EVALUATION

OF

SMALL FARM PRODUCTION SYSTEMS PROJECT

CATIE - ROCAP

PROJECT NO. 596-0083

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SEPTEMBER 1982

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EXECUTIVE SUMMARY

MAJOR FINDINGS

The Small Farm Production Systems (SFPS) Project is a complex, multi-objective agricultural research effort operating in the hemisphere's most politically and economically troubled region. Key project elements include:

- developing methodologies for farming systems research
- developing methodologies for extrapolating cropping systems from one area to others
- developing a model for technology transfer, and
- training regional personnel farming systems research and outreach.

The regional nature of the project implies that the bulk of activities must be carried out with national institutions in the six countries. These institutions have been subjected to very considerable instability over the project period. Personnel turnovers, fluctuating financial resources and program content modifications have influenced institutional capability to support the SFPS Project at national levels. In spite of these instabilities, the Project has been effective in maintaining continuity of farming systems research in the region. In fact, in half of the region's countries, it is the only notable agricultural research being undertaken. The SFPS Project clearly has been an important source — in some cases the only source — of national program maintenance and continuity of farming systems research.

The regional approach has been an effective means of carrying out farming systems research. CATIE has been able to provide many of the highly specialized discipline researchers and other resources necessary to farming systems research, but not available in national institutions. The SFPS has stimulated regional interest in farming systems research although to date there is little evidence of enhanced linkages between national programs.

A pragmatic farm-based research methodology has been developed by CATIE and is being utilized in national programs in cropping systems and large animal livestock systems. Development of mixed crop-animal system methodology is just getting underway. The developed methodologies and procedures in crop and in animal systems research generally evidence careful attention to scientific detail. Data collection however has exceeded data analysis capabilities of project researchers.

The Project has gone far in closing the gap between researchers and farmers. Alternative systems are well received by small producers and show promise of sharply increasing productivity. Such impacts, however, are generally limited to cooperating producers. Project outreach via national extension/technology transfer entities is very limited. The Project has not identified, developed or tested alternative technology transfer methodologies.

Training of national personnel in farming systems research by CATIE has exceeded intended project outputs. Although personnel turnovers of national institutions have reduced direct training impacts, a reservoir of trained farming systems personnel is developing in the region.

Project costs on a per farm impacted basis are high. This reflects the nature of the research effort. Promise for very high payoff in the near term future appears great. This applies not only to the development of new technologies but also to the extrapolation of known and new production systems beyond specific sites. Ultimate payoff of the project will be dependent on the extent to which widespread adoption of these technologies occur. This means that an improved means of technology transfer must be established.

The project has improved CATIE's short term capability to do research in farming systems. CATIE is now recognized as one of the leading institutions in such work. Long term maintenance of this capability is subject to continued funding in the form of core budget support rather than short term projects.

In sum, the SFPS Project has been capably managed, has produced very positive and observable results and offers potential for significant impact on the welfare of the region's small farmers. The ultimate impact is dependent upon the success in project outreach to small producers throughout the region.

RECOMMENDATIONS

GENERAL

-That the Small Farmer Production Systems Project be extended for four years beyond its original termination date, September 30, 1983, dependent upon the continued support and financing of the contributing agencies.

-That CATIE immediately incorporate a strong Extension and Communications element into the overall Project to better assure the utilization of the Project's findings.

SPECIFIC

-That careful attention and thought be given to a better definition of the minimum data requirements to achieve project objectives.

-That economic feasibility studies be developed for the Livestock "Modulos" for the purpose of showing if and how capital investments might be amortized.

-That consideration be given to commencing mixed systems methodology research on those farms where livestock "modulos" have already been established.

-That data collected for extrapolation trials be reviewed to eliminate information that may be highly correlated to soil texture such as soil water holding capacity and drainage.

-That future alternative cropping systems trials include additional complete factorial fertilizer experiments to determine crop(s) responsiveness to nitrogen, phosphate and potassium.

TABLE OF CONTENTS

Executive Summary	i
Table of Contents	iii
Preface	iv
Responses to Statement of Work	1
Responses to ROCAP Questions	26
Recommendations	38
Annexes	42

A. Selected References
B. Evaluation Team Contacts by Country
C. Status of Project Outputs
D. Statement of Work
E. Additional ROCAP Questions

PREFACE

This document is the final report of an evaluation of the CATIE-ROCAP Small Farm Production Systems Research Project (SFPS). The evaluation was conducted over a two and one-half week period in September 1982 by a four-person team provided by Experience, Incorporated.

The team arrived at the reported findings through an intensive series of project site visits, interviews and review of project documents. On-site visits to field research were conducted in all six participating countries: Honduras, El Salvador, Nicaragua, Guatemala, Cost Rica and Panama. Over 85 percent of the team's total working days were devoted to site visits and/or travel to these sites. In addition, research at the CATIE research station was reviewed. In the six countries over fifty different farms cooperating in the project research were visited and more than forty farmers interviewed (Annex B). Interviews and discussions were also held with well over 100 persons directly associated with the project and numerous others indirectly involved in project activities. These included researchers, technicians, field assistants, and administrators of CATIE and national institutions, both public and private. More than 50 project documents were studied in depth and many others reviewed as background for the evaluation.

The nature and magnitude of the SFPS Project and the very brief time available to review work at multiple sites in six countries and at CATIE required the team to focus efforts on addressing: 1) the twelve specific tasks identified in the Contract Statement of Work (Annex D) and 2) the ten "Additional Notes/Questions) specified by ROCAP in a meeting on the first workday (Annex E). These twenty-two tasks/questions/notes defined the evaluation approach and the content and organization of this report.

This report is a somewhat unconventional evaluation document because specific issues are addressed with limited attention given to the more general project background, setting, nature and objectives. However, such information has been provided in a previous evaluation of the SFPS (Reference No. 8) plus numerous other project documents (See Annex A). The team followed the recommendations of ROCAP to focus on the specific tasks and questions and avoid general project background and description.

EVALUATION TEAM RESPONSES TO STATEMENT OF WORK

A. Assess the effectiveness of organizational and administrative structure of CATIE and national institutions for carrying out multi-disciplinary research on crop/animal/mixed farming systems.

CATIE

The organizational and adminstrative structure of CATIE has been very effective in carrying out multi-disciplinary research on crops and large animals but not mixed systems. The personnel at CATIE have had a great deal of experience in their scientific field and are good administrators. The field technicians are well trained and native Spanish speakers, a necessary condition for working with farmers, national scientists and extension personnel.

CATIE has produced positive and observable results thus far, both at its Turrialba headquarters and in each of the six countries in which the Project is operating. The Project should come close to developing the intended outputs (See Annex C) despite obstacles of considerable proportions beyond CATIE's control: natural disasters, military action, governmental changes, lack of anticipated national support in some countries and abandoning of some Project activity areas. Additionally, CATIE itself suffered a financial trauma about two years ago. Changes in plans were also necessitated by an interruption in anticipated funding from ROCAP. The evaluators feel that CATIE has carried out the project in a very satisfactory manner.

National Institutions

The organizational and administrative capabilities of the national institutions vary greatly among the six participating countries. Moreover, the capabilities of given national institutions have varied over the duration of the SFPS Project. Though no single factor can be said to account for this, certainly internal political/economic change and uncertainty have very significantly contributed to

difficulties. In turn, political/economic upheavals have impacted: 1) human and financial resource availability and continuity, b) attitudes toward involvement with external institutions such as CATIE, and c) basic stability of the national institutions and their programs.

A complete response to this issue would entail a lengthy and comprehensive "blow by blow" and period by period historical account over the past four years. Such account is simply beyond the scope of a 15 day review of the SFPS Project in six nations. What can be stated and stated categorically is that in the absence of the SFPS Project, no multi-disciplinary research and for that matter, no agricultural research of any note, would have been carried out in perhaps half of the countries. Clearly, the Project has contributed to the maintenance of some degree of institutional capability to carry out such research. This has rested on the basic technical merits rather than any special "leverages" of the Project and its activities. In other words, the research has provided the only common basis for the preservation and furthering of agricultural research and extension in the region's national institutions.

B. Evaluate if the regional approach 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.

The regional approach has been very effective in stimulating and improving national capability in farming systems research and outreach. To date, cooperation and collaboration have not been measurably enhanced between national entities.

By commonly accepted definition, farming systems research must involve the farmer as an active participant in the research process. For five of the six countries, no true farming systems research was being undertaken prior to the CATIE Cropping Systems Project. The SFPS Project has extended and amplified work initiated by that project.

Excepting Guatemala, and very recently Panama, it is unlikely that any notable farming systems research would be under way in the absence of the SFPS Project. Traditionally, agricultural research in most of the region has been experiment-station based. In part, this has been due to the lack of knowledge about how to do such farming systems research, i.e., the absence of a workable methodology. In part, it has been due to a lack of resources—technical competence, vehicles, fuel and other essential research inputs. Too, it must be remembered that the concept of farming systems research is quite new and different for most of the region's agricultural researchers.

The regional approach of the SFPS Project has been highly effective in stimulating national interest and capability for the following reasons:

1) CATIE has developed and implemented a pragmatic, workable farming systems research methodology for the region. This methodology is transferable across national borders. The "demonstration effect" has been successful and national researchers are enthusiastic about the approach.

2) CATIE, with its well trained research staff has been able to provide the required technical competence in the diverse disciplines not generally available to national institutions. This must not be overlooked. Farming systems research requires that highly specialized discipline researchers work as a unit. One or more missing components precludes a systems approach. The CATIE specialists' efforts have been greatly magnified by their capability to work throughout the region. In doing so, they have provided on-the-job training to national counterparts. This has greatly enhanced national capability and has accelerated national research progress.

3) The continuity of the SFPS work in the face of national institutional instability has helped reduce the impacts of high personnel turnover and financial exigencies. The Project has, in some countries, been the only source of research continuity. Project personnel have been able to continue work while training a succession of national counterparts. Project vehicles, fuel, spare parts have been available to national research staffs when the flow of local resources has been reduced or even eliminated. A result is that the Project has shown that farming systems research has merit if continuity can be maintained. This is a lesson that is being learned to varying degrees in the six nations.

4) The results of first-year extrapolation work has strongly stimulated interest in farming systems research in all countries where work has taken place. Results of this work in drought-resistant corn and sorghum genetic materials is nothing short of spectacular. Large parts of the region have endured a record drought this past year. The extrapolation plots are producing very satisfactorily while farmers' fields have withered and died. Perhaps no other activity of the Project offers more promise in providing the breakthrough in stimulating strong action to enhance national institutional committment to farming systems research.

Although the SFPS Project has clearly stimulated national interest and improved national capability in farming systems research, there is little evidence of enhanced linkages between countries. For the most part, national researchers appear generally unaware of their colleagues' activities in nearby countries. There seeems to be little exchange of information across national borders even among CATIE's own Project professionals. Of

course, to date project work is still quite recent and there has not been that much information generated.

The evaluation team recommends that CATIE give this issue more attention in the future. A monthly or bimonthly house organ could serve to integrate Project participants and permit sharing of experiences. Such opportunities now exist at an annual conference for CATIE resident professionals. Each field station also keeps CATIE headquarters informed about is own activities. CATIE, through this Project, is in an ideal position to promote the exchange of research and extension information among the six countries.

C. Determine whether the project has demonstrated promise/potential for favorably influencing production and productivity of food crops, animals and combinations of crops and animals.

The evaluators visited some 50 farm sites, most of which were in the verification stage of a cropping alternative. The farmers involved were, without exception, convinced that the practices were beneficial and that they intended to follow them in the future (unless credit would be a limiting factor). Neighbors, who were not directly involved, also expressed interest in a limited trial on their own land. Even in the absence of complete knowledge of the economic benefits of the practices, farmers aware of the new practices appear likely to adopt the output increasing technologies.

Where the system involved livestock, results of a total system approach could not be adequately quantified after only one year of farmer involvement. It is doubtful that equal enthusiasm can be generated by the end of the Project due to the much greater complexity of the system of alternatives and the implied financial requirements in dealing with livestock (cattle and pigs).

An apparent weakness in the Project is the lack of specific plans to promote the extension of its systems improvement on a larger scale. Eventually, about 30 farmers will be directly associated with the validation of each alternative trial in each country, but the Project expects to complete the final validation process with only about 200 farmers by the end of 1983.

This project was conceived as a determined effort to provide close linkage between research and the farmer. The approach has already made commendable strides in this direction. Research specialists are addressing the problems of the small farmer in multiple cropping and mixed crops and livestock systems. Baseline studies of the farm and home enterprise have given researchers a far better understanding of the complexities involved in changing any single practice. Researchers have moved their trials from the "laboratory" to the farmer's land, and the farmer is participating in the application of the alternative methodology trials. Certainly, the gap in communication has been narrowed substantially.

With the ultimate goal within reach, it is unfortunate that the Project does not foresee a concerted effort to multiply and disseminate the validated results through the local extension services. At the present stage, the cost of the Project per contacted farmers has been very high. This is anticipated in a pilot operation Nonetheless, if positive results are obtained, the Project and the national extension services should capitalize on them, and on the entire new approach. This offers an opportunity, not only to close the gap between research and farmers, but to assess the value of this approach in comparison with traditional methods of Extension.

D. Examine if the quality and quantity of research can be evaluated as to cost-effectiveness relative to prevailing economic conditions, salaries and benefits within the region.

Cost-effectiveness evaluation of ongoing agricultural research and institution building activities is an undeveloped area of inquiry. Ruttan, in some of

his most recent writings, addresses this question. He outlines the many issues involved but suggests only fairly broad, general approaches and suggestions to policy/decision makers. Given present knowledge of the process, only insights into the "efficiency" issues can be obtained. The interpretation of these insights is quite subjective.

Succinctly, the efficiency issue is: At less cost can identical results be achieved over an identical time period by rearranging and/or recombining resources available to a research project? It is this question that is examined here.

A basis for examining the efficiency question is to compare relative proportions of the different budget line items of a given project to those of other "successful" projects. Further insight is obtained by then analyzing in detail, per unit expenditure magnitudes within given line items. For most AID-funded projects, the latter analysis entails giving primary attention to project salary levels. Per unit costs of other projects inputs, e.g., vehicles, participant training and etc. tend to be constants across projects.

For the SFPS Project, ROCAP-sourced obligations by line item through 1982 and the reprogrammed budget for the entire project period (as of May 1982) are shown in the following table. Percentages of the total by line item are also shown.

Of the ten line items, two — professional and non-professional salaries — comprise the largest percentage of the budget, some 52 to 54 percent. This figure is quite modest compared to the same coefficient of U.S. Land Grant Universities, International Agricultural Research Centers and some AID-funded bilateral research projects. Salaries as a percentage of total research costs are now typically in the range of 75 to 85 percent or more for U.S. Land Grant Institutions, around 70 to 75 percent for International Research Centers and 60 to 70 percent for many AID-funded bilateral projects. National Research Programs in the region typically expend 90 percent or more of total budgets for salaries.

AID/ROCAP SOURCED SFPS BUDGET BY LINE ITEM
(In $1,000 U.S.)

Item	Total OBL Thru 1982	% of Total	Reprogrammed Budget	% of Total
Professional Staff	2,345	40.1	3,027.7	40.9
Non-professional Staff	715	12.2	989.7	13.4
Commodities	325	5.5	330.3	4.5
Travel and Per Diem	490	8.3	639.4	8.6
Training	75	1.2	119.5	1.6
Other Costs: Scientific	1,000	17.1	1,366.5	18.5
Mgt: CATIE	435	7.4	435.0	5.9
Mgt: ROCAP	200	3.4	200.0	2.7
Contingencies	270	4.6	294.9	4.0

Clearly, the SFPS project cannot be directly compared to other research programs. However, SFPS project expenditures for professional and non-professional salaries as a percentage of the total budget are considerably lower than those for many other research programs. Considering only professional salaries, the SFPS percentage is markedly below most other programs.

This gross comparison implies that the SFPS project is relatively "understaffed" compared to other programs. Therefore, in terms of the efficiency cost-effectiveness criteria, the SFPS Project would appear to rate quite high.

The apparent high "efficiency" rating of the project occurs in spite of relatively high salary and benefit compensation levels of project professional. Compensation levels are roughly equivalent to those of the International Research Centers and resident AID contract employees, somewhat higher (on a net basis)

than for U.S. Land Grant resident faculty, and sharply higher than typical publicly employed professionals in the region.

Compensation levels alone are highly misleading comparative measures. Virtually, all of the SFPS project staff are contracted for a two-year period. They enjoy no tenure or long term job security. Opportunities for "after hours" consulting and similar income-producing activities commonly practiced by the region's publicly employed professionals are precluded.

Relatively high CATIE compensation levels are viewed by CATIE as tradeoffs for job insecurity and foregone income from other sources. Present international market conditions for professional agricultural researchers would likely permit entrance hirings at levels below those now paid. However, any momentary improvement in the market might result in resignations of personnel employed at such levels.

The evaluation team view is that present professional compensation levels are generally not inconsistent with the quality of personnel employed and the employment conditions CATIE can offer under contract projects. Current market conditions imply that entrance compensation levels could perhaps be lower. However, the impact of attempting to economize on professional compensation could prejudice the longer term quality and quantity of the research, and be counterproductive to the project's institution building objectives.

Given that CATIE derives funding from 48 different sources, the use of a consistent compensation policy for all of its professional personnel across all contracts is basic. The evaluation team's view is that CATIE's compensation policy is as an internal CATIE matter. However, the compensation policy must be sensitive and responsive to regional conditions and donor's concerns if CATIE is to maintain long term institutional viability.

E. Assess the effectiveness of analyzing, storing, disseminating and application of research results.

CATIE has very recently installed up-to-date data processing and storage equipment with four terminals. This represents a quantum improvement over its previous facilities.

Information received from each of the research plots and farmer validation plots is processed and stored at Turrialba for subsequent analysis by project technicians, and, where practical, by nationals of the country where the data were collected. In-service training for nationals in data processing and analysis is also provided. It is anticipated that new facilities will appreciably accelerate the analysis. Results are to be used in selecting additional farming system alternatives and in the extrapolation process. The data processing and storage capabilities at CATIE should no longer be a constraint in analysis of field trials, nor in the availability of this information to professionals involved in the activities.

The data from the experimental trials are processed by computer and stored on discs or tapes. At the present time, the following physical and chemical factors are being entered into the computer: slope of the land, water holding capacity of the soil, drainage, soil texture, nitrogen, phosphate and rainfall. An analysis should be made to determine if water holding capacity of the soil and drainage are correlated to soil texture. If there is a significant correlation, they could be deleted and data recorded only on the percent of sand, clay and silt.

In the case of the chemical analysis it would be desirable to analyze soil aluminum, potassium, magnesium, sulphur, zinc and organic matter. Most soil analyses include organic matter but not nitrogen so by including organic matter as well as nitrogen, the regression coefficients will be more valuable in the future. Many of the soils in Central America are volcanic in origin and high in potassium. Excess applications of potassium added to the soil when it is not necessary results

in an antagonism effect that reduces the available magnesium. It would be desirable to include potassium and magnesium in the correlation studies. Several soils in Central America are deficient in zinc and sulfur so it would also be desirable to include them in the extrapolation program. Aluminum is toxic in many soils in Central America and should be included in the analysis.

The application of research results and validation trials is not sufficient to reach a majority of the farmers. CATIE needs to develop such methods as flip books and video tapes on the validation trials as visual aids to train extension personnel in each country.

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.

CATIE's capability to do research in farming systems has undoubtedly been improved over the short-term. The increase in the number of qualified personnel was dictated by Project needs. The experience being acquired by the research and administrative staffs in carrying out the research adds to the capability in the qualitative sense. Hence, over the short-term, research capability is improved quantitatively and qualitatively. The physical facilities, laboratory, buildings, etc. have improved and a particularly noteworthy improvement is the new library building now under construction and financed by Great Britain. The library has implications for the long term.

Concurrently with the RDCAP/CATIE project, CATIE has attracted support from a number of international donors and informal support from other international research agencies. CATIE has matured into a respected institution and it could actually be called the leader among them with reference to the quantity of research ongoing in farming systems.

The long-term viability of CATIE has some negative aspects. Too much of its financing is from short-term project sources. As projects start and terminate, CATIE tends to expand and contract in an accordian effect. Contracted personnel may come and go, taking with them experience difficult to replace. Many research personnel have no tenure, being contracted for periods of two years at a time. They have no tenure and thus tend to demand higher compensation. From the aspect of continuity there is a problem. While the type of financing is not likely to defeat absolutely CATIE's long-term viability and the continuity of farming research, one must hope that ultimately more financing budget support — not dominated by project linkages may be forthcoming. A foundation with international interests in research and extension could be of great assistance to CATIE's long-term viability and to small farmer oriented research.

Apart from CATIE's role in farming systems research, the cooperating countries can, and some surely will, play a role. They endorse this type of research and presently all are involved in it. They are, however, as already pointed out elsewhere in this report, subject to a number of negative forces which are not easily predicted.

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

One lesson learned from the project is the very positive effect a regional research program can have in neighboring countries that are politically unstable. By using a regional approach to helping small farmers, it is possible to work in "Islands of Opportunity". If one area becomes politically unsafe, the program can be changed rapidly to another area in a short time. If the project had consisted of six separate national projects it might have been necessary to cancel the program in some countries. When AID must pull out of a country and later return, continuity of programs and personnel are often lost due to the fact that it often

takes two years or more from the time a project is in the conception stage until it is fully implemented. Small farmers thus tend to lose valuable information due to periods of project inactivity. The lesson learned in this case is that regional programs have merit under conditions such as those prevailing in Central America. There is also a considerable saving in the cost of designing and implementing a regional project, vis-a-vis the comparable cost of six national projects.

The evaluation team also conferred with CATIE on what lessons it might have learned. CATIE construed "future development efforts" to pertain to development through future project development, design and operations. CATIE observations follow:

1. Cooperating countries are prone to expect more financial support than CATIE can provide. If the project plan calls for initiation of the project in all countries at the same time, this tends to throw an overload on the CATIE personnel. A time-phased plan arranged with the countries would be better.
2. The counterpart contribution, estimated at the moment a project paper is written, is subject to much change as changing leadership in the countries shift priorities and resources. Thus, counterpart support needs to be under constant review.
3. It is probably better to introduce some of the activities of a new project on a demonstration basis to show the cooperating country technical personnel the merits of the project before going to higher officials, such as a Minister, to negotiate formal signed agreements.
4. More careful a priori study of the relation between the objectives of a project and the duration of the same is indicated.
5. More careful analysis of the type of product or of actions requested of a contractor would be of value.

Other lessons noted by CATIE were concerned with project management, internal coordination and with AID project management. The team would recommend that ROCAP note and discuss with CATIE those matters which affect both organizations.

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

LIVESTOCK

The Project Agreement calls for the development by CATIE of specific criteria for area selection in each country. This has been accomplished. The main criteria considered in the selection of research areas are:

1) National priority

2) Potential for improvement, biological and economic

3) Concentration of small producers

4) Tradition of livestock production

5) Presence of national institutions

6) Presence of infrastructure

Additionally, the areas chosen are representative of five important ecological zones. For example, very dry, tropical: Olanchito, Honduras; very humid, tropical: Guapiles, Costa Rica and La Ceiba, Honduras. The total number of target areas chosen was 15 in the six countries.

Of the six criteria for area selection listed above, numbers 2, 3, and 4 were studied by means of questionnaires which generated a substantial amount of data on local problems, practices, and what the producer considered to be problems. By the end of this project, CATIE will be able to produce a document with good information on the methodology for selecting an area for on-farm research and

data gathering. Moreover, CATIE will be able to produce for a given target area a data summary and technological recommendations. It is unlikely, however, that this document can be produced country-by-country in the form of a participating country document. CATIE will have to produce the document, but some of the countries (Panama, Guatemala and Honduras are possibilities) may give considerable assistance.

In the course of developing methodology for on-farm research with animals it is necessary to test and prove the methodology by the soundness of the technology which came about. The methodology is the product, but the technology is the reason for the methodology. The ultimate beneficiary is the small farmer identified by the Project, but he is not the beneficiary directly. What the Project does not provide is the actual transfer of technology to the small farmer; it does propose to develop research methods and/or research for effecting the transfer to the small farmer through the transfer agents of participating countries.

Quantity and Quality of On-Farm Animal Research

One familiar with the Central American scene will appreciate what confronts CATIE and participating countries in the planning and execution of animal and forage-pasture experiments on small farms. The target areas are often rather remote and the almost impassable country roads require the technicians to spend a high proportion of their work day in uncomfortable travel. The travel is expensive due to stress on the vehicles and high fuel consumption. Much of the vehicle mileage is in lower gears. The time required for travel to make visits reduces the number of on-farm studies that can be carried out.

A considerable proportion of the earlier efforts consisted of surveys out of which area studies were developed from the survey data. For example, the initial diagnostic study of an area in Guatemala -- Nueva Concepcion -- was based on data gathered from 66 farms.

After the study of the larger sample of farms, from which the area could be described in such terms as average size of farm, number of cattle per farm, type of cattle operation e.g. dual-purpose and etc., more intensive studies were made on a smaller number of "typical" farms. Certain ones were studied for a short period of time; others over longer periods so that information could be obtained on the changes taking place (the farm dynamics) and the decisions being made by farmers. These studies develop baseline information. They are not however what one usually associates with livestock research. They are more in the camp of the farm management specialist. Yet, such studies are valuable for orienting or focusing livestock research and further economic studies.

On some farms visited, four in Honduras and four in Guatemala, modulos (models) were established. Typically, the farmer's pastures were planted to an improved pasture grass, such as African Star Grass; the pasture area would be fenced and cross-fenced, resulting in a number of plots for rotational grazing; a milking stable with concrete floor, a roof, and stanchions for restraining cows during milking were constructed; molasses and urea were made available in special feeders; salt and minerals were provided; some modulos might have trench silos and sugar cane or Napier grass plots for dry season forage.

Resident CATIE people and their counterparts were following the modulos closely; recording herd inventory changes, milk production sales, cost of inputs, man-hours of labor, and etc. Again this is research which falls into the realm of agricultural economics research, although the data may be recorded by livestock technicians. Most of the animal husbandry practices introduced into the modulo are technology transfers; the research has already been done and the modulo tests how the farmer responds to the package. (It was a little suprising to learn that in the Nueva Concepcion area of Guatemala, 75 percent of the farms already had improved pastures and 45% practice rotational grazing. Eighty-six percent

provided salt for their cattle, 86 percent provided minerals, 33 percent molasses and 92 percent crop residues. The practice of vaccination and treatment of parasites are routine on 87 percent of farms studied.)

Besides the modulos developed in Nueva Concepcion, CATIE and the participating countries designed improved modulos for La Ceiba, Olanchito and Comayagua in Honduras; Matagalpa in Nicaragua, Monteverde and Cariari in Costa Rica and Bugaba in Panama. The evaluation team visited three modulos in Nueva Concepcion, three in Comayagua and one in Cariari. The modulos are being tested under conditions of the producer.

CATIE documents give details of economic performance in three situations in Nueva Concepcion: 1) the modulos managed by investigators, 2) the modulos managed by the farmer, 3) and the traditional system of one local producer. The economic returns on the modulos were superior.

The team endorses this type of economic study and recommends that it be expanded to include additional studies, such as analyses that would support a farmer's request for credit if he were preparing to finance the installation of the modulo. Two important studies needed are: 1) analysis and projections year by year of herd composition based on projected births, deaths, cullings, sex of animals; milk produced for sale and off-take of animals and 2) cash flow projection by years. Examples of these types of studies can be found in annexes of the loan papers for livestock projects of the World Bank.

These projections would give a good appraisal of the farmer's ability to amortize a loan for establishing a modulo (or some portion of it). Here is an opportunity to lay some groundwork for future small farmer loan programs for financing under international bank loan projects.

In a general sense, livestock technology is more transferable than plant technology. It is not as site-sensitive. Good milking practice is good anywhere.

Treatments for cattle ticks and torsalo are routine in all areas. But there are certain problems in Central America and Panama which call for some testing. The deficiency in protein for all classes of livestock is a severe constraint. The total feed supply (protein and other nutrients) is another, more particularly in those areas which have an annual dry season. It is pleasing to note that the search for protein is being emphasized by CATIE and colleagues in their forage research. For example, Leucaena, a shrubby legume, is being tested in several locations as a high protein forage. It is gratifying and even suprising to find as much research as appeared for this evaluation. The program of research for 1982 is documented and will not be repeated here. It is noted that the experiments are designed for studies in pastures and forage crops, nutrition and animal health in six countries. Quantified in more detail, there are 10 studies in Panama, 16 in Costa Rica, 9 in Nicaragua, 4 in El Salvador, 19 in Honduras and 11 in Guatemala. Most of these are on-farm studies.

In addition, there are approximately 40 studies going on in Turrialba. The studies are well oriented toward solutions to priority problems of dry season feeding, sources of home-grown protein and improving pasture quality and yield, and some work has been started with small animals (sheep, goats, swine and poultry).

The work with small animals focuses on nutrition and system of management, i.e. confinement vs. more freedom of movement. Swine and poultry are widely held by traditional small farmers. The animals are managed largely as scavenger operations. Both of these species earch out some of their animal protein requirements when they have freedom to move in the neighborhood. When confined, they do very poorly unless their protein, energy and other nutrient requirements are met. Hence at CATIE, work focuses realistically on how the nutrients are to be supplied. Panama has a law that prevents the sale of swine for

human consumption of animals not confined to pens. Sheeps and goats—both small ruminants—offer good possibilities for meat and milk production respectively but both are susceptible to the diseases and parasites of humid climates. There is a further constraint in that there is practically no tradition of raising sheep and goats by small farmers. Farmers' preference is a factor in introducing these small ruminants. The small animals will logically fall into mixed systems research when that is begun.

The design, execution, analysis and write-up of experience is highly correlated with the preparation, experience and backstopping of the personnel involved. Based on the qualifications of the personnel, the quality of the research is quite adequate.

Experimentation with animals on small farms is limited by small numbers of animals of similar sex, age, weight, stage of lactation, etc. Variability among experimental units is great. The investigator who visits the farm two or three times a week can never be positive that animals were maintained continuously in the treatment group to which they were assigned. Gates can be left open or fences broken down or the farmer decides it is just too much trouble to manage two or three groups. Results acquired on the farm may be classified as experience as much as experimentation. Results acquired demand a careful, even cautious appraisal. On the experiment station, the researcher has much better control of experimental materials and animals. There are more pens or lots available and station personnel are trained to maintain the integrity of the experiment.

The judgement of the team is that both types of investigation, on-farm and on-station, are useful. The mix developed so far is reasonable. It is conceivable that in the development of small-farmer systems, the matter of genetic improvement of the animals will arise. This does not imply long-term animal breeding research. Rather, at the farm level, a part of the model can and should

include culling older, damaged, and other low-producers, replacing them with more productive purchased animals or home-bred replacements. It should also include the selection of breeding males of whatever type that fits the local model, whether through artificial insemination, purchase, or other means of acquisition. Replacing unproductive animals slowly increases the average genetic merit of the group. All of this is part of the farm dynamics and would not delay the project. Long-term breeding projects for improving or developing a breed would not fall into the scope of this Project.

CROPS

The CATIE staff has done an excellent job in site selection and experimental designs. There has been a great deal of emphasis on varietal trials and herbicide trials. More work is needed on fertilizer trials using complete factorials plus a minor element treatment. Some of the research scientists are conducting fertilizer trials using complete formulas so it is not possible to separate out the fertilizer response of N, P_2O_5 and K_2O. The scientists indicated that it is impossible to purchase triple superphosphate and potassium chloride in some countries so that complete formulas had to be used. Some of the formulas available were 15-15-15 and 12-24-12. It will be necessary in the future for CATIE to purchase urea, triple superphosphate and potassium as well as minor elements, so that complete factorial experiments can be conducted. Complete factorial experiments are very important because farmers in many areas may be spending thousands of dollars for potassium that does not give a response in corn, rice and sorghum production.

The experiments are executed properly but more effort could be spent on monitoring the program by scientists from Turrialba. Data collection is good, but in some cases more data may be collected than is really necessary.

The data analysis is good but the dissemination of research results could be improved. The scientists need to develop flip books of the validation trials and make videotapes of how to establish validation trials so they can train extension personnel in improved techniques in order to multiply the effects of the validation trials in a short period of time.

There is insufficient data at the present time to assess the methodology for mixed systems and extrapolation. This is the first year the experiments have been placed in the field in four of the countries. The maps show that 40 trials are in the field in four different countries. This is the first year that data will be collected on this type of experiment. The rainfall at tassel time has been extremely low so the yield results will also be low in several areas. Therefore, the data for 1982 will not be very meaningful.

An extrapolation experiment should have at least five years of data in order to have a fair degree of reliability. It would be desirable if the extrapolation experiment could be conducted for at least four more years after the termination date of the project.

In some locations this year the same variety of cowpeas was not used so it will be difficult to separate out the effect of inheritance and environment. The hybrid H-9 was used in all locations so this will provide field data for simple and multiple correlations of yield on soil analysis and rainfall.

The program for the mixed system is just getting under way. It will require at least four more years to obtain reliable data on mixed systems of farming.

EXTENSION

In consideration of the fact that very little attention has been given to "extending" the alternatives beyond a few farmers in localized areas, there has been little extension methodology to evaluate. The team feels that some comments are in order regarding the efforts that have been made:

In some instances, representatives of the national extension service were very active and considered themselves as partners in the evaluation and verification trials; in others, there was little or no participation by local extensionists, even though they had been invited. Can Project personnel give more attention to local extension involvement, perhaps by obtaining a commitment at higher levels of government?

Several trials visited were advertised along the road, and were well labeled at the sites; others carried no identification whatever. Identification can serve to make other farmers aware of the work and may pique their interest.

Field days had been held at many plots. If the purpose is to increase quantity or quality of yields, such field days should be held at harvest time particularly, so that visitors can see tangible results. At that time, all farmers should be told about the actual cost of any additional inputs.

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

Because CATIE is implementing several regional agricultural development projects and receives support from several donors, it has the unique potential to pool its training resources to contribute to the global needs of the institution and the individual countries. For example, an in-service training course on data analysis may also serve national personnel involved in other projects. Long-term overseas training for an individual in one project may be amplified to provide capabilities which can be useful beyond the needs of that project in a reciprocal fashion. Thus, the end result becomes a larger reservoir of qualified professionals to serve present and future needs of CATIE or the individual countries. Each donor's contribution thus may result in a longer and broader pay-off than originally contemplated. This pooling approach has enabled CATIE to surpass the targets set in the Project Agreement.

Intended outputs for life of project

-8 cropping systems short courses/workshops

-4 livestock systems short courses/workshops

-Total of 148 technicians trained

-8 research information transfer and utilization workshops

-200 additional extension and outreach personnel trained

-On-the-job training of nationals

-11 master's degree level candidates

The minimum outputs for the life of the Project had been reached two-fold by September, 1982 except for graduate training and research information transfer and utilization workshops. In graduate training at the master's degree level, the targeted number of 11 students had been surpassed by 3; but workshops and training in information transfer numbered only 2 of a targeted 8. This is to be expected because useful research information will be generated only after validation data have been analyzed. On-the-job training of nationals is difficult to measure because of the rapid turnover of personnel in some countries or the lack of sufficient counterpart personnel. In at least one instance, local personnel avidly participated in the Project because the CATIE activities are the only ongoing remnants of agricultural development in their war-torn country.

J. Review research and implementation reports to determine:

1. Whether they are prepared and presented to give a clear understanding of what CATIE and the national agencies are doing;
2. Whether the bilateral USAID Missions, host country officials and AID/W are aware of these reports; and
3. How they can be improved

The evaluation team was provided with a complete set of periodic reports which included:

-Annual plan of work

-Bimonthly or quarterly reports on livestock systems work

-Bimonthly or quarterly reports on cropping systems work

-Annual cropping systems reports

-Annual livestock systems reports

-Annual reports by country

Activities at the headquarters and in the several countries have been well documented, particularly concerning CATIE's involvement. Continuous improvement is sought on the basis of user suggestions and Project experience. For example, the names of the technicians associated with each activity are to be included in future reports, and detailed descriptions of trials formerly included in the bimonthly and quarterly reports will be capsulated. Some of the reports include items which have little lasting value from the Project viewpoint.

USAID and host country officials contacted stated that they do receive progress reports but do not necessarily peruse all of them. In some cases, they were read from cover to cover by officials who were intimately involved with the Project. Most of the periodic reports are reproduced in about 35 copies, with at least one being sent to AID/W.

The CATIE headquarters maintains a separate mailing list of government and agricultural workers who are interested in research findings of the Project and journal papers prepared by its specialists. The mailing list numbers 619 persons. In addition, 492 individual requests were received in 1981 for 7712 documents.

K. Examine presently planned levels of financial contributions by CATIE, national agencies, other donors, and ROCAP and assess whether they have been provided as planned and are sufficient to achieve the project objectives.

CATIE is currently deriving funds from 48 different sources. In addition, CATIE works cooperatively with numerous national and international entities that provide resources for these efforts. In a very broad sense, many of the resources of other entities bear upon the SFPS Project in an indirect or direct way. The diversity of CATIE activities with other entities precludes a donor by donor or

institution by institution review of the direct contributions and impacts of other asistance on the SFPS Project. Discussion will be focused, therefore, on the contributions of other entities most closely associated with the SFPS Project.

Cropping Systems Research Support

The annual budget (1982) for the CATIE Crops Department is approximately $3.3 million. External sources provide the bulk of the total. Activities that directly complement the SFPS Project are funded by: 1) the International Fund for Agricultural Development (IFAD), 2) the European Economic Community (EEC) and 3) the International Development Reserach Center-Canada (IDRC). Data in the following table were derived from CATIE documents.

Annual Budget Support for Cropping Systems Research (1982)

	Fund Amount by Source ($1,000 U.S.)				
Item	ROCAP	IFAD	EEC	OTHER*	CORE
Personnel	655	787	172	121	543
Operations	366	302	87	51	63
Investment	0	85	7	58	34
Services	0	13	13	8	37
Administration	29	196	0	4	0

* Includes only funds that directly complement SFPS Project (as identified by CATIE). Approximately 97% is provided by the IDRC.

Discussions with CATIE administrators indicate that, in general, funding has been provided as planned and is sufficient to achieve project objectives for cropping systems research.

Livestock Systems Research Support

The annual budget (1982) for the CATIE Livestock Production Department is approximately $1.62 million. As with Crops, most of the support is from external sources. After ROCAP, the Inter-American Development Bank (IDB) is the primary external funding source followed by IDRC and Central Bank of Honduras. The following table provides total budget support amounts by source for the Livestock Production Department.

Annual Budget Support for Livestock Research (1982)

Entity	Amount ($1,000 U.S.)	Project Initiation	Project Period (yrs)
ROCAP	801.94	1979	4
IDB	587.95	1979	4
IDRC	109.50	1978	3 (2nd phase)
BCH	119.91	1978	4
CORE	295.70	-	-

To date, budget support has been provided as planned and has generally been sufficient to achieve project objectives. Support from ROCAP, IDB and the BCH is scheduled to terminate in the near future. Unless these sources are renewed or new sources obtained, current livestock systems research must be sharply reduced in the near future. The impact will be to pull back from on-farm research with heavy concentration on experiment-station based work.

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, and recommend how relationships can be fortified.

The team did not have the opportunity to interview and discuss the SFPS Project with AID Mission personnel in all six countries. Thus, response to this issue

is based largely on information obtained in field visits and knowledge of individual team members.

In general, the Project appears to have limited ties to AID-funded small farmer research programs at the country level. There are some exceptions. For example, SFPS Project personnel are working closely with IDIAP staff in Panama. AID/Panama is a major funding source for IDIAP. In Honduras, a new AID-funded small farm research project will carry on and expand work currently the focus of the SFPS Project. There may be other activities funded by AID that relate closely to the Project, but these are unknown. CATIE likewise was unaware of any other AID-funded small farmer research programs that were closely related to the SFPS Project.

As for the relationship of the SFPS Project to AID-funded small farmer research programs outside of the region, even less is known. CATIE researchers do not distinguish the source of host institution funding in their work with other institutions.

Given the lack of knowledge about the interrelationships of the SFPS Project and other AID-funded small farm research programs, the evaluation team makes no recommendations about how relationships might be fortified.

EVALUATION TEAM RESPONSES TO

ADDITIONAL ROCAP NOTES/QUESTIONS

1. Can it be determined if the project has/is favorably influencing national governments to focus more resources/commitment on research? Have national units formed multidisciplinary teams to address FSRE?

The personnel contacted from national governments have stated that the governments are planning to spend more money on research in the future. They also indicated that most of the funds will be allocated to research stations. Most of the research therefore will be conducted on research stations. They stated that there is a shortage of funding for vehicles, fuel and spare parts so that it is difficult to conduct applied research on farms.

Certain types of experiments like plant breeding, herbicide and pesticide trials can be done on the experiment station but fertilizer and variety trials should be done on farmers' farms. Validation trials on herbicide, insecticide and fungicide trials also need to be done on farmers' farms to determine if the applications are economical.

Research personnel in Honduras, Guatemala and Panama have formed multidisciplinary teams to work on small farms but Honduras has had problems of implementation due to budget cuts.

2. Is extension adequately involved, especially in validation? Are any private sector groups involved?

The Project is innovative in the sense that it is trying to incorporate all possible considerations in arriving at research findings which are meaningful to farmers. Unfortunately, there seems to be little concern about systems to move these findings to the masses of farmers who could become beneficiaries of the findings.

Some USAID, CATIE and national officials feel that the extension of the systems technology should be the responsibility of each individual country and this would be logical in theory. The reality is that the demonstration approach envisioned in the Project will not be completed until the methodology of conveying the results at the national level is also tested.

In the team's inquiries, it was learned that the local extension services were invited to take part at all stages of the local activities. Some countries were active in this participation, while in others, the manifested interest was spotty. The latter could be explained by staff shortages, or transport difficulties, or even indifference to the Project. Regardless of the reason, this represents the weakest link in the research-to-farmers communication.

No direct participation by private sector groups was reported.

3. Can workshops, seminars, short courses, etc. be made more cost-effective? Any training modules, packages units developed, especially on methodologies?

The training element, a traditional strong point for CATIE and its predecessor organizations, has far surpassed the Project's planned minimum outputs (see Annex C). The team was not privileged to see any sessions in action, but reports and outside comments gave the training quality and quantity high marks.

The second part of the question implies the steps which can multiply the training efforts. Modular texts are used as well as lesson plans. There appear to be possibilities for further "canning" of the testing material in slide/tape or videotape segments. The present limited facilities and personnel for the production of teaching aids precludes any great expansion in this direction.

4. Do they take advantage of research results developed by other groups (IARC's, other regional groups, national groups, etc.)?

The interaction and scientific exchange between CATIE and other research groups — IARC/s, regional entities, national institutions and etc., take place in

several different ways. First, CATIE scientists maintain currency in their respective disciplines through routine review of professional literature. Second, CATIE scientists are in frequent contact with colleagues in other institutions and programs via professional meetings, conferences, workshops, seminars and the like. Third, a nearly constant stream of scientists from throughout the world visit CATIE. Fourth, CATIE professionals travel frequently within the region and are in almost continuous contact with colleagues from national institutions. Fifth, CATIE sponsors and/or co-sponsors workshops and seminars at Turrialba and other locations. The recent workshop on Research on Crop-Animal Systems jointly sponsored by AID/ROCAP, AID/CRO, CATIE, CARDI and WINROCK International is an example.

These interactions and exchanges with scientists from other research entities are evident in the offices of all CATIE professionals. Publications and literature of other institutions are abundant. The main library and the specialized departmental and personal collections manifest professional interactions with individuals in other research programs.

The question of whether CATIE scientists "take advantage" of research results developed by other groups can be clearly answered in the affirmative. Research results of other groups are, of course, sifted, further researched, refined and modified to fit CATIE's needs and conditions. Genetic materials from some of the IARC's and international and national germ plasm blanks are being tested in CATIE research and introduced into the region when found superior. Validation trials, for example, are currently using corn and sorghum varieties from El Salvador and a tomato variety developed in Florida. As indicated elsewhere in this report, initial results appear promising.

The evaluation team found strong evidence that CATIE scientists are not working in isolation. Research results from other national, regional and international programs are, we believe, being quite effectively applied in the overall CATIE research effort and the SFPS work.

5. Is data collected the most pertinent? Should it be increased? Decreased? What happens to it?

The SFPS Project has resulted in the collection of a massive quantity of data. Every step in the SFPS research process has involved data collection. Every project output from the development of research methodology to the extrapolation of research findings has resulted in the collection of data. Data collected range from the very general to the highly specific and from the static to the dynamic. The magnitude of project-generated data is such that computer cataloging is the only rational and feasible data management alternative.

The initial reaction to this data mass by the outside observer is usually shock, bewilderment and confusion. But a better understanding of the project's highly complex nature reveals the pertinence and necessity for the collection and analysis of truly massive quantities of data.

SFPS researchers have chosen a "science" rather than an "intuition" approach to their farming systems work. This decision was made at the outset of the previous Cropping Systems Project. It remains in effect in the current project and appears to be an issue closed to debate. The veteran Farm Management professional lauds the objectives of scientific quantification, but trembles at the task SFPS researchers have undertaken.

Given the decision to approach farming systems research in a highly scientific manner, it could be argued that even the data mass collected and being collected is insufficient to obtain required information. There is evidence, however, that available data is underutilized. As of the time of this writing, it was

reported that about 80 percent of the collected data had not been analyzed. This is disturbing.

Inquiries into why such a limited part of collected data have been analyzed were only partially productive. Certainly one factor has been CATIE's limited computer facilities. Until very recently CATIE's computer facilities could be termed grossly inadequate. The computer for example, could not utilize standard statistical packages such as SAS. Thus, analysis often required writing of specialized programs. Programming resources were very limited and a large backlog of work was typical. Alternative computer facilities were available at IICA headquarters in San Jose, but the logistics of routine use were highly time consuming.

The computer problems have now been resolved with the acquisition of new equipment. Programming staff can now spend most of their time assisting analysis. If inadequate computer facilities have been a major constraint to data analysis, this should no longer be the case.

Turrialba-based SFPS professionals contend they have had insufficient time and/or research assistance to perform desirable data analyses. The demands of project administration, supervision, reporting and regional travel are cited as being very great. The evaluation team has no basis for disputing these contentions. Likewise, attempts to assess the quantity and quality of research assistance available to project professionals was inconclusive.

Regardless of the reasons for the apparently limited analysis of available data, the fact remains that data collection has exceeded data analysis capabilities. This may now be rectified with new computer facilities. However, concern must be expressed about the relevancy and usefulness of analyses of data collected in earlier project phases.

It is recommended that careful thought be given to what types of data should be collected for project needs. A sharp distinction of what is perhaps desirable and interesting and what is truly needed to carry out the research needs to be made. If agreement among researchers cannot be reached on this matter, a means for bringing more analytical resources into the project will need to be developed.

6. Does the work of the animal section, especially small animals, fit FSR? Is it systems work?

The term "systems", as used by the animal production scientists in CATIE refers to the class of livestock and also the manner in which it is managed. Examples are: 1) lowland cattle farm - dual purpose cattle - milked once a day - milk made into cheese; 2) mixed farm: two or three classes of livestock enterprises and crops.

Some on-farm work with swine has ben initiated in the Guapiles, Costa Rica area. Work at Turrialba tests bananas, sugar cane and different sources of protein. This research on "components" should be transferable with only minimal on-farm testing. The swine selection program is also looking into the use of criolla type and crosses as these appear to be more disease resistant.

Sheep and goat research remains on the Turrialba station where experience in their management is being acquired. Some small scale trials are under way with lactating milk goats for testing various forage crops for feeding. Similar forage studies for sheep are planned or ongoing.

The small animal work is systems work. Individual small experiments and feeding trials are the preliminaries to the on-farm small animal modulos and mixed modulos.

7. Any feedback from farmers on their perception of the promoted systems? The profitability/risk perception?

Discussions were held with many farmers. They are convinced that fertilizer, herbicides and improved varieties are economical and they plan to buy them and

use them in the future. They pointed out that when the rains come after planting it may not be possible to get in the field for two weeks to weed corn. They said that when it dries out enough to get in the field to weed corn, the weeds are so far ahead of the corn they cannot weed the corn before the next rain starts. Some farmers were losing half or more of their production due to weed competition with corn.

The validation trials proved to the farmers that they needed fertilizer and a high yielding variety. The results were very striking in the validation trials between the plots that received improved practices and the plots that received farmers' practice.

Many of the farmers were not convinced of the use of insecticides and fungicides except for the tomato growers. Most of the tomato growers were convinced that fungicides were needed to control fungus diseases on tomatoes. Nematodes are a problem on tomatoes so it would be desirable to import seed of hybrid tomatoes from the University of Hawaii so they could be included in the variety trials. Some of the hybrids in Hawaii are resistant to nematodes and seven other fungal and bacterial diseases. Seeds of tomato varieties also should be imported from the Asian Vegetable and Research Development Center in Tainan, Taiwan. The research staff has developed varieties and lines of tomatoes resistant to several diseases and they yield well even under high night temperatures.

The livestock farmers interviewed by the team ranged in attitudes from enthusiastic to almost ecstatic. The latter case was a recent convert from crops farming to cattle and grassland. He explained that now his work load is greatly reduced and he has a steady income from milk.

It must be stated, however, that the cattle farmers interviewed were cooperators with on-farm research and that much of the capital investment in

fencing, milking, stables and purchases of some kinds of inputs (molasses, minerals, etc.) were paid by the Project. What is not known and what it is hoped the Project will later show is how the investments can be amortized and in what time frame. From that information one can estimate the likelihood that other stock farmers will be candidates for modulos.

8. Other perceptions of the farmers as to missing elements or availability of inputs, T.A., market, etc.?

Many of the farmers in Guatemala, El Salvador and Honduras indicated that more information is needed on marketing for vegetable crops. It would be desirable to add a marketing component to the present project or encourage the local government to do some marketing research. The problem seems to be serious for cabbage, cauliflower, broccoli, cucumbers and tomatoes. Marketing was not a problem for corn, beans and sorghum.

Many of the farmers indicated that credit was a restraint, that there was a lot of paper work involved and that the interest rates were high. They also mentioned that it was difficult to obtain a loan if they did not have a clear title to their property. Livestock farmers also reported these difficulties. It would be desirable to encourage other agencies to try to improve the credit situation for small farmers.

9. Any perception of the costs of the research as compared to other similar projects?

Farming systems research is expensive. Basic research is expensive. The SFPS Project is involved in both; the latter dealing with the development of extrapolation methodology. The potential payoff to both types of research could be very great.

On-farm based research has two basic outputs: 1) the research information, and 2) the demonstration effect. Clearly, the former is of no value in itself unless

it can be utilized. The fact that farmers have the opportunity to directly compare their own practices with those of the researcher and in their own fields provides an added value that experiment field research simply cannot duplicate. But farm-based research is immensely expensive, especially in a region with poor roads, costly fuel, parts and vehicles. This cost cannot be justified unless research results are expanded to many more farmers via extension services.

Extrapolation methodology research offers the potential for a true breakthrough in international technology transfer. To date, the transfer of agricultur technology across international borders has at worst been random; at best based on the intuitive judgments of traveling agriculturalists. The first-year field results of CATIE's extrapolation methodology trials are spectacular. This research has not been particularly expensive, yet its potential for payoff could be virtually infinite in terms of the returns to research expenditures. If workable extrapolation methodologies can be developed in this Project, the results of just this single project component could justify the entire project effort.

10. Do technology packages or systems recommended contribute to conservation/maintenance of resources?

Technology packages recommended do contribute to conservation and maintenance of resources. On-farm research has shown that farmers can plant corn and beans with minimum or no tillage if they use herbicides. This saves the small farmer the cost of renting a tractor or bullocks to prepare his land. Many times it is difficult for the farmer to rent a tractor or bullocks at planting time because of the demand at that time.

Alternative systems research on farms has also shown that potassium is not needed for grain crops on some soils so the farmer can apply less fertilizer and still obtain high economic yields.

In livestock systems research, the financial projections that are so far not developed, it will be necessary to appraise the effects of the recommended technology on maintenance of farmer resources. The team is recommending that the projections be developed.

RECOMMENDATIONS

GENERAL

That the Small Farmer Production Systems Project be extended for four years beyond its original termination date, September 30, 1983, dependent upon the continued support and financing of the contributing agencies.

This recommendation duly considers the progress made to date, the time that will be required to adequately analyze the accumulated data, and the time span which is inherent in obtaining meaningful information on livestock and mixed crop/livestock trials.

That CATIE immediately incorporate a strong extension and communications element into the overall Project to better assure the utilization of the Project's findings.

CATIE and ROCAP should explore the possibilities of strengthening the extension and communication elements which should be an integral part of this Project, including: a) master's level training at CATIE, b) in-service training of national personnel both at CATIE and in-country levels, c) augmentation of audio-visual support capabilities at CATIE.

Political changes, personnel shifts, and national attitudes which have evolved over the past 15 years have left some of the national extension services in disarray. The eventual value of the SFPS Project lies in the improvement of small farm productivity. The local Extension Agent remains the final link from research to the farmer, and is also the element channeling feedback from the field to research. Much promise is evidenced in the Project to date and the research-to-farmer gap will apparently be narrowed. But the ultimate objective is to close the gap, and CATIE is in a position to accomplish this if given the mandate and resources to do so.

Help may be needed to re-create defunct extension services, or to strengthen existing services. Perhaps a new generation of agents will need to be trained in extension methodology, particularly as approached in the SFPS Project. Most of the present extensionists will need in-service training to acquaint them with the Project and its findings. And it may be necessary to update information on the most effective channels for communicating with the farm audience (radio was mentioned many times by the farmers interviewed, but small-group videotape presentations have not been tried).

The teaching of communication psychology and techniques has fallen by the wayside during the past decade in Central America, although the institute at Turrialba was at one time considered to be the center of excellence. Probably some of the training materials in the former train-the-trainer courses can yet be found in the CATIE or IICA archives. Some of the old talent and much newer expertise is scattered around Latin America; indeed, some already exists in CATIE and IICA.

Extension knowledge and techniques are not static. In-service training is needed on a regular basis for field staff. And advanced degree training should be available to assure a large cadre of professionals in the region.

Expansion of the facilities at CATIE's training materials center will permit the packaging of teaching kits, both for CATIE staff and, where desirable, for the use of nationals in their country extension programs. The possibilities of videotape recording for preserving and multiple use of presentations is well worth exploring.

SPECIFIC

That careful attention and thought be given to a better definition of the minimum data requirements to achieve project objectives.

A distinction must be made between what is perhaps desirable and interesting and what is truly needed to carry out analyses to meet project objectives.

Agreement among all professional project personnel will be mandatory. Each discipline within the project should be requested to state precise data requirements and fully justify how these data will be utilized in achieving project objectives. Assistance from deeply experienced outside discipline specialists may be useful in defining minimum data requirements.

That economic feasibility studies be developed for the livestock modulos for the purpose of showing if and how capital investments might be amortized.

Two analyses are needed: 1) year by year projections of herd composition based on projected births, deaths, cullings, sex of animals, milk production and animal off-take, and 2) cash flow projections utilizing these data to ascertain system profitability and ability to amortize a capital loan. Examples of such analyses can be found in World Bank livestock loan documents.

That consideration be given to commencing mixed systems methodology research on those farms where modulos have already been established.

Since most of the farms are actually mixed systems farms, since working relations with the farmer have already been established, and since much data are already available, money and effort will be saved if these farms are designated as cooperating units in the mixed systems methodology development.

That data collected for extrapolation trials be reviewed to eliminate data that might be highly correlated to soil texture such as the water holding capacity of the soils and drainage.

There are other data obtainable from a chemical analysis that might improve correlation studies in the future such as organic matter, potassium, zinc, sulfur, magnesium and aluminum. Previous research has shown an excess of potassium in some soils for grain crops which resulted in an antagonism effect for magnesium which makes it unavailable for the crops. Therefore,analysis of potassium and magnesium may be very important. Some soils have high levels of aluminum that are toxic to plants and other soils are deficient in zinc and sulfur so it would be

desirable to have information on these three elements for correlations with yield at a later date. Organic matter should be included because most soil analyses include a test for organic matter, but very few farmers have their soils analyzed for nitrogen.

That future alternative cropping systems trials include additional complete factorial fertilizer experiments to determine crop(s) responsiveness to nitrogen, phosphate and potassium.

The alternative trials should include complete factorial fertilizer trials in the future in all countries to determine the crop response to nitrogen, phosphate and potassium. A separate treatment of all the minor elements should be included. Zinc is deficient in some soils and other minor elements may become deficient in the future. If a "shotgun" treatment of all the minor elements gives a significant increase in yield it will be necessary in the future to determine which minor elements are responsible for the yield increase by conducting trials with separate treatments of the minor elements.

ANNEX A

PARTIAL LISTING OF REFERENCES

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d) Abril, Mayo, Junio 1981 (Programa de Cultivos Anuales)
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f) Julio, Agosto, Septiembre 1981
g) Julio, Agosto, Septiembre 1981 (Cultivos Anuales)
h) Julio, Agosto, Septiembre 1981 (Producción Animal)
i) Diciembre, Enero, Febrero 1982
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ANNEX B

LISTING OF EVALUATION TEAM CONTACTS

IN SFPS PROJECT BY COUNTRY

NICARAGUA

Name	Title	Institution
INSTITUTIONAL CONTACTS		
Raul Rodriguez	Chief, Corn Project	
Roger Lau Chavez		MIDINRA
Jose Ramon Peralta	Investigator	MIDINRA
Pedro Romero	Resident	CATIE/ROCAP
Edgar Berrios	Validation Agent	CATIE/ROCAP
Oscar Moreno	Validation Assistant	CATIE/ROCAP
Luis A. Briones	Validation Assistant	CATIE/ROCAP
Domingo Rivera	Validation Assistant	CATIE/ROCAP
Jacobo Reyes		MIDINRA
Victor Blando		MIDINRA
Arnoldo Ruiz		CATIE/ROCAP
Roberto Arias	Project Coordinator	FIDA
AGRICULTURAL PRODUCERS		
Abelino Lopez		
Victoriano Montoya		
Santos Herrera		
Inocencio Mendoza		
Absalon Rizo		
Narciso Perez		
Mercedes Gonzalez		
Ramon Matus		
Rualena Loisey		

GUATEMALA

Name	Title	Institution
INSTITUTIONAL CONTACTS		
Hector Gonzalez		ICTA
Arturo Rodriguez		ICTA
Carlos Saavedra		ICTA
Hugo Peralte		BID
Hugo Vargas		BID
Ruben Roca		ROCAP
Romeo Solano A.		ROCAP
Pablo Gamaliel E.		ICTA
Orlando Arjona	Director	ICTA
Luis Sagastume		
Juan Guerra		
Roberto Tobar		
Orelia V. de Tobar		
Gonzalo Roldan P.		ICTA
Francisco Tecum	President	Consejo de la Cooperacion, Santiago Scatepeque
Ricardo del Valle	Regional Director	ICTA
Osman Garcia	Field Assistant	CATIE
AGRICULTURAL PRODUCERS		
Pablo Peroba		
Enrique Cabrera		
Sergio Burgos		

PANAMA

Name	Title	Institution
INSTITUTIONAL CONTACTS		
Washington Bejarano	Resident	CATIE
Omar Chavarria	Regional Director	
Gerry Mott	Livestock Adv.	Univ of Florida
Rodrigo Tarte	Dir. General	IDIAP
Julio Santamaria	Extension Specialist	
Santiago Rios	Sub-Director	IDIAP
Marco Navarro	Agriculture Researcher	IDIAP
D. Carmona	Agriculture Researcher	IDIAP
L. Carranza	Agriculture Researcher	IDIAP
Phillip Shannon	Technical Resident	CATO
AGRICULTURAL PRODUCERS		
6 Cooperative farms (Asentamientos)		
2 private farms (owners absent)		

EL SALVADOR

Name	Title	Institution
INSTITUTIONAL CONTACTS		
J.F. Larios	Coordinator	CATIE
Ing. Rico	Soil Scientist	CATIE
Gale Roselle		USAID
Francisco Tecum	Pres. Agricultural Cooperative	
Antonio Miranda	Extension Agent	
10 extension staff		
4 zone chiefs		
AGRICULTURAL PRODUCERS		
Julio Alvrenga		
Pastos Espinal		
_____ Carvey		
Pablo Peroba		
Hernando Patzicia		
Zaragosa Ruicon		
Enrique Carera		

CATIE

Name	Title	Department
Raul A. Morena	Head	Crop Production
Alfredo Serrano	Acting Head	DPA
Carlos Burgos	Coordinator ROCAP	Crop Production
Marco Antonio Esnaola	Coordinator ROCAP	DPA
Luis A. Navarro	Ag econ and Coordinator Validation ROCAP	DPV
Helga Blanco	Publications Specialist	ROCAP
Julio Henao	Statistics and Coordinator Extrapolation	
Marcelino Avila	Ag econ DPA and Coordinator Mixed Systems	
Jorge Benavides	Small Animal Specialist	ROCAP
Joseph Saunders	Entomologist	ROCAP
Emilia Solis	Communication Specialist	
Alfredo Serrano	Coordinator BID Project	
Marco A. Esnaola		
Rolain Borel	Pasture Specialist	
Medardo Lasso	Vet and small animal researcher	
Mario Saenz	Assistant Coordinator	ROCAP
Donald Kass	Soil Management Specialist	
Carlos Molestina		
Anibal Palencia		
Gilberto Paez	Director	CATIE

COSTA RICA

Name	Title	Institution
INSTITUTIONAL CONTACTS		
Alvaro Cordero	Director of Graduate Programs	University of Costa Rica
Teodoro Cordero	Administrator Experimental Station "Los Diamantes"	Ministry of Agriculture and Livestock (MAG)
Jose Miguel Carrillo		MAG
Guillermo Fuentes	Resident Animal Production Department	CATIE/ROCAP
Mario Urcuyo	Graduated Student	CATIE
Luis A. Quiros	Resident Crop Production Department	CATIE/ROCAP
Anibal Palencia	Resident Crop Production Department	CATIE/ROCAP
Medardo Lasso	CATIE/ROCAP Project	CATIE
William H. McCluskey		ROCAP
AGRICULTURAL PRODUCERS		
Jorge Segura	Mixed System Cariari	
Jesus Arce	Livestock Cariari	
Edwin Mesen	Prototype Cariari	
Rafel Corrales	Crop System Cariari	
Abdon Quesada	Crop System Cariari	
Samuel Carranza	Crop System Cariari	
Luis Navarro	Mixed System Guacimo	

HONDURAS

Name	Title	Institution
INSTITUTIONAL CONTACTS		
Rodomiro Diaz Zelaya	Regional Director DARCO	MRN
Roduel Rodriguez Ardon	Regional Coordinator PNIA	MRN
Miguel Angel Soler	Assistant Coordinator PNIA	MRN
Alfredo Montes	Horticulturalist	CATIE
Enrique La Hoz Brito	Resident Honduras	CATIE/ROCAP
Roger Meneses	Resident Honduras	CATIE
Jorge Salgado Garcia	Validation Agent	SRN/CATIE
Gerardo Petit	Assistant Investigation	SRN/CATIE
Jorge A. Herrera		CATIE
Heraldo Lavaire Diaz	Investigation on farms	SRN
Juan Aeschlimann Sauter	In charge investigation La Paz zone	SRN
Luis Armando Aleman	Assistant investigation	CATIE
Neftali Monroy	Assistant investigation	SRN/CATIE
Brian Rudert		USAID
Stephen Wingert		USAID
Charles Oberbeck		USAID
Ramon Enrique Mercado	Field Assistant	USAID
Osman Garcia	Field Assistant	CATIE
Sario Soro	Credit Specialist	CATIE
Sergio Burgos	Horticulturalist	World Bank
Ricardo del Valle	Technician	

AGRICULTURAL PRODUCERS

Jose de Castallera

Jose Ramon Mercado

Ramon Bonilla

Wenceslao Torres

Romula Machado

Adolfo Juestroza

Jose Palencia

Ramon Valenzuela

Gustavo Donaire

Gaspar Vasquez

ANNEX C
STATUS OF PROJECT OUTPUTS

A. METHODOLOGY	OUTPUTS as of 9/30/82	Outputs for 9/30/82-10/1/83
1. Animal (1)	A preliminary document concerning the case of Guatemala has been prepared.	A complete document concerning all countries will be presented.
2. Mixed Farming (1)	We have a preliminary document "Lineamientos generales de una propuesta para iniciar la investigación en sistemas mixtos", Mayo 1982	Updating of "Research on Crop-Animal Systems" Proceedings of a Workshop June 1982, CATIE, CARDI, WINROCK INT.
3. Cropping Systems (1)	There is a document "Estrategias para el Desarrollo de Tecnologia Agricola. Mejorada en fincas de agricultores de Recursos Limitados, 1979.	This document needs revision and updating, but other project requirements will take most of professional time available.
B. RECOMMENDATIONS		
1. Cropping Systems (1)	Guatemala (3) Nicaragua (2) Honduras (2) El Salvador (2) Costa Rica (2) Panama (2)	Guatemala (0) Nicaragua (1) Honduras (1) El Salvador (0) Costa Rica (0) Panama (0)
2. Animal Systems (6)	Panama (0) Guatemala (1) Bovine Honduras (1) Bovine Nicaragua (0) Costa Rica (1) Bovine CATIE (1) Goats	Panama (1) Bovine Guatemala (0) Honduras (0) Nicaragua (1) Bovine Costa Rica (1) Pigs CATIE (1) Sheep
3. Mixed Farming (6)	Guatemala (1) (Designed) El Salvador (1) (Designed) Honduras (1) (Designed) Costa Rica (1) (Designed) CATIE (2) (Testing)	Guatemala (1 tested & validated) El Salvador (1 developed) Honduras (1 developed) Costa Rica (1 developed) CATIE (2 developed)

ANNEX D

STATEMENT OF WORK

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

A. Assess the effectiveness of organizational and administrative structure of CATIE and national institutions for carrying out multi-disciplinary research on crop/animal/mixed farming systems.

B. Evaluate if the regional approach 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/potential for favorably influencing production and productivity of food crops, animals and combinations of crops and animals.

D. Examine if the quality and quantity of research can be evaluated as to cost-effectiveness relative to prevailing economic conditions, salaries and benefits within the region.

E. Assess the effectiveness of analyzing, storing, disseminating and application of research results.

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.

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 as applied to 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 and implementation reports to determine:

1. whether they are prepared and presented to give a clear understanding of what CATIE and the national agencies are doing;

2. whether the bilateral USAID Missions, host country officials and AID/W are aware of these reports; and

3. how they can be improved.

STATUS OF PROJECT OUTPUTS, CONTINUED

4. Information on 18 analogous areas (RPA)	The Project has information for: Honduras, 281 Municipios Guatemala, 325 Municipios El Salvador, 247 Municipios General site information System/site information Climate information Soil information.	Nicaragua 135 Municipios
5. Extrapolation methodology (1)	The Project is testing the methodology in four countries.	In 1983 the Project will write the methodology and present results obtained in 1982.
6. Validation/Transfer methodology	A methodology is under testing in three countries: Costa Rica, Honduras, and Nicaragua.	A document containing a first version of validation/transfer methodology will be prepared.
7. In-service training seminars (18 national research technicians)	12 short courses (309 persons) 32 in training service events with the participation of 123 persons. 15 Central American and Panamanian MS level in problems on cropping and farming systems. 16 Non-Central American graduated MS level. Those prepared dealt with topics on cropping and farming systems.	At least four short courses or seminars (soil taxonomy, analysis of cropping systems results, preparation of technological packages and other phases of the professionals graduated at themethodology). At least 12 more Central American students will graduate with MS degrees and present theses on cropping systems research topics.
8. Institutional capacity	CATIE's Department of Crop Production has the capability of advising and assisting national institutions of research through staff contracted with funds provided by other agencies of technical cooperation.	The Crop Production Department will increase its personnel paid with core budget funds by 2 or 3 professionals.

K. Examine presently planned levels of financial contributions by CATIE, national agencies, other donors, and ROCAP and assess whether they have been provided as planned and are sufficient to achieve the project objectives. If the availability of human and/or financial resources is a constraint, recommendations will be made on what can and should be done to relieve the situation.

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, and recommend how relationships can be fortified.

ANNEX E

ADDITIONAL ROCAP QUESTIONS

1. Can it be determined if the project has/is favorably influencing national governments to focus more resources/commitment on research? Have national units formed multidisciplinary teams to address FSRE?

2. Is extension adequately involved, especially in validation? Are any private sector groups involved?

3. Can workshops, seminars, short courses, etc. be made more cost-effective? Any training modules, packages units developed, especially on methodologies?

4. Do they take advantage of research results developed by other groups (IARC's, other regional groups, national groups, etc.)?

5. Is data collected the most pertinent? Should it be increased? Decreased? What happens to it?

6. Does the work of the animal section, especially small animals, fit FSR? Is it systems work?

7. Any feedback from farmers on their perception of the promoted systems? The profitability/risk perception?

8. Other perceptions of the farmers as to missing elements or availability of inputs, T.A., market, etc.?

9. Any perception of the costs of the research as compared to other similar projects?

10. Do technology packages or systems recommended contribute to conservation/maintenance of resources?