SMALL FARMER CROPPING SYSTEMS FOR CENTRAL AMERICA

FINAL REPORT June 1975 - March 1979

Contract Nº AID 596-153 (CATIE - ROCAP)

CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA
TURRIALBA, COSTA RICA
1979

CATIE
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA
Program of Annual Crops

SMALL FARMER CROPPING SYSTEMS

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CONTENTS

PERSONNEL

Professional Staff of the Annual Crops Program who Have Contributed to the Small Farmer Cropping Systems Project

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Arze, José A. (MS)[2/]	Perú	Agronomist, Cropping Systems Specialist, resident in El Salvador
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Bejarano, Washington, (MS)	Ecuador	Agronomist, specialist in soils
Boynton, Damon (PhD)[1/]	United States	Senior Advisor to SFCS project
Burgos, Carlos F. (PhD)[2/]	El Salvador	Agronomist, Specialist in soil management
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Diaz-Romeu, Roberto (MAgr)	Guatemala	Soil Scientist, head of soils laboratory
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Forsythe, W. (PhD)[1/]	Jamaica	Soil Scientist, specialist in soil physics
Hart, Robert D. (PhD)	United States	Crop Ecologist, Systems specialist
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NAME	NATIONALITY	TITLE
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Shannon, Philip (MS)	United Kingdom	Entomologist
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NAME	NATIONALITY	TITLE
Soria, Jorge (PhD)[1/]	Ecuador	Geneticist, Former head, Tropical Crops and Soils Department
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1/ No longer working for CATIE

2/ Working directly on the SFCS project

Short-term Consultants to the SFCS Project

Name	Speciality
Albertazzi, Constantino	Statistics
Andrade, Eduardo	Information Science
Baird, Guy B.	International Research and Development
Bradfield, Stillman	Anthropology
Duisberg, Peter	Soil Science
Hargreaves, G. H.	Climatology
Harwood, Richard	Cropping Systems Research
Hildebrand, Peter	Economics
Latterell, Francis	Plant Pathology
Larios, Francisco	Agronomy
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INTRODUCTION

The CATIE/ROCAP Small Farmer Cropping Systems Project was a four-year project beginning in 1975 and ending on March 31, 1979. The principal objective of the project was to create a coordinated regional research approach for improving the cropping systems of small farmers.

The project was financed by the Regional Office for Central American Programs (ROCAP) of AID, and was carried out through the Annual Crops Program of CATIE. The Annual Crops Program was formerly called the Department of Tropical Crops and Soils and was under the direction of Dr. Jorge Soria, as head, and Dr. Rufo Bazán, as acting head, until 1978. In March of 1978, Dr. Pedro Oñoro became head of the Annual Crops Program.

The SFCS Project was carried out in the five Central American countries. In Costa Rica, work was done in the Southern Pacific and Atlantic regions and at Turrialba, CATIE's headquarters. The work in the Southern Pacific region was centered near the town of San Isidro de El General, in the areas known as San Rafael de Platanares, Palmares de Pérez Zeledón and Las Juntas de Pacuar, all in the "Cantón" of Pérez Zeledón. The work in the Atlantic region was done in the "distritos" of Cariari and Guácimo. Cariari is in the "Cantón" of Pococí, and Guácimo is in the Cantón of Guácimo. Work was also done at the Los Diamantes Experiment Station at Guápiles, in the Cantón Pococí.

The principal work in Nicaragua was done in the agricultural community of Samulalí in the "Municipio" of Matagalpa, in the "Departamento" of Matagalpa. The principal work in Honduras was done in the area near the "aldea" of Yojoa, in the Municipio of Santa Cruz de Yojoa, Departamento

of Cortes in the Sula Valley. Work was also done in the northern part of Honduras, near the towns of Agua Sucia, Cuyamel, and at the Guaymas Field Station. In the last year of the project work was done in the Comayagua area of Honduras.

In El Salvador, the principal work was done near the towns of La Trompina, in Municipio Sociedad, Departamento Morazán, and near the Municipio of Tejutla, in the Departamento of Chalatenango. Most of the work in Guatemala was centered in the Central Highlands in the Chimaltenango region, designated as Region V, in the Municipios of Santiago Sacatepequez, Tecpán, Zaragoza, Comalapa, Chimaltenango and Santa Cruz Balanyá. Some work was also done in the Quetzaltenango region (Region I).

The following final report of the SFCS Project summarizes the accomplishments of the four years. The format of the report is based on the scope of work agreed upon in the CATIE/ROCAP contract. There are four general categories: the collection of base line data; the planning, field testing and evaluation of cropping systems; recommendations for new cropping systems; and assistance offered in creating a Central American capability to conduct continuous cropping system research. A fifth category, other activities, presents information on activities not included in the original scope of work, and the bibliography lists many of the documents produced during the project.

HIGHLIGHTS

The main output of the SFCS Project has been the development of a methodology (or strategy) for conducting on-farm agricultural research directed towards making technical and economic improvements in the cropping systems practiced by small farmers of specific areas of the Central American Isthmus.

The project has contributed to the development of national research programs on cropping systems through training activities, by making technical information available, by interacting with the national staff in field work, and by promoting and cooperating in establishing a collaborative effort among the countries for cropping systems research. This contributed to the effort to initiate steps towards the identification of common interests and methodology and towards the possibility of an agricultural research network in the Isthmus. Through this project, CATIE as an institution consolidated and improved its working relations both with the national institutions of the area and with the international research institutions throughout the world.

The tangible success of the project can be summarized by two major outputs: (1) the acceptance by the national institutions of the work objectives and methodology proposed by the project, as well as the support given by those institutions to the coopearative project work, and (2) the quantifiable and very promising research results produced, some of them ready for validation at the small farmer level.

Description of Project Highlights

1. Base line data on the agronomic, socioeconomic and physiobiological environment of the small farmers in the project areas was collected and stored, ready for retrieval. Standardized procedures and techniques for the collection and interpretation of these data were formulated and refined, national personnel were trained and national teams worked with CATIE staff members in collecting, analyzing and interpreting base line data. Surveys were conducted as one of the principal method for collecting the data. Case studies were done on individual farms in order to develop methodologies for dynamic on-farm studies needed to interpret system performance and to gather additional base line data. Base line data on marketing, weed management, nutrition, climate, soils, insect pests, plant diseases and vegetable production were also collected. Support was given to national base line data collection projects.
2. Approximately 115 field experiments were conducted, most of them done on farmers' lands. The major output from this research was the production of ten cropping systems alternatives. The following is a summary of some of the experimental results from the project.
   2.1. An improved maize-bean cropping system tested at Samulalí, Nicaragua produced a 33% increase in maize yield and a 36% increase in bean yield as compared to the farmers' present system performance. With an increase in costs of 24%, a farmer could expect an increase in net income of 63% to 204% per hectare.

2.2. At Samulalí, sorghum was intercropped with the first bean crop in the traditional cropping system of beans in rotation with beans. The increased yields shown in the experimental results of this alternative represent an increase in gross income of $1,333.13 at an additional cost of $516.81. The system also offered the benefit of producing a crop of sorghum, which in some cases, could be useful as a soil conservation method as well.

2.3. At Yojoa, Honduras, experiments comparing cowpeas to common beans showed that cowpea yields were substantially greater than bean yields, in some cases as great as 300%, when conditions for common beans were unfavorable.

2.4. An alternative system of maize intercropped with rice followed by cowpea at Yojoa offered advantages over the traditional system of rice followed by beans. The alternative resulted in a potential net income increase of 273% at an additional cost of approximately 15%. It was also considered less risky to intercrop maize and rice than to plant rice alone, and to plant cowpea instead of common beans.

2.5. Replacing common squash with pipián (a squash with a good market value) at Yojoa yielded a system with a potential net income increase of 152% to 334% at an additional cost of 23%.

2.6. In El Salvador, a technical modification to the maize-sorghum system offered an increase in yield of 32% in maize and 75% in sorghum with a 37.2% increase in costs and an increase in net income of at least 63%.

2.7. At Pérez Zeledón, Costa Rica, one of the improved alternatives involving maize and common beans permitted an increase in net income of at least 123% over the highest income obtained from the farmers' system. The studies done for this alternative also showed the agronomic and biological potential of producing two crops of maize and two of beans on the same land during the normal rainy season.

2.8. At Pérez Zeledón, controlling a root-feeding insect with an inexpensive insecticide application increased maize production by 180%.

2.9. At Cariari, Costa Rica, an alternative system of maize associated with cassava and beans was compared to the farmers' system of maize associated wtih cassava. The alternative showed an increase in net income of 182% to 224%, with an increase in cassava yield of 154% to 167%, with beans produced as an additional crop.

2.10. At Guápiles and Turrialba, Costa Rica, there were significant reductions shown for the cost of land preparation and labor in systems where yields were the same under minimum and no-tillage management as under conventionally tilled plots. Minimum tillage also reduced the need for fertilizers based on P and K by approximately 30% in the production of maize and/or beans.

2.11. At Turrialba, a cropping system including cassava, common bean and sweet potato yielded 32,470 Megacalories per hectare.

This amount of nutritional energy satisfies the annual calorie requirement of 20 people plus a few head of livestock.

3. A Central Experiment with several cropping systems commonly used by small farmers was conducted at the research station at CATIE's Turrialba headquarters as part of a continous on-station research program. Other experiments were done on insect pests, plant diseases, effect of radiation on cowpeas, fertilization, varieties, etc. Eighteen UCR/CATIE Graduate students did their theses research at the station. A germplasm collection was maintained and biomass determinations, multiplication of seeds, work on soils and on insect and plant disease problems were done in the greenhouses and laboratories at Turrialba.

4. A methodology for conducting research on cropping systems used by small farmers was developed and is presented in a procedural guide. Various aspects of methodology, such as the conceptual framework for research on cropping systems, steps in diagnostic studies, design of possible cropping system alternatives, field testing and validation of these alternatives, and procedures and format for presentation and dissemination of the alternatives are discussed in this guide.

5. More than 379 Latin American professionals were trained during the course of the project, and of these, more than 75% were Central Americans. Training was accomplished through courses, formal seminars and in-service training. Through this training program, CATIE has played an important part in establishing a regional community of agricultural scientistis with interests directed towards small

farmer cropping systems research.

6. Approximately 2,500 documents dealing with cropping systems in the tropical region of the world, as well as documents dealing with additional information on the Central American Isthmus, were collected, processed and stored for easy retrieval in a documentation center, ready for the use of the project personnel and the national personnel working with the project in the countries. Technical papers and reports on the research done during the project were widely distributed. Non-published documents (work documents) were also collected, processed, and stored in this same documentation center.

7. In addition to working closely with Central American national institutions, CATIE staff reinforced the professional relationships with many other international centers, such as, CIAT, CIMMYT, ICRISAT, CARDI, IITA.

8. The countries of the Central American Isthmus gave strong support to the SFCS Project, and the national institutions collaborated in all aspects of it. A Regional Committee, national committees and national teams were formed to promote cooperation between CATIE staff and the national personnel in working towards the goal of creating a national capability for conducting continous cropping systems research. Many countries have begun or expanded national programs or projects on small farmer cropping systems, and although it is impossible to quantify CATIE's influence, it is safe to assume that CATIE has played an important role in the development of small farmer cropping system research in Central America.

A. BASE LINE DATA

The methodology of the Small Farmer Cropping Systems Project requires all research work and evaluation of results to be based on data collected from the farms, farmers and cropping systems specific to each work area. Several activities were undertaken to obtain this base line data. In accordance with the project's Scope of Work they could be classified as:

A.1. Formulation of standarized procedures and techniques for the collection of base line data.

A.2. Provision of training needed to qualify national personnel in the use of those techniques for the collection of base line data.

A.3. Assistance to national teams in the base line data collection process itself (i.e. secondary information search, field surveys,ect.).

A.4. Assistance to national teams in the analysis, interpretation and summary of base line data.

However, all base line activities were very much related and will generally be grouped together in this report. The following presentation will be directed towards activities related to section A1, specifying the additional activities pertaining to sections A2, A3 and A4.

Initial Development of Base Line Data Gathering and Interpretation Techniques, and the Training Aspects Connected with It

The base line data phase of the project began with the "Base Line Data Collection Meeting" held at CATIE, Turrialba, October 13-15, 1975. This meeting was coordinated by Dr. Damon Boynton. The participants included staff from CATIE's Tropical Crops and Soils Department and the

following invited experts: Dr. Constantino Albertazzi (Costa Rica), Dr. Stillman Bradfield (USA), Dr. Donald Fiester (USA), Lic. Eugenio Herrera (Costa Rica), Dr. Oscar Hidalgo (Nicaragua), Dr. Peter Hildebrand (Guatemala), Ing. Heleodoro Miranda (El Salvador), Dr. J.K. McDermott (USA), Dr. Howard Ray (USA), and Ing. Mario Sáenz (Costa Rica). A definition of "small farmers" and the general guidelines for data collection, analysis and interpretation were discussed and several examples were reviewed. It was decided that survey procedures should be practical and simple, small samples of farmers should be selected for interviews and the simplest and shortest questionnaire possible should be used. The objective would be to find out what small farmers are actually doing (i.e. what are the main cropping systems), how are they doing it and why are they doing it. This implies the collection of base line data on existing small farm cropping systems, present farm practices, production problems, production results, income and other benefits, employment generation, risk evaluation and nutritional status.

Based on the recommendations from the October meeting, the project staff began work to plan area reconnaissances, secondary information gathering and survey questionnaire design. The initial survey instrument was designed during November 1975. It was tested at Guayabo, a community of small farmers near Turrialba, by the project team and the Turrialba Agricultural Extension staff of MAG*, Costa Rica from December 12-26, 1975.

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* See list of abbreviations.

A user's manual was written (d. 685)* in order to standarize the use of the developed questionnaire. The questionnaire was supposed to be modified later only to adjust the terminology to local conditions.

This initial questionnaire was used for base line surveys in Costa Rica (Guayabo, Alajuela, Cariari, Guácimo, Platanares y Pejibaye; d. 170, 172 and 449), Nicaragua (San Ramón and La Trinidad; d. 262, 228) and Honduras (Yojoa, Guaymas; d. 261 and Agua Sucia d. 3813). Twenty four people in Costa Rica, 7 in Nicaragua and 15 in Honduras were trained (A2) in the execution of the surveys, and each survey was supervised by different members of the project staff (A3). The following surveys were done: Costa Rica December 1975-March 1976, 143 farmers interviewed in 6 locations; Nicaragua February 1976, 80 farmers interviewed in 2 areas; Honduras, February-March 1975 and January-February 1977, 78 farmers interviewed in 3 areas. Data from the surveys were analyzed and interpreted at Turrialba and discussed with national personnel (A4). More than 30 FORTRAN programs were specifically developed by project staff and IICA's IBM 1130 computer was used for processing the data. Data processing personnel from IICA helped in analyzing the data. Resulting documents are cited above and are also summarized in d. 171.

Other efforts at the beginning of the project to standarize procedures and techniques for the collection and processing of base line data

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* Document numbers indicate the classification number of documents in the Annual Crops Program Documentation Center at CATIE. (See Bibliography section of this report).

are documented in the first version of the CATIE/ROCAP Project guide on production systems for the small farmer (in Spanish) (d. 687). This document on guidelines was distributed to national professional teams for discussion and use. The guidelines deal with: a) experimental design and site selection, b) economic analysis for experimental data, c) procedures and forms for climatic data gathering at experimental sites, d) disease and insect damage and loss assessment in the field and e) experimental data recording forms and instructions for their use.

Further Development of Base Line Data Gathering and Interpretation Techniques, and Training Aspects

Based on the initial efforts, several activities were undertaken to improve data gathering procedures and analysis techniques. Some dealt with specific types of data or studies, while others were wider in scope. A summary of these activities is presented here, with documents containing more detailed information cited when available. These activities overlaped in time, therefore, their presentation is not chronological.

A) Case studies. The activities on individual farms were recorded for one year from 1977-1978. The objective was to develop methodologies for dynamic on-farm studies, to interpret system performance, and to gather base line data needed by the team. Periodic visits were made to the selected farms for informal interviews of family members and daily farm activities were recorded. The record forms were managed by a family member of by the professional responsible for the study. One case study was carried out at Pejibaye (Pérez Zeledón), two at Guayabo, and

six in the Atlantic Zone, Costa Rica; and one at Yojoa, Honduras. Detailed methodology, sample forms and partial results are reported in documents 226, 453 and in appendix 4 of d. 5072, 5073 or 5074. (Five national technicians trained-A2).

B) A marketing study on maize at the small farmer level, done at Guápiles, Costa Rica, in collaboration with the TAB support project. The survey report is in progress. (Six national technicians trained).

C) Weed management study at small farmer level, done in Cariari, Costa Rica in collaboration with the OSU/AID/CATIE support project. The survey report is in progress. (Six national technicians trained).

D) Anthropological study to relate socio-cultural aspects and small farmer technology, done in El Zapote, (Pérez Zeledón), Costa Rica. Anthropology thesis (for licenciatura degree) by Nora Solano, in progress, done in collaboration with the UCR (includes a survey on 68 small farmer's families). (Five national technicians trained).

E) Study on the relationship between small farm resources and cropping systems technology, done in San Isidro de El General and Guápiles, Costa Rica. Reported in Ph.D. thesis "An Economic Evaluation of Alternative Annual Cropping Systems in two Regions of Costa Rica" by Marcelino Avila, done with the collaboration of the University of Missouri and IICA (includes survey). (Seven national technicians trained).

F) Study of the relationship between some socioeconomic characteristics and small farmer level of technology, done in Guayabo, Costa Rica. Reported in M.S. thesis "Some physical, economic, administrative and social aspects associated with the level of technology in coffee and maize in a community of small farmers" (in Spanish) by Néstor Rojas (d. 6109) with

UCR-CATIE graduate program (includes survey). (Four national technicians trained).

G) Use of parametric programming in the evaluation of small farmer cropping systems, done at Turrialba and Guápiles, Costa Rica. Reported in M.S. thesis "Application of parametrics to the evaluation of cropping systems adequate for small farmers" (in Spanish) by Miguel Avedillo, (d.6013) with UCR-CATIE graduate program (uses survey data and Central Experiment results obtained at Turrialba). (Three national technicians trained).

H) Survey to characterize whole farming systems at the small farmer level in Yojoa, Honduras; Matagalpa, Nicaragua; and Guápiles, Costa Rica. Related training and result are presented in documents 1496, 1677 and 1744. Survey was carried out during August 1977. (Ten national technicians trained).

I) Survey on nutritional aspects at small farmer level in the work areas of the project, done at Pérez Zeledón and Guápiles, Costa Rica; Agua Sucia, Cuyamel and Yojoa, Honduras; and Samulalí, Nicaragua between November 1977 and February 1978. Documents 1484, 1485 and 1778 contain information on related personnel training and results. (Sixteen national technicians trained).

J) Initial reconnaissance survey done in the Estelí Agricultural Sub-Region (Nicaragua) during May of 1978. This survey was done with an improved questionnaire based on previous project experiences. Related documents include the "Explanatory manual on the initial reconnaissance survey in Nicaragua (in Spanish)" (d. 5082) and "Preliminary report, initial characterization of the small farms in the Estelí Sub-region, Nicaragua 1978" (in Spanish) (Vega, Navarro 1979, in progress). This

survey was more comprehensive than the initial surveys but still dealt mainly with cropping systems. (Ten national technicians trained).

K) Initial farm study survey, done at Caisán, (Chiriquí) Panamá in Aug.-Sep. 1978 (d. 3912). This survey includes information on the total farming system, giving a better perspective on the specific crop and animal production systems. The questionnaire used for this survey shows the progress made in the survey instrument up to the end of the project in 1979. Documents 3707 and 3917 contain information on area sampled, people trained and survey supervision analysis and reporting. (Twenty five national technicians trained).

National personnel were trained in the use of the survey instrument in all the surveys reported here so far. The project staff participated in survey supervision in all cases and the analysis was done mainly at Turrialba with participation of national professionals. The documents cited mention all these activities. Training in survey analysis was done at Turrialba through in-service training (Four people from Panamá and Nicaragua) and through various seminars (reported in Section B10 and 11).

Additional Base Line Data Gathering and Interpretation Techniques and Training Aspects

Other project-related standarization efforts on base line data collection and handling wererpresented at the different training sessions required by the project or requested by national teams. These seminars were held at Turrialba and in the countries (reported in Section B10 and

11). The related documentation include:

"Control of information in carrying out experiments" (in Spanish) (d. 1745), which includes several data handling forms and instructions for recording information on forms CS 7702-7704 and 7710. (These forms were made available to all personnel).

"Collection, processing and analysis of microeconomic information generated from agricultural experiments on farmers' lands (project for a manual)" (in Spanish) (d. 3817), developed at the request of INTA in Nicaragua who used it for training in the INTA-INVIERNO-AID project in Matagalpa.

"Tentative outline of the contents of a "Technological Package" for a cropping system (proposed)" (in Spanish) (d. 5081).

"Processing and analysis of surveys (instruction material)" (in Spanish) (d. 5084), used for in-service training.

"The farm system, the socioeconomic part in the analysis of the environment" (in Spanish) (d. 1672), used for the continuing seminar in El Salvador.

"The systems approach and the specific tools for studying cropping systems, the farmer and his total environment" (in Spanish) (d. 1676); used in several seminars during the project.

"Economic analysis of systems" (in Spanish) (d. 5083), used in a UCR-CATIE graduate program conference.

Support to the National Teams in Base Line Data Gathering and Interpretation

The CATIE team members continued to work actively with the national teams after they developed a capability for the type of research suggested by the project. This work is also related to base line data gathering analysis and experimental design. In Nicaragua, the CATIE team supported INTA's work in Matagalpa as part of the INTA-INVIERNO (PIAPA) Program and in Estelí as part of INTA-CATIE-IDRC Project.

In El Salvador, the project staff helped in the organization, formation and guidance of area-specific national teams. The teams have been working in five areas, including Tejutla and La Trompina, two areas in which the CATIE/ROCAP Project resident has been actively collecting base line data. Area-specific teams include up to nine members of different disciplines.

The CATIE team has been involved with the national team in Honduras in developing a survey questionnaire, in data analysis and interpretation and in experimental design, as well as in personnel training. The project staff has been involved in this way in the work at Comayagua, La Esperanza, San Gerónimo and El Rosario, as well as at Yojoa, Cuyamel and Agua Sucia. All are small farmer areas considered priority areas for the country.

In Guatemala, the project resident and other CATIE staff members have participated in "sondeos", the area reconnaisance method of ICTA, and in the gathering of climatic and soil base line data.

All these activities could be included in parts A2, A3 and A4 of the project Scope of Work.

Support Base Line Data

The collection, technique development, interpretation and reporting of support base line data have been undertaken for soils, marketing, anthropology, climate, and insect and plant disease conditions. These activities were carried out by short-term consultants, project staff members and national personnel. Secondary information combined with direct observations in the field were used in data collection and interpretation.

A discussion of the various types of support base line data collected during the project follows.

Concepts for the Development of Base Line Data Gathering and Processing Techniques

The consultancy reports of Dr. Richard Harwood and Dr. D.W. Norman (d. 691 and 5029) include the discussion of some of the factors involved in formulating standarized procedures and techniques for the collection and interpretation of base line data.

Anthropological Work

Dr. Stillman Bradfield was contracted as a short-term consultant to collect base line anthropological information from the project areas

in Costa Rica, Honduras and Nicaragua. He reported on historical background and infrastructure of the areas where farmers working with CATIE live, and he interviewed many of the local farmers. In 1977 he worked with J. Arze in an exploratory study in Las Peñas, El Salvador. The reports resulting from this study (d. 3723 and 3724) contain information on the general characteristics of the area, on the climatic characteristics, the socioeconomic characteristics, the agricultural aspects and systems of the area, a recommended methodology, and suggestions for the work in La Trompina and Las Peñas.

A method for identifying farmers to collaborate in the project research, different from the individual interview method, was tried by Lic. Andrade in Nicaragua and Honduras (d. 1679 and 1680). Farmers in the areas were invited to come to a meeting to discuss the project. The objectives of the project, its importance, the role of the CATIE staff, and the role of the farmers were discussed. The farmers reacted to this approach positively, offering their cooperation and answering questions on their agronomic practices and production costs.

Marketing Work

Observations and studies were done on marketing. Information collected included market size, types of products bought and sold, prices (wholesale, retail), etc. (d. 693 to 698, 1478, 1492, 1493, 1746 and 1749). Most of this work was conducted by T.D. Johnston as part of the AID/TAB support project.

Climatic Base Line Data

Climatic base line data from meteorological stations near the work areas of the project were collected (d. 4274). Monthly averages, annual distribution of average monthly minimum, median, and maximum precipitation on the base station, and figures comparing precipitation, temperature, relative humidity and the MAI index on the base station to other stations in the area are presented in the report.

In 1977, precipitation data was taken on some of the farms where the experiments were located. A pluviometer was placed on the farms and the farmers used a special form to record daily precipitation.

Ing. Arze, the CATIE resident in El Salvador, prepared a report (d. 1675) on the influence of climatic factors on the agricultural production process. This report includes some base-line data on precipitation (distribution, monthly averages) for La Trompina in El Salvador. A report on the Las Peñas area (d. 3724) also includes some climatic data.

Soils Base Line Data

The Soil Fertility Project (see Section E3) provided important base line data on soils. Work was done on soil classification, soil fertility and soil conservation as well as on a methodology to produce soil analogs. The final report of the project (d. 4132) is a summary of what was done on the project and lists the appendices which contain more detailed information.

This work was continued when the Soil Fertility Project ended in 1978, and base line activities such as soil and plant analysis, assessment of the soils laboratories in the countries and diagnostic studies in Panama, Honduras, El Salvador and Guatemala were done.

The physical and chemical characteristics of the soils at San Isidro de El General, Costa Rica were studied (d. 1665). Four experimental sites were chosen, samples were taken, and soil profiles and chemical analysis were done.

Base Line Data on Insect Pests

Over 800 references on approximately 1000 pest species have been searched out and systematically cross referenced by crop host and scientific names of the pests. Folders containing biological information and chemical control methods for approximately 500 pests have been prepared and systematically filed. A file of complementary information on management of pests and diseases for individual crops have been referenced by crop. A compendium of insect and mite pests by host and damages was compiled for 41 crops (d. 713). Studies have been done on potencial cassava insect problems (d. 1754). A provisional list of insect and mite pests of food crops in Central America is presented in document 1738. A study of the use of pesticides by small farmers in Central America was also done (d. 1755).

Base Line Data on Fungi Diseases

Dr. Francis Latterell visited the project in order to conduct a base line study on fungi diseases in food crops. The visits took place during 1977 and 1978. The work also required laboratory taxonomic work at Turrialba and in the United States. A report is in progress.

Base Line Data on Vegetable Crops for Central America

A report on vegetable crops for small farm production systems (d. 479) was done in 1976 by Dr. Miguel Holle, then acting as a consultant to CATIE. The report presents information on labor needed for vegetable gardens as well as comments and recommendations for various aspects of field experiments with vegetables. It also contains observations on vegetable production in specific areas of Costa Rica and Honduras. Other reports present information on vegetables in tropical areas and in multiple cropping systems (d. 692), information on the nutritional value of vegetables (d. 1201) and an example of a methodology to define the characteristics of particular crops (using cabbage as an example) to be incorporated as a component in an agricultural production system (d. 1096). Another report deals with the marketing of tomatoes in San Pedro Sula, Honduras (d. 1469).

An initial study for existing and potential vegetable crops for small farmers in the Central American Isthmus was done during the first part of 1979 by J.M. Villasuso. Secondary information at the country level was used. The final report is in progress.

General Base Line Data

Base line data on the geographical aspects of the regions in each of the countries where the experimental sites were located are presented in the published cropping systems recommendations from Costa Rica, Nicaragua, Honduras and El Salvador (see Section C of this report). The geographical data presented includes information on topography, climate and soils, and in some cases information on the geology, hydrology, and natural vegetation of the areas. A geographical description of the Caisán area of Panamá was also done (d. 3744).

The cropping systems and some characteristics of the agriculture (including information on climate and soils) in the Guápiles, Costa Rica area are described in document 1215. Similar information on San Isidro de El General, Costa Rica area is found in document 1217. Some of the problems and inputs of the systems at La Trinidad, Estelí and San Ramón, Matagalpa, Nicaragua are described in document 228.

This type of information is also found in the annual reports and in the technological recommendations for each country.

Present State of Base Line Data Collection

The present state of the data gathering procedures and techniques of the project is documented in the Procedural Guide, which is currently being reviewed. This document is directed towards the development of site-specific, applied research. It contains criteria and general procedures for area selection, initial diagnostic studies, identification

of main constraints and other problems, identification of possible solutions or formulation of hypotheses, field-experiment design, site selection and agroeconomic evaluation, technology validation and general considerations on technology transfer.

Additional base line data as well as summaries of previously collected data are presented in the documents on the main technological alternatives generated during the Project for Costa Rica (d. 5076, 5077, 5079, 5080), Nicaragua (d. 3708, 5075), Honduras (d. 5072, 5073, 5074) and El Salvador (d. 5078).

B. PLANNING, FIELD TESTING AND EVALUATION OF CROPPING SYSTEMS

B1. Memoranda of Understanding

A working relationship between CATIE and the agricultural institutions in each of the five Central American countries was established through a memorandum of understanding signed by the Director of CATIE and a representative of the Ministry of Agriculture or corresponding institution in each country. These memoranda provide for cooperation between CATIE and the Ministries in the planning and execution of the project work. Table B.1. lists the titles of the memoranda and the date signed.

Table B1. Memoranda of Understanding between CATIE and Minstries of Agriculture or corresponding institution.

Country	Title 1/	Date Signed	Doc. N°2/
Costa Rica	Document of the Agreement between MAG and CATIE for research on agricultural production systems for small farmers	Sept. 17, 1975	4289
El Salvador	Work agreement between CENTA, CATIE and IICA in the area of multiple cropping	Sept. 28, 1976	1660
Guatemala	Agreement between ICTA and CATIE for research on agricultural production systems for small farmers.	Nov. 9, 1976	1659
Honduras	Agreement between SRN and CATIE for research on agricultural production systems for small farmers.	Dec. 1, 1975	1658
Nicaragua	Agreement between MAG and CATIE for research on	Oct. 31, 1975	1657

Country	Title[1/]	Date Signed	Doc. N°[2/]
Nicaragua	Agricultural production systems for small farmers		

1/ Translation of the title; documents are Spanish

2/ Identification number from the Annual Crops Program Documentation Center

B2. Regional Committee

The First Regional Committee Meeting was held at CATIE on August 9-10, 1976. Technical personnel from the countries involved in the CATIE/ROCAP project, other invited guests, and staff from CATIE and ROCAP attended. The principal objective of the meeting was to name a Regional Advisory Committee for the project. Ing. Javier Williams of Honduras, Dr. Oscar Hidalgo Salvatierra of Nicaragua and Ing. Carlos Ramírez of Costa Rica were named to the committee, with Ing. Williams as head of the committee.

The Second Regional Committee Meeting was held at CATIE on August 19, 1977. The statutes for the Regional Committee were established at this meeting and the activities of the project for the past year were reviewed. The statutes established that the committee would be directed by a president, a vice-president, and a secretary. Ing. Javier Williams remained as president, and Dr. Oscar Hidalgo S. as secretary, and Ing. Romeo López Sánchez of El Salvador was elected as vice-president.

The statutes adopted by the Committee state that it is a civil, non-political, non-profit, non-discriminating organization with its headquarters at CATIE in Turrialba, Costa Rica. The statutes further state that the Committee will consist of representatives of (1) the countries of the Central American Isthmus, (2) CATIE, (3) other organizations directly involved in the project. The goals of the Committee are to:

a) Promote scientific research and study with the objective of improving the production systems of small farmers.

b) Promote the organization of the National Committees.

c) Act as a coordinating organization for the National Committees.

d) Interest the governments of the member countries in adopting and following the policies and research results of the project.

e) Develop a policy of regional cooperation through a coordinated research effort on cropping systems for small farmers.

f) Recommend an increase in field-demonstration days in order to acquaint and interest the authorities of the member countries in the project activities.

g) Promote training programs for the national personnel involved in implementing the project in the various member countries.

The Third Regional Committee Meeting was held at CATIE on October 10-11, 1978. The following were named to the Board of Directors of the Committee: Dr. Oscar Hidalgo, President, Dr. Santiago Ríos of Panamá, Vice-President, and Ing. Roberto Vega Lara of El Salvador, Secretary.

Representatives from all the countries of the Isthmus, as well as representatives from CATIE, ROCAP, and IICA, were present. Reports on different aspects of the project were presented at the meeting. The Committee reaffirmed its support for the project and noted the positive results achieved.

B3. National Committees

National committees responsible for coordinating the national research activities under the project were formed in each country. The original members of the committee in Costa Rica were Ing. Nevio Bonilla, Head of the Agronomy Department at MAG, Ing. Mario Sáenz, Director, CAR-PS Ing. Alberto Vargas, Subdirector of Research at MAG, Ing. Roger Meneses, MAG and Ing. Willy Loría presently vice-minister of Agriculture, MAG, and Ing. Adolfo Soto A., University of Costa Rica. The current committee members are Ing. Nevio Bonilla, Ing. Willy Loría, Ing. Gilberto Campos, Extension Director, MAG, Ing. Mario Sáenz, Ing. Teodoro Cordero, Director of the MAG Experiment Station at Los Diamentes and Ing. Luis Alberto Torres, Coordinator of the IICA Plan of Action in Costa Rica.

The original members of the Honduras national committee were Ing. Javier Williams, Director of Agricultural Region N°3, SRN, Ing. Antonio Silva, Research Director, SRN, Mr. Nery Mayorga, SRN and Ing. German Uribe, Director of the IICA office in Honduras. Later, the institutional aspects of agricultural research in Honduras were reorganized and the membership of the national committee was changed. Currently, Dr. Mario Contreras, Head of Agricultura Research, and members of the Unidad Central, the central agricultural research unit in Honduras, participate as members of the committee.

The members of the national committee in Nicaragua are Dr. Oscar Hidalgo S., Director of Agricultural Research, INTA, Ing. Carlos Zepeda, Director of Agricultural Training, INTA, Ing. Frank Barea, Director of Programming, INVIERNO, Dr. David Santamaría, National Planning, Lic. Ivan Flores, Planning Section, INTA and Dr. Juan A. Aguirre, Director, IICA office in Nicaragua.

No national committees have been formed yet in El Salvador and Guatemala since the work there began much later than in the other three countries.

B4. National Teams

In each country many people cooperated in this project. Staff from the agricultural institutions of the country, students, Peace Corps Volunteers and the farmers themselves were all part of the team working together with CATIE staff members to carry out the project research.

The following is a list of some of the people in the countries who cooperated in the project:

Costa Rica - Southern Pacific region

Ing. Mario Sáenz, Director, CAR-PS (MAG)

Ing. Jorge Meneses, CAR-PS Crop Specialist, MAG

Ing. Gilberto Araya, CAR-PS Crop Specialist, MAG

Ing. Willy Sánchez, Extension Agent, CAR-PS, MAG

Ing. Francisco Jiménez, Extension Agent, CAR-PS, MAG

Ms. Nora Solano, Graduate student in Anthropology, UCR

Ing. Marcelino Avila, Graduate student in Agricultural Economics, University of Missouri (presently a CATIE staff member)

Mr. Edwin Graham, Peace Corps Volunteer

Farmers:

J. Valverde
V. Víquez
R. Guillén
C. Solís
D. Gamboa
J.M. Fonseca

Costa Rica - Atlantic region

Ing. José A. Rodríguez Vega, Extension Agent at Guápiles (to 1977), MAG

Ing. Víctor Montoya, Extension Agent at Guápiles (beginning in 1978), MAG

Ing. Rolando Amador, ASBANA

Ing. Omar Romero, ASBANA

Agr. José A. Castillo, ITCO

Mr. Thomas Reilly, Peace Corp Volunteer

Farmers at Cariari:

Eduardo Vargas
Rafael Fernández
Héctor Wilson
Johnny Chavarría
Carlos Abarca
Máximo Granados
Filadelfo Barquero
José Mello

At Guácimo:

Víctor Gutiérrez
Miguel Elizondo
José L. Moya
Ramón Lovemore
Manuel Fonseca
Manuel Ruíz

Costa Rica - Guayabo

Mr. John Rafter, Peace Corps Volunteer

Costa Rica - Turrialba

Mr. Steve Risch, Graduate student in Entomology, Michigan State University

Ms. Melinda Troutner, Graduate student in Horticulture, California Tech

Mr. James French, Peace Corps Volunteer

Nicaragua

Dr. Oscar Hidalgo S., Director of Agricultural Research, INTA

Ing. Reynaldo Treminio, Regional Sub-Director for Research, INTA

Ing. José Angel Ponce, Head, Crop Management Project, (1976-77), INTA

Ing. Roger Montalván, Head of Fertilization Sub-project (1977), INTA

Ing. Ovidio Quintano, Head of Fertilization Sub-project (1976-77), INTA

Agr. Carlos Aragón, Head of Agricultural Extension Agency at Matagalpa, INTA

Mr. William Arancibia, Field Assistant

Mr. Filemón Díaz, Field Assistant

Farmers:

Gabino González	Santos Sánchez
Epifanio Herrera	Emilio Torres
Manuel Ruiz	Cándido González

Honduras

Ing. Javier Williams, Director of Region #3 (to 1977), SRN

Ing. Aroldo Paz, Agronomist, SRN

Mr. Nery Mayorga, Agricultural Assistant, SRN

Ing. Ulises Joya, Agricultural Assistant, SRN

Ing. Francisco Martínez, Head, Soil Fertility Program, SRN

Dr. Mario Contreras, Head of Research, SRN

Dr. Franklin Rosales, Head, Central Research Unit, SRN

Dr. Joshua Posner, Agronomist, Central Research Unit, SRN

Dr. Daniel Galt, Economist, Central Research Unit, SRN

Dr. Frank Peairs, Entomologist, Central Research Unit, SRN

Ing. Alvaro Díaz, UNDP-FAO (presently with IICA)

Ing. W. Fiallos, Agronomist, La Esperanza Experiment Station, SRN

Ing. Adam Bonilla, Agronomist, La Esperanza Experiment Station, SRN

Farmers:

At Yojoa

Sebastián Andino

Aureliano Alvarado

Héctor Sánchez

Pompilio García

Lauro Gutiérrez

Héctor Bonilla

Ramón Neito Pineda

At Cuyamel

Marcelino Aleman

Leslie Bronfield

José Reyes

Marcelo Rodríguez

At Agua Sucia

Encarnación Andino

Manuel Noyola

El Salvador

Ing. Nicolás Guillén A., Coordinator, Multiple Cropping Program, CENTA

Ing. Felipe Chinchilla, Researcher, Multiple Cropping Program, CENTA

Ing. H.E. Amaya M., Coordinator, Socioeconomic Program, CENTA

Carlos A. Gil, Field Assistant, CENTA

Luis O. Díaz, Field Assistant, CENTA

Four interdisciplinary teams at CENTA were involved in carrying out the diagnostic studies; the following staff members cooperated in this effort:

Roberto Alegría	Carlos M. García	Manuel Bernal
Carlos Deras	Yohalmo Cabrera	Felipe de J. Chinchilla
Heriberto Rosas S.	Aída Ma. de Calderón	Roberto Rodríguez
René Pérez Rivera	Manuel Cortés Flores	José Arnoldo Trejo
Roberto Sánchez	Nicolás Guillén	Jorge Cruz
Marco Tulio Duarte	Oscar Dueñas	Nelson Flores
Emidlia Guzmán	José Héctor Mayorga	Arely Huezo de Mira
Mario Ernesto Alvarado	Miguel Román Cortez	Efraín Ortiz
Muriel de Velis	Rafael Reyes	Joaquín Gómez
Víctor Rodríguez	Alejandro Damas	René Villa Acevedo
Ana Margoth Chávez	Ana Lillian Menéndez	Atilio Pérez C.
Gabriel Rosales	Víctor Salamanca	Eduardo Castellanos

Farmers:

Juan Angel Mata	Valentín Tobías
Julio Fuentes	Feliciano Rivera
Tránsito Delgado	Francisco Jaimes

Narciso Perla

Guatemala

Ing. Carlos Crisóstomo, Technical Coordinator, ICTA (to 1973)

Ing. Ramiro Ortiz, Technical Coordinator, ICTA (1978 to present); formerly, Regional Coordinator for Region I (Quetzaltenango)

Ing. Roberto Fonseca, Director of Region V (Chimaltenango), ICTA (to 1978)

Ing. Ricardo del Valle, Director of Region V (Chimaltenango), ICTA (from 1978 to present)

Ing. Mario Braeuner, Head, Soils Laboratory, ICTA

Ing. Alvaro del Cid, Coordinator of the "Prueba de Tecnología" group in Region I

Swiss Relief Agency

Farmers:

At Tecpán

Regino Surec Chali

Pedro Ajzak Sacop

Felipe Marroquín

Gabino Ajzak Sacop

At Santiago Sacatepequez

Anastasio Zoc

At Zaragoza

Enrique Cabrera

At Comalapa

Cipriano Iku

At Santa Cruz Balanyá

Arcelino Pej

At Chimaltenango

Luis Guicheem

B5. Resident Agronomists

The CATIE resident agronomist in each country works with the members of the national committee and the national team in planning, implementing, analyzing and interpreting the field research of the project, and in the general coordination of the project.

In Costa Rica, the host country for CATIE, no specific resident was assigned. Instead, the duties of the resident were shared by various members of the CATIE staff at Turrialba. The principal coordinators of the research at Pérez Zeledón in the Southern Pacific region of Costa Rica were Dr. Carlos F. Burgos in 1976, Drs. Miguel Holle and Joseph L. Saunders in 1977, and Dr. Holle in 1978. Other staff members, especially Drs. Raúl Moreno, Luis A. Navarro, Marcelino Avila and Andrew King, collaborated in the research in this area.

Dr. Carlos Burgos and Ing. Roger Meneses coordinated the research in the Pococí and Guácimo areas of the Atlantic region for 1976-1979. Other staff members, especially Drs. Myron Shenk, Joseph Saunders and Ing. Washington Bejarano collaborated in the Guápiles research.

Dr. Robert Hart was the CATIE resident in Honduras from March, 1976 to June, 1978, when he was transferred to Turrialba. Dr. Rafael De Lucía took his place in Honduras in June, 1978. Ing. Aníbal Palencia became the CATIE resident in Nicaragua in March, 1976, Ing. José Arze was appointed as CATIE resident in El Salvador in September, 1977, and Dr. Donald Kass was appointed as resident in Guatemala in December, 1977.

support. Currently, CENTA is basing its research on a systems approach.

2. He was actively involved at the field level in the design and execution of the experiments in the areas of Las Peñas, La Trompina and at the San Andrés Experimental Station. Technical assistance was given to the national technicicans in analyzing and interpreting experimental results.

3. He promoted the work methodology by means of:

   a. A seminar on cropping systems research methodology for the CENTA cropping system team (July 1978).

   b. A seminar and technical assistance on surveys, on collecting secondary information and on preparing preliminary diagnostic reports (September 1978).

   c. Collaboration in the organization and the carrying out of the seminar "The diagnostic study as a basis for agricultural development" for CENTA supervisors and regional heads of extension (November 1978).

4. He presented a paper to the Technical Meeting on Projects at CATIE in November 1978 called "El Salvador, an experience of the Small Farmer Production Systems Project in the Central American Isthmus" (in Spanish) (d.3791), describing the adoption of a new research policy in that country.

5. He was a member of the Organizing Committee of the XXIV PCCMCA Meeting. The meeting resulted in the formation of a round table on cropping systems and an agreement to include a table on production systems in the XXV Meeting of that organization.

Honduras

The activities of the project in Honduras were carried out by Dr. Robert D. Hart, the resident there from February 1976 to June 1978, and by Dr. Rafael De Lucía, the resident beginning in June 1978. As in El Salvador, the residents were very active in carrying out the objectives of the project. The following is a summary of some of these activities.

1. Both residents actively collaborated at all levels of research, and provided the necessary technical support. The resident was originally stationed at San Pedro Sula and later became a member of the SRN Central Research Unit team at Comayagua.
2. They were actively involved at the field level in the design and execution of experiments at Yojoa, Agua Sucia, Cuyamel, Guaymas Field Station, San Jerónimo, La Esperanza, El Rosario, La Paz and the Comayagua Field Station.
3. The resident maintained almost daily contact with the technical staff from the Guaymas Field Station and with the person in charge of the experiments at Yojoa, Agua Sucia and Cuyamel in the first 2-3 years of the project and with members of the SRN Central Research Unit in the last year of the project.
4. The resident participated in the following seminars and programming meetings:
   a. The annual SRN research programming meetings for the years 1976, 1977 and 1978.
   b. Seminar on production systems approach, held at Guaymas in 1977 and at Comayagua in 1978 and 1979.

c. Seminar on carrying out diagnostic surveys, held at Guaymas in 1976 and at La Esperanza in 1978.

d. Weekly planning meetings of the SRN Central Research Unit, beginning in 1978 at Comayagua.

e. Seminar at San Pedro Sula on maize and rice.

f. Meeting at La Esperanza on the SRN Operating Plan for 1979.

g. Various meetings at Tegucigalpa on the ROCAP project and on BID and CIID projects.

h. Seminars on cropping systems held at CATIE, Turrialba.

i. Planning sessions and regional meetings held at CATIE, Turrialba.

5. The resident participated in the following activities carried out at the Ministry level:

a. Presentation of the SFCS Project to the Advisory Committee to the Minister, consisting of the program heads and the regional heads of research, extension, seed production, etc.

b. Field day held at Yojoa, with the Minister attending.

6. Other activities that the resident participated in include:

a. Collaboration in the implementation of the research program on cropping systems in the western zone of Honduras, OAS Project.

b. Meeting with the tripartite group (BID, AID and IADS) in March 1978 to analyze the agricultural research program in Honduras.

c. Participation, with IADS (represented by Dr. Guy Baird), in designing a new organization with a regional approach, with multidisciplinary teams working at the farm level, for the SRN research section. This required additional meetings with the technical staff from the Ministry and from IADS.

d. Participation in a weed management course given by M. Shenk of the OSU/AID/CATIE Project.

e. Assistance at a PROMYF field day at Yojoa.

f. Collaboration on a course on Elementary Statistics with Dr. Franklin Rosales, of SRN, at Comayagua from February 5-9, 1979.

Nicaragua

The project in Nicaragua was coordinated by the resident there, Ing. Aníbal Palencia. Some of the activities he was involved in are listed below.

1. Ing. Palencia collaborated with the national institutions (MAG and INTA) in selecting a National Advisory Committee, in designating the National Technical Coordinator and the Representative to the Regional Advisory Committee and in forming the national technical team to work as a counterpart in the SFCS Project.
2. He provided technical assistance on all phases of the project activities, with the objective of developing a coordinated cropping systems research approach. He provided the necessary technical support to the national team in planning the annual program of activities and in the design, execution, analysis and interpretation of the results of the field experiments in zones of Matagalpa and Estelí.
3. He collaborated in the organization and carrying out of seminars, and in some cases, participated as an instructor. These seminars were directed towards training the national technical team in

survey execution (1 seminar), on cropping systems research methodologies (2 seminars) and on specific aspects of production factors, such as soil fertility (2 seminars) and weed control (2 seminars).

4. He provided technical assistance to INTA and INVIERNO in the planning, design, analysis and interpretation of results from experiments on cropping systems in the INTA/CATIE research program sponsored by CIID, and in the Program for Research Adapted to the Small Farmer (PIAPA) developed by INTA-INVIERNO.
5. The resident also participated in field days to demonstrate the development of the research activities to the heads and to the technical staff of INTA, INVIERNO, MAG and AID.

Costa Rica

The functions of the resident in Costa Rica were carried out through research coordinators at CATIE. In the Atlantic region, Dr. Carlos F. Burgos and Ing. Roger Meneses coordinated the work throughout the project. In the Southern Pacific region, Dr. Burgos coordinated the work in 1976, Drs. Miguel Holle and Joseph Saunders in 1977 and Dr. Holle in 1978-79. Some of the activities carried out are listed below.

1. Continous assistance was offered through the research coordinator and the technical staff at CATIE to the National Coordinator of the project at MAG.
2. Technical assistance was provided on surveys and on research work.
3. Training programs for national technical staff were prepared and carried out.

4. Surveys, diagnostic studies of the area and research on cropping systems were conducted in the Atlantic zone and in the Southern Pacific zone. These were done by the CATIE research coordinator with the help of the CATIE technical staff and the effective participation of the national technical personnel.
5. Field days and training programs were held for groups of technical staff and farmers at CATIE, with the objective of introducing systems research to the national institutions.

Guatemala

The CATIE resident in Guatemala, Dr. Donald Kass, began his work at the beginning of 1978. The following activities were carried out in Guatemala by Dr. Kass, working in cooperation with ICTA.

1. Dr. Kass provided technical assistance on activities in Region I through his participation in planning meetings and by visits and discussions with the technical leaders of that area.
2. He conducted a study of the horticultural areas of Zone V in the highland area, with the purpose of describing the dominant cropping systems and of designing and implementing research to improve those systems. The goal of the research was to help the small vegetable farmers of the Departamentos of Chimaltenango (Municipios of Comalapa, Tecpán, Zaragoza, Sumpango), Quetzaltenango and Sacatepequez (Municipio Santiago Sacatepequez) produce better quality vegetables, and to produce them in quantities sufficient for exportation, since there are companies interested in buying them. A technical relationship was established with the group of Swiss Volunteers who work in this vegetable area.

3. He participated in the socioeconomic improvement programs in various "municipios" carried out by the socieconomic group from ICTA and by the Prueba de Tecnología group from Zone V, with the objective of identifying the predominant cropping systems and establishing research priorities.
4. He collaborated on field days on wheat and vegetables.

B7. Meetings with the National Committees

Meetings were held to insure project coordination between CATIE and the national committees. From January 11 to 16, 1976, CATIE held an "Orientation Week on the CATIE/ROCAP Small Farmer Cropping Systems Project". National committee members from Honduras, Costa Rica and Nicaragua, as well as other guests from those countries and from El Salvador were invited to Turrialba for the meeting. The purpose of the meeting was to exchange ideas, discuss surveys, methodologies, and analysis and interpretation of research results.

A "Meeting on Research Activities and Programming for the Small Farmer Production Systems in Central America" was held at Turrialba from April 12-14, 1978. Representatives, including national committee members, from Costa Rica, Honduras, Nicaragua, El Salvador, Guatemala and Panama attended. A summary of project activities was presented, programing for the next year was discussed, and recommendations were made. One of the principal recommendations concerned future work in semi-arid areas.

Within the countries, meetings with the national committees were frequent. There were formal meetings of the national committees with

the CATIE resident in the country and with other CATIE staff members to discuss the project, but there were also many informal discussions. In some of the countries the resident had almost daily contact with a member or members of the national committee.

The formal meetings included yearly research programming meetings in the countries.

B8. Meetings of the Regional Committee

This is covered in Section B2 of this report.

B9. National and Regional Workshops

Information on national and regional workshops is covered in Section B2 of this report (Regional Committee meetings), in Section B3 (National Committee meetings) and in Section B11 (on workshops and seminars in relation to the training program).

B10., B11. Training Component of the Small Farmer Cropping Systems Project

There is a current trend toward research on agricultural production systems. In Central America, CATIE began emphasizing production systems in 1973 and started the SFCS project as an outreach program to the region in 1975. Training was developed on the basis of the research experiences and as needs and possibilities became clearer and real.

The main training activities of the project are described in Table B2. They are classified into four types:

a) Formal seminars

b) Formal courses at the graduate (M.S.) level

c) Training sessions

d) In-service training of individuals

Number of persons attending the courses is just one way to express the accomplishments of a training program, and in the case of training at this level, usually meaningless. The most important result of training for the researchers involved may well be changes in attitudes concerning agricultural research (for example, in identifying research problems and solutions, a researcher preferably will begin with studying the farmers' agriculture and situation rather than beginning with a subjective judgement). Results of these attitude changes are reflected in the work the researchers in Central America are reporting, as shown by the number and quality of papers presented on the subject at the PCCMCA meetings since 1976. This group has now recognized research in agricultural systems as a regular theme in their yearly program. The attitude change can also be seen in the changes in the program of activities in institutions within the region, such as INTA, CENTA, or SRN, where the systems approach is being applied to research efforts in crop production.

The training activities of the Annual Crops Program of CATIE provided an opportunity to present written documents on concepts and methodology of cropping systems research. The documents produced for the training

Table B2. Types of training activities, purpose, location and number of participants during the 1975 - 1979 SFCS Project.

Type of training	Purpose or Subject matter	Place and date	Number of participants: Nationals	Regional	Outside the region	Total	References Doc. No. 1/
Conference	Orientation	Turrialba, Jan 76	-	19	-	19	d. 681
Formal seminars	Information and/or motivation on cropping systems research	Turrialba, Aug. 77	-	30	16	46	d. 680
		" Mar. 1978	-	10	8	18	d. 3922
		" Feb. 1979	-	-	10	10	d. 5089.
	Information, motivation and in-service training	San Salvador, Feb-Dec, 1978	40	-	-	40	d. 1667, 1653, 1687 d. 5085
	Collaboration with Honduras National Team	Comayagua, Hond. Mar. 1978	40	-	-	40	-
Training sessions	Information on specific subjects such as:						
	Baseline survey design and operation	San Isidro de El General, C.R. 1975	6	-	-	6	Results in d. 171
	Baseline survey design and operation	Matagalpa, Nicaragua 1976	6	-	-	6	Results in d. 171
	General project methodology	S.I. El General, C.R. 1977	15	-	-	15	d. 80
	Component research in basic grains	S.I. El General, C.R., 1977	23	-	-	23	d. 1480
	General project methodology	Matagalpa, Nicaragua 1977	12	-	-	12	-
	Component evaluation and research: marketing	Matagalpa, Nicaragua 1977	12	-	-	12	-
	Component evaluation and research: soil	Matagalpa, Nicaragua	12	-	-	12	-
	Component evaluation and research: baseline survey	Matagalpa, Nicaragua	12	-	-	12	-
	Component evaluation and research: experimentation	Matagalpa, Nicaragua	12	-	-	12	-
	General project concepts	Zona Norte, Honduras 1977	5	-	-	5	-
	Project plan and methodology	Guápiles, C.R. 1978	30	-	-	30	-
	Baseline survey design and generation	Santiago, Panamá 1978	35	-	-	35	-
	Component research and evaluation: soil fertility	Tegucigalpa, Honduras 1978	6	-	-	6	-
Formal courses	1. Conference on production systems	Turrialba, Feb. 1974	(previous to project initiation)				d. 240-257
	2. Intensive course on production systems	" Feb. 1975	(" " " ")				d. 201-218
	3. Course for M.S. program UCR/CATIE on agricultural production systems	" 1977	Coordinated by Dr. J. Fargas				-
	4. "	" 1978	" " " "				-
	5. "	" 1979	Given by Dr. R. Hart				Document in Progress
In-service training	Economics	Turrialba, 77-78	3 (Panamá), 1 (Nicaragua)			3	-
	Information	" 1978	1 (Costa Rica)			1	-
	Field work	North region Honduras, 1976	2 (Honduras)			2	-
	Physiology	Turrialba, 1977	1 (El Salvador)			1	-
	Soils	" 1977	1 (El Salvador)			1	-
	Entomology	" "	1 (El Salvador)			1	-
		Matagalpa, Nicaragua 1977	1 (Nicaragua			1	-
	Weed science	Turrialba, 1977	1 (Nicaragua)			1	-
	Field work	Panamá, 1978	1 (Panamá)			1	-
	Soil analogs	Costa Rica, 1978	2 (C.R.)			2	-
		Turrialba, 1978	1 (Honduras)			1	-

1/ Number from the Documentation Center of the Annual Crops Program of CATIE.

program are listed in Table B3. The production systems course developed at CATIE and given at the M.S. level, under the leadership first of Dr. J. Fargas and now under Dr. R. Hart, with the participation of the CATIE staff, seems to be unique in Latin America.

Finally, personl contact of the students and researchers from the region has led to the formation of an informal community of agricultural scientists who talk a similar language and share difficulties and successes with regard to the subject.

The planning of the training component of the SFCS project is reported in several initial documents (d. 1491, 1653). Reports on this activity also appear in the Annual Reports for 1975-1976 (d. 113 in Spanish or d. 167 in English); for 1976-1977 (d. 3748); and for 1977-1978 (d. 3705).

Discussions of the team in evaluating the training activities led to some changes during the project and to the establishment of certain policies (d. 1486).

Table B3. A partial list of documents on cropping systems research produced as a result of the training component of the SFCS project (1975-1979).

Documentation Center number[1/]			
1202	1232	1671	1677
1208	1234	1672	3738
1220	1235	1673	3739
1228	1668	1674	3755
1229	1669	1675	3866
1231	1670	1676	3963
			1687

1/ See Bibliography Section of this report for titles.

B12. Research Station Studies

Field research was carried out at the Turrialba headquarters out to support the outreach phase of the SFCS Project. The conceptual and integrative aspects of a research methodology linking research station studies to base line data and on-farm studies have been developed through three main types of field experiments: a Central Experiment, Satellite Experiments and Component or Complementary Experiments (d. 125). In addition to the development of this research methodology, field experiments were useful educational tools for professional staff members, students from CATIE/UCR Graduate School and in-service trainees from Central American ountries.

Treatments in the Central Experiment consisted of several cropping systems commonly used by small farmers ranging from monocrop to different combinations of two, three, four and five crops in a cropping season. Fifty-four cropping systems were tried during the first year in an exploratory study. Twenty four of these systems were selected for experiments on 2.1 ha of land during the past four years. Cropping systems were cultivated on the same plot in order to evaluate the effect of continous cropping on soil fertility. No machinery was used in order to evaluate the demand for hand labor for each of the systems studied.

Satellite Experiments consisted of modifications in the management and/or cropping pattern of one of the cropping systems tested in the Central Experiment, which were used as the control plots. Treatments in Satellite Experiments usually consisted of modifications to inputs, components (plants), arrangement of components or combinations of the above.

Complementary Experiments were carried out to isolate the effect of a particular variable on the performance of a cropping system. Laboratory and greenhouse trials were used to complement field results. (See Section B13 of this report).

Developed in 1972, the Turrialba Methodology for On-Station Cropping Systems Research is widely used in countries such as Brasil (Northeast, Amazon Basin and Southern Region), Perú, in the cultivation of quinoa (*Chenopodium quinoa* Willd.) and Ecuador, for irrigation practices.

Results from the Central Experiment (d. 978, 3748, 3705) showed a that Land Equivalent Ratio (LER) values increased as the number of components cultivated per unit time increased. Land use was more efficient when the number of crops cultivated in a cropping season was more than one. Demand for hand labor was more evenly distributed throughout the year in the multiple cropping systems than in the monocultures. In general, investment return increased as the number of crops in a system increased. Cropping systems including maize tended to be more reliable than cropping systems including root crops. Reliability also increased with the number of crops (d. 3447).

Protein production ranged from 822 kg/ha/year in a double cropping of maize/beans and maize/sweet potatoes, to 582 kg/ha/year in a triculture of maize/beans/cassava. Energy production ranged from 32420 Mcal/ha/year in a cassava-based cropping system with beans planted simultaneously with the cassava, and sweet potatoes interplanted in the cassava stalks after harvesting the beans, to 23470 Mcal/ha/year in a cassava monoculture cropping system (d. 978, 3748, 3705).

The detrimental effect of cassava diseases was diminished by intercropping with other species, mainly maize (d. 222, 223, 3476) and insect populations tended to be more diversified as the number of components in a cropping system increased (d. 231).

Interspecific competition for resources such as water, soil nutrients and light was one of the main reasons for yield reduction of the individual components of a crop association as compared to the yield of their respective monocrop. Growth analysis of cassava, sweet potato, beans and maize was calculated for the different combinations of these crops (d. 125, 6064, 6012, 6039).

Data from the Central Experiment are stored, ready for retrieval, in CATIE's computer system facility and are being constantly re-examined as a source of information for the design of new cropping systems at Turrialba or elsewhere. Several attempts of integral analysis of cropping systems have been made. A holistic approach in which several variables were ranked according to farmers' criteria was used in developing a mathematical model for evaluating the performance of a particular cropping systems in a given environment (d. 214). Also, Parametric Programming was used in an evaluation of Central Experiment cropping systems (d. 6013).

Eight CATIE/UCR Gradutate School students completed the thesis requirement for the M.S. degree through research on different aspects of the Central Experiment. Approximately 300 persons a year visited the Experiment and 12 field days held exclusively for visiting scientists from Costa Rica, El Salvador, Honduras, Nicaragua and Guatemala were organized around the Experiment. Participants in the four Cropping

Systems Seminars held at Turrialba also used the Central Experiment for field experience.

Several Satellite Experiments on the different aspects of the traditional maize/bean cropping system were carried out at Turrialba. Most of CATIE's maize and bean germplasm was studied in different arrangements to find optimal plant-type combinations for this crop association (d. 174, 6091). Experiments on arrangement of components, plant density, planting dates and use of inputs for this cropping system were also conducted. The maize/sweet potato crop combination was studied from the standpoint of inputs used, mainly the N/K_2O ratio in the fertilizer applied (d. 6060, 6073). Several cassava/bean crop combinations were studied to determine the best timing for the bean intercropping. Simultaneous planting and planting 240 days after the cassava planting provided the highest bean yields. Cassava was also interplanted with several other legumes with the objective of finding a wider range of possible combinations of energy and protein-producing crops. Several cropping systems including maize and beans were tried under actual small farm conditions of hillside cultivation to determine the effect of management, particularly weed control, on the erodability and the chemical and physical characteristics of the soil (d. 6081).

Ten Satellite Experiments were conducted as research theses by graduate students from the CATIE/UCR Graduate School.

Complementary Experiments consisted mainly of studies on the effect of radiation on the performance of several maize-based cropping systems (d. 6012). Sweet potato pests (d. 1754), and the effect of insect population on the dissemination of virus diseases, both in monocrops and

associations, and the life cycles of several economically important insects were also studied in complementary experiments (d. 3475). Two B.S. degree students from the University of Costa Rica and a Ph.D. candidate from Michigan State University completed their graduation requirements through these experiments.

In addition to the three types of experiments described above, the Research Station at Turrialba maintains, and constantly adds to, a collection of germplasm that is frequently used in on-farm research throughout Central America. Several varieties of cassava, sweet potato, cowpea, common bean, maize, taro, mung bean, winged bean, pigeon pea, cucumber and other crops are grown, and are then characterized, evaluated and preserved for further distribution.

By-products from some of the cropping systems are constantly being used and evaluated as an animal food source, and several experiments on intercropping under forest plantations have been conducted to integrate component technology with a whole-farm research approach (d. 6127, 6064).

B13. Greenhouses and Laboratories Studies

Activities carried out routinely in the laboratories and greenhouses at Turrialba include chemical analysis of soil samples and plant materials, biomass determinations and examination and diagnosis of disease, insect and nematode problems. In the physiology laboratory, under the direction of J. Fargas, equipment, glassware and reactants are available to staff members and students for their work in relation to production systems.

Seeds of various crops used by small farmers were multiplied in the physiology laboratory during the course of the project. Some of these were maize (under the direction of C. Burgos), tomato (M. Holle), common bean (R. Moreno), and other legumes (G. Enríquez, H. Miranda).

A study was done in the physiology greenhouse (d. 6112) on the absorption pattern of nutrients in a maize-bean association, with the plants grown under controlled conditions. C. Burgos did a greenhouse study on the soils of the Atlantic and Southern Pacific regions, reported in the documents "Soil chemical properties and greenhouse studies of soils from Cariari, Guápiles, Costa Rica" (d. 5098) and "Soil physical and chemical properties, profile descriptions and greenhouse studies of soils from Platanares and Pejibaye, Pérez Zeledón, Costa Rica" (d. 5097). He also conducted a study, beginning in 1977, on the microbiology of soils from an experiment on soil management in the systems maize followed by maize, maize followed by beans and maize followed by maize intercropped with beans. M. Holle and M. Troutner conducted a greenhouse study on shade-effect on different varieties of tomato.

Various experiments were conducted in the plant pathology laboratory under the direction of R. Moreno. During the last four years studies have been done on cowpea viruses (d. 3475, 5094), principally on insect transmission of the viruses. Serology studies were done to identify the cowpea viruses. Also, plant pathogens were kept on susceptible hosts in the greenhouse for use in experiments.

R. Díaz-Romeu and W. Bejarano conducted greenhouse studies in Costa Rica and Nicaragua, as a support activity to the SFCS project. R. Bazán did a characterization of the soils from the experimental sites of the

project. These studies are reported in the Final Report of the Central American Soil Fertility Project (d. 4132).

A study on the effect of drought on maize, cowpea, pigeon pea and sorghum was done under field conditions and in the greenhouse under the direction of J. Arze in cooperation with CENTA staff members in El Salvador.

B14. Planning and Implementation of Field Experiments

Field experiments in Costa Rica were conducted in the Southern Pacific and Atlantic regions. The first planting of the field experiment phase of the project in Costa Rica was done in the Southern Pacific region of Costa Rica. After completing the survey in the Platanares and Pejibaye districts (January 28 to February 13, 1976), the search for farmers to cooperate in the project began. In April 1976, with the help of Agr. Francisco Loría, two farmers were selected to cooperate in the project and two experiments were planted on their farms. Another farmer, Mr. Víctor Manuel Víquez, cooperated in a case study on a daily record of farm activities. The results of this case study are presented in the document written by Navarro, "Víctor Manuel Víquez, a case study in Costa Rica, preliminary report" (in Spanish) (d. 226).

The two experiments in the Southern Pacific region were used to find out what some of the problems of the small farmers were. Based on this information, nine experiments were designed and conducted in that region in 1977-78: four experiments on the interaction between soil insect control and soil fertilization on the yield of a maize system planted in

the first planting season of the year; four experiments with six arrangements of crops, with the objective of measuring the effect of crop intensification on the soil; and one experiment to study soil management practices and the efficiency of these practices in correcting unfavorable chemical properties commonly found in the area. The results of these nine experiments are summarized and discussed in the document "Description of an alternative to the system maize in the first planting of the year and beans in second planting, practiced by the farmers in the zona de Palmares de Pérez Zeledón, Costa Rica" (in Spanish) (d. 5080).

In 1978-1979 four experiments to study soil management and fertility were done in this same region. The results of these studies were presented at the XXV Meeting of the PCCMCA in Tegucigalpa, Honduras and are summarized in the document on the second alternative suggested for the farmers of Pérez Zeledón (d. 5079).

The research carried out in the Atlantic zone is described in the "Work plan for the Atlantic zone, districts of Guácimo and Cariari" (in Spanish) (d. 1298). The results of these experiments were presented at the PCCMCA meetings in 1978 and 1979.

Three field experiments were conducted at Cariari in the Atlantic region in 1976-1977 to study the performance of intensified crop systems designed to take advantage of the prolonged rainy season. An experiment on land preparation was continued during 1977-1978 in the Atlantic zone, and an experiment to measure the performance of these preparation methods on soils of different textures was initiated on six farms. The results of these experiments were presented in preliminary form at the PCCMCA Meeting in March 1979.

In 1978-1979, experiments were conducted on fertilizer recommendations for the system maize in rotation with maize, and on weed management recommendations for the system maize in association with cassava, with beans climbing the cassava stalks in the months just before harvest. Experiments were continued on crop systems including such crops as hot pepper, ginger, cowpea and a system of maize, cassava and rice planted simultaneously, with the possibility of planting another crop in the cassava after the rice is harvested. Other experiments were done on the interaction of weed management and insect pests in maize, and on the effect of insect pests in four cropping systems. A continuing dynamic diagnostic study of pests in cassava systems was conducted.

Two cropping system alternatives based on the experiments were developed for the small farmers of the area (d. 5076, 5077). The documents on these alternatives also contain information obtained from recording daily farm activities on six farms, for the purpose of describing the farmers' systems. The documents also include the results of various weed management experiments conducted by the personnel of the OSU/AID/CATIE Weed Control Project.

During the first year of work in Nicaragua (1976-1977), field studies were done on a maize-bean rotation system, on sorghum intercropped with maize and on fertilizer in a maize monoculture and in a bean monoculture, with beans planted in both planting seasons. The results of these experiments are discussed in the Second Annual SFCS Project report (d. 3748) and in the documents on the technological alternatives suggested for the small farmers of the area studied (d. 3708, 5075).

Two experiments repeated at five sites were done at Samulalí during the 1977-1978 planting season in order to confirm the 1976 results. The treatments were modifications in the management of a maize-bean rotation system, which is common in the region. The effect of hilling-up plants in relation to two nitrogen sources, one of them a slow-release nitrogen source, and the interaction between soil insect control and fertilization in a maize-bean rotation system were studied in separate experiments. Three different spatial and chronological arrangements were tried to evaluate the most appropriate system for the region. Also, an experiment with two rows of maize was planted on half a hectare in order to measure the costs of the production system.

The results obtained in the above studies are discussed in more detail in the 1977-1978 third annual SFCS Project report (d. 3705) and in the reports on the two technological alternatives suggested for Samulalí, Matagalpa (d. 3708, 5075).

Some of the experiments done in Honduras were used to generate the three technological alternatives for three common cropping systems practiced by farmers of the Yojoa, Honduras area. Maize and pipián (a squash with a good market value) in rotation with maize and pipián was a technological alternative suggested for the system maize and squash in rotation with maize and squash practiced by the farmers of the area (d. 5074). In 1976-1977, three experiments were done to evaluate the performance of various spatial and chronological arrangements of maize and squash, maize and pipián, and pipián in monoculture. In 1978-1979 an experiment was conducted on levels of fertilization in the system maize and pipián.

Details of the results of these experiments are described in document 5074.

Twelve field experiments were used for the basis of two technological alternatives: maize intercropped with rice in rotation with cowpea, as an alternative to the system rice in rotation with beans (d. 5072); and, maize planted in relay with cowpea, in rotation with maize as an alternative for the system maize in rotation with maize (d. 5073). Two experiments were done in 1976 on maize and rice: one to compare the monoculture systems with the intercropped system and another to try various spatial arrangements of maize and rice. In 1977-1976, three experiments were conducted on maize and rice: one on spatial arrangements of maize and rice in different environments, one on spatial arrangements of maize and rice with one or more varieties of maize and rice, and one on chronological arrangement of maize and rice intercropped. Four other experiments, on chronological and spatial arrangements of maize, beans and cowpea, and on evaluation of cowpea varieties, were also done in 1977-1978. An experiment on l vels and management of nitrogen fertilization in the system maize and rice intercropped, on levels of fertilization in cowpea alone, and on the level of fertilizeer in the system maize and cowpea in rotation were done in 1978-1979.

A summary of the results obtained in the twelve experiments indicated above are presented in the experimental evidence section of documents 5072 and 5073.

Nine other experiments were conducted in 1977-1978. An experiment on spatial arrangements of maize and sorghum and an evaluation of different legumes was conducted at Yojoa, Honduras. A study on fertilizer

response in the systems maize alone, tomato alone and maize and tomato in relay, and a study on spatial arrangements of maize and sorghum were done at Agua Sucia, Honduras. Four experiments were conducted at Cuyamel, Honduras: substitution of cowpea for velvet bean (*Stizolobium deeringianum*) in a maize and bean cropping system; spatial arrangements of maize and cassava; evaluation of cowpea varieties; and spatial arrangements of maize and sorghum. An experiment on chronological arrangement of maize and rice was done at Guaymas, Honduras. These experiments are described in the third annual SFCS project report (d. 3705).

Field experiments were begun in El Salvador in April 1978. Three experiments on spatial arrangements of maize, sorghum, pigeon pea and cowpea planted in rows were conducted on farmers' lands. An experiment managed by the farmer was conducted on amount, and timing of fertilization in the system maize intercropped with sorghum. The results of this experiment were presented at the XXV PCCMCA meetings and are part of the experimental evidence for the technological alternative of maize associated with sorghum suggested for the farmers of the Municipio of Tejutla in El Salvador (d. 5078).

The growth of maize, sorghum and pigeon pea intercropped was studied in a field experiment at the experiment station. The results of this study also form part of the experimental evidence for the technological alternative for Tejutla.

Three experiments were done on evaluating maize, sorghum, pigeon pea and cowpea in intercropped systems. A study of the effect of drought on maize, cowpea, pigeon pea and sorghum was done under field conditions

and in the greenhouse at the experiment station. A study of different varieties of pigeon pea intercropped with sorghum was done an a farmer's land.

Field experiments were begun in Guatemala in February 1978. Most of the experiments were located in the Central Highland area, designated as Region V by ICTA. The CATIE resident concentrated his experimental work on horticultural crops. The work can be grouped into two categories: 1. Studies of alternative production systems and 2. Studies of components (crops, insect and disease control, introduction of varieties, weed control, fertilizer and other management aspects). A description of the work in Guatemala is presented in document 3786.

Eleven different crops were tried in the work on production systems. These were planted in sequence, monoculture or in rotation with maize.

Fifteen spatial and chronological arrangements using these crops and "chorequeque" (a legume, *Lathyrus nigrivalis*, used as a green manure by farmers) were tried.

Field experiments planted in 1978 include four variety trials with various species (maize, climbing beans, wheat and peas); a multifactorial experiment with wheat, maize, climbing bean and broad bean; an experiment on maize density; two factorial experiments to study interactions between components of systems; and an experiment to study the magnesium requirements in potato and cauliflower. These studies were carried out in seven municipios of Chimaltenango. Ten experiments on an alternative for the common "milpa" cropping system (maize, beans and broad bean planted in the same hole) were conducted in Region I under the responsibility of ICTA personnel. The possibilities of diversifying existing

cropping systems for the first planting season were studied in Santiago Sacatepequez.

The activities in Guatemala began in 1978, 15 months before the end of the project, and therefore, the results obtained will appear in more detail in the June 1977-December 1978 CATIE report (in progress). Some partial results are summarized in the 1977-78 SFCS Project annual report (d. 3705). The experimental results have been reported by the CATIE resident in Guatemala, Donald C.L. Kass, in his monthly report of the 15th of January to the 15th of February, 1979, and were presented at the annual results and planting meeting for Region V, Guatemala from Feb. 5-9, 1979.

Table B4 lists the number of field experiments conducted for each year of the project in each country.

Table B4. Number of field experiments conducted in each country as part of the Small Farmer Cropping Systems Project.

	Project years			
Location	1976-1977	1977-1978	1978-1979	Total
Costa Rica	5	15	21	41
Honduras	5	16	4	25
Nicaragua	5	14		19
El Salvador			10	10
Guatemala			20	20
TOTAL	15	45	55	115

B15. Comparison of Results from Field Trials with Base Line Data

Base line data were used in the selection of crops and cropping systems for experiments on new combinations of production inputs and other modifications. The national teams discussed and accepted this procedure, and therefore, all the experiments in each area were related to local conditions, i.e. based mainly around the local cropping systems, labor and other input availability, marketing possibilities and the observed technological level. This has been the starting point for introducing gradual changes in the farmers' cropping systems in order to maintain the attention and interest of the farmers. More aggressive type of changes, based on ecological production possibilities and future marketing possibilities, were also tried. An example of this type of change is the introduction of a new species to an area. Cowpea was introduced to areas in Honduras and Costa Rica. This type of change needs more study, especially since it is expected that in the future more research will be directed towards aggressive changes in the farmers' systems.

Adapting research to local conditions has resulted in experiments which, when observed at the regional level, may look very different from each other. However, they do have the common objective of adapting the new cropping system to the local environmental production possibilities and the farmers' interests. This methodology has produced good results in specific areas and has helped maintain the interest of the national technicians and the farmers.

The base line data on the area collected during and prior to the experimentation phase were used in the evaluation of field trial results.

The main evaluation criteris used were those specified in the Project's scope of work: family labor use, income generation and production, and the relationship between the inputs required for a new cropping system and the availability of inputs on the small farms during the year.

The documents which best describe the efforts to relate field trial results and base line information are the descriptions of the technological alternatives generated during the project for Costa Rica (d. 5076, 5077, 5079, 5080), Nicaragua (d. 3708, 5075), Honduras (d. 5072, 5073, 5074), and El Salvador (d. 5078). The economic analysis in the appendices of these documents compares base line data to results from the new alternatives for such things as labor, operation costs, yield, and net, gross and family income. Agronomic production comparisons are also presented in other sections of the documents.

The experimental analysis and evaluation of these technological alternatives were done in cooperation with the national teams.

The Annual Reports (d. 167, 3748, 3705) also contain information on comparisons of agricultural production as observed in the base line data to agricultural production obtained in the field trials. Some of the more outstanding results are presented in "Promising results in food production and economic implications of selected cropping systems for Central America. November 1977" (d. 3830), and "Small farmer cropping systems project highlights - Decembe 1978" (d. 5052).

Other efforts of a similar nature are documented in the 1977 annual report on the OSU/AID/CATIE weed management project and in a paper on beans and cowpea in Pérez Zeledón, Costa Rica (3471) presented at the PCCMCA meeting in El Salvador, 1978.

B16. Compilation and Dissemination of Research Information

Research and other cropping system information from activities within the project and from sources other than the project were compiled. This information was made available to CATIE staff members and to the national professionals involved in the project, i.e., the members of the Regional Committee, the national committees, and the national teams, as well as to others who requested it. Additional information on this subject is presented in Section E5 of this report.

C. RECOMMENDATIONS FOR CROPPING SYSTEMS

C1., C2. Definition, Format and Summary of the Recommendations Developed

The term Technological Package (Tech-Pack) has been used by various international agencies and has different meanings. In this project, the term cropping systems "alternatives" was used. A document written on an alternative should contain a description of the technology used and pertinent information on the particular target area. It is not a mass distribution document and in this sense, is not extension oriented. CATIE tries not to interfere with national responsibilities by attempting to write extension documents. However, the recommendation can be adapted by extension personnel for use in extension bulletins.

Format of Cropping System Alternatives

A format for presenting an alternative has been developed and is still being evolved. Basically, the format consists of:

1. A summary of the information in the document. This contains a brief description of the target area and the cropping system commonly used by small farmers of the area.
2. A description, in the form of a table, of the farmers' cropping system. This table shows chronological sequence of activities and the inputs and outputs needed at each stage. The activities are arranged by week.

3. Description of crop pattern alternative. This is a table containing the plan of activities for each week. The amount of materials needed at each stage is also specified. In the observation column, reference is made to the experimental evidence supporting the recommended practice.

4. A week by week comparison of the farmers' system and the recommended alternative system. In this table, the two systems are compared for each activity.

5. Appendix 1. This contains a detailed agronomic description of the farmers' systems and, in some cases, a description of the recommended modifications discussed in more detail. The description covers: a) land preparation, b) varieties, c) planting methods, d) plant densities, e) weed control, f) fertilizer levels, g) pest management, h) harvesting methods, i) storage, and j) transport and marketing.

6. Appendix 2. This contains a socioeconomic characterization of the area where the described farmers' system is commonly used. It also specifies the set of conditions under which the proposed alternative is expected to perform as anticipated. Many of the social characteristics of the people are analyzed in relation to the cropping systems described in the alternative. The infrastructure of the area is analyzed in relation to the new and to the existing cropping patterns.

7. Appendix 3. This consists of the geographical description of the area where the alternative could be applied. General aspects of soil, climate and natural vegetation are covered, so that where

appropriate, ecological considerations can be given their proper importance.

8. Appendix 4. This contains the economic analysis of both the farmers' system and the recommended alternative. This is a complete analysis relating the economic resources of the farmer to the recommended system.

9. Appendix 5. This consists of the experimental evidence supporting the recommendations or the modifications to the farmers' system.

10. Appendix 6. This is a bibliography of documents with additional information on the alternative.

This document provides the research team with a framework which can serve as a guide for future research. It also provides a format for reporting results that can be utilized by other technicians doing research on cropping systems methodology, and it helps identify how each specialty can contribute to research on any particular area.

First approximation alternatives should be validated in the field. This validation should involve many farmers in order to sufficiently test the assumptions made at the time the alternative was produced. It should be clearly understood that this test is not a demonstration and the farmer must be made aware that he is part of the research team in this phase of the methodology. A second approximation alternative can be prepared after one year of validation of the first approximation alternative. The preparation of alternatives is a continuous process which depends on the availability of new information on system components and on changes in exogenous and endogenous factors to the farming system.

Table C1. summarizes the characteristics of the 10 different alternatives developed during the project. Documents with a detailed description of the ten alternatives are available (d. 3708, 5072 to 5080).

C3. Publish and Distribute the Area-specific Recommendations

Documents with a detailed description of the ten alternatives (d. 3708, 5072 to 5080) were distributed to project staff members and to the national professionals involved in the project. They were also sent to the IICA-ROCAP agricultural research information program (PIADIC). See Section E5 of this report for additional information on documentation in the SFCS Project.

C4. Formulate Procedures for Extension Demonstrations

Cropping system alternatives based on diagnostic studies, available agronomic information, existent cropping systems and field experiments were regarded as first approximation alternatives. These alternatives are considered to be options which can be presented to the farmer. However, certain assumptions made at the time the alternatives were produced need to be verified with a larger number of farmers than those involved in the testing phase.

This process of verification has been referred to as the validation phase. The specific objectives of this phase are:

1. To assess the agronomic performance of the proposed alternative under the farmer's management with actual commercial field production conditions.

Table C1. Technological alternatives developed under the CATIE/ROCAP Project from 1975 - 1979 with description of crops involved, where developed, and changes introduced.

Technological Alternative 1/	Area where developed	Crops Involved	General Changes 2/	SPECIFIC CHANGES IN COMPONENTS									
				Variety	Spatial Arrangement	Chronol. Arrangement	Soil insect control	Fertilizer	Disease control	Other pest control	Weed Control	Land preparation	Harvest	Agricultural practic
1. Maize/beans	Samulalí, Nic.	Maize	Quantity and quality of inputs available to both crops					X					Improved harvest practice	
		beans		X	X			X						
2. Sorghum + beans in rows	Samulalí, Nic.	Sorghum	Intensification		X									
		beans						X						
3. (Maize + pipian)-(maize + pipian)	Yojoa, Hond.	Maize	Quantity and quality of inputs		X	X		X					Earlier Harvest	Hill-up with ho not oxe
		Pipian, common squash	Substitution	Pipian squash										
4. (Maize + rice) - cowpea	Yojoa, Hond.	Maize, rice	Intensification		X			X						Double- over maize a maturity
		Cowpea, common bean	Substitution											
5. (maize/ cowpea) -maize	Yojoa, Hond.	Maize						X				Reduce one operation		Double- over maize in September.
		Cowpea	Intensification			X								
6. Maize-Bean	Pérez Zeledón, C.R.	Maize	Quantity and quality of inputs	X	More plants		X	X		X			Improved harvest practice	
		Beans, cowpea	Substitution		More plants			X	X					
7. (maize + bean) - (Maize + Bean)	Perez Zeledón C.R.	Maize	Intensification			X				X	X		Improved harvest practice	
		Common bean, cowpea	Substitution									Minimum tillage		

Table C1. Continued....

Technological Alternative 1/	Area Where developed	Crops Involved	General Changes 2/	SPECIFIC CHANGES IN COMPONENTS										
				Variety	Spatial Arrangement	Chronol. Arrangement	Soil insect Control	Fertilizer	Disease control	Other pest Control	Weed control	Land preparation	Harvest	Agricultural practice
8. Maize - maize	Guápiles C.R.	Maize	Quantity and quality of inputs; intensification	X				X		X	X	Minimum tillage		
9. (Maize + cassava) - beans	Guápiles C.R.	Maize, cassava	Quantity and quality of inputs	X	X	X		X		X	X			Prune cassava
		Beans	Intensification diversification											
10. Maize + sorghum	Tejutla, El Salvador	Maize,	Quantity and quality of inputs					X		X		Improved practice		
		Sorghum												

1/ + = intercropped; / = in relay - = in rotation.

2/ Definitions of changes:

1. Change in quantity of inputs: the amount of a given material or operation is changed (usually increased)
2. Change in the quality of the input: the material or operation is modified by replacing it or by changing the date significantly
3. Intensification: at least one crop is added to the number of crops in the pattern that the farmer handles during one agricultural period (year)
4. Substitution: one crop in the pattern is replaced by another, usually with similar agronomic and labor requirements. (For example, *Vigna unguiculata* as a replacement for *Phaseolus vulgaris* beans).
5. Diversification: a new crop (not normally planted by the farmers in the area) is added to the usual pattern. There are cases where a variety can be change as drastic a change as introducing a new crop.

2. To transfer the information contained in the alternative to transfer agents and to key farmers of the region.

3. To develop the required capacity for participating farmers to act as additional transfer agents for the new technology.

The logistics for validating cropping system alternatives are discussed in detail in Chapter VIII of the Procedural Guide being prepared by the cropping systems research team at CATIE.

The project resident in El Salvador formulated another approach for validation of new cropping system alternatives. Because of the organization which exists at CENTA, a variation of the methodology was adopted. Details of this methodology are included in the document "El Salvador, an experience of the Cropping Systems Project for Small Farmers in the Central American Isthmus" (in Spanish) (d. 3791) by José Arze.

In Costa Rica, as in the other four Central American countries, field testing of cropping system alternatives was carried out on farmers' fields. In the case of Costa Rica, the cooperating farmers were selected from a group contacted through the extension agent. The extension agent, in agreement with CATIE's research team, occasionally used the experimental plots as demonstration units. There were some experiments, which because of the nature of the treatments under study, were not used as demonstration plots.

D. ASSIST IN THE CREATION OF A CAPABILITY IN CENTRAL AMERICA TO CONDUCT CONTINUOUS CROPPING SYSTEMS RESEARCH

D1. Personnel and Finances Allocated by the Cooperating Governments in 1974

In 1974, only one of the present cooperating governments had allocated personnel and finances for cropping systems research. This was the case of CENTA in El Salvador where a multiple cropping program had been started within the Agricultural Economics Department. This department had been recently created in CENTA. The 1974 budget for that department was US$42,800.

One year later, ICTA in Guatemala began its work on multiple cropping. Since 1975, Nicaragua, then Honduras and finally, Costa Rica have shown interest in starting research on cropping systems.

D2. Determination of the Actions and Resource Allocations Required to Develop a Self-sustaining Research Program for Cropping Systems in Central America

Three Regional Committee meetings were held during the life of the project. In the 1978 meeting, the committee indicated their interest in emphasizing the common problems present in several countries of Central America.

Representatives from each country recognize the need for a cooperative research program on cropping systems for Central America,

but they have not committed themselves to participation in the organization of a regional cropping systems program.

Perhaps through their association with CATIE, in becoming aware of the advantages of cooperative efforts, they may show more interest in establishing a regional cropping systems network in the future.

Nevertheless, Nicaragua, El Salvador and Honduras have reorganized their personnel in ways which definitely favor the multidisciplinary approach for cropping systems research and the Costa Rican director of research has decided to appoint a systems research specialist who will work closely with CATIE personnel.

D3. Preparation of a Written Plan for a Central American Capability to Develop a Continuing Cropping Systems Research Program

Because of the particular conditions which have prevailed in the last three years in Central America, especially those regarding Central American economic integration, it was not feasible to prepare a written plan for Central American capability to develop a continuing cropping systems research program. However, a first draft of a document which could serve as the basis for a written plan for such a program has been prepared. This Procedural Guide (in progress) presents the conceptual framework for carrying out cropping systems research. Methodological steps are suggested and explained in detail for diagnostic (base-line) studies, designing of possible alternatives, field testing of these alternatives, validation of promising alternatives and the preparation of refined alternatives based on validation and other previous steps. In

addition to the description of the methodology, suggestions on techniques for conducting field experiments and ideas on personnel and equipment needs are included in the guide. A national organizational structure is not defined because there are marked differences from one country to another. Changes in organizational structure will come about gradually as cropping systems research begins to produce good cropping system alternatives.

Better regional cooperation may develop when extrapolation methodologies are shown to be successful in generalizing experimental results from tested to untested areas.

At the end of the project, a research team dedicated to cropping systems research had been organized in each country and they were requesting additional assistance from CATIE in matters related to methodology, experimental analysis and organization of cropping systems research teams.

D4. Discussions with the Central American Ministers About a Cropping Systems Research Plan for Central America

Throughout the project, the Director and Sub-directors of CATIE, and the Head of the Annual Crops Program have met many times with the Ministers from all five Central American countries. The advantages of cooperation and collaboration among the Central American in cropping systems research has frequently been discussed in these meetings. The advantages of even closer cooperation through a formal Central American network for cropping systems research should become even more apparent in the future, and it is likely that the initial collaborative effort begun with this project will serve as a basis for more extensive cooperation among the countries.

E. OTHER ACTIVITIES

E1. Conceptualization

During the course of the project there have been many discussions on the conceptual aspects of small farmer cropping systems research. The ideas generated from these discussions and from individual efforts have helped to guide the project and to clarify the direction of the program.

The following is a summary of some of the documents written by staff members on conceptual aspects of the project.

Staff members have written articles on the subject of a systems approach to agricultural research. The project research methdology, described by C. Burgos (d. 1208), is based on a systems approach. Burgos also wrote about research on annual crop production systems (d. 1673) and on cropping system methodology (d. 5053). R. Moreno discussed a possible plan and fundamental ideas on production systems research (d. 709, d. 1218), and wrote on the systems approach and on research on cropping systems in Central America (d. 1232, 3447), and Moreno and Saunders discussed a broader aspect of this type of research in a paper on a farming systems research approach for small farms in Central America (d. 659). L. Navarro reviewed some general ideas on systems research (d. 3739) and outlined a general agricultural research methodology (d. 3738). Navarro and Moreno presented ideas on a multi-disciplinary approach to agricultural research with small farmers (d. 227). R. Hart wrote on the systems concept, on systems analysis and on the

agroecosystem as a unit of research (d 1668, 1670, 1671), on the ordering and the relationships of agricultural information in hierarchical systems (d. 3755), and on the crop system as a unit of research (d. 178). He also presented an ecological systems conceptual framework for agricultural research (d. 4061, 1669, 4055), and discussed a Central American crop system research network (d. 1472), a crop system classification (d. 1474) and methodologies to produce agroecosystem management plans for small farmers in tropical environments (d. 3811). The case study he carried out in Honduras was based on svstems principles (appendix 4 in d. 5072, 5073 or 5074).

Other articles on methodology have been written. J. Arze wrote articles specifically related to the national programs on integrating research (d. 1656), on structuring research (d. 3809) and on the generation and use of technology as a reference for a conceptual framework (d. 3866). D. Boynton discussed the different types of research essential to the project (d. 3846). Two of the consultants to the project, Dr. Richard Harwood and Dr. David W. Norman produced documents concerning methodology. Dr. Harwood discussed evolution of ideas and methology, the cropping systems approach, the impact of research on development and the gradient approach to cropping systems research (d. 691, 455). Dr. Norman discussed methdology and risk economics (d. 5029). Another consultant to the project, Dr. Wayne Wymore, wrote papers on systems for the small farmer (d. 1079), on designing a system for management of experimental data (d. 1205) and on the basic concepts of engineering systems (d. 214).

Conceptual papers were written on implementation and analysis of experiments. P. Oñoro presented some ideas on data management systems (d. 710), and on research techniques within a systems framework (d. 1235). L. Navarro wrote on evaluating research results (d. 1475). R. Hart wrote a paper evaluating methodologies for extrapolation of results (d. 1473). R. Hart and M. Holle are in the process of preparing an article on an index to measure risk in cropping systems.

Other conceptual papers were written on more specific topics. C. Burgos discussed the importance of soil fertility research to systems studies on agricultural production (d. 1202) and the relationship of agricultural systems and diet, presenting some strategies for improving diet through improved cropping systems (d. 3782). J. Arze discussed climatic factors in the agricultural production process (d.1675). M. Holle wrote on horticultural crops in small farmer production systems (d. 479), on production systems including vegetables and fruits on the farm, with emphasis on tropical areas (d. 692) and on crop and variety diversification as part of crop system research (d. 5057).

Various papers were written on socioeconomic concepts. L. Navarro wrote on the methods and on the specific tools needed to collect information on production systems, the farmer and his whole environment (d. 1233, 1676). He also wrote a paper on risk and uncertainty in crop production (d. 1247). The case studies done by L. Navarro (d. 226) and R. Hart (appendix 4 of d. 5072, 5073 or 5074) also present various socioeconomic concepts. D. Johnston wrote a paper on limiting factor evaluation of cropping systems (d. 107). E. Andrade, a consultant to

the project, wrote on the socioeconomic part of the farm system in an analysis of the environment (d. 1672). S. Bradfield, also a consultant to the project, wrote on the social position of the farmer and its consequences for agricultural development in the tropics (d. 205).

E2. Activities linking the 1975-1979 SFCS Project to the Small Farmer Production Systems Project

A ROCAP financed project on Small Farmer Production Systems began on April 1, 1979. The project will build on the results obtained in the SFCS Project. Activities related to this new project were undertaken during the course of the SFCS project, especially during the last year of the project. Staff members, especially C. Burgos, L. Navarro, and R. Hart, along with B. Quijandría of the CATIE Animal Production Program, and with the help from some consultants, especially P. Warnken, wrote the proposal which led to the funding of the new Small Farmer Production Systems Project.

This new project will include research on a technology transfer phase. In preparation for this, Dr. Howard Ray, as a consultant to CATIE, discussed the subject with staff members and wrote a report on this phase of the project. Staff members also attended a conference in Guatemala on technology transfer.

A Procedural Guide (in progress) was prepared both as part of the SFCS project and as a source of reference for national researchers to use in cropping systems research.

The new project will include Panama, in addition to the five Central American countries. An informal relationship between CATIE and Panama was established during the SFCS project. Representatives from Panama attended some of the regional meetings held at CATIE, and CATIE staff visited Panama many times in preparation for beginning work there. W. Bejarano conducted a study on the geography of the Caisán area of Chiriqui, Panama (d. 3744) and L. Navarro, in cooperation with staff members from IDIAP and other CATIE staff members, carried out a survey and initial characterization of 59 farms in Caisán, Panama (d. 3912), including information on crops and animals. Panama signed the agreement with CATIE on April 9, 1979 to begin work officially on the new project.

E3. Central American Soil Fertility Project

The Central American Soil Fertility Project was financed by ROCAP from March 1976-March 1978. Its principal goal was to institutionalize a methodology of soil research at CATIE in order to establish a technical base so that CATIE could offer technical assistance on soil-related matters to the countries of the Central American Isthmus. The soil research methodology was based on the one developed by the International Soil Fertility Evaluation and Improvement Project (ISFEI) of North Carolina State University. The project also included a subproject on soil analogs, with the objective of arriving at a methodology for defining areas in Central America with similar soils and climate which could be used in the extrapolation of data. A summary of the results of the project is presented in document 4132.

The Soil Fertility Project acted as a support project to the SFCS project. The soil fertility work begun during the project continued during 1978-1979 under the Annual Crops Program of CATIE.

E4. International Meetings

Staff members attended various international meetings during the course of the project. These professional meetings allowed for important exchanges of information. The staff members learned of new technical advances and of methodologies and ideas from other institutions, and also presented results and methodologies developed at CATIE to other professionals for their information and for their comments.

Meetings atended by staff members include:

American Society of Agronomy

Programa Cooperativo Centroamericano para el Mejoramiento de Cultivos Alimenticios (PCCMCA).

American Institute of Biological Sciences

Soil Inventory Workshop (AID/Cornell University)

American Agricultural Economic Association

Seminar on Economic Analysis in the Design of New Technology for Small Farmers (CIAT)

American Society of Horticultural Science

American Society of Horticultural Science-Tropical Region

First Symposium on Tropical Tomato-AVRDC (Taiwan)

International Federation of Organic Agriculture Movements - Third World Agriculture Workshop

Workshop on Farming Systems Research, Nairobi (The Consultative Group on International Agricultural Research, Technical Advisory Committee)

Intercropping with Cassava: A Workshop Sponsored by the Central Tuber Crops Research Institute of India and the International Development Research Centre of Canada.

Annual Meeting of the American Association of Information Sciences

Seminar on Cassava Protection (at CIAT)

CARDI-CATIE Workshop on Agricultural Production Systems, Research (Trinidad)

Symposium on Cropping Systems Research and Development for the Asian Rice Farmer (IRRI, The Philippines)

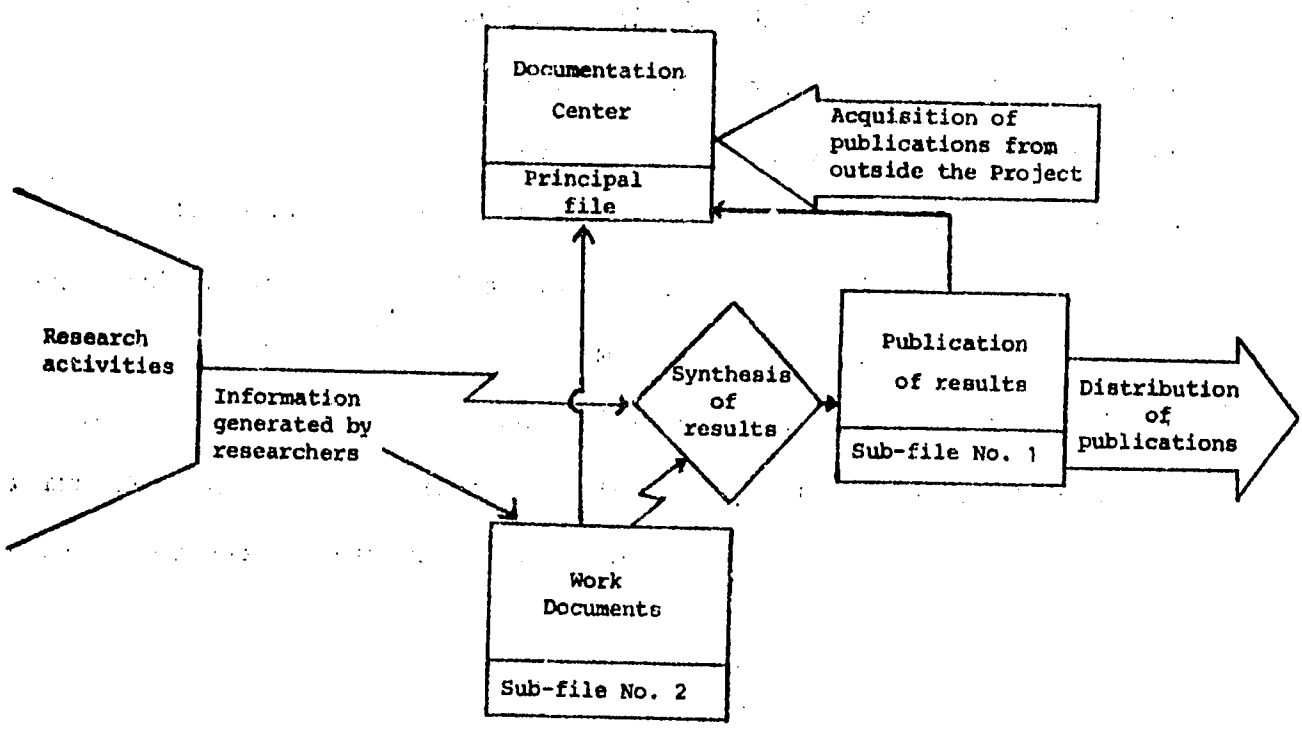
Conferencia sobre "La Interacción entre la Agricultura, Ciencia y Tecnología de Alimentos y Nutrición (INCAP-United Nations-Rockefeller Foundation).

Entomological Society of America

Basic Village Education Workshop (Guatemala)

E5. Information Activities

Information activities, i.e. publications and documentation, were conducted according to the description in Figure E.1. under the leadership of Humber to Jiménez.



LEGEND

PRINCIPAL FILE. Documentation Center. This file contains documents published by CATIE (Sub-file No. 1) and documents published outside of CATIE (on tropical cropping systems; on soils, climate and other basic data from the Central American Isthmus; and the proceedings of the annual regional meeting of PCCMCA). It also contains documents from Sub-file No. 2.

SUB-FILE No. 1. Publications. This sub-file contains publications on cropping systems prepared at CATIE.

SUB-FILE No. 2. Work documents. This sub-file consists of unpublished documents (forms, memoranda, diagrams, reports, etc) containing information generated by the Small Farmer Cropping Systems Project. Users of this file are mainly those people who are directly or indirectly connected with the Project. In the near future the information in this sub-file will be processed with the help of the CATIE Computer Center. The documents in this file are not for general distribution.

Fig. E1. Flow of information in the Project.

Most of the documents dealing with cropping systems (Principal file) were collected under the leadership of Dr. Damon Boynton. Documents were classified using the uniterm card system. About 2,500 documents dealing with cropping systems in the tropical regions of the world (1,700 titles), as well as documents dealing with soil, climate and other basic data of the Central American Isthmus (250 titles) and of other tropical countries (550 titles) were collected and processed. Lists of new acquisitions were periodically distributed to project staff members and national co-operators. In addition, 1,700 documents from all the PCCMCA annual meetings were added to the above 2,500 and were also classified using the uniterm system. With additional support from CATIE, this collection could become the basis for a comprehensive documentation center on tropical cropping systems.

Data from field trials and supportive research were disseminated through the distribution of technical papers and reports prepared by staff members. Approximately 160 publications were published and widely distributed (Sub-file No. 1). A list of publications is presented in the Bibliography of this report (Cumulative list No. 5). Approximately 10,700 copies of these publications were distributed to 870 people during the last two years of the project (Table E1). Most of the publications were sent to the Central American Isthmus, including publications sent to institutions connected with the IICA-ROCAP Agricultural and Research Information System (PIADIC).

Table E1. Distribution of publications.

	1977*		1978		1979**		Total		
	No. of Requests	Docum.***	No. of Requests	Docum.	No. of Requests	Docum.	No. of Requests	Docum.	%
Central American Isthmus	161	1780	244	2700	65	1300	470	5780	(54%)
South American countries and USA	73	890	127	1400	34	600	234	2890	(27%)
Other countries	60	630	85	900	21	500	166	2030	(19%)
Total	294	3300	456	5000	120	2400	870	10700	(100%)

* Starting March 1977

** To May 1979

*** Number of documents sent

Approximately 150 work documents, including memoranda, internal reports, field survey forms and other unpublished documents, were classified and stored in such a way that fast and easy retrieval is possible (Subfile No. 2). A list of these documents is presented in the Bibliography of this report (Cumulative List No. 2). These work documents represent the nucleous of the larger and more complex file (possibly a data bank) that should be managed in the future.

Technical assistance was given to national information officers on preparing reports (INTA, Nicaragua) and to documentation officers on acquiring, cataloging and retrieving technical information (CENTA, El Salvador). Monthly reports as well as quarterly and annual reports were prepared and submitted to ROCAP.

LIST OF ABBREVIATIONS

AID	Agency for International Development (U.S.A.)
ASBANA	Asociación Bananera Nacional (Costa Rica)
AVRDC	The Asian Vegetable Development and Research Center (Taiwan)
BID	Banco Interamericano de Desarrollo
CARDI	Caribbean Agricultural Research and Development Institute
CAR-PS	Centro Agrícola Regional del Pacífico Sur (MAG, Costa Rica)
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza
CENTA	Centro de Tecnología Agropecuaria (El Salvador)
CIAT	Centro Internacional de Agricultura Tropical
CIID	Centro Internacional de Investigación para el Desarrollo (Canadá) (See IDRC)
CIMMYT	Centro Internacional de Mejoramiento de Maíz y Trigo
IADS	International Agricultural Development Service
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics (India)
ICTA	Instituto de Ciencia y Tecnología Agrícola (Guatemala)
IDIAP	Instituto de Investigaciónes Agropecuarias de Panamá
IDRC	International Development Research Centre of Canada (See CIID)
IICA	Instituto Interamericano de Ciencias Agrícolas
IRRI	The International Rice Research Institute
IITA	International Institute of Tropical Agriculture (Nigeria)
INTA	Instituto Nicaraguense de Tecnología Agropecuaria
INVIERNO	Instituto de Bienestar Campesino (Nicaragua)

ISFEI project	International Soil Fertility Evaluation and Improvement Project (North Carolina State University)
ITCO	Instituto de Tierras y Colonización (Costa Rica)
MAG, C.R.	Ministerio de Agricultura y Ganadería, Costa Rica
MAG, Nic.	Ministerio de Agricultura y Ganadería, Nicaragua
OSU	Oregon State University
PCCMCA	Programa Cooperativo Centroamericano para el Mejoramiento de Cultivos Alimenticios
PIADIC	Programa de Información Agropecuaria del Istmo Centroamericano (IICA-ROCAP)
PIAPA	Programa de Investigación Adaptada al Pequeño Agricultor (Nicaragua)
PROMYF	Proyecto Piloto de Maíz y Frijol (Honduras)
ROCAP	Regional Office for Central American Programs
SFCS project	Small Farmer Cropping Systems Project (CATIE/ROCAP)
SRN	Secretaría de Recursos Naturales de Honduras
TAB	Technical Assistance Bureau (AID)
UCR	University of Costa Rica
UNDP-FAO	United Nations Development Program - Food and Agriculture Organization

BIBLIOGRAPHY

This Bibliography consists of two Cumulative Lists of documents from the Documentation Center of the Annual Crops Program of CATIE. Cumulative List No. 5 lists publications from Sub-file No. 1, and Cumulative List No. 2 lists work documents from Sub-file No. 2 (see Section E5 of this report).

This Bibliography includes the works cited in the text of this report, as well as other publications.

(107)
JOHNSTON, T.D. Limiting factor economic evaluation of cropping systems. Turrialba, Costa Rica, CATIE, 1978. 31 p.

(113)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Primer informe anual, contrato AID 596-153-CATIE/ROCAP, sistemas de cultivo para pequeños agricultores. Turrialba, Costa Rica, 1976. 30 p.

(See also english version 167).

(125)
BAZAN, R. Programa de investigación en sistemas de producción agrícola para el pequeño agricultor en América Central. Turrialba, Costa Rica, CATIE, 1976. 14 p.

(163)
BAZAN, R. Fertilización con nitrógeno y manejo de leguminosas de grano en América Central. Turrialba, Costa Rica, CATIE, 1974. 26 p. 18 ref.

(164)
BAZAN, R. Sistemas de producción agrícola y transferencia de tecnología al pequeño agricultor. In: Reunión Técnica Regional Sobre Transferencia de Tecnología a los Productores Maracay, Ven., 1975. Informe. Maracay, Venezuela, IICA. Zona Andina, 1975. 24 p. 15 ref.

(165)
BAZAN, R. Los paquetes tecnológicos, su preparación y utilización en la agricultura. Turrialba, Costa Rica, CATIE, 1977. 8 p. 8 ref.

(166)
BAZAN, R. et al. Estudio comparativo sobre la productividad de ecosistemas tropicales bajo diferentes sistemas de manejo. In: Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano, Maracaibo, Ven., 1973. Informe. Maracaibo, Venezuela, Universidad del Zulia e IICA. Programa IICA-Trópicos, 1973. 17 p.

(167)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Small farmer cropping systems for Central America; first annual report June 10, 1975 - June 30, 1976; contract No. AID 596-153 (CATIE-ROCAP). Turrialba, Costa Rica, 1976. 19 p. (Véase también versión en español (113))

(168)
MATEO, N. y MORENO, R. Estudio de siete sistemas de producción agrícola en Platanares de Pérez Zeledón, Costa Rica. Turrialba, Costa Rica, CATIE, 1976. 23 p.

(171)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Informe resumido de la encuesta preliminar en Costa Rica, Nicaragua y Honduras. Turrialba, Costa Rica, CATIE, 1976. 25 p.

(173)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Summaries of the magister scientiae theses done at CATIE on cropping systems. Turrialba, Costa Rica, 1977. 33 p.

(174)
DESIR, S. y PINCHINAT, A.M. Producción agronómica y económica de maíz y frijol común asociados, según tipo y población de plantas. Turrialba 26(3):237-240. 1976. 8 ref.

(175)
GARCIA N., J. y PINCHINAT, A.M. Producción asociada de maíz y soya a diferentes densidades de siembra. Turrialba 26(4):409-411. 1976. 6 ref.

(176)
HART, R.D. A bean, corn and manioc polyculture cropping system. I. The effect of interspecific competition on crop yield. Turrialba 25(3):294-301. 1975. 4 ref.

(177)
HART, R.D. A bean, corn and manioc polyculture cropping system. II. A comparison between the yield and economic return from monoculture and polyculture cropping systems. Turrialba 25(4):377-384. 1975. 21 ref.

(202)
ARAUJO, J.E. Desarrollo agrícola. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica, CATIE, 1975. 4 p.

(203)
SORIA V., J. Los sistemas de agricultura en el istmo centroamericano. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica, CATIE, 1975. 21 p. 20 ref.
[También en: Rev. Biol. Trop., 24 (Supl. 1): 57-68, 1976]

(204)
SORIA V., J. Introducción a la agricultura de cultivos tropicales perennes. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica, CATIE, 1975. 19 p. 18 ref.

(205)
BRADFIEL, S. La posición social del campesino y sus consecuencias para el desarrollo agrícola en los países tropicales. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica, CATIE, 1975. 10 p.

(206)
VALVERDE, V.; ARROYAVE, G. y FLORES, M. Revisión de la contribución calórica y proteínica de dietas de poblaciones de bajo nivel socio-económico en Centro América; existe un problema de proteínas. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica CATIE, 1975. 15 p. 39 ref.

(207)
MORAN, M.J. Mercadeo agropecuario y sistemas de producción agrícola. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica, CATIE, 1975. 36 p.

(208)
VANDERMEER, J.H. Los potenciales de los agroecosistemas tropicales hacia un amalgamiento de teoría y práctica. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica, CATIE, 1975. 12 p. 48 ref.

(209)
FORSYTHE, W. M. Las condiciones físicas del suelo y la producción. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica, CATIE, 1975. 12 p. 38 ref.

(211)
SANCHEZ, P.A. Aspectos agronómicos de los sistemas tradicionales de producción en el trópico americano. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica, CATIE, 1975. 33 p. 147 ref.

(212)
ECHANDI S., R. Producción de semillas de calidad. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica CATIE, 1975. 17 p. 15 ref.

(213)
LOS INSECTOS como organismos integrantes de un agro-ecosistema; características bio-ecológicas y económicas. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica, CATIE, 1975. 29 p. 44 ref.

(214)
WYMORE, A. W. Un bosquejo de los conceptos básicos de la ingeniería de sistemas. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica, CATIE, 1975. 26 p. 81 ref.

(215)
PAEZ, G. Delineamento experimental de sistemas de producao agrícola. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica, CATIE, 1975. 21 p. 10 ref.

(216)
PINCHINAT, A.M. Estrategias para desarrollar estudios de campo sobre agrosistemas de producción en el trópico. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica, CATIE, 1975. 6 p.

(217)
PAYEC, N. Objetivos, manejo y control de experimentos en sistemas de producción para pequeños agricultores. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica, CATIE, 1975. 4 p.

(218)
RAY, H. E. y MONTERROSO, J. L. Transferencia de tecnología. In: Curso Intensivo sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, C.R., 1975. /Trabajos/ Turrialba, Costa Rica, CATIE, 1975. 5 p.

(221)
JOHNSTON, T.D. El rebrote como una alternativa promisoria para incluir en sistemas del pequeño agricultor. Turrialba, Costa Rica, CATIE, 1976. 63 p. 12 ref. (See also english version (329)

(222)
LARICE C., J.F. y MORENO M., R.A. Epidemiología de algunas enfermedades foliares de la yuca en diferentes sistemas de cultivo. I. Mildiu polvoroso y roña. Turrialba 26(4):369-398. 1976. 22 ref.

(223)
LAS ENFERMEDADES de las plantas y los sistemas de cultivo. Actividades en Turrialba 5(4):3-4. 1975. (See also english version (444))

(224)
MORENO, R. Diseminación de Ascochyta phaseolorum en variedades de frijol de costa bajo diferentes sistemas de cultivo. Turrialba 25(4): 361-364. 1975. 4 ref.

(226)
NAVARRO, L.A. Víctor Manuel Víquez, estudio de caso en Costa Rica; informe preliminar. Turrialba, Costa Rica, CATIE, 1977. 77 + 24 p.

(227)
NAVARRO, L. y MORENO, R. El enfoque multidisciplinario en la investigación agrícola con pequeños agricultores. Turrialba, Costa Rica, CATIE, 1976. 8 p.

(228)
PALENCIA-ORTIZ, A. Algunos aspectos relacionados con la encuesta a pequeños agricultores practicada en las regiones de la Trinidad (Esteli), y San Ramón (Matagalpa) Nicaragua, para el proyecto CATIE/ROCAP. Turrialba, C.R., CATIE, 1976. 10 p.

(229)
PINCHINAT, A.M.; SORIA, J. and BAZAN, R. Multiple cropping in Tropical America. In: Symposium on Multiple Cropping, Knoxville, Tennessee, 1975. /Proceedings/ Madison, Wisconsin, American Society of Agronomy, 1976. pp. 51-64. 30 ref.

(230)
PINCHINAT, A.M.; BAZAN, R. y SORIA, J. Sugerencias para la institucionalización del PCCMCA. In: Programa Cooperativo Centroamericano para el Mejoramiento de Cultivos Alimenticios. Reunión Anual, 22., San José, C.R., 1976. Memoria. San José, Costa Rica, MAG/IICA, 1976. 5 p. 2 ref.

(231)
RISCH, S. Effect of variety of cowpea (Vigna unguiculata L.) on feeding preferences of three Chrysomelid beetles, Cerotoma ruficornis rogersi, Diabrotica balteata and Diabrotica adelpha. Turrialba 26(4):327-330. 1976. 8 ref.

(232)
SELLERS, S. The relationship between land tenure and agricultural production in Tucurrique, C.R. Turrialba, Costa Rica, CATIE, 1976. 11 p.

(233)
SISTEMAS de producción agrícola probados en el CATIE, Turrialba. Aspectos agronómicos y económicos. In: Programa Cooperativo Centroamericano para el Mejoramiento de Cultivos Alimenticios. Reunión Anual, 22., San José, Costa Rica, 1976. Memoria. San José, Costa Rica, MAG/IICA, 1976. 11 p. 2 ref.

(234)
SISTEMAS DE producción de cultivos alimenticios; resultados preliminares. Actividades en Turrialba, 3(2):2-4. 1975.

(Also in english Nº 438)

(235)
SORIA, J. Farming systems under various ecological conditions of Latin America, and the improvement of traditional farming with specific preference to the small holders. In: Expert Consultation on Agricultural Research in Latin America, Panamá, 1975. /Papers/ Panamá, FAO, 1975. pp. 111-122. 20 ref.

(236)
SORIA, J. et al. Investigación sobre sistemas de producción agrícola para el pequeño agricultor del trópico. Turrialba (Costa Rica) 25(3):283-293. 1975. 14 ref.

(238)
VICTOR, A. y FORSYTHE, W. M. Drenaje superficial por diferentes tamaños de caballones hechos a mano en un cultivo de maíz y frijol asociados. Turrialba 26(4):357-364. 1976. 28 ref.

(239)
BAZAN, R. et al. Desarrollo de sistemas de producción agrícola, una necesidad para el Trópico. Turrialba, Costa Rica, CATIE, 1974. 12 p.

(241)
CONFERENCIA SOBRE SISTEMAS DE PRODUCCION AGRICOLA PARA EL TROPICO, TURRIALBA, COSTA RICA, 1974. Resumen. In: _____. Turrialba, Costa Rica. CATIE, 1974. 3 p.

(242)
CONFERENCE ON AGRICULTURAL PRODUCTION SYSTEMS FOR THE TROPICS, TURRIALBA, COSTA RICA, 1974. Summary. In: Conferencia sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, Costa Rica, 1974. Informe final. Turrialba, Costa Rica, CATIE, 1974. 3 p.

(244)
CONFERENCIA SOBRE SISTEMAS DE PRODUCCION AGRICOLA PARA EL TROPICO, TURRIALBA, COSTA RICA, 1974. Propuesta; apéndice B. In: _____. Turrialba, Costa Rica, CATIE, 1974. 17 + 8 p.

(247)
DESARROLLO DE sistemas de producción agrícola para el trópico. In: Conferencia sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, Costa Rica, 1974. Informe final. Turrialba, Costa Rica, CATIE, 1974. 5 p.

(248)
NORTON, D. Systems of agricultural production for small farmers in Central America. In: Conferencia sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, Costa Rica, 1974. Informe final. Turrialba, Costa Rica, CATIE, 1974. 4 p.

(249)
CHURCH, P.E. Perspectivas económicas de nuevos sistemas de cultivos múltiples en América Central. In: Conferencia sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, Costa Rica, 1974. Informe final. Turrialba, Costa Rica, CATIE, 1974. 23 p. 26 ref.

(250)
CLIFFORD, H.A. Sistemas socioculturales de producción agrícola. In: Conferencia sobre Sistema de Producción Agrícola para el Trópico, Turrialba, Costa Rica, 1974. Informe final. Turrialba, Costa Rica, CATIE, 1974. 15 p. 25 ref.

(251)
HILDEBRAND, P.E. y FRENCH, E.C. Un sistema salvadoreño de multicultivos: su potencial y sus problemas. In: Conferencia sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, Costa Rica, 1974. Informe final. Turrialba, Costa Rica, CATIE, 1974. 26 p.

(252)
HILDEBRAND, P.E. y FRENCH, E.C. Producción de pepinos utilizando tallos de maíz. In: Conferencia sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, Costa Rica, 1974. Informe final. Turrialba, Costa Rica, CATIE, 1974. 7 p.

(253)
CASTILLO, M. Algunos sistemas de producción agrícola en Guatemala. In: Conferencia sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, Costa Rica, 1974. Informe final. Turrialba, Costa Rica, CATIE, 1974. 6 p. 7 ref.

(254)
ALAS LOPEZ, A. Breve descripción del sistema de producción del pequeño agricultor en El Salvador. In: Conferencia sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, Costa Rica, 1974. Informe final. Turrialba, Costa Rica, CATIE, 1974. 9 p.

(255)
REYES DISCUA, M. Breve descripción del sistema de producción del pequeño agricultor en Honduras. In: Conferencia sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, Costa Rica, 1974. Informe final. Turrialba, Costa Rica, CATIE, 1974. 8 p.

256)
VARGAS BARQUERO, A. Como se pueden definir o estudiar los sistemas o métodos de producción de un país. In: Conferencia sobre Sistemas de Producción Agrícola para el Trópico, Turrialba, Costa Rica, 1974. Informe final, Turrialba, Costa Rica, CATIE, 1974. 12 p.

259)
FORSYTHE, W. M. Parcela demostrativa del control de erosión en un cultivo de maíz. In: Programa Cooperativo Centroamericano para el Mejoramiento de Cultivos Alimenticios. Reunión Anual 22., San José, Costa Rica, 1976. Memoria. San José, Costa Rica, MAG/IICA, 1976. 4 p. ref.

(260)
MORENO, R.A. Efecto de diferentes sistemas de cultivo sobre la severidad de la mancha angular del frijol (Phaseolus vulgaris L.) causada por Isariopsis griseola Sacc. Agron. Cost. 1(1): 39-42. 1977. 17 ref.

263
PALENCIA O., A. Informe de actividades del proyecto de investigación en sistemas de producción de pequeños agricultores en Nicaragua (Proyecto MAG-Nicaragua-CATIE/ROCAP). Turrialba, C.R., CATIE, 1977. 38 p.

(329)
JOHNSTON, T.D. Achiote, a promising alternative for inclusion in small farming systems. Turrialba, Costa Rica, CATIE, 1976. 73 p. 12 ref. (Véase también versión en español (221))

(438)
FOOD CROP production systems, preliminary results. Activities at Turrialba (Costa Rica) 3(2):2-4. 1975.

(También en español Nº 234)

(440)
AGRICULTURAL PRODUCTION systems tested at CATIE, Turrialba: agronomic and economic aspects /Summary/. Activities at Turrialba (Costa Rica) 4(3):3-5. 1976.
(Véase también versión en español (441))

(441)
SISTEMAS DE producción agrícola probados en el CATIE, Turrialba; aspectos agronómicos y económicos /Resumen/. Actividades en Turrialba (Costa Rica) 4(3):3-5. 1976.
(See also english version (440))

(444)
PLANT DISEASES and cropping systems. Activities at Turrialba 3(4):3-4. 1975. (Véase también versión en español (223))

(445)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. CATIE-ROCAP project on small farm cropping systems. Turrialba, Costa Rica, 1975. 11 p.

(448)
CAMACHO V., E. El pejibaye (Guilielma gasipaes (H.B.K.) L.H. Bailey). Turrialba, Costa Rica, CATIE, 1972. 87 p. 12 ref.

(450)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Aspectos administrativos del proyecto de sistemas de producción agrícola para pequeños agricultores. Turrialba, Costa Rica, CATIE, 1977. 40 p.

(1229)

HOLLE, M. Factores agronómicos controlables Turialba, Costa Rica, CATIE. 1977. 6 p

(1231)

JIMENEZ-SAA, H. Disponibilidad de los documentos agrícolas. Turrialba, Costa Rica. CATIE. 1977. 12 p.

(1232)

MORENO. R.A. Sistemas y enfoque de sistemas. Turrialba, Costa Rica. CATIE. 1977. 33 p.

(1234)

NAVARRO, L.A. Evaluación socio-económica de las tecnologías en estidio. Turrialba, Costa Rica. CATIE. 1977. 9 p.

(1235)
CROSO, F. Consideraciones sobre técnicas experimentales en la investigación de sistemas de producción de pequeños agricultores. Turrialba, Costa Rica, CATIE, 1977. 35 p.

(1247)

NAVARRO, L.A. Dealing with risk and uncertainty in crop production, a lesson from small farmers. Turrialba, Costa Rica, CATIE, 1977. 29 p.

(1248)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Resúmenes de las tesis sobre sistemas de cultivo presentadas en el CATIE para optar al título de Magister Scientiae 1974-1977l Turrialba, Costa Rica, CATIE, 1977. 47 p.

(1298)
BURGOS, C.F. Plan de trabajo para la zona Atlántica. Distritos de Guácimo y Cariaria. Versión preliminar. Turrialba, Costa Rica, CATIE. 1977. 12 p.

(1468)
LARIOS, J.F. y MORENO, R.A. Epidemiología de algunas enfermedades foliares de la yuca en diferentes sistemas de cultivo. II. Roya y muerte descendente. Turrialba 27(2):151-156. 1977.

(1469)
JOHNSTON, T.D. Comercialización del tomate en San Pedro Sula, Honduras. Turrialba, Costa Rica, CATIE, 1977. 43 p.

(1470)
JOHNSTON, T.D. and MARRIGAL, L.G. Metodología para el estudio del punto de equilibrio aplicada a una fábrica de chisp y harina de yuca en San Carlos de Alajuela, Costa Rica. Turrialba, Costa Rica, CATIE, 1977 101 p.

(1634)
ENRIQUEZ, G.A. Sampling for plant analysis of common bean, Phaseolus vulgaris L. Turrialba, Costa Rica, CATIE, 1977. 12 p. 23 ref.

(1638)

ENRIQUEZ, G.A. Mejoramiento genético sobre otros factores limitantes de la producción de frijol Phaseolus vulgaris, diferentes de enfermedades o insectos. Turrialba, Costa Rica, CATIE, 1977. 50p. 66ref.

(1639)
CAMACHO V, E. Cultivo de la macadamia. Turrialba, Costa Rica, IICA, 1970. 16 p. (Presentado en "Primer Seminario Internacional sobre Ensañanza de Cultivos". San José, Costa Rica., setiembre 27-octubre 3, 1970.)

(1654)
SISTEMAS DE cultivo para pequeños agricultores, actividades durante el año 1976-1977. Actividades en Turrialba (Costa Rica) 5(3):6-7. 1977.

(Also in english, Nº 1655)

(1655)
SMALL FARM cropping systems, general summary of activites during 1976-1977. Activities at Turrialba (Costa Rica) 5(3):6-7. 1977.

(También en español Nº 1654)

(1668)
HART, R. El concepto de Sistemas. Turrialba, Costa Rica, CATIE, 1978. 5 p.

(1669)
HART, R. Breve resumen de los principios y conceptos de ecología aplicable al estudio de sistemas agrícolas. Turrialba, Costa Rica, CATIE, 1978. 9 p.

(1670)
HART, R. Análisis de Sistemas. Turrialba, Costa Rica, CATIE, 1978. 5 p.

(1671)
HART, R. El agro-ecosistema como unidad de investigación. Turrialba, Costa Rica, CATIE, 1978. 9 p.

(1672)
ANDRADE, H.E. El sistema de finca, la parte socio-económica en el análisis del ambiente. Turrialba, Costa Rica, CATIE, 1978. 21 p. 17 ref.

(1673)
BURGOS, C.F. Investigación de sistemas de producción en cultivos anuales. Turrialba, Costa Rica, CATIE, 1978. 14 + 12 p.

(453)
HART, R. Las primeras 24 semanas de un estudio de caso en Yojoa, Honduras; informe preliminar. Turrialba, Costa Rica, CATIE, 1977. 40 p.

(479)
HOLLE, M. Las hortalizas en sistemas de producción para condiciones del pequeño agricultor; informe final de consultoría. Turrialba, Costa Rica, CATIE, 1977. 50 p. 48 ref.

(659)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. A farming System Research Approach for Small Farms of Central America. Turrialba, Costa Rica CATIE, 1977. 54 p.

(1079)

WYMORE, W. Sistemas para un pequeño agricultor. Turrialba, Costa Rica. CATIE. n.d. 14 p.

(1199)
BLACK, T. and BLACK, S. Interplanting helps increase Central America food supply. Organic Gardening and Farming 24(7):132-134, 136. 1977.

(1200)

SELLERS, S. Tipos de agricultores en Tucurrique, Costa Rica. Turrialba, Costa Rica, CATIE. 1977. 17 p.

(1201)
HOLLE, M. Las hortalizas en la alimentación de Centroamérica en base a la evaluación nutricional de la población realizada por INCAP. Turrialba, Costa Rica, CATIE, 1977. 20 p. 9 ref.

(1202)
BURGOS, C.F. Importancia de la investigación en fertilidad de suelos como componente de los estudios en sistemas integrados de producción agrícola. Turrialba, Costa Rica, CATIE, 1977. 9 p.

(1203)
WEED MANAGEMENT project. Activities at Turrialba. (Costa Rica) 5(1-2):7-10. 1977.

(También en español Nº 1204)

(1204)
PROYECTO DE manejo de malezas. Actividades en Turrialba. (Costa Rica) 5(1-2):7-10. 1977.

(Also in english Nº 1203).

(1203)
WYMORE, A.W. Sobre el diseño de un sistema para manejar datos experimentales. Turrialba, Costa Rica, CATIE, 1975. 17 p.

(1208)
BURGOS, C.F. Bosquejo sobre la metodología seguida por CATIE en la ejecución del Proyecto de Sistemas de Cultivos para Pequeños Agricultores. Turrialba, Costa Rica, CATIE, 1977. 29 p.

(1215)

BURGOS, C.F. Descripción de los sistemas de cultivo y algunas características de los agricultores de Guápiles, Pococí, Costa Rica. Turrialba, Costa Rica, CATIE. 1977. 25 p.

(1216)

HART, R. Características de variedades que pueden tener potencial como componentes de los sistemas de cultivos de Yojoa, Honduras. Turrialba, Costa Rica, CATIE. 1977. 3 p.

(1217)
HOLLE, M. y SAUNDERS, J. Descripción de los sistemas de cultivo y algunas características de los agricultores de San Isidro de El General, Costa Rica. Turrialba, Costa Rica, CATIE, 1977. 18 p.

(1218)

MORENO, R.A. Fundamentos del programa de sistemas de producción de cultivos para pequeños agricultores del CATIE. Turrialba, Costa Rica, CATIE. 1977. 11 p.

(1219)
MIRANDA, H. Algunos aspectos de la situación de frijol en Centroamérica. Turrialva, Costa Rica, CATIE, 1977. 2 p.

(1220)
NAVARRO, L.A. Requerimientos de los agricultores involucrados en el Proyecto de Sistemas de Cultivos del CATIE, hacia sus variedades de cultivo. Turrialba, Costa Rica, CATIE, 1977. 23 p.

(1228)

HOLLE, M. El análisis de los factores físico-biológicos utilizando información secundaria. Turrialba, Costa Rica, CATIE. 1977. 12 p.

(3475)
VALVERDE., H., GAMEZ., R. y MORENO, R.A. Algunos vectores del virus del mosaico del caupí (Vigna unguiculata L.) en Costa Rica. In Reunión Anual del PCCMCA, 24a., San Salvador, 1978. Memoria, San Salvador, CENTA, 1978. v. 1, pp. L23/1-2.

(3476)
MORA., L.E. y MORENO., R.A. Incidencia y severidad de la roya del frijol (Uromyces phaseoli) en monocultivo y asociado con maíz. In Reunión Anual del PCCMCA, 24a., San Salvador, 1978. Memoria, San Salvador, CENTA, 1978. v. 1, ppL24/1-2.

(3509)
BURGOS, C.F. y MENESES, R. Efecto en el suelo y en el rendimiento de maíz de tres métodos de laboreo en Guápiles, Costa Rica. In Reunión Anual del PCCMCA, 24a., San Salvador, 1978. Memoria, San Salvador, CENTA, 1978. v.2. pp. M22/1-18.

(3538)
SHENK, M., JOHNSTON., T.D. y LOCATELLI., E. Evaluaciones económicas de sistemas de producción para pequeños productores: el caso de retribución a los factores limitantes. In Reunión Anual del PCCMCA, 24a., San Salvador, 1978. Memoria, San Salvador, CENTA, 1978. v. 3. pp. M51/1.

(3539)
ZAFFARONI, E. et al. Análisis económico de sistemas de producción agrícola con énfasis en alternativas de laboreo y no laboreo. Sólo Resúmen. In Reunión Anual del PCCMCA, 24a., San Salvador, 1978. Memoria, San Salvador, CENTA, 1978. v.3. pp. M52/1

(Véase también Nª 4178).

(3569)
JIMENEZ-SAA., H. y RUIZ., S.E. Análisis de la información publicada por el PCCMCA. In Reunión Anual del PCCMCA, 24a., San Salvador, 1978. Memoria, San Salvador, CENTA, 1978. v. 3. pp. M13/1-13.

(3582)
WALKER., L.J. y BEJARANO., W. Uso práctico de los modelos discontinuos para interpretación rápida de la respuesta de cultivos a la aplicación de fertilizantes. In Reunión Anual del PCCMCA, 24 a., San Salvador, 1978. Memoria, San Salvador, CENTA, 1978. v. 3. pp. A11/1-9. (Sólo resúmen).

Véase documento completo Nª 4136

(3593)
BAZAN, R. Analogía de suelos, un enfoque hacia la transferencia de tecnología en la investigación agrícola. In Reunión Anual del PCCMCA, 24a., San Salvador, 1978. Memoria, San Salvador, CENTA, 1978. v.3. pp. A12/1-11.

(3709)
DON VICTOR: A small farmer in Costa Rica.. Activities at Turrialba. (Costa Rica) 6(1):3-8, 1978.

(También en español Nº3710)

(3710)
DON VICTOR: Un pequeño agricultor en Costa Rica. Actividades en Turrialba. (Costa Rica) 6(1):3-8, 1978.

(Also in english Nº 3709)

(3723)
ARZE BORDA, J. y BRADFIELD, S. Estudio preliminar de La Trompina alta, una comunidad en marcha hacia la desertificación. San Salvador, CENTA-CATIE-IICA, 1977. 19+5+6 p. Informe Nº 1.

(3724)
ARZE BORDA, J. y BRADFIELD, S. Estudio exploratorio de Las Peñas para la aplicación de una metodología de investigación por sistemas de producción agrícola . San Salvador, CENTA-CATIE-IICA, 1977. 11+3+5 p. Informe Nº 2.

(3738)
NAVARRO, L.A. Una metodología general de investigación agrícola aplicada basada en el enfoque de sistemas. Turrialba, Costa Rica, CATIE, 1979. 24 p.

(3739)
NAVARRO, L.A. El problema general de la agricultura y la investigación agrícola basada en el enfoque de sistemas. Turrialba, Costa Rica, CATIE, 1979. 25 p.

(3748)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Small farmer cropping systems for Central America; second annual report, July 1976-June 1977. Turrialba, Costa Rica, CATIE, 1978. 51 p.

(3755)
HART, R. El ordenamiento y las relaciones de información agropecuaria en sistemas jerárquicos. Turrialba, Costa Rica, CATIE, 1977. 29 p.

(3756)
BAZAN, R. El Centro Agronómico Tropical de Investigación y Enseñanza, CATIE y su contribución a la investigación agrícola en la zona de las Antillas. Turrialba, Costa Rica, CATIE, 1977. 29 p.

JIMENEZ-SAA, H. Los investigadores agrícolas latinoamericanos no divulgan la información que generan; breve análisis de la situación. Turrialba, Costa Rica. CATIE, 1978. 17 p. 1 ref.

(1675)
ARZE, J. Los factores climáticos en el proceso de producción agrícola. Turrialba, Costa Rica, CATIE, 1978. 24 p.

(1676)
NAVARRO, L. A. El enfoque de sistemas y herramientas específicas para el reconocimiento de los sistemas de cultivo, el agricultor y su ambiente total. Turrialba, Costa Rica, CATIE, 1978. 47 p. 15 ref.

(1677)
NAVARRO, L. A. Reconocimiento de los sistemas de finca en las áreas de pequeños agricultores en Costa Rica, Nicaragua y Honduras. (Informe parcial). Turrialba, Costa Rica, CATIE, 1978. 16 p.

(Also in english Nº 1744)

(1678)
SORIA V., J. La agricultura de cultivos perennes en el trópico americano. Turrialba, Costa Rica, CATIE, 1978. 22 p.

También en: REUNION TECNICA DE PROGRAMACION SOBRE DESARROLLO DE LA AGRICULTURA PERENNE EN EL TROPICO AMERICANO, TINGO MARIA, PERU, 1974. Informe IICA. Informes de Conferencias, Cursos y Reuniones Nº 40.

(1736)
ENRIQUEZ, G.A. Inheritance of maturity in basic grains and other tropical crops. A review. Turrialba, Costa Rica, CATIE, 1977. 30 p.

(1737)
SAUNDERS, J.L. Cassava production and vegetative growth related to control duration of shoot flies and fruit flies. Turrialba, Costa Rica, CATIE, 1977. 11 p.

(1738)
KING, A. B. S. Provisional list of insect and mite pests of food crops in Central America. Turrialba, Costa Rica, CATIE, 1978. 9 p.

(1744)
NAVARRO, L.A. An understanding of the farming systems in the areas of operation of the small farmer cropping systems project, CATIE, 1977. (A partial report). Turrialba, Costa Rica, CATIE, 1978. 15 p.

(También en español Nº1677)

(1754)
KING, A.B.S. The pests of Sweet Potato (Ipomoea batatas) at Turrialba, Costa Rica, with special reference to Polygrammodes elevata F. (Len., Pyralidae) and its effect on yield. Turrialba, Costa Rica, CATIE, 1978. 22 p.

(1755)
SAUNDERS, J.L. El uso de plaguicidas por agricultores de recursos limitados en América Central. Turrialba, Costa Rica, CATIE, 1978. 7 .

(1921)
LA DINAMICA de población de plagas de insectos en sistemas de cultivos mixtos. Actividades en Turrialba (Costa Rica) 5(4):5-7. 1977. (See also english versión Nº1922).

(1922)
POPULATION DYNAMICS of insect pests in mixed cropping system. Activities at Turrialba (Costa Rica) 5(4):5-7. 1977. (Véase también versión en español número 1921).

(3447)
MORENO, R. Investigación en sistemas de cultivo en Centroamérica. In Reunión Anual del PCCMCA, 24a., San Salvador, 1978. Memoria, San Salvador, CENTA, 1978. v. 1, pp. E1/1-5.

(3454)
TIRADO S., H. Y ENRIQUEZ., G.A. Análisis económico preliminar de dos sistemas de producción cultivados bajo dos métodos de labranza y dos niveles de tecnología. In Reunión Anual del PCCMCA, 24a., San Salvador, 1978. Memoria, San Salvador, CENTA, 1978. v. 1, pp. L2/1-8.

(3471)
MOLLE, M. et al. Prueba de 6 arreglos cronológicos de maíz (CV. tuxpeño y local), frijol (Phaseolus vulgaris CVS. Turrialba 4 CATIE 1) y caupí (Vigna unguiculata) CV. CENTA 105) en el Cantón de Pérez Zeledón, Región Pacífico Sur, Costa Rica. In Reunión Anual del PCCMCA, 24a., San Salvador, 1978. Memoria, San Salvador, CENTA, 1978. v. 1, pp, L19/1-24.

(3472)
ENRIQUEZ, G.A. Frijol alado Psophocarpus tetragonolobus, una leguminosa de alto valor nutritivo, para pequeños productores de los trópicos americanos. In Reunión Anual del PCCMCA, 24a., San Salvador, 1978. Memoria, San Salvador, CENTA, 1978. v. 1, pp. L20/1-17.

(3775)
SORIA V.,J. y CAMACHO V.,E. Informe de progreso de las investigaciones agronómicas sobre macadamia, pejibaye, naranjilla y otros frutales. Turrialba, Costa Rica, IICA, 1972.

(3782)
BURGOS, C.F. Sistemas integrados de cultivos alimenticios como medios para proveer una dieta adecuada. Turrialba, Costa Rica, CATIE, 1978. 37 p.

(3784)
DIAZ-ROMEU, R. Características químicas de suelos de sitios experimentales del proyecto de sistemas de producción para pequeños agricultores en Guácimo y Cariari provincia de Limón, Costa Rica. Turrialba, Costa Rica, CATIE, 1978. 10 p.

(3788)
MENESES, R. Descripción general del procedimiento de trabajo seguido en Guápiles, Pococí, Costa Rica. Turrialba, Costa Rica, CATIE, 1978. 8 p.

(3796)
HOLLE, M. Análisis de los requisitos del proceso de producción de brassicas con énfasis en repollo (Brassica oleracea var. capitata). Turrialba, Costa Rica, CATIE, 1978. 23 p.

(3861)
MORENO, R.A. and HART, R.D. Intercropping with cassava in Central America. Turrialba, Costa Rica, CATIE, 1978. 22 p.

(3866)
ARZE BORDA, J. Flujograma para la generación y uso de tecnología agropecuaria como un marco conceptual de referencia. Turrialba, Costa Rica, CATIE, 1978. 13.p

(3963)
JIMENEZ-SAA, H. Investigación y documentación agrícola en América Latina. Desarrollo Rural en las Américas (Costa Rica) 8(3):208-225. 1976.

(4271)
EL USO regional del frijol alado en los sistemas de cultivos, para mejorar la nutrición de pequeños productores de los trópicos húmedos. Actividades en Turrialba (Costa Rica) 6(3):3-6. 1978.

(Also in english Nº 4272)

(4272)
THE RATIONAL use of winged bean in cropping systems, to improve the nutrition of the small farmers in the humid tropic. Activities at Turrialba (Costa Rica) 6(3):3-6. 1978.

(También en español Nº 4271)

(4273)
RAFFARONY, E. y ENRIQUEZ, G.A. Asociación de cultivos perennes, una alternativa de diversificación en áreas tropicales para pequeños agricultores. Revisión de literatura. Turrialba, Costa Rica, CATIE, 1979. 17 p. 39 ref.

(4274)
HOLLE, M. Datos del clima en las áreas de trabajo del proyecto de investigaciones en sistemas de cultivo para pequeños agricultores: 1. Costa Rica; 2. Nicaragua; 3. Honduras; 4. El Salvador; 5. Guatemala. Turrialba, Costa Rica, CATIE, 1978. 99 p. (p. irr).

(4288)
ARZE BORDA, J. Proyecto sobre sistemas de producción para pequeños agricultores en El Salvador. Turrialba, Costa Rica, CATIE, 1978. 36 p.

CUMULATIVE LIST No. 2. WORK DOCUMENTS

(0048)
BRADFIELD, S. Trip report on visit to Cariari, Pococí, Costa Rica (distribution restricted to project members only). Turrialba, Costa Rica, CATIE, 1976. 14 p.

(0049)
BRADFIELD, S. Some notes on the socio-economic climate of Pejibaye, Pérez Zaledón, Costa Rica. Turrialba, Costa Rica, CATIE, 1970. 17 p.

(0093)
SAUNDERS, J. L. Trip report Honduras 2-7 November 1976. /experimentación sistemas de cultivos/. (Memorando CT/DC-1555). Turrialba, Costa Rica, CATIE, 1976. 6 p.

(0094)
BOYNTON, D. Notes on trip to CIAT, January 9-16 1977. /documentación, publicaciones sistemas de cultivo/. Turrialba, Costa Rica, CATIE, 1977. 10 + 1 p.

(0096)
ESQUEMA TENTATIVO del contenido de un paquete tecnológico para un sistema de cultivo (solo es una propuesta). Turrialba, Costa Rica, CATIE, 1978. 6 p. (Propuesta de Luis A. Navarro, distribuida por memo CT/DC-1026 de Pedro Oñoro a Personal Técnico).

(0097)
JIMENEZ, H. Informe de viaje a Panamá (junio 7-11, 1978) para colectar información básica /documentación, mapas/. (Memorando CT/DC-1062). Turrialba, Costa Rica, CATIE, 1978. 12 p.

(0100)
INFORME DE la primera reunión de agricultores que colaboran en el proyecto de sistemas de cultivo para pequeños agricultores, celebrada en el CATIE el 8 y 9 de diciembre de 1977, Turrialba, Costa Rica, CATIE, 1977. 9 p. (Memorando CT/DC-2430, diciembre 13, 1977, de Eduardo Andrade a Personal Técnico).

(170)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Informe de la encuesta preliminar a pequeños agricultores hecha en la región del Pacífico Sur, Costa Rica. Turrialba, Costa Rica, 1976. 15 p.

(172)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Primer informe de la encuesta preliminar a pequeños agricultores efectuada en las regiones de Guayabo (Provincia de Cartago) e Itiquís (Provincia de Alajuela), Costa Rica. Turrialba, Costa Rica, CATIE, 1976. 27 + 7 p.

(178)
HART, R. El sistema de cultivos como unidad de experimentación. Turrialba, Costa Rica, CATIE, 1976. 11 p.. 3 ref.

(0179)
MADRIGAL, J. Informe de viaje efectuado a San José /visita Banco de Costa Rica información productos alimenticios por meses 1977/. (Memorando CT/DC-834). Turrialba, Costa Rica, CATIE, 1978. 6 p.

(261)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Primer informe de la encuesta preliminar a pequeños agricultores, efectuada en las áreas de Yojoa (Depto. Cortes) y Guaymas (Depto. Yoro), Honduras. Turrialba, Costa Rica, Proyecto CATIE/ROCAP/MRN-Honduras, 1976. 22 + 7 p.

(262)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Primer informe de la encuesta preliminar a pequeños agricultores, efectuada en las regiones de San Ramón y La Trinidad, Nicaragua. Turrialba, Costa Rica, Proyecto CATIE/ROCAP/MAG-Nicaragua, 1976. 32 p.

(449)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Primer informe de la encuesta preliminar a pequeños agricultores, efectuada en los distritos de Cariari y Guácimo, Provincia de Limón, Costa Rica. Turrialba, Costa Rica, 1976. 27 + 7 p.

(455)
HARWOOD, R.R. Why cropping systems research? s.n.t. 7 p.

(Véase también Nº (691).

(677)
BOYNTON, D. Notes on 1975 yield responses in Central Experiment. Turrialba, Costa Rica, CATIE, 1976. 3 p.

(678)
BURGOS, C. F. Informe de viaje a IRRI (Filipinas) para asistir al Simposio "Simposium on Cropping Systems Research and Development for the Asian Rice Farmer", September 21-24, 1976. (Memorando CT/DC-1473, octubre 26, 1976, dirigido a Rufo Bazán y Jorge Soria). Turrialba, Costa Rica CATIE, 1976. 9 p.

(679)
BURGOS, C. F. El programa de sistemas de cultivo de IRRI. (Resumen de seminario, octubre 22, 1976). Turrialba, Costa Rica, CATIE, 1976. 11 p.

(680)
SEMINARIO EN SISTEMAS DE PRODUCCION DE CULTIVOS ANUALES, TURRIALBA, COSTA RICA, AGOSTO 16-19, 1977. Lista de participantes. Turrialba, CATIE, 1977. 3 p.

(681)
CONFERENCIA DE ORIENTACION SOBRE SISTEMAS DE CULTIVO PARA EL PEQUEÑO AGRICULTOR /Propósitos, programa, información general/. TURRIALBA, COSTA RICA, ENERO 11-16, 1976. Turrialba, CATIE, 1976. 6 p.

(682)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Proyecto desarrollo de sistemas de producción agrícola para el trópico. Turrialba, Costa Rica, CATIE, 1974. 55 p. /FITO 477-74; FITO 470-74; FITO 473-74/.

(683)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Documento del primer contrato CATIE/ROCAP. Descripción de actividades propuestas. Turrialba, Costa Rica, CATIE, 1976. 9 p. /FITO 638-76/.

(684)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Encuesta para identificar colaboradores, proyecto sistemas de cultivo para pequeños agricultores Dic. 1976-Feb. 1977. Cuestionario confidencial. Turrialba, Costa Rica, CATIE, 1977. 7 p. /Eduardo Andrade/. /FITO 670-77/

(685)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Encuesta preliminar a pequeños agricultores; texto explicativo y cuestionario. (Documento para uso exclusivo durante la Conferencia de Orientación sobre Sistemas de Cultivo para el Pequeño Agricultor, Proyecto CATIE/ROCAP, enero 11-16, 1976). Turrialba, Costa Rica, CATIE, 1976. 37 p. /FITO 590-76/

Los resultados de esta encuesta están en los nos. 170,171,172,261,262 y 439.

(686)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Encuestas y estudios de casos. Turrialba, Costa Rica, CATIE, 1976. 11 p. /Luis A. Navarro/. /FITO 639-76/.

(687)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACIÓN Y ENSEÑANZA. Guía de procedimientos para el proyecto CATIE/ROCAP sobre sistemas de producción para el pequeño agricultor. (1a. versión). Turrialba, Costa Rica, CATIE, 1976. p. irr. (8 partes). /Carlos Burgos/. /FITO 616-622-76/.

(688)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Notas sobre los suelos del Cantón de Pérez Zeledón cerca de San Isidro de El General. Turrialba, Costa Rica, CATIE, 1976. 2 p. /Damon Boynton/. /FITO 596-76/.

(689)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Primera reunión del Comité Regional Asesor del Proyecto de Sistemas de Cultivo para Pequeños Agricultores, Contrato CATIE/ROCAP. Turrialba, Costa Rica, CATIE, 1975. 4 p.

(690)
HART, R. D. Pensamientos sobre tu memorando del 16 de mayo, 1977 CT/DC-754 (Memorando dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, mayo 1977. 3 p.

(691)
HARDWOOD, R. R. Report of a consultant visit; August 29-Sept. 10, 1976. Turrialba, Costa Rica, CATIE, 1976. 33 p.

(692)
HOLLE, M. Sistemas de producción incluyendo hortalizas y frutales en la finca con énfasis en zonas tropicales. Turrialba, Costa Rica, CATIE, 1976. 3 + 3 p.

(693)
JOHNSTON, T. D. Información preliminar sobre el tamaño del mercado local para hortalizas, frutas y tubérculos en Quépilas, Pococí, Costa Rica. Turrialba, Costa Rica, CATIE, 1977. 5 p. /FITO 731-77/

(694)
JOHNSTON, T. D. Información preliminar sobre el tamaño del mercado local para hortalizas, frutas y tubérculos en San Isidro de El General de Pérez Zeledón. Turrialba, Costa Rica, CATIE, 1977. 5 p. /FITO 727-77/.

(695)
JOHNSTON, T. D. An interview with Hector Moreno of the CNP, regarding CNP's buying prices for basic grains, on October 28, 1976. (Memorando CT/DC-1540, November 11, 1976, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1976. 6 p.

(697)
JOHNSTON, T. D. Precios de insumos /Cañalica y San Isidro de El General, Costa Rica/. (Memorando CT/DC-1325, julio 14, 1977, dirigido a personal técnico). Turrialba, Costa Rica, CATIE, 1977. 20 p.

(698)
JOHNSTON, T. D. Price information in Costa Rica (Memorando CT/DC-1592, November 25, 1976, dirigido a Jefe de Programa). Turrialba, Costa Rica, CATIE, 1976. 38 p. /FITO 649-75; FITO 650-76; FITO 651-76/.

(699)
JOHNSTON, T. D. Progress report number 1. (Memorando CT/DC-1654, dirigido a William Merril). Turrialba, Costa Rica, CATIE, 1976. 3 p.

(700)
JOHNSTON, T. D. Puntos prácticos para considerar cuando se necesita hacer una encuesta. In Taller Regional sobre Metodología y Análisis de la Información de Mercados, San José, Costa Rica, 1977. San José, IICA-PIADIC, 1977. 17 p.

(701)
JOHNSTON, T. D. Trip to Honduras, November 17-19, 1976. (Memorando CT/DC-1592, November 25, 1976, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1976. 2 p.

(702)
JOHNSTON, T. D. Trip to Nicaragua, November 2-5, 1976. (Memorando CT/DC-1599, November 26, 1976, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1976. 4 p.

(703)
JOHNSTON, T. D. Trip to Quepos /Costa Rica/ on August 24-25, 1976. (Memorando CT/DC-1405 October 29, 1976, dirigido a Jefe de Programa). Turrialba, Costa Rica, CATIE, 1976. 3 p. /FITO 656-76/.

(704)
JOHNSTON, T. D. Trip to San Carlos, Alajuela, Costa Rica, on September 7-9, 1976. (Memorando CT/DC-1406, November 1, 1976, dirigido a Jefe de Proyecto). Turrialba, Costa Rica, CATIE, 1976. 4 p. /FITO 657-76/.

(705)
JOHNSTON, T. D. Una metodología para presentación de precios, que sería útil para analizar sistemas de cultivos. (Memorando CT/DC-1357, julio 19, 1977, dirigido a personal técnico). Turrialba, Costa Rica, CATIE, 1977. 4 p. + 34 cuadros.

(706)
JOHNSTON, T. D. Summary of work completed to date and plans for the future. Turrialba, Costa Rica, CATIE, 1976. 6 p.

(707)
JOHNSTON, T. D. Visita a Francisco Chacón Araya de la compañía "Abonos Superior" en San José, el 15 de octubre de 1976. (Memorando CT/DC-1543, noviembre 12, 1976). Turrialba, Costa Rica, CATIE, 1976. 2 p.

(708)
JOHNSTON, T.D. A visit to the yuca processing plant in Turrialba on October 18, 1976. (Memorando CT/DC-1539, November 11, 1976, dirigido a Raúl MOreno). Turrialba, Costa Rica, CATIE, 1976. 3 p.

(709)
MORENO, R. A. Posible enfoque del programa de Sistemas de Producción para Pequeños Agricultores para 1977. (Memorando CT/DC-1724, diciembre 29, 1976, dirigido a Personal Técnico). Turrialba, Costa Rica, CATIE, 1976. 4 p.

(710)
OÑORO, P. Consideraciones sobre el sistema de manejo de datos para el Departamento de Cultivos y Suelos Tropicales. Turrialba, Costa Rica, CATIE, 1976. 22 + 6 p. /FITO 749-77/.

(0711)
PINCHINAT, A. M. Lista de investigadores en frijol (Phaseolus vulgaris L.) en América Latina. Turrialba, Costa Rica, CATIE, 1973. 29 p. 4 ref.

(712)
REUNION INTERNA DE PROGRAMACION TECNICA, TURRIALBA, COSTA RICA, FEBRERO 14-18, 1977. Programa de investigación en sistemas de producción agrícola para pequeños agricultores. Turrialba, Costa Rica, CATIE, 1977. 47 p. /FITO 679-77/

(713)
SAUNDERS, J. Status report, entomology. Turrialba, Costa Rica, CATIE, 1977. 4 p. /FITO 696-77/.

(714)
SEMINARIO DE mercadeo; clase de José Fargas, 21 de febrero de 1977. Turrialba, Costa Rica, CATIE, 1977. 10 p. /David Johnston/, /FITO 697-77/.

(715)
SORIA V., J. Informe de evaluación del Dr. R. Harwood. (Memorando CT/DC-511, abril 6, 1977, dirigido a personal técnico). Turrialba, Costa Rica, CATIE, 1977. 47 p.

(716)
JOHNSTON, T. D. Reporte de viaje, información sobre mercadeo de camote. (Memorando CT/DC-1720, setiembre 12, 1977, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1977. 3 p.

(978)

CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Investigación en sistemas de cultivos para pequeños agricultores. In: _____ Memoria Anual 1976-77-3. Informe del Departamento de Cultivos y Suelos Tropicales. Turrialba, Costa Rica, CATIE. 1977. pp. 1-122.

(1081)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Desarrollo de sistemas de producción agrícola para el trópico. Turrialba, Costa Rica, CATIE, 1974. 13 p. /FITO 477-74/

(1095)
RAY, H. Comments on different steps to be taken to get CATIE/ROCAP Project going. Turrialba, Costa Rica, CATIE, 1975. 1 h.

(1096)
HOLLE, M. Aspectos de producción en el cultivo de Brassicas (repollo) (Memorando CT/DC-519, abril 13 de 1977, dirigido al personal técnico). Turrialba, Costa Rica, CATIE, 1977. 12 p. /FITO 668-777.

(1098)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Cuestionario confidencial; encuesta preliminar a pequeños agricultores en la región de _____, Costa Rica, noviembre 1975. Turrialba, Costa Rica, CATIE, 1976. pp. 5-12.

(1099)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Cuestionario confidencial; encuesta preliminar a pequeños agricultores en la Región de _____, Honduras. Turrialba, Costa Rica, CATIE, 1977? 7 p.

(1100)
/FORMULARIOS PARA registro de experimentos de campo, preparados por Pedro Oñoro/. Turrialba, Costa Rica, CATIE, octubre 1977. 6 formularios.

(1101)
PAZ, A. Cronología de actividades dentro del Proyecto /Sistemas de Cultivo para Pequeños Agricultores/. San Pedro Sula, Honduras, SRN, 1977. 1 h.

(1102)
EXPERIMENTOS DEL proyecto sistemas de producción, Honduras, 1977-1978. San Pedro Sula, SRN, 1977. 24 p.

(1104)
BOYNTON, D. Small farm cropping system project of CATIE. Turrialba, Costa Rica, CATIE, 1975. 8 p.

(1206)
SAUNDERS, J.L. Plagas potenciales de la yuca. Turrialba, Costa Rica, CATIE, 1977. 4 p.

(1207)
HART, R. D. Cropland pollution control. In Clark, J. R. Coastal ecosystem management; a technical manual for the conservation of constal zone resources. New York, Wiley, 1977. pp. 595-600.

(1213)
BAZAN, R. Estado del proyecto de sistemas de producción para pequeños agricultores en El Salvador. Turrialba, Costa Rica, CATIE. 1977. 5 p.

(1214)
BAZAN, R. Estado del proyecto de sistemas de cultivo para pequeños agricultores en Guatemala. Turrialba, Costa Rica, CATIE. 1977. 8 p.

(1230)
HOLLE, M. El seminario como actividad del proyecto en sistemas de cultivo para pequeños agricultores. Turrialba, Costa Rica, CATIE. 1977. 3 p.

(1233)
NAVARRO, L.A. Conocimiento de los sistemas de producción de cultivo, el agricultor y su ambiente total. Turrialba, Costa Rica, CATIE. 1977. 47 p.

(1239)
NORMAN, D. W. State of the art of farming systems research in the savanna areas of West Africa. (Resumen de seminario dictado el 30 de setiembre de 1977). Turrialba, Costa Rica, CATIE, 1977. 5 p.

(1393)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Resultados preliminares de una investigación en sistemas de producción de cultivos alimenticios realizada en el CATIE, Turrialba, Costa Rica. Turrialba, CATIE, 1975. 5 p. [Basom R. et al.]

También en: Reunión Anual de PCCMCA 21a., San Salvador, 1975. Vol. 1, pp. 39-43.

(1472)
HART, R. D. A proposal, a central american crop system research network. Turrialba, Costa Rica, CATIE, 1977. 10 p. /FITO 783-777.

(1473)
HART, R. D. Evaluación de metodologías para transferir entre sitios los resultados de investigación con sistemas de cultivos. Turrialba, Costa Rica, CATIE, 1977. 7 p. /FITO 784-777

(1474)
HART, R. D. Crop system classification some preliminary considerations. Turrialba, Costa Rica, CATIE, 1977. 14 p. /FITO 787-777

(1475)
NAVARRO, L. A. Investigación en sistemas de cultivos alternativos para agricultores de bajos ingresos: pensamientos sobre evaluación de resultados. (Resumen de seminario dictado el 17 de octubre de 1977). Turrialba, Costa Rica, CATIE, 1977. 5 p.

(1476)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Promising results in food production and economic implications of selected cropping systems for Central America. Turrialba, Costa Rica, CATIE, 1977. 7 p. /Carlos F. Burgos, Damon Boynton/.

(1477)
CORDERO VASQUEZ, A. Estudio de cultivos asociados en Carolina del Norte (nuevo interés en un viejo sistema). Resumen de seminario (dictado el 14 de noviembre de 1977). Turrialba, Costa Rica, CATIE, 1977. 2 p.

(1478)
JOHNSTON, T. D. y MADRIGAL, J. Información sobre mercadeo de hortalizas, frutas, raíces y tubérculos, obtenidos en el último viaje a San Isidro de El General, Pérez Zeledón, Costa Rica. (Memorando CT/DC- 2210, noviembre 8, 1977, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1977. 12 p.

(1480)
SEMINARIO EN GRANOS BASICOS, CAR-PS, SAN ISIDRO DE EL GENERAL, COSTA RICA, DICIEMBRE 5-7, 1977. Informe. Turrialba, Costa Rica, CATIE, 1977. 7 p.

(1481)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. A summary of some of the preliminary results from experiments carried out by the Small Farmer Cropping Systems Project in Central America, 1976. Turrialba, Costa Rica, CATIE, 1977. 34 p. [R. Moreno] /FITO 685-77; FITO 689-77; FITO-692-77/

(1484)
ANDRADE M., E. Guía para entrevistadores encuesta sobre hábitos alimentarios y antropométrica materno infantil. Turrialba, Costa Rica, CATIE-Ministerio de Salud Pública, 1977. 7 p. /FITO 781-777.

(1485)
ANDRADE M., E. Instructivo. Encuesta sobre hábitos alimentarios y encuesta antropométrica materno-infantil. Turrialba, Costa Rica, CATIE-Ministerio de Salud Pública, 1977. 4 + 9 p. /FITO 778-777.

(1486)
MORENO, R. A. Resumen de reunión técnica general octubre 3-7, 1977. (Memorando CT/DC-2196, noviembre 3, 1977, dirigido a Jorge Soria). Turrialba, Costa Rica, CATIE, 1977. 20 p.

(1487)
INQUIETUDES DEL personal sobre el program actual /precisión y detalle de la información obtenida/. Turrialba, Costa Rica, CATIE, 1977. 3 p.

(1488)
EVALUACION PRELIMINAR para confección de recomendaciones de paquetes tecnológicos /Honduras, Nicaragua, Costa Rica/. Turrialba, Costa Rica, CATIE. 1977. 4 formularios.

(1489)
SEMINARIO EN SISTEMAS DE PRODUCCION DE CULTIVOS ANUALES, TURRIALBA, COSTA RICA, AGOSTO 16-19, 1977. Evaluación del seminario /formulario/. Turrialba, Costa Rica, CATIE, 1977. 5 hojas.

(1491)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Seminar on cropping systems (a proposal). Turrialba, Costa Rica, CATIE, 1977. 4 p. /Miguel Holle/. /FITO 686-777.

(1492)
JOHNSTON, T. D. y MADRIGAL, J. Informe de viaje /Guápiles, Costa Rica, mercadeo hortalizas, frutas, verduras/. (Memorando CT/DC-1551, agosto 23, 1977, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1977. 8 p.

(1493)
JOHNSTON T. D. y MADRIGAL, J. Reporte de los viajes efectuados al mercado de mayoreo de la 10a. Ave. en San José /Costa Rica, comercialización de camote/. (Memorando CT/DC-2200, noviembre 7, 1978, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1977. 6 p.

(1495)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Cuestionario confidencial. Encuesta sobre la finca como sistema (farming system) y tendencias de los agricultores. Turrialba, Costa Rica, CATIE, 1977. 15 p. /FITO 709-777.

Véase también no. 1496.

(1496)
ANDRADE M., E. Texto explicativo y guía para entrevistadores; encuesta sobre la finca como sistema (farming system) y tendencias de los agricultores a su mantenimiento (o cambio). Turrialba, Costa Rica, CATIE, 1977. 8 + 7 p. /FITO 707-77; FITO 714-777.

Véase también no. 1495

(1653)
SEMINARIO SOBRE SISTEMAS DE PRODUCCION DE CULTIVOS ANUALES, SAN ANDRES, EL SALVADOR, ENERO 30-FEBRERO 2, 1978. /Información general, tema y horario/. Turrialba, Costa Rica, CATIE, 1978. 10 p. /FITO 803-787.

(1656)
ARZE, J. Lineamientos generales para el enfoque de la investigación agropecuaria integrada. San Salvador, CENTA, 1978. 2 p.

(1657)
DOCUMENTO DE acuerdo entre el Ministerio de Agricultura y Ganadería de Nicaragua y el Centro Agronómico Tropical de Investigación y Enseñanza para la realización de investigación en sistemas de producción agrícola para pequeños agricultores. s.l., s.e. 1975. 11 p.

(1658)
CONVENIO ENTRE la Secretaría de Recursos Naturales de Honduras y el Centro Agronómico Tropical de Investigación y Enseñanza, para la investigación de sistemas de producción agrícola de pequeños agricultores. s.n.t. 1975. 7 p.

(1659)
DOCUMENTO DE convenio entre el Instituto de Ciencia y Tecnología Agrícolas y el Centro Agronómico Tropical de Investigación y Enseñanza para la realización de investigación en sistemas de producción agrícola para pequeños agricultores. s.l., s.e., 1976. 8 p.

(1660)
ACUERDO DE trabajo entre CENTA/CATIE/IICA en el área de multicultivos. San Andrés, CENTA, 1976. 8 p.

(1661)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Cuestionario confidencial. Encuesta sobre los recursos disponibles de los agricultores y sistemas de cultivos utilizados 1977. (Proyecto CATIE-ROCAP-U. de Missouri). Turrialba, Costa Rica, CATIE, 1977. 7 p.

(1662)
PROYECTO DE investigaciones en sistemas de producción de pequeños agricultores; proyectos experimentales 1977. Managua, CATIE-NICA, 1977. 23 p.

(1663)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Some promising results of the small farm cropping systems project of CATIE, a brief description. Turrialba, Costa Rica, CATIE, 1978. 9 p. /James Murphrey/. /FITO 801-787.

(1664)
MADRIGAL, J. Informe de viajes efectuados a San José /Costa Rica, comercialización zanahoria, repollo, cebolla, precios y volúmenes de venta de productos químicos/. (Memorando CT/DC-250, febrero 9, 1978, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1978. 5 p.

(1665)
BAZAN, R. Informe de los suelos de San Isidro de El General (Memorando CT/DC-238, febrero 8, 1978, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1978. 26 p. /FITO 807-787.

(1666)
MADRIGAL, J. Reporte de los viajes efectuados a San José /Costa Rica, comercialización de tomate, papa. ... /. (Memorando CT/DC-210, febrero 1° 1978 dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1978. 5 p.

(1667)
SEMINARIO SOBRE SISTEMAS DE PRODUCCION DE CULTIVOS ANUALES, SAN ANDRES, EL SALVADOR, ENERO 30-FEBRERO 2, 1978. /Informe final/. Turrialba, Costa Rica, CATIE, 1978. 10 p.

(1679)
ANDRADE M., E. Identificación de agricultores colaboradores en Nicaragua. Turrialba, Costa Rica, CATIE, 1977. 7 p.

(1680)
ANDRADE M., E. Identificación de agricultores colaboradores en Honduras. Turrialba, Costa Rica, CATIE, 1977. 15 p.

(1681)
MORENO, R.A. Informe de viaje /Nigeria, IITA/. (Memorando CT/DC-1107. turr Turrialba, Costa Rica, CATIE, 1978. 16 + 5 p.

(1682)
ENRIQUEZ, G. A. Efecto de la temperatura y el fotoperíodo en la herencia de la época de floración en cuatro líneas de frijol. Resumen de seminario presentado en el CATIE el 20 de junio de 1977. Turrialba, Costa Rica, CATIE, 1977. 3 p.

(1683)
MADRIGAL, J. Informe de viajes efectuados a San José /Costa Rica, comercialización de tomate, papa, cebolla, repollo, zanahoria/. (Memorando CT/DC-525, abril 3, 1978). Turrialba, Costa Rica, CATIE, 1978. 8 p.

(1687)
EL SALVADOR. CENTRO NACIONAL DE TECNOLOGIA AGROPECUARIA. Lista bibliográfica preparada para el Seminario de Sistemas de Producción, con énfasis en la información generada en El Salvador. San Andrés, 1978. 60 ref.

(1693)
MADRIGAL, J. Informe de viajes efectuados a San José /Costa Rica, comercialización de cebolla, papa, zanahoria, repollo y tomate/. (Memorando CT/DC-743, abril 18, 1978, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1978. 11 p.

(1732)
/INFORMACION SOBRE precios y unidades de venta para insecticidas/. s.n.t. [JORGE MADRIGAL]

(1733)
MADRIGAL, J. Informe de viaje efectuado a San José /Costa Rica/. (Memorando CT/DC-882, Mayo 16, 1978, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1978. 6 p.

(1734)
MADRIGAL, J. Informe sobre datos de insumos químicos. (Memorando CT/DC-914, mayo 19, 1978, dirigido a personal técnico). Turrialba, Costa Rica, CATIE, 1978. 4 p.

(1739)
MADRIGAL, J. Informe de viaje efectuado a San José /Costa Rica, información sobre plátano verde, tiquisque, malanga, ñampí y yuca/. (Memorando CT/DC-979, de mayo 31, 1978, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1978. 5 p.

(1741)
JIMENEZ SAA, H. Información que no se divulga. (Memorando CT/DC-2329, de noviembre 15, 1977, dirigido a Jorge Soria). Turrialba, Costa Rica, CATIE, 1977. 2 p.

(1742)
OÑORO, P. Información sobre investigación. (Memorando CT/DC-995, junio 2, 1978, dirigido a personal técnico). Turrialba, Costa Rica, CATIE, 1978. 11 p. más 20 formularios.

(1745)
OÑORO, P. Anexos. /Elaboración, control, registro de información de experimentos/. (Memorando CT/DC-638, de mayo 2, 1977, dirigido a personal técnico). Turrialba, Costa Rica, CATIE, 1977. 23 p. (p irr.)

(1746)
JOHNSTON, T.D. y ARCE, H. Información adicional sobre el mercadeo de frutas, tubérculos y hortalizas en San Isidro de El General /Costa Rica/. (Memorando CT/DC-1519, agosto 19, 1977, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1977. 3 p.

(1747)
JOHNSTON, T. D. Thesis proposal. (Memorando CT/DC-387, March 21, 1977, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1977. 1 + 7 p. /Tesis Angel Altamirano/.

(1748)
MADRIGAL, J. Informe de viaje /San José, Costa Rica, información sobre productos químicos utilizados en el CATIE/. (Memorando CT/DC-2265, November [illegible] 1977, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1977. 3 p.

(1749)
JOHNSTON, T. D. Trip to San Pedro Sula /Honduras/ October 19-23, 1976. (Memorando CT/DC-1567, November 18, 1976, dirigido a Raúl Moreno). Turrialba, Costa Rica, CATIE, 1976.

(1750)
HART, R. Algunas inquietudes sobre nuestro nivel de investigación. (Memorando del 18 de abril, 1977, dirigido a miembros del equipo). Turrialba, Costa Rica, CATIE, 1977. 5 p.

(1751)
MORENO, R.A. Comentarios generales de tu memorando del 18 de abril, 1977. (Memorando CT/DC-754, de mayo 16, 1977, dirigido a Robert Hart). Turrialba, Costa Rica, CATIE, 1977. 6 p.

(1778)
ANDRADE MARTINEZ, R. Encuesta nutricional en comunidades de pequeños agricultores de Costa Rica, Nicaragua y Honduras (Informe preliminar). Turrialba, Costa Rica, CATIE, 1978. 25 + 6 p.

(1781)
BAZAN, R. Informe de viaje a Panamá, octubre 2-4, 1977 /negociaciones con MIDA-IDIAP Proyecto de Sistemas/. (Memorando CT/DC-1966, octubre 10, 1977, dirigido a Jorge Soria). Turrialba, Costa Rica, CATIE, 1977. 5 + 2 + 2 + 2 p.

(1782)
SORIA V., J. Informe de viaje a Panamá, agosto 3-setiembre 1, 1977 /negociaciones con MIDA-IDIAP, ROCAP y AID, Proyecto Sistemas de Cultivo/. (Memorando CT/DC-1634, setiembre 2, 1977, dirigido a Santiago Fonseca Martínez). Turrialba, Costa Rica, CATIE, 1977. 7 p.

(1783)
MADRIGAL, J. Informe de viajes a Guápiles y a Cartago /costos de transporte de productos/. Memorando CT/DC-1016). Turrialba, Costa Rica, CATIE, 1978. 7 p.

D.T.

(1995)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Preliminary outline of CATIE project on development of improved farming systems for small farmers in Central America. Turrialba, Costa Rica, CATIE, 1974. 17 p.

(3701)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Encuesta de reconocimiento inicial (cuestionario confidencial) Nicaragua. Turrialba, Costa Rica, CATIE, 1978. (9 formularios).

(3702)
HOLLE, M. Informe de viaje: El Salvador. Turrialba, Costa Rica, CATIE, 1978. 15 p.

(3703)
MORENO, R.A. Informe de una visita de consultoría a las Universidades de Ayacucho, Cuzco y Puno en el Perú, julio 31 - agosto 15, 1978. Turrialba, Costa Rica, CATIE. 1978. 19 p.

(3704)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Cropping system research in semi-arid regions of Central America. A proposal submitted to the International Development Research Center by CATIE. Turrialba, Costa Rica, 1978. 43 p.

(3705)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Annual report 1977-1978. Small farmers cropping systems research project in Central América. Contract Nº AID 596-153 (CATIE - ROCAP). Turrialba, Costa Rica, CATIE, 1978. 86 p.

(3706)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Descripción crítica de un área de trabajo del proyecto de sistemas de cultivo (alimenticios anuales) para pequeños agricultores: Pérez Zeledón, Región Pacífico Sur, Costa Rica, Turrialba, Costa Rica, CATIE, 1978. 23 + 21 p.

(3707)
NAVARRO, L.A. Texto explicativo y cuestionario para un estudio inicial de finca. Turrialba, Costa Rica, CATIE CATIE/IDIAP, 1978. 36 p.

(3708)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Descripción de una alternativa para el mejoramiento del sistema maíz-frijol en relevo practicado por pequeños agricultores en una comunidad agrícola de la región interior central de Nicaragua (Comunidad de Samulalí, Matagalpa). Turrialba, Costa Rica, CATIE, 1978. 65 p.

(3743)
HART, R.D. Un análisis del informe preliminar del grupo de trabajo de Tejutla (Chalatenango, El Salvador): comentarios y sugerencias. Turrialba, Costa Rica, CATIE, 1978. 18 p.

(3744)
BEJARANO, W. Descripción geográfica del corregimiento del Caizán Chiriquí Panamá; zona seleccionada para el proyecto de investigación en sistemas de cultivos para pequeños agricultores, IDIAP-CATIE. Turrialba, Costa Rica, CATIE, 1978. 66 p.

(3757)
BAZAN, R. Proyecto en analogías de suelos en América Central. Turrialba, Costa Rica, CATIE, 1978. 19 p.

(3758)
BAZAN, R. Documento base en analogías de suelos de América Central. Turrialba, Costa Rica, CATIE, 1978. 29 p.

(3783)
HOLLE, M. Proyecto: sistemas de cultivo para pequeños agricultores área de Pérez Zeledón, Región Pacífico Sur, Costa Rica. Turrialba, Costa Rica, CATIE, 1978. 7 p.

(3785)
LUCIA, R. DE. Proyecto CATIE/ROCAP/MRN Honduras 1978 informe de actividades. Turrialba, Costa Rica, CATIE, 1978. 9 p.

(3786)
KASS, D. Actividades en Guatemala. Turrialba, Costa Rica, CATIE, 1978. 9 p.

(3791)
AREE BORDA, J. El Salvador, una experiencia del proyecto sistemas de producción para pequeños agricultores en el istmo Centroamericano. Turrialba, Costa Rica, CATIE, 1978. 16 p.

(3809)
AREE BORDA, J. Ideas para la estructuración de investigación. (Para discusión). Turrialba, Costa Rica, CATIE, 1978. 7 p.

(3810)
HART, R.D. Informe de viaje a Honduras 3-4 de agosto, y descripción de los experimentos programados en Honduras para este año. (Memorando CT/DC-1412). Turrialba, Costa Rica, CATIE, 1978. 23 p.

(3811)
HART, R.D. Methodologies to produce agroecosystem management plans for small farmers in tropical environments. Turrialba, Costa Rica, CATIE, 1978. 15 p.

(3812)
HART, R. Trip report Panamá 23-28/7/78. (Memorando CT/DC-1396). Turrialba, Costa Rica, CATIE, 1978. 3 p.

(3813)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Primer informe de la encuesta preliminar a pequeños agricultores efectuada en el área de Agua Sucia departamento Santa Bárbara, Honduras. Turrialba, Costa Rica, CATIE, 1978. 17 p.

(3814)
OÑORO, P. Paquetes tecnológicos del Proyecto Sistemas de Cultivos para Pequeños Agricultores. (Memorando CT/DC-1550). Turrialba, Costa Rica, CATIE, 1978. 2 p.

(3815)
COMITE ASESOR DEL CATIE EN EL PROYECTO DE SISTEMAS DE CULTIVO PARA PEQUEÑOS AGRICULTORES. Acta de la reunión 3. Turrialba, Costa Rica, CATIE, 1978. 9 p.

(3816)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Informe de evaluación del programa de investigación adaptada al pequeño agricultor (PIAPA) INTA-INVIERNO-AID, Nicaragua. Turrialba, Costa Rica, CATIE, 1978. 31 p.

(3817)
NAVARRO, L.A. Colección, Procesamiento y análisis de información microeconómica generada en experimentos agrícolas en terrenos de agricultores. (Proyecto para un manual). (Documento preliminar solo para discusión). Turrialba, Costa Rica, CATIE, 1977. 22 p.

(3818)
OÑORO, P. Documentación de materiales audiovisuales. (Memorando CT/DC-908) Turrialba, Costa Rica, CATIE, 1978. 2 p.

(3819)
ANDRADE R., M. Informe de viaje a Nicaragua. (Memorando CT/DC-1012). Turrialba, Costa Rica, CATIE, 1978. 2 p.

(3820)
HOLLE, M. Informe sobre Seminario en Granos Básicos (CAR-PS/CATIE). (Memorando CT/DC-098). Turrialba, Costa Rica, CATIE, 1978. 7 p.

(3821)
BURGOS, C.F. Informe de los viajes a San Isidro, Pérez Zeledón, los días 28 al 30 de enero y 3 al 6 de febrero, con motivo de la encuesta para pequeños agricultores. (Memorando CT/DC-193). Turrialba, Costa Rica, CATIE, 1976. 5 p.

(3822)
HOLLE, M. Informe sobre el seminario en Sistemas de Producción de Cultivos Anuales (Turrialba, 27-31 marzo de 1978). (Memorando CT/DC-1257). Turrialba, Costa Rica, CATIE, 1978. 24 p.

(3823)
BAZAN, R. Experimentos en Honduras. (Memorando CT/DC-905). Turrialba, Costa Rica, CATIE, 1978. 6 p.

(3824)
NAVARRO, L.A. Informe de viaje a Panamá (IDIAP). (Memorando CT/DC-1247). Turrialba, Costa Rica, CATIE, 1978. 24 p.

(3825)
HART, R. Metodología /Investigación sistemas de cultivo/ (memorando CT/DC-1460). Turrialba, Costa Rica, CATIE, 1978. 4 p.

(3826)
NAVARRO, L.A. Evaluación económica de algunos sistemas incluidos en el experimento central durante el período 1976-1977. Turrialba, Costa Rica, CATIE, 1978. 8 p.

(3827)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Experimentos en desarrollo durante 1978. /Guatemala, El Salvador, Costa Rica, Honduras, Nicaragua y Panamá/. Turrialba, Costa Rica, CATIE, 1978. 7 p.

(3828)
BEJARANO, W. Descripción zona Plaza Caizán, Panamá. (Memorando CT/DC-1520). Turrialba, Costa Rica, CATIE, 1978. 5 p.

(3829)
BURGOS, C.F. y NAVARRO, L.A. Informe de viaje a Panamá, 28 - 31 de agosto de 1978 (Memorando CT/DC - 1522). Turrialba, Costa Rica, CATIE, 1978. 6 p.

(3830)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Promising results in food production and economic implications of selected cropping systems for Central America. Turrialba, Costa Rica, CATIE, 1978. 19 p.

(3831)
KASS, D. Informes mensuales; Guatemala, abril 1976 -. Turrialba, Costa Rica, CATIE, 1978.

(3832)
PINCHINAT, A.M. Informe anual de 1975-1976 /Departamento de cultivos y suelos tropicales CATIE/. Turrialba, Costa Rica, CATIE, 1976. 11 p.

(3833)
ANDRADE, E. Borrador investigación, sugerencias. (Memorando CT/DC -334). Turrialba, Costa Rica, CATIE, 1978. 5 p.

(3834)
BOYNTON, D. Fourth contraqt september 19 - december 19, 1977(end of contract report. Turrialba, Costa Rica, 1977. 3 p.

(3835)
CONFERENCIA SOBRE metodología de recolección de información básica acerca de sistemas de producción de pequeños agricultores. Proyecto CATIE/ROCAP. Turrialba, Costa Rica, CATIE, 1975. 86 p.

(3845)
PROYECTO DE sistemas de producción para campesinos de escasos recursos de Centro América y Panamá. Institucionales nacionales de investigación. CATIE - ROCAP. s.n.t. 8 p.

(3846)
BOYNTON, D. Thoughts on the different types of research essential to tho SFCS project. Turrialba, Costa Rica, CATIE, 1976. 3 p.

(3847)
OÑORO, P. Documentación de trabajo del proyecto de Sistemas de Cultivo para Pequeños Agricultores /Lista Nº 1/. (Memorando CT/DC-1379). Turrialba, Costa Rica, CATIE, 1978. 21 p.

(3848)
SAUNDERS, J.L. Experimento sistemas de producción para Guápiles. Plano provisional. (Memorando CT/DC-862. Turrialba, Costa Rica, CATIE, 1976. 3 p.

(3912)
NAVARRO, L.A. Encuesta de reconocimiento y caracterización inicial de 59 fincas de Caizán, Panamá (1978). Turrialba, Costa Rica, CATIE, 1978. 62 p.

D.T.
(4055)
HART, R.D. Un marco conceptual para la investigación con sistemas agrícolas. Turrialba, Costa Rica, CATIE, 1979. 22 p.

D.T.
(4061)
HART, R.D. An ecological systems conceptual framework for agricultural research and development. Turrialba, Costa Rica, CATIE, 1979. 20 p.

(4132)
BARAN, R. et al. Proyecto centroamericano de fertilidad de suelos marzo 1976 - marzo 1978. Turrialba, Costa Rica, CATIE, 1978. 62 p.

(4233)
SALAZAR, E. y HOLLE, M. Procedimiento para cosecha de experimentos en Pérez Zeledón. Turrialba, Costa Rica, CATIE, 1978. 5 p.

(4240)
BAIRD, G.B. CATIE/ROCAP project; report february 23, 1979. Turrialba, Costa Rica, CATIE, 1979. 14 p.

D.T.
(4268)
ACUERDO ENTRE el Instituto de Investigación Agropecuaria de Panamá y el Centro Agronómico Tropical de Investigación y Enseñanza para campesinos de limitados recursos. s.l., s.e. 1979. 4 p.

(4289)
DOCUMENTO DE acuerdo entre el Ministerio de Agricultura y Ganadería de Costa Rica y el Centro Agronómico Tropical de Investigación y Enseñanza para la realización de investigación en sistemas de producción agrícola para pequeños agricultores. Turrialba, Costa Rica, CATIE, 1975. 6 + 3 p.

(5003)
ACUERDO ENTRE el Instituto de Investigación Agropecuaria de Panamá y el Centro Agronómico Tropical de Investigación y Enseñanza para realizar investigación en sistemas de producción agropecuaria para campesinos de limitados recursos. s.l., s.e., 1979. 4 p.

(4300)
MADRIGA, J. Informe de viaja a San José, solicitado por el Dr. Miguel Holle, Horticultor. Memorando CT/DC-1517. Turrialba, Costa Rica, CATIE, 1978. 6 p.

(4301)
MADRIGAL, J. Información sobre varios tipos de productos para insumos no conocidos en el CATIE. Memorando CT/DC-2004. Turrialba, Costa Rica, CATIE, 1978. p. irr.

(5029)
NORMAN, D.W. Notes concerning evaluation of improved cropping systems by CATIE. s.l. s.e. 1977?. 16 p.

(5052)
BURGOS, C.F. Small farmer cropping systems project highlights-december 1978. Turrialba, Costa Rica, CATIE, 1978. 13 p.

(5053)
BURGOS, C.F. Some aspects on cropping syatems methodology. Turrialba, Costa Rica, CATIE, 1979. 28 p.

(5054)
JIMENEZ-SAA, H. Reunión de Programación de Cultivos Anuales. Memorando CT/DC-592. Turrialba, Costa Rica, CATIE, 1979. 10 p.

(5055)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Highlights of the small farmer croppingy systems project (SFCSP) (CATIE-ROCAP Project). Turrialba, Costa Rica, CATIE? 1978. 2 p.

(5057)
HOLLE, M. Diversificación de cultivos y variedades (cultivares) como parte de la investigación en sistemas de cultivo. Turrialba, Costa Rica, CATIE, 1979. 10 p.

(5072)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Descripción y evaluación del sistema de cultivos (maíz+arroz) - frijol de costa: una alternativa para el sistema arroz-frijol practicado por los agricultores de Yojoa, Honduras. Turrialba, Costa Rica, CATIE, 1979. 135 p. 24 ref.

(5073)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Descripción y evaluación del sistema de cultivos maíz/frijol de costa-maíz: una alternativa para el sistema maíz-maíz practicado por los agricultores de Yojoa, Honduras. Turrialba, Costa Rica, CATIE, 1979. 117 p. 24 ref.

(5074)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Descripción y evaluación del sistema de cultivos (maíz+pipián) - (maíz+pipián): una alternativa para el sistema (maíz+ayote)-(maíz+ayote) practicado por los agricultores de Yojoa, Honduras. Turrialba, Costa Rica, CATIE, 1979. 114 p. 24 ref.

(5075)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Sorgo y frijol asociados en fajas alternas, una alternativa para el mejoramiento del sistema frijol en monocultivo practicado en Samulalí, Matagalpa, Nicaragua. Turrialba, Costa Rica, CATIE, 1979. 73 p. 7 ref.

(5076)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Descripción de una alternativa para el sistema de cultivo maíz asociado con yuca practicado por los agricultores de la zona de Guácimo y Pococí, Costa Rica. Turrialba, Costa Rica, CATIE, 1979. 118 p. 34 ref.

(5077)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Descripción de una alternativa para el sistema de cultivo maíz-maíz practicado por los agricultores de Pococí y Guácimo, Costa Rica. Turrialba, Costa Rica, CATIE, 1979. 53 p. 35 ref.

(5078)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Descripción de una alternativa para el sistema de producción maíz asociado con sorgo practicado por agricultores del Municipio de Tejutla, Chalatenango, El Salvador. Turrialba, Costa Rica, CATIE, 1979. 54 p.

(5079)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y EN ENSEÑANZA. Descripción de alternativas para el sistema de maíz y frijol asociado en primera seguido por frijol solo en postrera practicado por agricultores de la zona de Palmares de Pérez Zeledón, Costa Rica. Alternativa 1: maíz asociado con frijol en ambas épocas; alternativa 2: reemplazo del frijol por Vigna unguiculata (L) Walp. Turrialba, Costa Rica, CATIE, 1979. 55 p.

(5080)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Descripción de una alternativa para el sistema maíz en primera y frijol en postrera, practicado por agricultores de la zona de Palmares de Pérez Zeledón, Costa Rica. Turrialba, Costa Rica, CATIE, 1978. 169 p. 71 ref.

(5081)
OÑORO, P. Contenido de un Paquete Tecnológico. Memorando CT/DC-1026. Turrialba, Costa Rica, CATIE, 1978. 6 p.

(5082)
ANDRADE M., E. Manual explicativo de la encuesta de reconocimiento inicial. Turrialba, Costa Rica, CATIE, 1978. 15 p.

(5083)
CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA. Análisis económico de sistemas. Turrialba, Costa Rica, CATIE, 1977. 14 p.

(5084)
NAVARRO, L.A. Procesamiento y análisis de encuestas (material de instrucción). Turrialba, Costa Rica, CATIE, 1978. 63 p.

(5085)
HOLLE, M. y ARZE, J. Informe comentado sobre "Capacitación para la investigación utilizando el enfoque de sistemas". Memorando CT/DC-2049. Turrialba, Costa Rica, CATIE, 1978. 14 p.

(5086)
TIRADO SANCHEZ, H. La técnica de la cero labranza. Turrialba, Costa Rica, CATIE, 1979. 19 p.

(5087)
TIRADO SANCHEZ, H. La mosquita del sorgo Contarinia sorghicola (Coq). Turrialba, Costa Rica, CATIE, 1979. 12 p.

(5088)
TIRADO S., H. Manchas foliares de cercospora en maní (Arachis hipogaea L). Turrialba, Costa Rica, CATIE, 1979. 22 p.

(5094)
VALVERDE, R., MORENO, R. and GAMEZ, R. Beetle vectors of cowpea mosaic virus in Costa Rica. Turrialba 28(1):90-91. 1978.

(5096)
MANEJO DE malezas. Turrialba, Costa Rica, CATIE, s.f. 7 p.

(5097)
BURGOS, C. Soil physical and chemical properties, profile descriptions and greenhouse studies of soils from platanares and pejibaye, Pérez Zeledón, Costa Rica. Turrialba, Costa Rica, CATIE, s.f. 17 p.

(5098)
BURGOS, C. Soil chemical properties and greenhouse studies of soil from Cariari, Guápiles, Costa Rica. Turrialba, Costa Rica, CATIE, 1976. 6 p.

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