the following:

- over centralization of the diagnostic phase (yet we believe the diagnoses were well-done);
- lack of interaction with national institutions in order to

establish the proper organization for responsive FSR/E field teams; and

- great emphasis on formal documentation.

In order to advance the state-of-the-art at CATIE so that CATIE can render the best service to its member nations we recommend that:

- CATIE develop an FSR/E training strategy that includes principal staff of all other projects. This would introduce staff to the concepts of FSR/E and make them aware of possible application. The strategy should also include permanent training activities at the practitioner level including extension personnel. Effective participation in international farming sytems symposia should be part of the strategy. This would increase the exchange of ideas with other planners and parctitioners, in effect broadening the CATIE experience.
- Farming systems as a project be discontinued at CATIE but should be incorporated farming systems components in other projects. Integration can be supported via the training discussed above. In addition, the first three stages of the farming systems methodology -- site selection, characterization and design of alternatives -- could be adpated to project design as well as implementation. For example, a characterization would help better orient the Integrated Pest Management Project.
- That CATIE retain core research staff competent to assist member nations (and others) in their FSR/E projects as well as to supply FSR/E support to CATIE projects.
- Farming systems be included in the academic curriculum at CATIE. The training should include surveying producers in the field.

- Characterization documents should be divided into two parts. The static characterization process should be shortened and the appropriate summary document be produced in a shorter time than is currently utilized. The dynamic characterization summary (mostly farm registers) should be separate and also produced more quickly. These are part of the pre-validation phases.
- That static characterization document should get wider circulation. Recepients should include those who perform an extension function. The extension function does not have to be performed by a national extension institution.
- That, in general, more documents produced by CATIE should be directed towards extension personnel rather than towards the scientific community. (IDIAP of Panama, a research institution, does produce such documents.) Personnel specialized in that area should be employed by CATIE.
- That efforts should be made to avoid projects that are independent of existing organizations. CATIE should work through national institutions in order to assure continuity of project activities.
- That technology components (versus package or modules) be researched in order to increase the number of trials. Recommendations would then be alternatives that farmers could incorporate according to their needs and capacities.
- That CATIE concentrate its participation in the areas where it has comparative advantage or much greater knowledge. These are generally products with which other international institutions have little experience. Amongst the products are livestock and

tree crops.

- That CATIE consider developing a seed project which would attempt to enhance the production and marketing of seed to benefit the small farmer.

Project Outputs

There were several groups of project outputs agreed upon under the Pro-Ag. As regards training all output goals were exceeded. There were over 1,500 participants in a variety of short-courses and workshops as compared to the required 1,000. Nineteen Central Americans received M.S. degrees in areas related to FSR/E while it was required that 11 do so (Tabe 1).

As summarized in Table 1 most of what was required of the Crops Department (DPV) was fulfilled. Similarly, the Livestock Department (DPA) met the bulk of its requirements. These statements hold despite the exclusion of the outputs generated in Nicaragua from the output total. The violence in El Salvador and Guatemala also impeded goal attainment. It is to the credit of the CATIE field staff that the goals were almost attained or attained completely.

Table 1. Project Goals and Outputs

Activity	Goal	Unit	Output
Training			
Participant training	1,000	person-sessions	1,500
M.S.	11	degrees	19
Development of production systems a>			
Crop a>	13	systems	11b>
Animal a>	7	systems	7
Mixed a>	6	systems	4c>
Validation/transfer of production systems			
Crop a>	10	systems	7b>
Animal a>	7	systems	6c>
Mixed a>	4	systems	4

a> Nicaragua is excluded from the outputs, but not from the goals.

b> Despite the exclusion of Nicaragua, the goal would have been achieved had it not been for violence in El Salvador and Guatemala.

c> Had Nicaragua been included in the outputs the goal would have been attained.

SPECIFIC TASKS

a. Assess the effectiveness of the organizational and administrative structure of CATIE and national institutions to carry out multi-disciplinary research on crop/animal/mixed farming systems on a continuing basis.

b. Evaluate if CATIE, through the project, has been effective in stimulating national interest and improving national capability in farming systems research/outreach and if it has measurably enhanced cooperation and collaboration between national and regional entities.

Because these two points are very closely linked, the discussions are presented together. The issues and questions under these points must be analyzed on a country-by-country basis as well as at the CATIE level. Additionally there are two sets of multi-disciplinary aspects that must be examined: 1) the integration of the sciences, and 2) the integration of research and extension. The team believes the latter to be necessary to a successful farming systems program. The situation at CATIE is discussed first.

1. CATIE. CATIE is a research institute and has dealt primarily with national research institutions. It cannot be expected to deal with the national extension institutions without the direct support and participation of the research institutions. When possible CATIE did work with extension entities.

As regards the disciplines, CATIE did not effectively integrate crop and animal aspects. The first farming systems (FS)

project was a cropping systems project. Because of this the Crops Production Department was more advanced than the Livestock Production Department as regards FS methodology development and understanding. At the outset of the present project the Livestock Department was unsure as to how to participate. After much internal discussion it made a commitment to the project and had defined its role within the project. Soon after these decisions were made, however, administrative change took place within the department. The change prevented full participation as well as coordination with the Crops Department with respect to the project. The difference has persisted. That the person on the Livestock Department staff who has been most actively involved with the project for approximately the last year and a half is an agricultural economist is indicative of the situation.

Mixed systems clearly requires the cooperation between crop and livestock technicians. At trial sites, however, the mixed systems work that did occur depended upon who was in the field, not upon a joint Livestock Department - Crops Department decision. In addition, no matter which department the field person worked under, he received little, if any, direct support from the Livestock Production Department.

Another difficulty is that CATIE operates on a project-by-project basis. Thus, even though some personnel that worked under the FSR project are presently working on other CATIE projects, such as Integrated Pest Management (IPM), they are not applying the FSR methodology. This is particularly distressing in several cases where the team believes that the FS approach would enhance the other projects. In the case of IPM a characterization

would help to identify specific research topics. These in turn, could benefit from on-farm trials. Given this situation as well as the circumstances of the Livestock Production Department, it is not possible for the team to state that the project has enhanced the ability of CATIE to carry-out FSR on a continuing basis. It has been able to do so only partially under the specific case of the SFPS project.

Despite these difficulties or short-comings, as is demonstrated in some of the country discussions that follow, CATIE was very effective in helping to promote the idea of farming systems in the region. To some extent due to this project the need to coordinate research and extension efforts as well as the efforts of crop and animal scientists have become more apparent to the institution involved. These developments can be viewed only in a positive light.

2. National Institutions. Organizational and administrative capabilities of the national institutions vary greatly among the six participant countries. More details can be found in country summary section. In general, the organization of the Ministries of Agriculture, the research divisions and the extension divisions vary greatly. A rapid turnover of national counterpart personnel, relatively low salaries often paid in arrears, personnel with a wide variation in training, limited support funds for on farm trials and travel for farming system personnel have all impacted on the effectiveness of this project. However, it can be categorically stated that this project has had a positive impact upon the national institutions associated with it. They can do a better job of farming system research because of the SFPSP.

2.1 Costa Rica. Cooperation between MAG and CATIE over the years has been minimal. In this project CATIE has operated the on farm trials independently with their own technical assistants. Communications between CATIE technicians in the field and MAG personnel were dependent more on who the personnel were in the area than on any mandate from MAG. Perhaps the lack of human and material resources within MAG for farming systems research is noteworthy and has conditioned its cooperation with CATIE. Of equal importance are the limitations of the research organization and the extension service. Perhaps the reorganization of the research and extension service via the PIPA mechanism -- a BID funded project-- will improve the interfacing between research and extension.

The Farming Systems Research Methodology is not functioning within the MAG at the present time. However, a number of MAG personnel have worked with or have been trained by the SFPSP project. It is apparent that PIPA personnel are capable of implementing research and extension in Farming System Research and Extension if and when they are given the mandate to do so.

2.2 El Salvador. The first CATIE resident began working in El Salvador in November of 1977. Farming Systems Research has been in collaboration with CENTA. This organization, created in 1972, was rocked by instability and financial crises for a number of years since 1979. Virtually all of CENTA's personnel and material resources were diverted to implement the agrarian reform in 1980. In 1982, the entire Ministry of Agriculture was restructured as part of a decentralization effort under which CENTA was absorbed by another institute. Another reorganization

of the Ministry of Agriculture took place in 1983 when the CENTA name was restored. Personnel instability at high levels in both research and extension have been a serious deterent to the progress of FSR in El Salvador as has been political instability.

However, CATIE has provided technical assistance, agricultural inputs, seasonal labor, transportation and per diem. CATIE has filled a vacuum and has done what CENTA could not have done. Creation of a Department of Production Systems for Small Farmers within the Crop Research Division of CENTA is one of the strongest indications of CENTA's commitment to FSR/E. In contrast, livestock activities conducted by the Ministry do not have an FSR/E orientation.

2.3. Guatemala. All agricultural research in Guatemala is to be coordinated by ICTA, and all research involving foreign entities is to be a collaborative effort with ICTA. Furthermore, research is to be conducted under on ICTA banner, and the results are to be published by ICTA.

It is possible to identify much friction between ICTA and CATIE during the life of this project. ICTA's position was that there was no reason to seek crop or farming systems research assistance from CATIE when they had their own research methodology. Differences in research methodologies have placed a strain on CATIE researchers working in Guatemala. Some horticultural research was conducted in Chimaltenango area and some livestock research in the Alto Verapaz area but both were abandoned in 1980-81 due to political instability in the region.

ICTA began livestock research in the Nueva Concepcion area in 1979. Soon after it entered into a cooperative agreement with

CATIE to develop a Dual Purpose Cattle Production Module. ICTA and CATIE worked together and developed the dual-purpose, cattle module. ICTA, DIGESEPE--the livestock extension entity--, and BANDESA, the agricultural development bank, have developed a program that extends this dual-purpose cattle technology to other in the same area through a BID project.

2.4. Honduras. The Secretary of Natural Resources (SRN) is responsible for agricultural research and extension in Honduras. Crops research and extension is under the Director General of Agriculture and cattle research and extension under the Director General of Livestock. In Honduras, agricultural research and extension are plagued by low salaries, high personnel turnover and job insecurity. The above, combined with a number of organizational changes within SRN, have reduced CATIE's effectiveness and impact in Honduras. Most of CATIE's effort in FSR has been conducted in the region of Comayagua (Region II), where they have interacted mainly with the SRN regional office.

During the first three years of the project, there were four CATIE residents in Honduras. Despite many problems, excellent CATIE residents were able to make significant contributions during the last two years of the project. CATIE-ROCAP project activity in the San Jeronimo supported SRN research and extension activities. This was a departure from CATIE's usual operational procedure in Honduras, whereby it had worked in isolation and managed its own research operations.

2.5. Panama. The Institute for Agricultural Investigations in Panama (IDIAP) was founded in 1974. It is a semi-autonomous institute within the Ministry of Agricultural Development (MIDA)

and charged with agricultural research in Panama. Within IDIAP, there is a unit for crop research and one for livestock research. There was no extension service in Panama betweem 1968 and 1984. CATIE began systems research in Panama in 1979 with the newly organized IDIAP. Apparently CATIE exercised considerable influence on IDIAP and exposed it to a methodology for generating technology for small producers.

CATIE's influence on farming systems research methodology in Panama was considerable in the first years of the project when IDIAP was searching for ways to do agricultural research. Some have criticized CATIE methodology for being inflexible. The concern for developing a regional methodology has prevented CATIE from adapting to the needs and reality of Panama. Both CIMMYT and CATIE are engaged in training IDIAP personnel in farming systems research. Perhaps the competition will help to develop a methodology which will address Panamanian realities.

c. Determine whether the project has demonstrated promise or potential for increasing production and productivity of food crops, animals, and combination of crops and animals on individual farms.

Point C is a part of point D and is dealt with in more detail in that discussion. Table 2 is a summary of the opinions of the team of the potential impact of the project on individual farms. Because the team tried to consider things indirectly as well as specifically related to the project, the team feels that the Dual-Purpose activity in Honduras will have little impact. On the other hand, if leucaena seed were made available we believe that the situation of the cattle producer would be greatly improved.

Table 2. Impact projections of CATIE/ROCAP country projects based on their present status. August, 1985.

	Dual Purpose	Maize-Sorghum	Maize-Maize	Rice	Milk	Swine	Vegetables
Costa Rica	3		4			1	
El Salvador		2			2		
Honduras	1	2		3			
Guatemala	3						1
Panama	2			3,1*			

a/ 1 = Little or no impact; 2 = Technology developed is adequate but has little potential; 3 = Technology developed is appropriate and has great potential; and 4 = Technology developed appropriate and is moving out to farmers.

Present status of each project are dictated by many factors, e.g. appropriateness of the technology and the ability of the institution to continue the program beyond its state at the end of the contract period.

* The values represent the situations at Progreso and Guarumal, respectivel

d. Conduct a cost/benefit or appropriate quantitative analysis to the extent possible of the actual and projected benefits through 1995 resulting from the project (i.e. institutional strengthening, development of new/improved farm technologies, training of scientists).

A true cost-benefit analysis of the project cannot be performed. We believe, however, that the project has been cost effective. We believe this to be so primarily due to the training (see points i/m below) that was done under the project, the technical support that was given at the design of alternative technologies stage, and the ability of CATIE to attract high quality personnel for field positions. The team members have observed many bilateral projects which were more costly and had less impact at both the farm and institutional levels.

The following discussion centers on the institutional aspects and the potential impact of the technologies. The training discussion is presented in Section i/m.

Institutional

CATIE has recieved a good deal of budgetary support from the project. This has enabled it to hire central and field staff for project implementation. Given the lack of a strong core budget and the project-by-project budget which has developed at CATIE, CATIE can only be strengthened through personnel who stay with CATIE for other projects. No such continuity is guaranteed. To the contrary, by the time the team started this evaluation most project personnel were already employed elsewhere.

The field teams that were supported by the project had

adequate resources at their disposal to conduct experiment station and on-farm research. Their transport as well as the production inputs required for the research was supplied by the project. Thus the project did enable CATIE to conduct a Farming Systems Research Project. (The funding situations, however, might have been too generous because national institutions did not develop means to continue the research.) An area which proved difficult was the staffing of the CATIE field teams. On the whole, there was a good deal of personnel turnover, often accompanied by lapses of three months between the departure of old staff and the arrival of new. (In several cases the lapse was about a year.)

There was also a dichotomy in the field between the livestock and crop aspects of the program. (The mixed systems, were usually handled as livestock systems). Generally, the crop systems personnel conducted a good deal of supporting component research. Such research was conducted only infrequently by the animal systems staff. A major reason for this lack of component research was lack of time. The cropping systems project ended in 1979. It was possible to build upon experience gained under that project. In addition, much effort was spent on designing an overall cattle system or module and little time was available to experiment with components of that system. A cause of this approach was the late start of field work in the area of animal production. When this was coupled with the validation/transfer requirements of 1983, a need arose to short-cut the research system.

The dichotomy between the two departments at CATIE was reflected in the field in a more basic way than the differences in component research. Although included in the project paper, mixed

systems research did not start until 1983. Until that time, because of differences between the two relevant departments, crops systems research was segregated from animal systems research. The segregation continued even under the mixed systems. In the field mixed systems research was not integrated research, but rather research on its two major components --crops and livestock-- which had some measure of biological integration.

The national institutions section under points a/b address most of the relevant aspects at that level. We would like to state again, however, that the training that was done under SFPS can only help to strengthen the national institutions. Additionally, some of the people who worked for CATIE under the project are either currently employed by a national institution associated with agricultural research development or are hopeful of being so employed in the near future. The last column of Table 3 demonstrates, however, that the team believes that even at this early date (relative to termination of field efforts) only in about 40% of the cases has there been good institutional follow-up in the field.

Impact of Technologies

As stated above, Table 3 summarizes the opinion of the team about the potential impact of the project on farm-level production. The impact potential is in part related to the institutional follow-up (Table 3). Probable specific gains are as follows:

Costa Rica.

Maize -- an increase in yields of over 100% in the project area. Method to affect over 75% of the producers in the Guacimo and Guapiles areas.

Milk and beef -- via a CATIE based module increases milk production by 40% and beef production by 30%. About 100 producers will adopt a form of the module.

El Salvador

-- Due to the political situation it is difficult to discuss potential impact. It is obvious, however, that the livestock program will have little, if any, impact. The impact of the maize program is questionable. It cannot have an impact with present limited seed availability.

Guatemala

Crops -- The project will have only limited impact as regards to horticultural crops in Chimaltenango. The private sector, independent of the project, has entered the relevant region very strongly. ICTA has not continued the work.

Milk and beef -- Similar to Costa Rica. Milk and beef production should increase by 30-40 percent on affected farms. The number of farms could well reach 200 (100 from

the present BID - funded project and 100 from the anticipated CIDA - funded project. See the country report for details).

Honduras

Rice -- Rice production should increse by at least 20% on at least 50% of the rice producing farms in the San Jeronimo region.

Maize -- We are unsure as to the impact of the project on this commodity. Many producers have adopted the variety and density recommendations of the "tech-pack". Without chemical inputs, however, the benefits are uncertain.

Milk and beef -- Little impact will be obtained directly from the project. If leucaena seed were available the impact would be about a 10-20 percent increase in the production of each.

Panama

Rice -- In the Guarumal area the impact will be very slight. In the Progreso area rice production could increase by about 20% for the 60% of producers who participate in the credit program.

Milk and beef -- The impact of the project on milk and beef production will be negligible except for those few who participate in the (extension) program.

e. Assess the effectiveness of analyzing, storing, and disseminating research results by CATIE and national research agencies.

Data collection has been complete, but indications are that more data was collected than could be analyzed and utilized. It is apparent that data analysis improved greatly during the course of this project. There are many examples of how the CATIE staff was over-zealous regarding data collection. Several illustrative

anecdotes follow.

1. The team was shown a very large computer printout (about 8 inches thick) and was told that it contained the information for Costa Rica. The data was also on a computer tape. These together with instuctions were to be sent to the appropriate office of MAG. A similar scenario is to occur for each country. The team believes that information supplied in that fashion will be of little value.

2. Because of the ROCAP/PRO-AG requirements characterization documents had to be prepared for the specific project sites. The characterization document for Chimaltenango, Guatemala, was dated 1984, several years after CATIE technician departed the area.

3. At most project sites the team inquired as to documents received from CATIE that could be considered useful for feedback into the research system. In no instance were such documents available.

   The logical question then becomes what is being done with this data and who is actually applying or using it. The information delivery system varies from country to country but in general is weak. This is widely recognized and projects are underway in most countries to help to correct this void. If the extension services had more information on crop production systems they could be more effective.

   In sum, the team believes that too much data were collected. This made analysis slow, in fact too slow to perform the important FSR feed-back function. Additionally, some of the Project (contractual) requirements hindered effective use of

time as regards data collection analysis and dissemination.

f. Evaluate whether the project has contributed to the long-term improvement of CATIE's research capability in farming systems, to the long-term viability of CATIE, and to the continuity of farming systems research within the region. Does CATIE now have the capacity to respond to requests for information and technical assistance from national programs?

Because the project provided a vehicle for CATIE to perform field work, it enhanced the long-term viability of CATIE. Almost all national-level officers that the team spoke with appreciated the work done by CATIE staff--especially the field staff. The project, through on-the-job training and association as well as formal training exercises helped to promote the idea of farming systems. In comparison, however, only about 40% of the specific project sites are presently involved in serious FSR/E efforts. Representative of the national institutions did state that they would like to expand the experience to include other geographic locations and that all that was lacking were funds to do so.

CATIE itself is another matter. Because of its specific project orientation, its institutional memory is almost exclusively tied to its staff. The staff, however, is funded on a project-by-project basis. Thus much information is lost when inevitably, staff departs. As previously stated, the specific project orientation not only influences staffing, but approach. For example, the farming systems component in other CATIE projects is weak to non-existent. The IPM, watershed management and fuelwood projects should follow the FSR methodology to improve effectiveness. Many of the specific problems in these areas are

farm production or farm family consumption problems which should be studied from the point of view of the farm family in order to be resolved.

The project has been successful in allowing FSR to occur in the field and by funding a central staff to work in FSR related activities. To the detriment of the project, however, the rhythm of the research, especially in what was called animal and mixed systems, was partially controlled by ROCAP demands. The participation of the Department of Livestock Production at CATIE headquarters was limited before 1983 and almost non-existant afterwards. The staff at headquarters was active in training and designing alternatives, in analyzing data collected during research and in analyzing research results. Field personnel were trained to conduct FSR, but were not always able to conduct it. This difficulty was often caused by lack of funds at the national institution level, the relationship between national crop and livestock departments, and the relationship between research and extension departments.

Despite the funding and project-by-project orientation, CATIE presently has the capability to respond to requests for information and technical assistance on FSR matters from national programs. The future, unfortunately, is uncertain. The team does not feel confident that this capability will remain with CATIE. The critical staff could leave upon termination of current CATIE responsiblities for the SFPS project. Such responsibilities can be either related to FSR activities or not.

g. Identify any lessons learned that should be applied to improve future development efforts.

We present our conclusions and recommendations after the Country Report section.

h. Evaluate methodologies and procedures used by the integrated research and technical teams at CATIE in site selection, experimental design, selection basis for research treatments used in experiments, experiment execution, monitoring, data collection, processing, analysis and dissemination.

1. The following discussion is perhaps the most important (other than conclusions and recommendations) that we present. Farming systems research and extension is much more than on-farm trials and/or the study of crop rotations or cropping systems. It is an approach, a methodology (not just a method) to research. In this section the methodology as developed and applied by CATIE staff is discussed. Throughout the discussion it is important to bear in mind that CATIE has played a major role in the development of the methodology. This development occured over the first part of the project. The team took this into account, but has differences with CATIE on how some of the aspects of the methodology were applied. In the analysis we have used definitions and critera that have been in wide use by farming systems practitioners since 1981.

Site selection was largely determined by the national institutions. No other broad statement can be made about the subject. In all instances selection was made to meet a national priority--either in terms of commodity research or in terms of location needs. Thus, in some cases CATIE field staff was used to support or augment existing national field staff and in other cases it was used instead of national field staff. In Honduras

CATIE staff essentially played the first role at first and then played the second role as national staff was diminished.

Table 3. Evaluation and Application of Methodology.

	Charac.	Design of Alter.	Back-up Exp.Station Research	On-farm Testing	Validation	Institutional Follow-up
COSTA RICA	3					
Dual Purpose		4	2	2	1	1
Swine		2	2	2	1	2
Maize		4	4	4	4	2
EL SALVADOR	3					
Milk		4	2	2	1	1
Maize-sorghum		4	4	4	2	4
HONDURAS	3					
Dual purpose		4	1	2	1	2
Rice		4	4	4	2	4
Maize assoc.		4	4	4	2	4
GUATEMALA	3					
Dual purpose		4	4	4	1	4
Vegetables		4	4	4	1	1
PANAMA	3					
Rice		4	2	4	2	4/2 a/
Dual purpose		4	2	2	1	2

1. Not carried-out

2. Poor or scanty

3. Done to excess

4. Well done

a/ 4 refers to Progreso; 2 refers to Guarumal.

Methodology

2. The methodology proposed by CATIE for development of technological alternatives in specific areas was obtained by experience in conjunction with national institutions in the region, on farms and with small producers.

The conceptualization and structure of the methodology is a synthesis of investigative work done on farms. The methodology is a grouping of experiences which offers flexibility and dynamic change in the process of adjusting and testing to obtain improved technology. The methodology is being structured in broad terms to facilitate adaptation to the various ecolgical zones, available resources of the national institutions and socioeconomic conditions in the area of influence. The final user of the methodology should be the national institutions.

The process of the selection of the area, characterization and identification of dynamic changes are important determinations in the identification of constraints and producers' problems. The process of designing alternatives, on-farm research and validation is related to the development of technological alternatives to help solve producer problems in a way which is compatible with circumstances which exist. The processes of support and extrapolation represent a force to expand the application of technological alternatives into other areas.

Under this methodology the farm is viewed as a single productive unit and the intent of technology development is to consider systems of production as subsystems in relation to the total farm. The method being utilized by CATIE is for the

development of improved technology and alternative systems of production in selected food crops in well defined geographic areas. The primary target is small or limited resource farmers.

It is also clear that the principles of this methodology could be extended to other systems of production and other producers including medium and large producers.

One of the key elements of the Small Farm Production Systems Project was "developing a methodology for farming systems research". Given that this project was a complex, multi-objective agricultural research effort operating through CATIE in five Central American countries and Panama, it becomes immediately apparent that a complex multifaceted methodology would result. One approach is to discuss and evaluate methodology relative to (1) cropping systems - plant production systems with both edible and cash crops, (2) cattle production systems - plants supplying pasture and forage as major components of the system and (3) mixed crop and animal systems where livestock use some of the crops produced. Cropping Systems was under the control of DPV (Crops Department) and Cattle Production Systems was under the control of DPA (Livestock Department). This becomes evident during the evaluation of project activities.

Cropping Systems - Characterization, Design of Alternatives, and Testing.

Cropping systems research at CATIE can be identified as beginning with the Central Experiment in 1972. Under this experiment corn, beans, rice, cassava and sweet potatoes were studied as monoculture crops, in numerous combinations and rotational patterns. This research was managed by the Tropical

Crops and Soils Department which is today the DPV. One of the objectives was to study cropping systems and practices that had application for the small and limited resource farmer in the region. The more promising associations and technologies from the Central Experiment were then subjected to further research in satellite experiments. Subsequent cropping systems research and development was sponsored by CATIE-ROCAP projects. The first was from 1975 to 1979. The researchers who remained at CATIE had considerable experience with cropping systems research. A logical next step was to expand this concept to other institutions and on-farm research in the region through an FSR/E approach. This was done via the 1979-1985 CATIE-ROCAP Small Farm Production Systems Project.

The process of selection, characterization of crop production practices and identification of constraints to producers problems are areas which received much attention under the project. Experienced researchers at CATIE, excellent field personnel and cooperating nationals all have contributed to these activities. We question, however, the value of collecting large quantities of diagnostic data when in many cases it is not analyzed nor available for design of on-farm trials.

Design and execution of on-farm trials is of major importance in developing a recommended methodology. On the whole, CATIE staff have done an excellent job of designing field trials. Field staff and cooperating farmers are to be congratulated on a job well done. Indications are that much emphasis has been placed on varietal, spacing and herbicide trials which is good.

Fertilization trials, control of soil pests, seed treatment,

weed control, spacing trials, cropping alternatives and associated cropping systems were some of the components studied. This sector has been a strong CATIE focus for many years. It is apparent that the trials were well designed and the comoponents for study were carefully selected. However, testing of alternatives under farmers' conditions and under farmer control appeared to be limited in several situations. Perhaps this focuses on the limitations of CATIE, national research organizations and viable extension services, to adequately interface with each other. In Costa Rica and El Salvador we found participating farmers completely convinced as to the value of changes in maize fertilization levels, fertilizer formulations and timing of application. In other field visits we learned that cooperating farmers had no idea whether they would follow improved practices because all the on-farm trials were under the control of CATIE. The validation trials were not under the control of the producer.

3. Animal Systems -- Characterization, Design of Alternatives, and Testing.

Cattle production systems at CATIE can be identified as starting with the Dairy Production Module. Since 1973 a large part of CATIE's research and training effort for the cattle production program has been oriented toward the development of a Dairy Production Module for the tropics. The basis for this approach was that in the Central America and Panama forages constitute the most abundant nutritional resource for cattle production. This suggested that cattle production should be based upon the most efficient use of pasture as the principal resource during the rainy season and must be supplemented with conserved

forage (silage or hay), fresh forage, and agricultural and industrial by-products during the dry season. Results from the dairy cattle module at CATIE indicated that it was possible to produce more than 12,000 liters of milk per hectare per year; 7 liters daily production per cow at a carrying capacity of 5 cows per hectare. To obtain this level of production it was necessary to make heavy applications of nitrogen fertilizer to intensively grazed African star grass (Cynodon nlemfuensis).

Rotational crossbreeding with dairy breeds, Jersey and Ayrshine x criollos, was needed to obtain adequate genetic potential for milk prodution and reproductive efficiency while retaining adaptability to the tropics.

A major project designed to study the use of tropical crops and residues of these crops in the feeding of dual-purpose cattle also influenced the SFPSP. That project began in 1976 and was funded by IDRC Canada. Its objectives were to conduct surveys on the current use of tropical crops and residues and to sponsor component research for improved utlilization of available nutrient resources.

For example, characterization studies in Costa Rica had indicated that approximately 80 percent of the small farms with less than 35 ha had cattle for the production of meat and milk. Since the ultimate objective of research at CATIE is to generate recommendations for production systems for the small farmer, a logical step was to attempt to transfer the Dairy Production Module to these farmers. Discussions with participants and a review of documents indicated that the Dairy Production Module as developed at CATIE was, unfortunately, unacceptable to farmers.

Modifications of the CATIE Dairy Production Model were established in four countries but always with major components greatly different from those found at CATIE/Turrialba. Numerous components such as best pasture grasses and the best protein source for the dry season were studied at experiment stations under controlled conditions. In the field, modified cattle production models were established. These models were under close supervision of project personnel and were compared with cattle production systems in the region. This gave a comparison between managed models and traditional systems of production. As indicated under validation, components of the cattle production model were not truly validated by cooperating producers.

Some of the major modifications that were made are listed as follows:

	CATIE Module	On-Farm Module
Purpose:	Milk	Both milk and meat
Breed:	Dairy	Dual Purpose
Pasture:	African star	Various grasses
Fertilization:	Heavy nitrogen	Minimal
Dry season:	None	Often 4 to 6 months
Supplemental feeding	Not critical	Very critical
Milking parlor:		
Floor:	Concrete	Pached dirt
Roof:	Metal or	Various including palm
Stalls:	Two	From 0 up
Milking:	Machine	Hand

Numerous modules were visited in different countries during the review of this project. In summary, it can be stated that not

one module was found on producers farms that was identical to the CATIE module. However, the CATIE module provided many ideas. Technical components of the modules were modified in collaboration with CATIE technicians, national personnel and farmers in order to adapt them to the specific in country sites.

CATIE experiment station research results at Turrialba appear to have had only a limited influence on the characterization and design of alternatives in the Cattle Production Module. Reasons for this were previously outlined. Early in this project CATIE had an excellent core staff of experienced and well trained animal scientists. Furthermore, CATIE was able to hire some dedicated, well trained animal scientists for resident work in the six countries. However, frequent turnover of personnel throughout the life of the project markedly affected continuity. The review team identified only one animal scientist in all the countries that worked with the project for the full 5 years. He worked with the most successful program.

Characterization and design of alternatives were primarily arrived at by a "meeting of the minds" of experienced and well trained animal scientists. However, many of the suggested alternatives were modified by the producers when they began using them on their farms. A classic case in point is the use of Leucaena leucocephala as a protein source for catlle. The recommended way to use it is cutting, chopping and feeding it to cattle. This requires much labor and many producers refused to use it in this way. Cattle grazing it two hours per day received sufficient protein and eliminated the hand labor. Both cattle producers and available literature confirmed grazing to be a

feasible alternative.

4. Mixed Cropping - Livestock Systems - Characterization, Design of Alternatives and Testing.

Small ruminant (sheep and goats), and poultry have often been associated with mixed cropping livestock systems. However, these animals have not received the same degree of research and development effort within the context of the small farm production system or within the research and training program of CATIE, Turrialba.

Characterization surveys indicated the presence of relatively few goats. A small percentage are dairy goats, the rest are meat goats. Some poultry (10 to 30 chickens) was also found on a majority of small farms. One to five heads of pigs per family was also relatively common.

Characterization of swine and poultry production was conducted in the Guapiles area of Costa Rica and the Nueva Concepcion area of Guatemala. It should be understood that although mixed production systems were specified in the original (1979) project agreement they received comparative little emphasis. Consequently, the only mixed animal-crop system was limited to swine in the Guapiles area. Validation of components was not conducted.

The CATIE-ROCAP project paper indicated that the technical feasibility of improving swine and poultry production, of expanding sheep and goat production, and introducing Klaki Cambell ducks into small farm systems needed to be studied. It was also indicated that much of the component research information was available but that the pertinent information needed to be

synthesized into tech-packs or similar systems and tested. Economical sources of feedstufs and socio-economic factors concerned with production management and marketing were determined to be major limitations.

CATIE-Turrialba did not have any on going research in the small animal area at the time the CATIE-ROCAP project was begun. They had made some diagnostic surveys. Small animal research and small animals in farming systems were new subjects for CATIE.

A number of research studies were conducted at CATIE during the life of this project to study alternative sources of energy and protein for pigs and goats. The component research included alternative sources of energy-reject bananas, chopped sugar cane and malanga for pigs; alternative sources of protein: whey, leaf protein, and joik bean (Canavalia ensiformis), were also studied for pigs. A management system was developed for pigs. Various energy and protein sources were studied for goats and some base line data over three years were collected in a herd of hair sheep.

Collaborative and on-farm studies in the various countries were limited in scope. A swine management module was constructed adjacent to the MAG swine research station at Guapiles, although no data were being collected when the team visited there. Some swine-cropping activities were carried out in the Guapiles, Pococi area of Costa Rica. The team visited one swine producer in the area who had received assistance from the project. This family operation had expanded their production, had built new facilities and was using reject bananas, rice milling by products, some corn and a protein concentrate successfully. A study was conducted with pigs fed plantains, soybeans and kudzu in Baru, Panama. A

diagnostic survey to characterize poultry and swine production in the Nueva Concepcion area of Guatemala was conducted. Off station sheep and goat activities included a bioeconomic study of goat production systems in Costa Rica. Studies concerning dairy goats were conducted in Panama including case studies, parasites and leucaena as a source of protein.

5. Support Research.

With the exception of Guatemala, there was very limited support from existing experiment stations in conducting related research. In Guatemala component research for the animal and mixed production systems was conducted on a substation in the area that the project was working (Nueva Conception). However, existing information from the research center was used to define on-farm research activities. Such was the case with the animal production activities in Panama that depended heavily on information from the Gualaca experiment station. In Comayagua, Honduras, linkage with the research station in defining on-farm research in rice and maize was also evident.

6. Summary of data collection, analysis and information dissemination.

In general, many technical components were studied most of which were in cropping systems. These studies followed the logical sequence which generated much data. In order to complete the process of generating information for technological packages modifications of the CATIE Dairy Production Model were established in form countries but always with major components greatly different from those found at CATIE Turrialba.

Another viewpoint is that much technical information was

generated. However, this data has been reported as research information in reports or presented at technical meetings and seminars. This data does not appear in the form of recommendations or as technological packages for the producer. Unfortunately, much of this information will not reach or benefit the producer unless a major dedicated effort is made to obtain this data from the research report and communicate it to the producer. The interfacing and interaction between research and extension needs to be greatly strenghtened.

7. V/T Methodology

Although the idea of Validation Transfer (V/T) was discussed in the Project Paper, it was not included in the original Project Agreement (effective April, 1979). The need to develop an effective method to transfer of research results to producers, however, was included in the Project Agreement. Specific use of the term validation/transfer was not made until Amendment III, 11 May, 1982, of the Project Agreement. The use of V/T was originally suggested by ROCAP and accepted by CATIE after much discussion and some change. As described in relevant CATIE documents, V/T is the final phase of the farming systems (FS) research effort. As is generally understood by most FS research and extension practitioners, V/T is a composite step--validation being the final step in research and transfer the first in extension. The joining of the two as a single action as well as the late addition of V/T to the project (even considering the extended termination date of 30 June, 1985), added much confusion to a difficult situation.

The situation was difficult due to at least one of two

primary problems. First, the close relationship between research and extension required by FS programs was generally lacking at the country level. Second, the relationship in the field between CATIE and the national research institution was often weak and that with the extension institutions was generally lacking. (Guatemala is the only true exception to these problems). In turn, the weakness in the CATIE-national institution link was primarily caused by lack of resources on the part of the national institutions. In addition CATIE, a research institute, usually worked through the national research institutions. Thus, only when the national research-extension link was strong was the CATIE-extension link strong. In general extension did not get involved in V/T process in an appropriate way.

Validation

The team believes that although CATIE expended much energy on validation the effort was misguided. CATIE performed validation in some instances when research was not really completed. It did so in order to conform with the obligation to validate "tech packs." The validation that was also performed was marred by the weak realationship with extension institutions. The team believes that validation should test the acceptability (by the producer) of the technology or technique. This cannot be accomplished if the field team is involved in the management of the production-site or if inputs are supplied to the farmer. Thus, we believe that CATIE validated the technical efficiency of the technology or technique and did not attain the goal of validation.

Crops. For crops, validation is the phase in which participating producers use part of their land to produce the crop(s) in

question at their own risk, using the recommended technique or technology. (The research effort should neutralize the risk factor). Although the extension agent and/or researcher should monitor the situation, the producer should manage production and pay for the inputs used. Depending upon producer reaction to the various aspects of the technology, different alternatives have to be developed and either: 1) tested and validated or only validated; or 2) the technology should be extended or transferred.

The pattern that was followed by CATIE in most areas was quite different. In most cases on-farm trials were run. The trials were managed by researchers and the inputs were furnished. Because of poor coordination with extension these trials had little transfer effect. Thus, in the validation stage it was necessary to supply producers with inputs. (They didn't believe that little or no risk was involved.) In addition, because of the research perspective, more field management was given by CATIE staff than should be done at the validation stage. In addition, there was no parallel planning of commercial stocks of seeds of new crops and/or varieties. This led to some delays in the early acceptance of technologies tested that depended on this input.

Livestock. The concept of validation is difficult to define in the case of livestock. The reasons are varied but generally include: 1) the length of time required to evaluate properly a livestock program; 2) the interaction between plant and animal; 3) the need to perform agronomic component tests while one procedes with livestock tests; and 4) the investments required for forage and feed, animals and infrastructure. The last point is particularly important in the present case.

CATIE has sponsored a prototype method as regards animal production. The model developed by CATIE, while seeking to address the most critical problem -usually feed and forage production- also includes specific installations to be used. The type of installation (eg. silos or no silos), however, depends upon the environment as does the type of feed and forage. Thus, in order to validate a CATIE livestock production system, the farmer must install the entire system. If the producer were forced to do this at his own risk or expense it would be difficult, perhaps even impossible, to find producers to participate. Those who have participated have done so with great financial support from the project. The support, although necessary, is contrary to the principle of validation as used in farming systems research.

The investment requirement of the prototype caused another problem. The national institutions have had very small budgets. Thus, they could not afford to make the investment necessary to build even a single livestock module. CATIE, through the project, could. The number of such investments was limited to six or seven for both cattle and hogs in each country. Not all of the producers who benefited from the investment remained in the project. Thus, in each country only about two or three on-farm livestock modules were available for analysis. Obviously, no significant statistical analysis could be conducted with so few observations.

A way to improve upon this situation is to conduct the livestock related research on a component basis. The agronomic aspects could be tested in many locations (as the crops research

was done). Then, validation of only the agronomic components could be conducted.

Transfer

Transfer is the dissemination of the new technique or technology. It is an extension exercise, but needs to have strong links with other types of institutions. Prominent among these are research and credit institutions. The coordination with research is necessary in order to have feed-back so that research and backstopping on specific components can continue. Credit institutions must be involved so that producers can have the funds necessary to employ the new techniques. The latter is especially important for the livestock programs.

Transfer has not taken place in most cases. A comparison of two examples displays the importance of overcoming the cost of production problem. In Honduras, the maize program has had little success and a poor prognosis for wide-spread adoption of the technology that was developed. In comparison, the rice program has been relatively successful and has a good prognosis for wide-spread adoption. In the case of maize, farmers have adopted the variety and planting density aspects of the recommended package. The aspects of fertilizer and other chemical inputs have not been adopted. Lack of financial resources to pay for the chemicals was the reason given for the extremely limited adoption of the entire package. It is not known how long the variety and density aspects will have favorable results without chemicals. In the case of rice, the recommended technology was little different from that commonly used. The recommendations were those of timing of insecticide and fertilizer applications and of fertilizer

composition. Costs of production associated with the recommendation are only slightly greater than those of the common practice. This comparison shows that even with the same level of research and extension participation -both cases occurred in Comayagua Valley- there needs to be a source to finance the increased costs of a package or the cost increases need to be limited.

8. Summary of Methodological Review.

Table 3 summarizes the beliefs of the team about the five key steps of the methodology on a site-by-site basis. As can be seen by looking at the table we think that too much time and effort was placed on characterization. This slowed the process down or work started before the (static) characterization was finished. The amount of information that was gathered was too great--much was not relevant to the problem at hand. In general the early phases of the methodology were, we believe, done very well. Only after the V/T phase was (in most cases too early) entered did the quality of the work seem to decline.

- Evaluate the quantity, quality, cost-effectiveness and appropriateness of project funded training to the needs and priorities of the region.
- Determine how effective CATIE sponsored seminars/conferences and training activities related to this project have been in increasing the understanding of farming systems research in the region.

Specific tasks i and m are very similar. It would be difficult to respond to them independently. Thus, we treat them together below. Overall, training was the most successful aspect

of the program. As such the cost-effectiveness of the training program was, we believe, very high. There is a general concensus of opinion that CATIE's training activities were adequate to the project's needs.

A total of no less than 97 events with 2727 particants were counted in the documents reviewed. (Approximately 1,500 were funded by the SFPS project.) Table 4 summarizes the events by country and year. Most of the courses and seminars were related to methodology in the farming systems approach to research and extension. Specific courses and conferences on animal production and crop management also were given. In general, the participants gave the short courses and other training activities favorable evaluations. They especially thought the subject matter to be good, but also felt that time was too short. (This is a national level problem, not a CATIE problem).

The course-workshop on validation-transfer and communication methods offered in Honduras, El Salvador, Guatemala and Costa Rica in the first semester of 1983 was a good effort in promoting the research-extension interaction. They were attended by a total of 108 participants and the work groups contributed to a positive interaction of the researcher and extensionists of the respective countries. A three volume document with material presented at the courses was printed. The conclusions and recommendations of the work groups in each country was also published.

Table 4. Number of short-term events and participants in 6 countries durin 1980-1984.

Year	COSTA RICA		EL SALVADOR		GUATEMALA		HONDURAS		NICARAGUA		PANAMA	
	Evnt	Part	Evnt	Part	Evnt	Part	Evnt	Part	Evnt	Part	Evnt	Part
						NUMBER						
1980-1981	4	120	--	---	1	38	4	103	1	50	1	15
1981-1982	2	64	--	---	1	30	3	110	2	106	2	60
1983	6	76	26	736	2	65	5	100	12	363	1	5
1984	3	69	13	401	4	98	2	57	--	--	2	61
Sub-T	15	329	39	1,137	8	231	14	370	15	519	6	141

	Events	Participants
TOTAL:	2,727	97

Academic training at CATIE was also important. In the 1979-1984 period the following number of thesis from MS students dealing with farming systems published at CATIE were:

Country	MS Theses
Honduras	1
Guatemala	3
El Salvador	3
Costa Rica	8
Panama	2
Nicaragua	2
Sub-total Central America	19
Other countries	17
Total theses	36

It can be assumed that all of the 19 Central Americans benefited from the CATIE-ROCAP project.

j. Review research publications to determine:

1. Whether they were prepared and presented to give a clear understanding of what CATIE and the national agencies are doing; whether research reports meet high scientific standards for format and content.

2. Whether research and extension personnel in national institutions are aware of these reports and find the information

therein relevant to their needs.

3. Whether additional types of publications are required to adequately disseminate information obtained.

The publications/documents prepared under this project have been of high quality in several ways. Their presentation and organization were of high quality. They have suffered, however, from several shortcomings. The shortcomings are as follows:

-Timeliness Often the documents were not completed in a timely way. Thus, they were not as useful to national agencies and personnel as they might have been. In the case of characterization part of the problem arose from combining static and dynamic characterization in one document. In addition, documents reporting results from four or five participants apparently received as much attention in preparation as those of from 30 to 40 participants, further slowing the preparation process.

- Focus The information was not always focused. Often the same environmental and physical data were repeated in several documents. (Many pages had to be read before the point is reached). Thus, relevand data or analysis have often been omitted or obscured.

-Quality The resources used in preparation and presentation seemed too great. Not enough working documents were in the field. The documents were oriented too much to the scientific and administrative communities, not to the field practioner or extensionist.

We believe these difficulties were reflected in our field findings. Most research and extension field personnel had only a

few, if any, documents. They were aware that such documents were being/had been prepared, but thought that the results should have been in the field long ago. Given the lack of continuity of CATIE and, especially, national personnel, it is important that documents be straight-forward and timely. We believe that fact sheets and research bulletins directed towards field personnel would be of great help in fulfilling the need and overcoming the difficulties.

k. Determine if planned levels of financial and personnel contributions by CATIE, national agencies, other donors, and ROCAP were provided as planned and were sufficient to achieve the project outputs and the project purpose.

Institutional Strenghthening The ability of CATIE to perform FSR during the project period (1979-1985) is intimately tied to the ROCAP sponsored Small Farm Production Systems Project. In many ways the conduct of the project has been controlled by ROCAP. In return, ROCAP has been quite flexible in the support afforded CATIE for the project. Funding was increased during the project to perform new tasks. The project has been extended in order to accommodate the expanded requirements as well as the capacity of CATIE to perform the tasks within a specific time frame. Validation/transfer (V/T) is a case in point.

The original Project Agreeement did not include a V/T phase among the responsibilities of CATIE. ROCAP identified this as a weak point. It was verified by an independent evaluation and V/T was included in the project under Amendment Three in May, 1982. In June, 1983 the project was extended from 30 September, 1983, to 30 June, 1985. This was done in order to permit validation to

occur and to permit most of the validated recommendations to be published. CATIE was not able to meet the final publication deadline. The project was then extended to 30 September, 1985, so that CATIE could publish the information. (Funds for publication were made available under an early 1984 amendment).

ROCAP, through the farming systems project, supported CATIE staff at Turrialba as well as in the field. The staff at Turrialba included animal scientists and crop specialists. The latter were far more active under the project than the former. Except for an agricultural economist assigned to the Department of Animal Production there is little evidence that said department actively participated in the project since early 1983. The Department of Vegetable Production has conducted almost all project activity at Turrialba. It has also carried-out most of the training in FSR that was conducted by CATIE staff.

Given the nature of an FSR effort, a central staff such as the CATIE Turrialba staff is of limited direct importance. Such a staff can, however, lend technical assistance for specific stages of the overall research effort. (It can also be used to train its own field personnel as well as that of the national institutions). The stages where a central staff can be of greatest value are those of area characterization, problem identification and design of (techonology) alternatives. The CATIE staff at Turrialba was active in the national programs at these stages. In addition, on a limited scale, it conducted support component research and gave advice on component research to be conducted in the field.

- Analyze the relationship of this project to any other AID-funded small farmer research programs at the country level within the

region and elsewhere.

Only in El Salvador and Panama did we find a serious relationship between this project and USAID-funded bilateral projects. In El Salvador, CENTA with the help of USAID is attempting to institutionalize the farming systems approach. In Panama, however, for a variety of reasons, the bilateral project (which is about 6 months old) has not been able to take advantage of the work done under the CATIE-ROCAP project.

n. Determine other benefits from this project which were not foreseen when the project was designed (i.e. assistance provided to CATIE's overall graduate program, to elaboration/implementation of new project activities). There obviously has been a spill-over effect from this project. Not all, however, has been positive. Some theses were prepared with the help of project personnel. (See Training--Specifice Tasks section i and m). On the other hand, project time requirements interfered with the teaching schedules of some of the staff.

Staff from this project are presently participating in other projects which could benefit from input from FSR-experienced people. The input, however, seems limited at the CATIE level as well as at the national institution level. Honduras, is an exception to this. A former ICTA staff member is utilizing the FSR/E methodology in an appropriate rural technology project. A former CATIE staff member is also participating in this effort.

RELATED TOPICS

The following narrative is based upon the perception of the team that not all the important relevant issues were included in the Specific Tasks section. Additionally, the topics are general and do not report specific country visits. Thus, they do not belong in the Country Visits section. The following topics are discussed:

1. The future of FSR/E and some of the national institutions;
2. Extrapolation;
3. Characterization;
4. "Tech Packs";
5. A review of a CATIE draft project proposal.

National Institutions and the Future of FSR/E

Costa Rica

Officials of the Ministry of Agriculture in Costa Rica made reference to CATIE's influence being significant in all of Central America and Costa Rica. Whether or not this perception is true, it is clear that a closer working relation between CATIE and MAG would be beneficial to agricultural development of Costa Rica.

With the establishment of PIPA greater resources are being made available to the Ministry. A prime objective of PIPA will be to bring about a closer working relationship between extension and research. This implies that farming systems concepts and methodology should be well established throughout MAG. From interviews with various individuals in MAG it is apparent that the enthusiasm for change or improvement of the present system is present but greater education in farming systems is needed. Research and extension are at present

moving ahead with a program, but it is our opinion that resources will be wasted without more guidance.

Within PIPA and research in MAG there are individuals who previously worked in the CATIE program. These individuals presently have a strong input into the formation of the upcoming organizational plan and methodology. We noted methodological errors inherent to the CATIE program being incorporated into the new research/extension scheme.

Input from outside the organization at this time would facilitate the process of designing and initiating this new national program from a broader base of understanding. It would be appropriate if CATIE were involved in training of farming systems methodology and assist in program design.

Honduras

A future working relationship between the Secretariat of Natural Resouces and CATIE should stem from a felt need within the Honduran organization. CATIE must come prepared to work within and for the organization, providing technical assistance complimentary to that of its Honduran comterparts. CATIE personnel must come well versed in farming systems research and extension concepts and methodology which will enable them to guide and train where needed.

Guatemala

All agricultural research in Guatemala is to be coordinated by ICTA, and all research involving foreign entities is to be a collaborative effort with ICTA. Furthermore, research is to be conducted under the ICTA banner, and the results are to be published by ICTA.

ICTA began livestock research in the Nueva Concepcion area in 1979 and soon after entered into a cooperative agreement with CATIE to develop a dual purpose cattle production module. Perhaps it is somewhat ironic that CATIE had cattle production expertise but had developed a "Dairy Module" rather than the module needed in Guatemala. Nevertheless, ICTA and CATIE worked together and developed the dual-purpose cattle module.

In 1983 ICTA was faced with the decision whether or not to continue with the CATIE cooperative agreement. Varied circumstances almost resulted in a severing of the CATIE/ICTA relationship. Better judgement prevailed and the program continued until the end of the last budget extension. This is fortunate because the impact of the program is about to be felt.

Continuity of personnel and focus have been well demonstrated in Guatemala. Host country counterparts (in ICTA) involved in the evolution of the "modelos lecheros" are presently involved in the expansion of the research effort and coordination of the field team backstopping the technology transfer by DIGESEPE to farmers. The continued effort by the ICTA group has lead to additional funding by CIDA. CIDA is providing money for milk collection centers which will also serve as a farmer training facility. The CIDA grant is a four year cooperative effort through IICA focused specifically at promoting the expansion of technology to more producers.

Although the CATIE program in FSR eventually was limited to cattle, we spoke to the Director General of ICTA as well as the Director of the Region V Experiment Station. This station performs no cattle research. The commitment of ICTA to the FSR/E approach was

apparent. There is presently a plan to increase the effort through the use of paraprofessionals. It is planned to use and pay farmers to manage or perform some of the field work done by ICTA. Thus, a central team through a pyramid of professional field teams which in turn manage paraprofessional field team could reach over 10,000 producers.

Panama

There remains a large void between research and extension. The effectiveness of extension is limited without a joining of forces with research. AID recently financed regional offices to house the research group of the region. There was no attempt to place the research and extension personnel in close proximity. Research appears to be serving an extension role through their farmer contact with on-farm trials, but more could be accomplished if research joined forces with extension. There seems to be a recognized understanding of the need for such coordination. Unfortunately, the leadership and/or political climate is not conducive at this time to it bring about.

EXTRAPOLATION

An expected output of the project was: "Development of methodology for extrapolating of cropping systems research from area to similar area, and by multiple production factors". A very intensive and sophisticated approach was designed and implemented to test a corn-sorghum association in Guatemala, El Salvador, Honduras, and Nicaragua during 1981-1984. Empirical m[illegible]ls and natural resource inventories were used to provide the basis for extrapolation.

The effort did not produce a positive basis to the use of extrapolation of research results. The usefulness and reliability to the small farmer of extrapolation is doubtful. Four reasons why extrapolation is not to be recommended as a necessary step in the FSR/E process are:

1. The need to test alternatives on a permanent basis in many locations to effectively extrapolate recommendations is very costly.
2. The models that were used only consider biophysical factors and not socio-economic conditions that play important roles in the decision process of small farmers. Furthermore, there is little reliable agroclimatic information in the region that could justify the extrapolation concept. These uncertainties make the outcome of a costly endeavor uncertain as well.
3. The extrapolation concept is inconsistent with the farming systems approach in that it is dependant on a top-down criterion. It does not consider farmer participation in the

local research and validation process.

4. The effort and cost involved in the characterization of homologous areas and the permanent research required for every set of commodities can better be used to solve priority problems in each region. Using only extrapolation seems a highly questionable research approach.

Characterization

Characterization of the farm clientele was observed religiously at the outset of each country project. A post mortum observation of the characterization process leaves an unclear impression of precisely what were the objectives to be achieved and how they were to be reached. The following is a list of comments made in regard to the characterization carried out by CATIE personnel.

1. Limited multidisciplinary team involvement of both CATIE and host country personnel during the survey process.
2. Survey instrument limited the free flow of farmer's perspective of his problems and required too much time to complete (up to four hours per survey in Panama), i.e. very ridgid/formalized survey.
3. Survey data not analyzed in its entirety.
4. Survey data was sent to Turrialba for analysis instead being analyzed on site as a cooperative effort between host country and CATIE personnel.
5. Evaluation of prospective clientele did not include a social perspective, which could have influenced the final research orientation.
6. Imposition of extrapolated, preconceived models on a particular clientele group, particularly without social science input, following an expensive characterization seems contradictory to the ideas supporting a characterization.

"Tech Packs"

Like extrapolation, the idea of "tech packs" is very appealing. They offer attempts at risk-reducing methods to increased

productivity. They have been used for many years, particularly with subsidized supervised credit programs. Only on rare occasion, however, have they been successful. They are often too complicated (different from common practice to be applied without outside supervision because of new management requirements. Alternately, the require more capital than the producer has available or is willing to utilize.

Tech packs were to be developed under this project. They wer developed. The type of tech pack was not specified or required at th outset. Thus each one that was developed was different. In the case of the crops, the more successful tech packs have been those that wer only slightly different from common practice. They were based, in essence, on specific changes of specific components. This supports our view as to the importance of component research. Not only will the time requirement for research be cut but also acceptability would be increased with changes based upon a small number (2-4) component changes as opposed to a completely new package.

A Current CATIE Proposal

In a recent draft proposal entitled Technology for Development's Network, dated June 25, 1985, it becomes evident that not all lessons of the current (596-0083) project have been perceived or adjusted to or incorporated by CATIE. A major goal of the proposed project is to generate two technological alternatives comprised of several components in each participating country. The complexity of the technology should be determined in the field via a characterization, not at the present phase. It is apparent that the proposed research goals are being set from the top down--a problem

with the current project.

The proposed project is to operate through a centralized mechanism. A core at CATIE would lead and coordinate the research effort. This could lead to a repetition of errors, e.g. lag in data analysis, that have occured under the present project. Resources and personnel should be concentrated in the region of interest. This could mean using more people with lower (academic) qualifications than are usually employed at each level of operation.

COUNTRY SUMMARIES

Costa Rica

Agricultural research and extension in Costa Rica is organized so that each has its own administrative unit within the Ministry of Agriculture and Livestock (MAG). Crop and animal research is conducted on five regional experiment stations under the Directorate General of Agricultural Investigations (DGIA). There is also a Directorate General of Animal Health and Animal Production. There has been some cropping systems research within DGIA. A few Costa Rican students who have majored in farming system research at CATIE have had limited opportunities to follow this interest in MAG.

A reorganization of MAG, sanctioned by law in March of 1985, may greatly stimulate farming systems research. The reorganization combines research and extension into a single Directorate of Agricultural Research and Extension at the national level with separate sub-directorates for research and extension. Furthermore, within MAG, PIPA (Program to Increase Agricultural Production) has

been developed to work with subprograms on research, technology transfer, seed production and distribution and the supply of agricultural inputs. With PIPA to assist with the coordination of research and extension, and with a number of persons interested in farming systems, there is a promising future for farming systems research in Costa Rica.

Cropping Systems

The CATIE-ROCAP project began operating in Limon Province, eastern humid tropical lowlands in 1979. Work centered in the county of Pococi, Districts of Guapiles, Jimenez, Cariari, Rita and Roxana and in the county of Guacimo, Districts of Guacimo and Rio Jimenez. Most of CATIE's farming systems work has been in the Pococi-Guacimo area but there was also some activity in the country of Puriscal from 1979 until 1982.

Cropping alternatives were studied in the Pococi-Guacimo areas. The earlier (1975 - 1979) CATIE-ROCAP project had worked in Pococi, beginning in 1976. Experiments were conducted on the corn-corn system, corn-cassava and corn-cassava-beans systems.

Corn-cassava was a good alternative for the area but encountered two problems. On-farm trials in the area involved a new variety of cassava, a change in plant spacing and chemical weed control. The new variety was selected because of more rapid maturing and increased production. Trials in 1982 and 1983 indicated that the new variety was unacceptable to the farmers. This combined with a marked drop in the price of cassava essentially made the corn-cassava alternative unattractive to the producer.

The corn-corn alternative appears to have had the greatest impact of the CATIE-ROCAP cropping systems activity in Costa Rica. The alternative included changes in plant spacing, changes in the fertilizer analysis and time of application and the use of herbicides and insecticides. Two crops of corn are grown per year with the first being planted in February, March and harvested in July with yields about twice what they are from the second crop. This corn-corn alternative was validated on ninety six farms during 1982 and 1983. The credit bank of the Institute of Agrarian Development (IDA) is usisng the alternative as the basis for credit to 125 farmers, most of them in the Cariari area where the alternative was validated.

Farmers who were visited were highly complementary and said they didn't know of any producers not using the alternative. Estimates of the adoption of the alternative indicate between seventy-five and ninety-five percent of the farmers are using it. However, some farmers are adopting only part of the alternative, mainly fertilizers and spacing, because of the high cost of the agrochemicals.

Numbers of trials conducted to study alternatives were as follows: 10 in 1979, 9 in 1980, 13 in 1981, 10 in 1982 and 6 in 1983. Numbers of trials conducted to study validation and transfer of technology were 32 in 1982, 64 in 1983, and 36 in 1984. One corn-corn alternative studied changed the spacing, introduced new seed and change fertilizer practices. This resulted in an average increase of 1000 kg/ha and increased returns by 128%. The fertilizer change was primarily based on the fact that nitrogen is the most limiting nutrient. By reducing the use of 12-24-12 fertilizer and increasing the use of ammonium nitrate corn yields were greatly increased at

essentially the same fertilizer costs.

Dual Purpose Cattle Systems

Characterization of the Cariari area revealed some 365 small farms averaging some 20 ha each. Eighty percent of the producers had cattle and some 45 percent had dual purpose cattle. A dynamic study of 39 farms over a period of about 6 months revealed poor pastures, little division of pastures, limited genetics for milk production, and little supplemental feeding. A diagnostic study of seven farms in 1982 gave more details. In 1983 three farms installed alternative systems of production with some components modified from the CATIE Dairy Production Model.

Interventions included a new bull with more dairy production trials, planting king grass, sugar cane and legumes for supplemental feeding, installation of a milking parlor, a small forage chopper, improved herd management and improved milk handling. At about the same time a new road was completed in the area and one company began buying milk in the area. In addition five dual purpose herds in the area were monitored continuously and served as controls.

Of the three farms that served as the prototypes, one had family problems and was eliminated, one remained with 20 ha, and one bought 20 more hectares. The one that has 20 ha has greatly modified his operation during the past three years.

Some of the major changes have been as follows: Numbers of cows increased from 2 up to 74 and is now milking 20 head daily; changed breed from criollo to Jersey to Holstein as the prominent breed but with some Bos indicus (Zebu). Greatly increased milk production per cow -which is sold under contract to a restaurant, door to door and to

a company. Pasture has been divided into 8 parcels (the CATIE model has 26), supplemental forage and legumes are fed, many management practices have been improved. This dynamic well managed dual purpose farm has truly become a model for the area.

Mixed Animal - Cropping Systems

This part of the project was the last to be established. During 1983 five of six projected swine-cropping systems were established in the Guacimo area. Preliminary data gathered in 1983 had indicated that pigs in the area had high death losses from birth to weaning, were slow growing, reached market at 9 to 12 months of age, and were primarily criollos with an undesirable fat to lean ratio. Numerous sources of energy were being fed to pigs including corn, taro, cassava, bananas, plantains, sugar cane and pasture. However, on farm sources of protein were limiting production and purchased sources of protein such as imported soybean meal were expensive. High rainfall 3000 mm (150 inches) per year complicates management and special facilities were designed in which to accomodate 5 sows, one boar and their progency from birth to market in one 160 square meter area. Some alternative protein sources studied were five varieties of soybeans (Glycine max.), twelve varieties of cowpeas (*Vigna unguiculata*) and 20 varieties of horse bean (*Cannavalia ensiformis*).

Most of these component studies were conducted during 1983. The literature indicates that Cannavalia contains a substance which is highly toxic to pigs and has killed 50 percent in some trials. Both soybeans and cowpeas need to be processed or heat treated to destroy the trypsin inhibitors.

In summary, although a late attempt was made to try to resolve

protein problem for swine production, the approaches used were unsuccessful. Energy sources which were studied to some extent and are successfully used in the area are corn, bananas, plantains, cassava and sweet potatoes. Some studies previously conducted at INCAP had indicated that criollo pigs require less protein than that proposed by the National Research Council for improved breeds. Figures were presented as follows from studies conducted at Turrialba: Pigs were fed for 90 days from 20 kg up to 40 to 45 kg liveweights. Pigs fed the 50% level gained, 252 g/day compared to 280 g/day for those fed 100% of the NRC recommended protein requirement.

El Salvador

Highlights

The CATIE livestock-modules (under animal and mixed systems) operated in La Trompina, Morazan, 1977-80, Tejutla, Chalatenango, 1978-82 and Jocoro, Morazan, 1979-85. Another location, Candelaria de la Frontera, was added in 1981 mainly for crop systems assistance. The Jocoro location was the main project site evaluated. In every location a characterization study was made and published. The study included information in excess of the fundamental topics required to implement the projected research and validation activities.

Animal production

Little component research was used to design the animal production modules in Jocoro that later (1982) evolved into the mixed systems modules now under validation. Political disturbance partially accounts for the limited output observed. Other explanations include:

- Weak field teams. One CATIE counterpart worked with part time assistants (3 days a week) in securing records.
- Scarcity of physical resources. CATIE had to substitute the MAG for input and labor needs.
- Insufficient component research. Previous research was isolated and directed from the top down. It was done almost solely on experiment stations (there are two). For example, silage of chicken manure and molases was tested. This idea originated with a producer whose son carried on an experiment as a thesis problem in a US University; there

was no validation and nothing happened.

- Gandul experiment field days with CATIE's help led to its consideration for mixed system modules.
- Lack of support. Gandul seed and seed from improved drought tolerant maize variety CENTA MB-3 was not readily available. The animal production extension service was non-cooperative.

Output includes three mixed systems modules that focused on milk production. Alternatives recommended include:

- silage of sorghum and gandul for the dry season and the association of corn-gandul.

It was expected that the first alternative would reduce the purchase of cotton seed meal in the dry season. The second intends to substitute sorghum in the traditional maize-sorghum relay association while improving the feed value of forage. Simultaneously, it makes available a bean substitute for the family. In practice the farmer interviewed continues to plant the old system as well. It is claimed that gandul does not produce as much fresh forage as sorghum.

Farm records were kept on the three modules and 9 check farms by part-time assistants that spent 3 hours on each interview. They averaged one to two visits per week according to their activities. Although the modules were considered to be in the validation stage, they could be considered as exploratory exercises because

a) - there are too few locations;

b) - inputs are not paid for by farmers; and

c) - there are too many untested factors affecting milk production.

Other alternatives had been included that did not get properly established and were thus discontinued. Gandul hay and leucaena are in this group. At the evaluation visit a farmer was producing hay from Estrella pasture and erratically raising leucaena forage on a plot that had a very poor stand.

Very little can be expected to continue on these modules as there are no resources or real motivation available. Only one farmer was partially conducting the alternatives tested, the other discontinued the process after being kidnapped for eleven days. (The third module was not visited.)

Crop systems

The farming systems approach is well established in CENTA. A recent AID project is consolidating farming systems methodologies in the research division that includes a section for validation and transfer of technology within the Department of Economics and Statistics. Elements of the farming systems approach existed in El Salvador since the early seventies, when research on farms was carried on with collaboration of Dr. Peter Hildebrand and Tito French under the influence of the Asian multicropping systems approach. Previous to 1973, research programs were organized by commodities. The Program of Basic Grains was then organized and included various crops and their agronomic relations. The initial characterization stage is conducted. It usually followed the IICA motivated "Perfiles de Tecnologia Actual de los Agricultores y de la Investigacion". The one on Zapotitan included 1) Physical and natural limitations on production and 2) Technological production activities in corn, beans, rice, tomato, sweet pepper, potato and cucumbers.

Influence from CATIE was complemented with ICTA's experience, particularly through informal cooperative program in maize breeding through CIMMYT personnel collaborating with ICTA at the time. The positive trend towards the farming systems approach was interrupted in 1980 by the requirement that all personnel and resources be diverted from their research activities to the agrarian reform efforts. After a succession of Directors that held office for short and unstable periods, CENTA seems to be consolidating its activities and program leadership around the farming systems concepts. IDB and AID projects designed with farming systems premises are already established or will be so shortly.

The most significant farming systems component can be seen in the Validation and Transfer of Technology Section in the Department of Economics and Statistics within the Research Division. It is organized in three regions with local teams made up of two extensionists and two researchers. They conduct on-farm research and validation by unreplicated plots. Social and economic evaluations are included. These activities are effectively being supported by the ongoing AID farming systems project. The availability, however, of CENTA MB-3 and Gandul seed to collaborating farmers was often mentioned as a constraint for a faster acceptance of the tested technologies.

In 1984 a centralized System Department was established consisting of multidisciplinary specialist including the social scientists.

Overall the research department collaborates with CIMMYT, CIAT, PRECODEPA and CATIE. Specific research interaction with CATIE exists in Candelaria de la Frontera and in Jocoro.

Positive opinions of CATIE relate to training and to research that was anticipated within a year. Among negative opinions was that CATIE contracted national staff from CENTA with better conditions creating sensitive differences in the CENTA personnel. In addition, the fact that CATIE managed the project funds was viewed negatively.

Guatemala

The CATIE-ROCAP Project programmed work in animal production in two regions: Tecpan and Nueva Concepcion, and one location for crop production in the Chimaltenango area. The project at Tecpan had to be discontinued because of guerrilla activies in the region. One assistant from ICTA was killed. The crop production work at Chimaltenango was also discontinued for the same reason. In Nueva Concepcion the objective was achieved fully. A follow up program with strong backing from ICTA, DIGESEPE and BANDESA has been developed.

Animal Production

The area of Nueva Concepcion is an "Asentamiento" mainly made up of 20 hectare farms and smaller units. ICTA has been active in crop research and validation activities for farmers who have strong dedication to milk production and maize production in very good soils.

The project began in 1980 with 6 trials, 8 in 1981, 8 in 1982 and 13 in 1983. In total 35 trials were run. They consisted mainly of component research for pasture evaluation and management, new sources of forages and animal nutrition. These trials were conducted generally at the sub-station in Nueva Concepcion and with farmers.

The field team was made of two CATIE staff and two assistants from ICTA. An early characterization identified the availability of feedstuff in the dry season as a major limitation and pasture management in the rainy season as another. The component research led to the identification of modules that included the following alternatives:

- Silage: Leucaena - Napier
- Forage for dry season: Napier, Leucaena

- Construction of dairy facilities.

The project originally established 5 modules that are now reduced to three. They are demonstrating excellent results and set the standards for the promotion of more modules that are being financed by BANDESA with funds from the government of Guatemala. DIGESEPE has assistance teams that supervise the credit. Seven loans have already been assigned and 17 are waiting approval. The goal is 25 per year during four years. The costs of each module including animals, installation, pasture improvement, and fences can be as much as Q27,000. The bank (BANDESA) allows a grace period of four years with 8% interest. The loan is for 10 years.

The main feature of the module is the division of pasture into 18 lots of approximately .5 ha each. The lactating milk cows graze one day per lot and are followed by the dry cows and young stock another day. This allows for a pasture rest period of 16 days. This is done during the rainy season. After November, silage and forage from the Napier field is brought to the animals. The total number of animals in each module of 10 hectares varies form 25 to 40. (One farmer was planning to use his 20 hectares for pasture and handle 95 animals). Another feature is the management of the herd to select out unproductive cows through production records and pregnancy checks.

The success of this project has moved ICTA to start two new projects: in Jutiapa with funds from CIID and IICA and in Cuyuta with funds from BID and FIDA. Also a milk chilling plant is planned for Nueva Concepcion to be built with the farmers cooperation and financial assistance from CIID.

The coming research activities will center around the use of Kudzu

and Canavalia in association with Napier (or King Grass) and handling of manure as fertilizer. Also the genetic improvement of the herd car raise the efficiency of the modules. Present efficiency is attributed more to increase of milk per hectare than per cow.

Crop Production.

The CATIE-ROCAP Project started a vegetable research activity in Chimaltenango in 1978. It ran into serious guerrilla interference and had to be abandoned in 1982. Dr. Donald Kass was assigned to this project that inititated cropping systems studies around the double row maize pattern. Later a one-row maize pattern evolved. There is agreement that technical progress was being made and inter-institutional cooperation with ICTA was also working well.

At present there is much production of vegetables for export to neighboring countries and the US. Various US exporting and freezing companies are carrying on variety and agronomic trials and assisting growers in the region. ICTA is conducting some research of a more basic nature with snow peas and strawberries.

Training

CATIE involvement in training has been adequate according to persons interviewed. However, the number of short term courses and workshops were less towards the end of the project. A reflection of the 1982 evaluation of the project were found in the course-workshop about Validation-Transfer and Communication Methods. It was stated that training needed strengthening.

Conclusions

- CATIE staff were well integrated into the overall ICTA program.
- CATIE worked with commodities in which ICTA had no expertise.

- ICTA personnel learned to work with cattle and with DIGESEPE staff. They have been able to continue with the effort.

Honduras

1. Despite the problems experienced during the Honduran project the general concensus among review team members is that CATIE did have a positive influence on the counterpart personnel working in the secretariat of Natural Resources. This effect was stimulated primarily through training and the personal influence of the CATIE personnel working there.

Honduras has a fledgling research/extension organization which is presently struggling with institutional restructuring, incorporation of a greater on-farm focus as part of this basic methodology, a high rate of personnel turnover in the organization and a budget that barely covers salary which frequently arrives a month or more behind schedule. Except for the present pains of institutional restructuring which didn't begin till the end of the CATIE/ROCAP project, CATIE was faced with how to get on with it's task amidst the multitude of problems.

It is clear that CATIE did have an effect on the institution. Much of CATIE's influence was achieved through training. From 1979 to 1983, 17 training sessions where held with approximately 300 persons receiving training in a wide range of topics, particularly in the area systems research methodology. The idea of working on-farm was a totally new concept for many researchers. The total experience with CATIE and the close alignment with CIMMYT with corn research impart, formed a base of understanding that today is being written into the reorganization plan (INTAGRO) to be submitted to AID for funding. The

reorganization, if achieved, will bring research and extension together in a closer working relationship.

2. Although the animal science section in Natural Resources was formed during a time of close relationship between CATIE and its host country counterparts, the field personnel in Comayagua demonstrate a serious lack of methodological understanding of FSR, while the program directors based in Tegucigalpa are preoccupied with guarding their own turf within the INTAGRO reorganization scheme.

The INTAGRO proposal being submitted by the animal science section indicates their preference to remain separate within any new reorganization scheme. This tendency did and will continue to block progress toward developing an integrated farming systems institutional approach where plant and animal elements must be considered together. It appears that the impact of CATIE's thinking has been slight on the present group in the animal science section. In fact the lack of cooperation between the crops and animal sections in CATIE has permeated down to the country level programs which in part explains the present state of affairs.

Lack of enthusiam and lack of methodological understanding by field personnel in Comayagua are principal reasons why the program with small producers has deteriorated since the end of CATIE project. Animal science section personnel in Comayagua indicated their preference to work with larger or affluent producers who have resources to implement their suggestions. This implies that farming system methodology has not been absorbed and incorporated.

3. The animal science group complained of the high cost of setting-up and maintainning a model on-farm. For this reason they could not

continue with the program as it was managed by CATIE. Their limitation of resources to continue underscores the pitfall of working with complex package that requires large inputs to the farm from outside. The present state of deterioration of the dairy system model work in the Comayagua region brings into question the emphasis given to the tec-pac concept. The present state of the dairy system modules established is as follows:

1) one is working as it was originally established;
2) another stopped when the chopper broke and the cooperating farmer thus removed half of the leucaena planted;
3) another incurred a bad infestation of an irritant weed in the leucaena which prevented it from being harvested; and
4) the forth model was being modified and improved beyond the goals of the project.

The rejection of specific components in the dairy system and the farmer initiated modifications are all healthy signs and demonstrate the role the farmer should plan during an active adoptive research phase. However, the present lack of creative technicians in the field that lack the ability to read signals given by farmers will result in little advancement from the present state.

4. The project remains short of on-farm component research data that can fit into a dairy system model framework. In fact, due to the complexity and high cost of dairy system model and the enumerable modification that will inevitably be made, component research should have been the prime focus of the project. Components could have been tested over a large number of farms, e.g. 30-50 instead of 4, and modifications be made at nominal cost. Farmers could select, modify

and adopt those components suitable to their particular constraints. Results from a large number of trials provides a stron base for partictioning technology recommendations by homogenuous groups and/or measuring technology stability between environments.

5. Little time or money remained in the project when work with the mixed system model began. Consequently the entire model could not be put in place on farms, the team was forced to work with the important components, corn-sorghum, which are traditionally grown and leucaena-sugar cane which were being introduced.

By keying in on the important element dry season supplement, a simplified solution was introduced which showed great potentional for adaption. Today there is a growing demand by farmers for leucaena seed.

6. The dairy system work as it stands has gone backwards. The project remains short of on-farm component research data that could have been fit into a wholistic model framework. The program research has degenerated to a point that importance is given only to distribution of leucaena seed and collection of farm records from the remaining models with no understanding of why or what to do with it. The dairy system which should have been considered as a mixed ystem in the beginning remains in the adoptive research mode and will not move beyond this stage without significant guidance and change in attitude.

7. Cropping systems work with rice in San Jeronimo has been successful particularly that work carried out with weed control and fertilizer application. Farming system methodology, which begins with problem identification and goes through to adoption, was followed more

or less in its entirety with the rice project in San Jeronimo. Validation results of the technology tested indicated that 40% of the farmer group involved continued to use the suggested weed control, 50% of the 22 tested adopted the recommended second fertilization. Net income resulting from application of the tec-pac was slightly higher than the traditional system. The results were convincing and the national agricultural bank has adopted the new recommendations. Results of the Jeronimo rice project demonstrate the power of the methodology when carried to completion using simple technological introductions which are relavent to an indentified farmer need and tested on a large number of farm sites.

8. CATIE imposed its project and its ideas on the Honduran institution, working as a separate entity, particularly in the beginning and in the end creating institutional dependancy on CATIE's resource assistance for all phases of work pertaining to the project and some outside its primary focus.

The Honduran research entity was overly dependant on CATIE funding for purchase of material logistic support and man power. This dependancy is very evident today as evidenced by the decreased level of activity directed toward the CATIE initiated projects that remain. Comments made by lost country personnel indicates their opposition to the level of support CATIE gave the farmers which now they can not offer.

9. The time and energy expended during the characterization phase was not justified by the amount of utilizable information gathered. In most instances the volumes of information gathered during the characcterization phase has not been completely analysed or utilized

in subsequent work. One farmer interview could take up to 4 hours and was still weak in socioeconomic data needed to establish research priorities. It could be concluded that the information taken in some subject areas was so detailed that one couldn't see the forest for the trees.

10. Work initiated with swine production models illustrated a lack of information or interpretation of the characterization results. Swine models were designed to be established on farm. The innovators of this idea failed to realize that because the farmers live away from the farm no one is to care for the pigs. Traditionally pigs reside in and around the houses in the towns which at present negates the possibility of swine models on the farm.

11. The farming systems approach to problem solving was hindered by the lack of a complimentary multidisciplinary field team that had continuity over the life of the project. There was no core field team that worked in a complimentary fashion i.e. backstopping each other in component research directed toward a system. CATIE technicians often worked independently. The potential and productivity of the CATIE program was reduced due to its independant nature. The number of field trials they could manage with their limited core staff was quite reduced. They were unable to have several field teams made up of host country personnel which limited their multiplier effect. Consequently too few on-farm trials were established which resulted in the development of an inadequate data base.

Research objectives that we assume resulted from characterization worked appeared to be too dispersed, non-focused for the resources available.

The individual research projects established did not appear to have direct focus on farmer needs. The observed shortfall in achieving problem solving research designed to meet farmer needs is due to: 1) turnover of CATIE personnel; 2) academic approach used i.e. preocupation with such things as a mathematical model for extrapolation of technology and the creation of tec-pacs; 3) centralized approach to research, i.e. heavy dependance on CATIE/Turrialba base group for project backstopping in design and analysis of results; 4) lack of farm orientation for technology generation and testing, i.e. there is need for closer association of CATIE personnel with farmer and greater numbers of on-farm trials; 5) simplicity of on-farm trials needed to facilitate of on-site analysis and interpretation of results. This is particularly true with mild and mixed systems model work which was made complicated by working with all innovation at once instead of one or two most important components.

Panama

The Panamanian Agricultural Research Institute (Instituto de Investigacion Agropecuaria de Panama, IDIAP) was founded in 1974. It is an autonomous institution. It is divided into three geographic regions: east, central, and west, each being semi-autonomous from the central organization. In this way IDIAP is organized in such a way so as to be able to work on regional (if not local) problems. In addition, IDIAP has local agencies staffed by personnel who either live at the agency or in a near-by community. This set-up enhances researcher-producer interaction.

Crop Production

The CATIE Project began in Panama in 1979. In the crop production activities two CATIE staff (Washington Bejarano and Phillip Shannon) were backed by two agronomists from IDIAP and up to five field assistants. They worked in two areas: Guarumal in the Corregimiento of Guarumal in the District of Veraguas and in the Corregimiento of Progreso, Province of Chiriqui. Characterization was conducted and a sequence of exploratory component validation trials were planned and executed from 1980 to 1984. The validation plots combined the best components in each case. A limitation on ready availability of seed of the new varieties recommended was mentioned.

Guarumal

In rice, the validated package was based upon the use of a new variety (CR 5272) modified fertilizer practice and improved timing and selection of herbicides. The combination demonstrated a 28% increase in yield at a similar cost. The number of validation trials in 1983 were 8, contributing to a total of 120 on-farm trials in the four year

period.

A visit was made to two asentamientos where validation trials were conducted. Farmers demonstrated a total lack of knowledge of what alternatives were being validated. Just a few months after the end of the Project, the local IDIAP team, made up of two agronomists and one assistant were limited to carry on only 3 validation trials on farms and three experimental trials in their otherwise excellent facilities at the edge of Guarumal. There was confusion about different recommendations being offered by IDIAP, the BDA (Agricultural Development Bank) and MIDA in the region.

The experiments conducted at their headquarter were fertilization of igname, fertilization of otoe and planting time of maize. The experiments seem to have been decided upon via a top-down approach, originating from the Proyecto Rural Integrado being conducted in the region.

Maize had been considered as a worthwhile alternative to introduce in the area. Some mention was made about related research, but no evident follow-up was noticed in the short visit.

Progreso

A more professional IDIAP team is following up work done during the CATIE Project. The number of rice trials, however, was reduced from 60 to 8. In the four year period the total number of trials approximated 200. Reasons given for this reduction include:

- Alternatives now available satisfy felt needs; and
- Shift of priority from rice to banana and plantain and maize.

The validated alternative applies research pointing to the lack of response to phosphorus. It changed the common practice of fertilizing

with complete fertilizer followed by urea application to ammonium application followed by two applications of urea. Also the weed control was changed to two applications of herbicide instead of one application: the first at 8-12 days and the second at 28 days. The alternative, it was said, increased yield by 28% and reduced cost by $30/ha. The information was validated in 20 locations where CATIE paid for inputs and farmers for labor. At present, the BDA gives credit to 60% of farmers in the region taking into consideration the IDIAP recommendations.

Livestock Production

The effort of the CATIE FSR Project for livestock in Panama was limited to cattle production in the Bugaba area. In the approximately six years of the Project, two project-funded livestock experts were employed. There was about a year's lapse between the first and the last. The last one, Mike Sands, was stationed in David, Chiriqui, for two and a half year. He required about a year to get organized and design alternatives and thus had only about 1.5 years to do field trials and validate the alternatives. The field trials included work on grazing intervals, fertilization, and calf management systems. In addition, work was performed in the areas of mineral requirements and parasite control.

The experts had the collaboration of an IDIAP technician and a field assistant. This is a small team, but it was not over-burdened by their work load. Sands stated that he had little to build upon from previous work in the area. He mounted five validation trials which have been maintained and four control farms.

According to the IDIAP staff, 2 years were spent on

characterization and problem definition; one year was used for design of alternatives and research, and two years for validation. It seems that during the initial two year period some component research was also done. It was difficult to ascertain how this research was applied in the design of alternatives.

The team visited three of the five producers whose farms continued to serve as bases of the validation trials. Project personnel participated in the improvement of pasture and pasture management, herd management and animal health practices. The project paid for all inputs except labor to accomplish these improvements during the first and second year. The producers supplied their own labor as well as any hired labor that was required. The labor was required to install adequate fencing to accomodate herd and pasture management improvements. There is no apparent system of production that is being promoted by the IDIAP team. Each producer has been handled as a separate case. Thus, there is a wide array of forages and pastures that are being used by producers.

The following points became clear through the visits with IDIAP personnel and producers:

- Little, if any, cattle research is being conducted. Almost all work is extension work.
- Little is known about animal-forage interactions. This aspect should be investigated.
- Although kudzu is being promoted in association, minimal research has been done on its management. Availability of kudzu seed was lacking and no mechanism seemed to be in course to solve this limitation.

- The improvements being promoted by IDIAP personnel could increase milk production by at least 30%. Calving rates of from 70% - 80% could be attained (as compared to about 40% which are currently attained).
- The IDIAP personnel at Bugaba is well-motivated. As evidenced by the type of work being done, however, it lacks focus. Short (0.5 - 1.5 years) and medium (1.0 - 2.5 years) term research programs and goals should be drawn-up to improve the focus.
- The structure of IDIAP seems well-suited to carry-out research in the farming-systems mode.
- Existing facilities are under-utilized. Bigger multidisciplinary teams, including animal production and social scientists as required, would improve utilization. The larger teams could then better establish local research priorities and carry-out and analyze relevant field trials themselves. The backing of specialized, professional senior staff teams from the national level should be accorded the local teams. (International assistance could also contribute to a stronger local team).
- There is a tendency for top-down decision-making regarding research priorities. Less research is done according to local priorities than should be the case.

CONCLUSIONS AND RECOMMENDATIONS

In 1979, CATIE had little experience in farming systems research. As has been common the world over an overly academic, discipline-oriented approach to research made FSR execution more difficult. The combination of lack of experience and discipline orientation caused some problems for the project. As time has passed CATIE staff has learned. It is highly probable that the staff would not now design an FSR project exactly like the one developed in 1979. We feel, however, that some of the faults would be repeated unless they are pointed-out. Keeping this in mind, and realizing that the members of the evaluation team have also learned some insight since 1979, the following conclusions and recommendations are made. (The evaluation team understands that CATIE has already started working, along the lines of some of the recommendations. We apologize if we seem redundant). The discussion is divided into groups. We realize, however, that there is a good deal of overlap among the groups.

Training

Training was one of the strongest components of the project. Many courses, in one form or other, were presented to a wide variety of participants at a variety of locations. One of the reasons that the training program was successful was the existence of a staff at Turrialba that assumed teaching responsibilities. A lack of understanding of FSR/E philosophy and methodology by the CATIE staff assigned to other projects, however, was noted. The following recommendations are made:

T.1 A part of the CATIE core staff should be responsible for coordinating and leading courses in FSR/E.

T.2 The understanding of FSR/E by other core staff should be enhanced via short-courses presented by the knowledgeable staff.

T.3 Project personnel --especially field personnel-- should be more throughly trained in FSR/E.

At present CATIE is coordinating several projects that would benefit from a farming systems approach. The projects are:

- Firewood and alternate energy sources;
- Watershed management; and
- Integrated pest management

Effort should be made to instruct on-campus and field personnel in FSR/E methods.

T.4 CATIE remain involved in instructing appropriate personnel of member-country institutions in FSR/E techniques and methodology. Some extension personnel should be included in the training exercises.

T.5 The expansion of the teaching faculty at CATIE should be used as an opportunity to allow for a minor in Farming Systems. (Such a program exists at the University of Florida. The program has been quite succesful).

Methodology

The evaluation team considers that a successful approach to on-farm research is through the use of a non-sophisticated methodology that spans the initial problem identification phase to final technology generation and dissemination. The generation of technology

that has simple techniques and that is developed by using a large number of on-farm tests, with the farmers incorporated into the research team, should be the goal of such work. This approach has proven effective in the generation of appropriate technology that will be adapted, accepted and incorporated by the farmer into his system. As indicated by the large number of sophisticated publications developed under this project, we believe that CATIE spent too much effort addressing the scientific community and not collaborating farmers and extension workers. The following recommendations reflect our belief that an FSR endeavour must be structured differently from the structure associated with on-station work.

M.1 Less base-line data should be collected. In addition less detailed descriptive information during the on-farm research stage should be collected. This would permit the data to be analyzed at the local level, thereby improving turn-around and increasing information feed-back to the research effort.

M.2 The team has used a different definition for Validation than CATIE has used (see text). According to the definition used by the team, Validation was the weakest phase in the methodology. Because inputs were purchased for producers, the reliability of the validation trials is questionable. To increase reliability

- The number of trials of components and tech packs needs to be increased greatly (30 or more per technique); and
- Validation trials must be farmer managed and financed.

M.3 The crop and livestock production departments of CATIE have not cooperated with each other to the extent necessary to

perform a high level of mixed systems research. Because in most cases the farming system is a mixed system (with crop and animal subsystems), the two departments must coordinate their efforts more effectively in order to increase the effectiveness of the reesearch effort.

M.4 Much component research was performed to form the basis for a large proportion of the crop research effort. This was not the case with much of the livestock research. In either case, however, validation of single components or logical component pairs should be performed. (For example, in crops, variety and density for maize in Comayagua could be tested jointly. In animals, kudzu-Guinee grass management in Panama should be researched.) At present, a cattle producer who cannot adopt the entire module is likely to reject it in en toto. Component validation could improve the acceptance index of some of the more critical components of the cattle module.

M.5 In animal production or mixed systems, many components are strictly agronomic (forage and feed crops). These components should be tested over a wider area than the animal components to account for the environmental interaction.

M.6 In the FSR/E methodology it is important that research address the needs that have been identified at the farm level.

- In the event that a project is (partially) based upon a national policy or opportunity potential, e.g. new export crops, the adaptability of the commodity into the farming

system must be studied. Depending upon circumstances and knowledge, research should start on the experiment station or with on-farm trials.

National Institutions

N.1 CATIE should emphasize work with on-going national projects. It should strengthen existing field teams (with professionals holding M.S. or lesser degrees) and/or the implementing institutional team of senior staff via training or by supplying the necessary personnel.

N.2 A greater number of larger multidisciplinary teams (not necessarily CATIE staff) should be in the field. The teams should be strengthened (as compared to present teams) through the addition of more disciplines. An important criterion for field team staff selection should be good previous field experience.

N.3 The addition of the V/T stage to the project indicates that it was realized that the research-extension link had to be strengthened. This is still true in most of the participating countries. By including extensionists in the field teams the link would be strengthened.

N.4 The addition of more field teams would increase the efficiency of regional (or central) teams. The increased efficiency could be put to good use in an information networking system. Each participating country should have an information network hub.

N.5 In the event that no FSR/E project exists and it is requested

that CATIE initiate one, it is recommended that CATIE promote a limited pilot project. Such a project must have strong national participation.

Documentation

Although the subject of this section can be considered a part of the section entitled CATIE, we believe the issues regarding documentation to be so important so as to require their own section. CATIE, the Centro Agronomico Tropical de Investigacion y Ensenanza, is a research and teaching institution. In a project like the SFPS project it is logical that the national counterpart institutions be research institutions. This does not mean, however, that the staff of research institutions are the only users of documents prepared by CATIE personnel. The docments prepared under the CATIE banner for this project unfortunately have been addressed almost solely to that audience or client group. The documents have been presented very well, professionally written and have tended to be beyond the scope of most extension personnel. Additionally, we frequently heard the complaint that the research analyses or documents were not availale in a timely fashion.

Research institutions are the counterparts for CATIE's research efforts. The clients for the training efforts are both research and extension personnel. In order to better address this clientele in a more timely fashion we recommend:

D.1 That CATIE include more extension personnel in short courses dealing with applied research. Documents be prepared especially for such short courses.

D.2 There should be a greater emphasis on the preparation of documents specifically for the use of extension personnel in the field. These documents could be in the form of extension bulletins or circulars and fact sheets. (They could be used by the more sophisticated producers as well as extension personnel.) Such documentation would increase the speed and effectiveness of getting research results into the hands of those who should apply the results. Additionally, it could improve the efficiency of the feed-back from the field to researchers.

D.3 We believe that the research performed by CATIE is important. When enough on-farm (or other) trials are included so that statistical analysis can be performed, the research should be reported. Thus, if the documents described above are produced, CATIE research personnel could devote some of their present publication effort to preparing papers for professional journals. (Such publication opportunities would help to attract additional staff to CATIE.)

CATIE

This section pertains to CATIE itself. In it we try to explain our views as to the areas in which CATIE should focus its efforts. A statement about the CATIE-ROCAP relationship is also made.

C.1 CATIE should help to enhance the information network in the

region. It could start with information about products in which CATIE already has acknowledged expertise.

C.2 CATIE is the only institution in the region that performs research on certain commodities. It can take advantage of the situation by serving as a major source for personnel and information. These areas include livestock, perennial and tree crops, and forest products. It is realized that this includes products that might be new to an area. (See recommendation M.6 in which this possibility is discussed.)

C.3 The team found that in some cases --Honduras (Leucaena), Panama (Kudzu and Rice CR5272), and El Salvador (Maize CENTA MB 3)-- good seed was not available in either adequate quantities or in a timely fashion. This is a constraint to the acceptance to improved technologies. A seed production and distribution system which would address the needs of the small farm in a reliable fashion should be developed. It is recommended that a coordinated regional effort be established to promote research and production and distribution mechanisms which address local needs.

C.4 Some of the agreement (ProAg) requirements imposed on the project were counter productive. The late inclusion of V/T caused a diversion of energy from research to validation. In most cases the validation was premature. Most of the characterizations, which had to be published, were published too late to be used as feed-back into the research scheme. The ROCAP - CATIE relationship should be more client-directed in the area of research.

C.5 There has been little interaction between this project staff and other farming systems groups. If some core CATIE staff were involved with FSR/E on a continous basis, a representative should attend the annual international farming systems, a staff representative should attend if there is interest in farming systems at the institutional level.

C.6 CATIE should work through existing national FSR/E projects. It should not operate independently. This institutional apporach would help to ensure the continuity of project.

C.7 CATIE should give-up attempts at the highly technical and expensive form of extrapolation that it has investigated. A good multidisciplinary team could perform the extrapolation function in a much more efficient manner.

C.8 An independent farming systems research project should be discontinued at CATIE. The FSR/E methodology should be included in present and future projects. The FSR/E methodology would be useful in new project design as well as most aspects of any project that directly includes producers.

ANNEX I

PEOPLE CONTACTED

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PANAMA

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Otro	

Pedro Gordon	ex Director de Servicio de Extension, Gerente General de Melo y Cia, SA

ANNEX II

TERMS OF REFERENCE

Attachment No. I
PIO/T No. 596-0000.3-3-50025
596-0000.6-3-50026

Statement of Work

A. General

The work required under this contract is a final evaluation of AID/ROCAP Project No. 596-0083, Small Farm Production Systems, an agricultural research effort being carried out through the Tropical Agronomic Center for Research and Training (CATIE) in Panama, Costa Rica, Nicaragua, Guatemala, Honduras, and El Salvador. Life-of-project funding was $ 8.0 million, and the project completion date was extended twice resulting in a total project life of six and one half years. The project termination date is now 9/30/85.

The goal of the project formulated in the original project paper was "to improve the regional conditions in which the rural poor will have increased outputs and income from the land they work". The project purpose is "to develop a continuing Central American expertise to conduct and convey small farmer crop, animal and mixed-farming production systems research".

End-of-project conditions in the original PP are as follows:

- National institutions will be conducting production system and transfer research as developed in conjunction with CATIE.
- Trained personnel within national institutions will be producing systems recommendations and exchanging this information with other countries of the isthmus.
- Modes for transferring production systems recommendations will have been developed and tested.
- The CA countries will have recognized the importance of production systems research and CATIE's leadership in this research area.

Original outputs which were to have been accomplished during the course of the project are as follows:

1. Project Outputs

   a. Methodology for development of crop, animal and mixed farming systems recommendations.

2. Magnitude of Outputs

   a. One recommendation development methodology for animal and mixed farming; refinement of cropping system recommendation methodology.

b. Crop, animal and mixed farming system recommendations for specific areas.	b. Ten cropping system, six animal system, and six mixed farming recommendations.
c. Baseline information and research results where small farms are concentrated.	c. Information on eighteen analogous geographic areas (replicable production areas).
d. Extrapolation methodology for transfer of cropping systems recommendations from one geographic area to another.	d. One evaluated and disseminated extrapolation methodology.
e. Recommendations for transfer of production system techpacks to small farmers.	e. Two thoroughly researched and tested transfer recommendations.
f. Formal training through short courses and graduate training.	f. Eight cropping system, four animal system and eight information transfer courses for national technical personnel; Master's level training for ten technicians from collaborating institutions.
g. In-service training through direct participation in field research.	g. Eighteen national research technicians.
h. Institutional capacity to continue technical assistance for production and transfer of recommendations.	h. CATIE permanent staff capable of advising and assisting national agencies.

In September 1982, an evaluation of the project carried out by Experience, Inc. recommended an extension of the project to allow more time for the team to carry out the animal production and mixed systems phases of the project. A PP amendment dated 6/22/83 subsequently extended the project completion date from September 30, 1983 to June 30, 1985 and increased life of project funding by $ 597,000 to a new total of $ 8.0 million. Although project outputs expanded slightly, the purpose of the project extension was to focus on meeting the original outputs and do so with the highest level of scientific confidence. Changes in the four components of the project were as follows:

— Farming Systems Research (FSR). Three different systems were being examined under this component: crops, animals, and mixed (crop-animal). Research on crops was almost complete, while the animal and mixed systems were lagging due to slow start-up of research activities, as well as the longer production cycle of animals and the corresponding need for additional time to complete the research. Consequently, most research activities during the extension period were to be on the animal and mixed systems. This component also includes the on farm validation of each system (i.e., demonstrating that the technologies developed are workable in a small farm setting).

— Transfer. Mechanisms for transferring the systems methodologies (tech packs) to the small farmer via host country agencies were being developed under this component. An important element of the component was training of host country personnel in the use of the transfer mechanisms. Progress was closely tied to the availability of research results and recommended tech packs under the FSR. Therefore, most efforts focused on the cropping systems, but were to turn to the animal and mixed systems during the extension period.

— Extrapolation. Activities under this component were limited to the cropping systems. A methodology was developed for the introduction of a system into an analogous area without the need for prolonged site specific research. Preliminary testing of the methodology was also conducted and, with the additional time provided by the extension, a second test was to be completed to provide two full years of data for analysis and use in technical modifications.

— Training. Included in this component were short-term workshops, seminars, and courses for technicians from national institutions as well as a limited amount of Master's-level training at CATIE. These activities were on-going and were to continue over the extension period, with particular emphasis on strenghtening the outreach capacity of national technicians.

Revised outputs under the PP amendment were as follows:

— Farming Systems Research. Recommendations for up to 13 crop systems, 7 animal systems and 6 mixed systems developed, with 10 crop, 7 animal and a minimum of 4 mixed systems to be validated.

— Transfer. A methodology, including verification of its technical and economic performance, developed and training provided which enables national institutions to transfer recommended systems to the direct management of target farmers.

— Extrapolation. An analogous area methodology developed and tested under one set of production determinants and which includes the description and results of five trial sites in the region.

— Training. Over 1000 national level personnel trained in seminars and workshops presented on the production systems, validation, transfer and extrapolation; in addition, 11 Masters level degrees completed at CATIE.

During May and June of 1985, an analysis of the impact this project has had on national research, extension, and development programs, was carried out by Dr. James Jones of the University of Florida as an outgrowth of a seminar entitled "Farming Systems Research and its Contribution to Development in Latin America" held in April 1985. The seminar was jointly sponsored by CATIE and the AID/University of Florida Farming Systems Support Project to analyze various approaches to farming systems research, including that developed by CATIE under Project 596-0083. Dr. Jones' report should be completed by late July, and he will be available to brief the evaluation team on the findings of the report at the University of Florida.

This final evaluation, then, should review the total effort carried out under this project, record the benefits accrued to the region from the project, and provide CATIE and AID/ROCAP with guidance on future actions which should be undertaken in this area.

B. Specific Tasks

The contractor shall provide a team to perform the following tasks:

a. Assess the effectiveness of the organizational and administrative structure of CATIE and national institutions to carry out multi-disciplinary research on crop/animal/mixed farming systems on a continuing basis.

b. Evaluate if CATIE, through the project, has been effective in stimulating national interest and improving national capability in farming systems research/outreach and if it has measurably enhanced cooperation and collaboration between national and regional entities.

c. Determine whether the project has demonstrated promise or potential for increasing production and productivity of food crops, animals, and combination of crops and animals on individual farms.

d. Conduct a cost/benefit or appropriate quantitative analysis to the extent possible of the actual and projected benefits through 1995 resulting from the project (i.e. institutional strengthening, development of new/improved technologies, training of scientists).

e. Assess the effectiveness of analyzing, storing, and disseminating research results by CATIE and national research agencies.

f. Evaluate whether the project has contributed to the long-term improvement of CATIE's research capability in farming systems, to the long-term viability of CATIE, and to the continuity of farming systems research within the region. Does CATIE now have the capacity to respond to requests for information and technical assistance from national programs?

g. Identify any lessons learned that should be applied to improve future development efforts.

h. Evaluate methodologies and procedures used by the integrated research and technical teams at CATIE in site selection, experimental design, selection basis for research treatments used in experiments, experiment execution, monitoring, data collection, processing, analysis and dissemination.

i. Evaluate the quantity, quality, cost-effectiveness and appropriateness of project funded training to the needs and priorities of the region.

j. Review research publications to determine:

1. Whether they were prepared and presented to give a clear understanding of what CATIE and the national agencies are doing; whether research reports meet high scientific standards for format and content.

2. Whether research and extension personnel in national institutions are aware of these reports and find the information therein relevant to their needs.

3. Whether additional types of publications are required to adequately disseminate information obtained.

k. Determine if planned levels of financial and personnel contributions by CATIE, national agencies, other donors, and ROCAP were provided as planned and were sufficient to achieve the project outputs and the project purpose.

l. Analyze the relationship of this project to any other AID-funded small farmer research programs at the country level within the region and elsewhere.

m. Determine how effective CATIE sponsored seminars/conferences and training activities related to this project have been in increasing the understanding of farming systems research in the region.

n. Determine other benefits from this project which were not foreseen when the project was designed (i.e. assistance provided to CATIE's overall graduate program, to elaboration/implementation of new project activities).

C. Team Composition

ROCAP suggests a three-person team to conduct the evaluation. The team leader will be responsible for completion of the draft and final report, and debriefing CATIE and ROCAP prior to departure. The team should be qualified to address the following subject areas:

1. Farming systems research methodology.

2. Crop production, livestock production and mixed production systems including cereals and vegetables crops, cattle and swine.

3. Agricultural production economics.

4. Agricultural extension, including linkages between research and extension agencies.

5. Data collection and analysis.

6. Institutional management/reinforcement.

Team members should have a minimum of five years experience including time in developing countries. They should be familiar with agriculture and institutions in Latin America and able to read documents and conduct interviews in Spanish.

D. Timing/Reports

The evaluation will require services of the team members for five weeks over the period July 19, 1985 to September 23, 1985. The team will spend approximately one (1) week at CATIE to begin the evaluation, then two and one

half (2 1/2) weeks visiting project activity sites in Guatemala, Honduras, El Salvador, Costa Rica and Panama, followed by one and a half (1 1/2) weeks at CATIE to prepare the draft evaluation report and debrief CATIE and ROCAP. Comments on the draft document will be provided by CATIE and ROCAP to the team leader (in the U.S.) within two (2) weeks of the debriefing. The final report (5 copies) is due in English, delivered to ROCAP/San Jose, by October 15, 1985.

ANNEX III

COMMENTS BY CATIE AND OBSERVATIONS

ANEXO

Comentarios del CATIE al informe de evaluación del Proyecto Sistemas de Producción para Fincas Pequeñas

Luego de haber revisado el informe de evaluación del Proyecto de referencia, nos complace ver que existen numerosas y valiosas coincidencias entre nuestra propia apreciación del proyecto y la de los evaluadores, particularmente considerando que el volumen de información proveniente de la propia investigación y el número de técnicos e instituciones involucradas hacen difícil una evaluación de este tipo. A pesar de ello la evaluación del Proyecto SFPS por el grupo contratado por la Universidad de Florida, muestra buen grado de objetividad, ya que ha sido capaz de captar las limitaciones institucionales y prácticas dentro de las cuales CATIE tuvo que desarrollar su trabajo de investigación en sistemas.

No obstante, es importante puntualizar algunos aspectos que, a juicio de CATIE, debieran incluirse en el informe final de evaluación.

1. Es importante señalar que el CATIE ha participado en reuniones sobre el tópico de investigación en sistemas de fincas a lo largo de la vida del Proyecto.

El CATIE inició la integración de los aspectos de cultivos y animales para lograr avances en el cumplimiento del elemento de sistemas mxitos. Entre las actividades realizadas figuran la reunión de trabajo sobre investigación de Sistemas con Cultivos y Animales de 1982.

En tal reunión quedó establecdio el estado de integración de los aspectos cultivos y animal en otras partes del mundo.

2. Es de crucial importancia recalcar la aparente diferencia conceptual entre el equipo evaluador y CATIE. Es evidente que la Universidad de Florida tiene sus propias experiencias en el campo de la investigación en sistemas, lo cual le ha permitido desarrollar su propiesta metodológica; al mismo tiempo que CATIE ha desarrollado la suya. Sin embargo, ambas propuestas difieren tanto conceptualmente como en la forma de implementación de algunas de sus etapas; por lo tanto, la evaluación de cada etapa de la propuesta metodlógica del CATIE debe hacerse con base en ella misma y/o en sus propias definiciones, características y limitaciones. Esta diferencia se hace patente especialmente en las etapas de caracterización y validación.

En este contexto es importante recordar que cualquier proceso metodológico debe ser evaluado en función de su propia coherencia interna, así como de su flexibilidad para ser eficientemente implementado en la práctica. Al evaluar la metodología y/o la investigación en el campo el equipo evaluador usó un enfoque lineas, en el cual, se separó la propuesta teórica de su capacidad para responder adecuadamente a la realidad. Además, reconoce las limitaciones estructurales e institucionales dentro de las cuales CATIE debió operar. Sin embargo, la evaluación no propone cambios alternativos. En este sentido cabe mencionar las siguientes diferencias de opinión por parte de CATIE.

a) El elemento Validación/Transferencia (V/T) fue programado con base en disuciones con especialista en extensión contratadas por el proyecto de común acuerdo con ROCAP. Al momento de hacer tal programación se acordó definir el trabajo que se haría en V/T. La evaluación debió hacerse de acuerdo a tal definición. La definición acordada entre CATIE y la Gerencia del Proyecto por parte de ROCAP fue la base para el plan de trabajo que originó la enmiendad III

del qq de mayo de 1982. Posteriormente se contrató un consultor de los Estados Unidos para que revisara uno de los elementos de V/T. La opinión del consultor en esa oportunidad fue positiva. Por esa razón se mantuvo la definición del término V/T tal como fuera propuesto por el CATIE.

El proceso de validación tanto en producción animal como en sistemas mixtos no fue realizado de acuerdo con las definiciones metodlógicas, debido a las limitaciones de tiempo. Aunque el grupo evaluador reconoce esta limitante, excluye totalmente de su análisis la experiencia real de validación de la alternativa de producción animal realizada en las regiones de San Carlos, Río Frío y Zonafluca en Costa Rica, lo caual fue ampliamente discutivo con el grupo.

En consecuencia, la opinión del equipo evaluador en cuanto a las definiciones de los términos Validación, Transferencia y V/T son bienvenidas pero no son aceptables al CATIE como patrón para la evaluación. Parece que los evaluadores no profundizaron en su entrevista con el coordinador de V/T acerca de los motivos para definir V/T en los términos como se hizo.

b) En cuanto al elemento Extrapolación, la opinión del equipo evaluador del proyecto está basado en suposiciones muy particulares; una es que la metodología debería ser útil al agricultor de escasos recursos; la otra que la información que sería extrapolada entraría directamente a la fase de validación/transferencia de la metodología.

El equipo del CATIE tiene otra conceptualización, acerca de la utilidad de extrapolación. Basicamente la capacidad de extrapolar proporcionaría conocimientos para desarrollar o tener mejor capacidad para diseñarmejores opciones. Autoridades reconocidas en la investigación de Sistemas de Cultivos y Fincas indican que un equipo de investigación de sistema debe buscar desarrollar una

capacidad de diseño..

El equipo evaluador señala en su informe que no hay información agroclimática confiable en la región que justifique el concepto de extrapolación. El CATIE no puede aceptar esa afirmación porque los estudios y trabajos realizados por CATIE demuestran lo contrario; entre estos estudios están análisis de la canícula para la vertiente pacífica de Centro América y el cálculo de balances hídricos realizados para áreas específicas representativas. Se debe añadir que la información agroclimática no es solamente necesaria para FSR/E. La investigación en componentes necesista de tal información, también.

La observación del equipo evaluador que los modelos usados tomaron en cuenta factores biológicos solamente y no condiciones socioeconómicas no debe considerarse como negativo en la metodología. Se debe recordar que el proyecto era regional y los tipos de tierra y clima cruzan fronteras lo que produce diferencias socioeconómicas que modifican el manejo que se desea a los sistemas estudiados. Los aspectos socioeconómicos determinan las variantes de manejo de los sistemas. Para simplificar la metodología se identifcaron las variables biofísicas que determinaron el sistema, ya que éstas se mantiene a través del área seleccionada en Centro América. El acoplamiento de la tecnología que puede ser extrapolada constituye así, un insumo valioso a la fase de diseño de opciones tecnológicas.

3. Las observaciones en cuanto a los aspectos de manejo del proyecto en los países no reflejan los esfuerzos del CATIE para buscar la mejor manera de institucionalizar FSR/E y cumplir al mismo tiempo con los términos del convenio CATIE/ROCAP. Debe recordarse que el proceso seguido por ROCAP antes de iniciar el proyecto incluyó una consulta a cada organización de investigación del país

o a la Secretaría de Estado rectora correspondiente quienes indicaron la disposición de participar. Al momento de realizar el proyecto, CATIE debió trabajar en cada país a pesar de los cambios que ocurrieron en algunos de ellos. En cierto sentido, el esfuerzo era nacional pero con elementos muy fuertes hacia la región. Esto último presentó muchas ventajas para elementos tales como: Extrapolación y V/T y que, permitía estudiar la influencia de un rango más amplio de variabilidad que las encontradas en un solo país.

a) CATIE no impuso el proyecto a ningún país. Todos los países a través de sus representantes solicitaron la participación del CATIE en FSR/E. En algunos casos pedían más involucración del CATIE en aspectos tales como: organización administrativa por realizar FSR/E, preparación de proyectos FSR/E para solicitar financiamiento a organizaciones apropiadas y en el caso de uno de los países, ayuda para administrar fondos de convenios suscritos por agencias internacionales para hacer FSR/E. Los representantes del país mencionado creen que la administración de fondos por el CATIE les da mayor flexibilidad para utilizar fondos externos adecuadamente.

b) En varios párrafos del informe aparece la sugerencia del equipo evaluador de que CATIE use metodología no sofisticada para FSR/E. El CATIE ha utilizado la tecnología disponible en la región y los Estados Unidos para el análisis de los datos numéricos. En el caso de extrapolación, se debe pensar que la no utilización de los modelos cuantitativos disponibles podría significar un retraso para la generalización de los resultados beneficiosos de las opciones producidas.

c) El módulo lechero desarrollado en la Estación Experimental del CATIE, no tuvo como objetivo fundamental servir de base para el trabajo desarro-

llado en los países por este Proyecto, ya que por su propia naturaleza ("sofisticación" y costos) y la zona ecológica donde se encuentra limitan la probabilidad de extrapolación. Es por lo tanto redundante cualquier comentario con respecto a este módulo y su conexión con los trabajos realizados en los países, y es todavía más peligroso concluir a partir de esta opinión que el trabajo en sistemas de producción debe ser terminado a nivel de CATIE.

En CATIE podrían realizarse algunos de los trabajos de investigación en sistemas de producción, siempre y cuando éstos respondan estrictamente a las necesidades detectadas en los países en zonas ecológicas semejantes. Trabajos específicos de investigación en componentes, especialmente dado sus costos, podrían sin duda ser efectuados en CATIE.

En otras palabras, aunque la mayor parte del trabajo en sistemas de producción debe ser realizada en las áreas de los proyectos en los países conjuntamente con las instituciones nacionales, ya sea en Estaciones Experimentales o si la situación lo permite, en las fincas de los agricultores, no se puede excluir definitivamente la posibilidad de realizar alguna investigación en sistemas en CATIE.

d) Es necesario aclarar que la alternativa tecnológica desarrollada para El Salvador tenía como objetivo fundamental reducir costos unitarios de producción. Los resultados muestran que efectivamente el objetivo fue logrado y además se consiguieron aumentos en productividad. Por lo tanto, se espera que el impacto potencial de esta alternativa sea significativa a nivel de los pequeños productores, ya que para ellos una reducción en costos de producción es fundamental.

5. El tratamiento del proceso de generación y retroalimentación de la información proveniente de la investigación de sistemas en los respectivos países, pareciera haber sido evaluado por partes, perdiéndose así la perspectiva de la articulación entre ellas, lo cual conduce a una falta de compresión del proceso de generación de información y uso de la misma. En este caso específico, vale aclarar que la información generada en los países vuelve a los mismo en la siguiente forma:

- Información original en cinta magnética y salida de computador, caso considerado por el grupo evaluador como anecdótico.
- Información analizada mensualmente en los respectivos documentos para cada país.
- Información interpretada y presentada de manera accesible en panfletos apropiados para técnicos agrícolas y/o campesinos.
- Información evaluada finca por finca con y para los productores.

Es interesante observar como se hace una crítica genérica que puede ser pertinente, sin embargo, no llega a proponerse procesos alternativos que podrían mejorar el procedimiento actual.

b) Las publicaciones del CATIE correspondientes a las alternativas incluyen apartes que pueden ser utilizadas para preparar material de divulgación. El material preparado por el CATIE ha sido estructurado de tal manera que da al técnico nacional la información necesaria para apoyar la validez de él o los cambios propuestos. También, tiene el propósito de describir el sistema más frecuente de los agricultores estudiados al momento de finalizar la caracterización.

c) La publicación de las caracterizaciones se que sometió a ROCAP se hizo al final del Proyecto por motivos de practicidad para cumplir con los

requerimientos del proyecto. Sin embargo, la caracterización inicial y las versiones mejoradas durante la vida del proyecto estuvieron disponibles al equipo del CATIE y las instituciones nacionales hace ya más de 4 y 2 años, respectivamente.

Las aproximaciones sucesivas de las alternativas tienen incorporada la información actualizada. Tanto la caracterización inicial, como los diagnósticos dinámicos fueron incluídos en documentos de trabajo para uso del equipo investigador del CATIE.

6. Es difícil comprender la distorsión de entendimiento de la propuesta de la red de Technology for Development, la cual es caracterizada como que "CATIE no ha sido capaz de entender e incorporar en esta propuesta las lecciones del proyecto acutal... es aparente que los objetivos son definidos from the top down..." Además del grupo evaluador caracteriza la propuesta como demasiado centralizada en CATIE. Es evidente que la propuesta no fue entendida a pesar del tiempo dedicado a explicarla a uno de los miembros del equipo. Para aclarar vale la pena presentar los aspectos principales de la propuesta que se mencionan en el documento del grupo evaluador.

- La propuesta detallada del proyecto en cada país será definida conjuntamente con las instituciones nacionales pertinentes. La participación dinámica permanente de esta instituciones es absolutamente necesaria para ejecutar eficientemente estas actividades.

- Se definieron tentativamente, dos áreas ecológicas en cada país con el objetio de estimar los requerimientos mínimos, tanto financieros como de personal. Esto no excluye la posibilidad de tener que seleccionar un mayor número de áreas por país.
  Los problemas de cada área serán analizados con las instituciones nacionales.

- Se descentralizará al máximo el trabajo de la red, incluyendo el tratamiento de la información, para lo cual se

ha presupuestado personal y equipo para cada país.

Varios de los elementos observados por la misión evaluadora en producc: naimal y/o sistemas mixtos, ya habían sido detectados a lo largo del proyecto por los técnicos de CATIE. De hecho se hicieron las correcciones posibles a lc largo del camino, especialmente durante el último año y medio. Entre otras es evidente que es necesario:

- Fortalecer las articulaciones interdepartamentales en CATIE;
- fortalecer el trabajo en sistemas de producción en el Departamento de Producción Animal;
- incrementar la integración con las instituciones nacionales;
- descentralizar algunas actividades de CATIE, para ser realizadas en los países. Esto es especialmente necesario para la investigación en componentes y el manejo de la información;
- aumentar el énfasis en capacitación de investigación en sistemas del personal nacional.

Estos elementos, entre otros, han sido considerados durante la preparación de la propuesta de CATIE para formalizar su trabajo en sistemas.

Algunas de las conclusiones y recomendaciones finales del equipo sugieren que CATIE incursione en actividades de extesnión propiamente dichas, si tales sugerencias son aceptadas esto implicaría ampliación de los objetivos del CATIE.

En el borrados aparce un comentario sobre el área en la cual CATIE y ROCAP podrían actuar conjuntamente. La sección dedicada a CATIE sugiere cuatro áreas de acción para CATIE específicamente y una (producción y distribución de semillas para pequeños agricultores) de acción conjunta. Esta última parece

un área para la cual el CATIE tendría que iniciar el desarrollo de una capacidad adecuada para este fin. Sería útil para el CATIE si el equipo evaluador indicara alguna otra área de cooperación que a juicio de ellos presenta potencial promisorio.

The following is a response to some of the comments made by CATIE about the evaluation report. We appreciate the comments by CATIE and believe that they help to clarify some of our concerns. Our comments are essentially limited to V/T and extrapolation.

As stated in the report it is appreciated that CATIE expended much effort on V/T and that CATIE fulfilled its contractual obligation in this area. Also as stated, it is believed by the team that a good part of the effort was misspent because the validation was generally of the technology not of the acceptability of the technology. (The result of doing the former is a reduced frequency of adoption by producers). What the team (as well as most practitioners) believes to be the correct definition would have been applied had either CATIE or ROCAP been better versed in FSR/E techniques. It is thought that ROCAP should have supported CATIE staff so that they could have attended and participated in international FSR/E symposia. Such contact with other practitioners would have helped to increase the awareness of more recent thinking than that which was used to define validation under the project amendment.

The principle that underlies FSR/E is that problem identification and solution depend upon the producer. The team believes that while extrapolation via a sophisticated bio-physical model is an intelectually appealing idea, it runs counter to the principle of FSR/E. A (good) project design team could perform the extrapolation function when the team conducts its field trips. It is good to have available the data used for extrapolation. When such data is

available it can be used by the design team, but not as a substitute for field visits. The extrapolation itself should be used as a set of clued pointing towards potential, solutions. It is time that the data required for an extrapolation model could be used for projects or activities other than for an FSR/E project. We do not wish to state that it is of limited value within the FSR/E context.