Technical Progress Report

EXTENSION OF THE PILOT PROJECT FOR RURAL DEVELOPMENT AND CONTRIBUTION TO CORE BUDGET

(Agreement Nº NA/79-31/C1)

Tropical Agricultural Research and Training Center (CATIE)

Crop Production Department

Turrialba, Costa Rica, 1983

SUMMARY

The present Technical Progress Report is an effort to summarize the most important activities and present status of the joint CATIE/EEC project on "Extension of the Pilot Project for Rural Development and Contribution to Core Budget" (Agreement Nº NA/79-31/C1), during the time period between October 1982 and September 1983.

Two issues constitute the most relevant activities during the year: the revitalization of field activities in El Salvador by initiating the validation of a technological alternative for maize-beans small growers of the western part of the country, and the initiation of technical assistance and training to the national research and extension team of the pilot project of "Las Flores" in the Comayagua Valley in Honduras.

Activities in Nicaragua and Turrialba continued very much according to plans for this year, although some specific research and coordination activities went beyond planned action as a response to new field activities in Honduras and El Salvador, and the increasing demand for alternatives to specific technical production problems.

Due to the field work integration with national agricultural institutions, a planned austerity policy developed by CATIE's administration, and the time gap in the implementation of some activities as a consequence of the 1981 underfunding, the time horizon for this project execution can be extended perhaps up to the first quarter of 1985 within the same EEC budgetary contribution and CATIE counterpart. Plans for this extension in time include the continuation of technology validation in Nicaragua and El Salvador, documentation of the on-farm research methodology and results in Nicaragua, continuation of training and technical assistance to the Honduran

team in Las Flores, and extension of this strengthening of national institutions and research-extension teams in other Central American countries through intensive training and technical guidance, since demand for those services is increasing over time.

This technical progress report covers main activities of the joint EEC/CATIE program under the denomination NA/79-31/C1 from the last quarter of 1982 to the third quarter of 1983.

The present report is presented according to the activities carried out at the headquarters, and at each of the geographical areas in which field activities take place. In each case, main actions and research results are briefly explained, and some data are provided where necessary. Reference to action plans for 1983 presented in the Technical Progress Report of 1982 will be made since most of this year's activities are the result of implementing those plans, and new actions are also related to them and to the entire project.

1. Activities at the Headquarters (Infield Backing Support)

Activities carried out at the headquarters in Turrialba are twofold: a) A technical support to CATIE's Crop Production Department (CPD) activities directed toward developing methodologies and appropriate technology for small farmers through which national institutions in the Central American Isthmus are strengthened, and b) A direct technical and logistic coordination of all activities directed toward the implementation of EEC grants to CATIE, which includes the project on "Energy Flows in Rural Communities" (Agreement NA/80-31/C1).

These activities have been grouped as follows: personnel recruitment, planning and adoption field activities, technical and logistical coordination and training and research support to the CPD.

1.1 Personnel Recruitment

The personnel recruited during the period corresponding to this Progress Report is referred to in Table 1.

Table 1: Summary of Personnel Recruited during the Last Year.

Date	Position	Profession	EEC/CATIE Project
Oct./82	Data analyst*	Systems Ing. B.S.	Rural development
Oct./82	File officer*	Office training	Rural development
Jan./83	Researcher	Ecologist Ph.D.	Energy Flows
March/83	Research Assist.	Agronomist B.S.	Rural development
May/83	Research Assist.	Agronomist B.S.	Energy Flows

* These positions provide support to both EEC project as well as the CPD.

These new staff members are posted in Turrialba. Other positions at the field level have been covered by national technicians from the national agricultural institutions which are cooperating in every country, under the coordination provided by CATIE.

1.2 Planning and Adoption Field Activities

This is a permanent activity to evaluate the direction and results of field activities in relation to the project objectives, the interest and requests of national institutions, and other CATIE projects with which this EEC project is planned to fit.

Two major aspects have been raised in relation to this activity: the revitalization of field activity in El Salvador, and the assistance to a national research-extension team in Honduras to implement a pilot project through the use of the farming system research approach.

The redefinition of priority areas by El Salvador's agricultural research and extension agency (CENTA), the field results of another CATIE project implemented during three years in the western part of the country, and the need to complete the methodological scheme partially developed through the two phases of this project were decisive factors to respond to the CENTA request to collaborate on a cooperative basis in the validation/transference activity of a technological alternative for maize-beans small growers in a geographical area under the influence of a dry spell period.

The west directorate of the natural resources secretariat of the Ministry of Agriculture of Honduras, after an evaluation of two CATIE's projects in Honduras, requested technical assistance in the implementation of a pilot project aimed at integrating research and extension services at the field level. It was decided that the farming systems research methodology was

the most adequate approach to implement this effort and develop appropriate technology for small farmers. The EEC/CATIE activities in this pilot project are focused on the training of the national team, the planning phase of the project life, and a permanent technical assistance through CATIE's network in Honduras and the technical staff at the headquarters.

1.3 Technical and Logistical Coordination

Activities in these two aspects are also permanent and directed toward maintaining a harmonic technical development in all working areas, and the administrative support to keep field activities running at an efficient level to ensure the accomplishment of physical goals.

On this ground, a significant effort has been devoted to stimulate national institutions' collaboration in order to obtain direct cooperation in the joint implementation of field work as the means to incorporate national technicians in the process of testing and developing the methodology and the multidisciplinary approach to confront technical production problems of small farmers.

These coordination actions have been successful in the sense that permanent agronomists have been assigned by the Land Reform Agency of Nicaragua to collaborate with the EEC/CATIE staff in the Estelí area. In the same direction, all field activities in the validation of technology and farms record keeping in El Salvador is carried out by CENTA staff members. Moreover, officials in both Nicaragua and El Salvador are active participants in the planning phase of field and training activities, and in both cases national technicians posted in different areas have been sent to training sessions. This working mode has also been implemented in Honduras from the very beginning of the project.

Technical coordination of all activities within the action frame of the CPD includes a coherent action to complement and supplement other technical work that takes place in all areas through other CATIE projects. This is the case of the EEC/CATIE work in Nicaragua and El Salvador where some phases of the methodology for technology generation were already completed by other projects. The steps toward the merging of projects are the subject of these activities. Progress has been achieved this year in El Salvador to incorporate former research results not only obtained by CATIE researchers, but by the national institution, as well.

Logistical support to operate this project has been a minor activity, since CATIE's central administration provides means and methods of operations, and the funding of the project has been provided as requested.

1.4 Training and Research Support to the CPD

Cooperation with other projects and research activities of the CPD has been supplied mainly in the form of participation in training events, direct technical research in slug control, advising graduate students of the University of Costa Rica-CATIE graduate school, technical cooperation in some data analysis of a former CPD weed control project, and partial technical services of the data analyst.

2. Activities and Progress in El Salvador

During the time period recorded in this Progress Report the activities in El Salvador have been focused on the continuation of some actions in the geographical area of Tejutla, and the initiation of field activities in the areas of Candelaria de la Frontera and the west part of Ahuachapán, as mentioned before.

2.1 The Final Evaluation of the Maize-Sorghum Technological Alternative.

Field activities directed toward the completion of the technological alternative development in the area of Tejutla have resulted in the refinement of a methodology for the on-farm experimentation phase for generating technology (see Technical Progress Report, 1982), and in the improved technological alternative itself which is the site specific output of the project. According to the CATIE farming systems research method, a phase in which the best experimental result is tested once again at the semi-commercial level under the exclusive farmer management was the next step before the national institution takes the technological alternative for massive diffusion.

The implementation of this final phase was postponed last year due to the socio-political harassment that has taken place in the Eastern part of the contry during the last five years. This year a new effort was dedicated to complete these final trial tests, but only eight farmers out of thirty were able to collaborate during the entire cropping season, and recorded data was not complete in all cases such that it was decided to drop the data analysis, and transfer a complete documentation to the national institution for future completion.

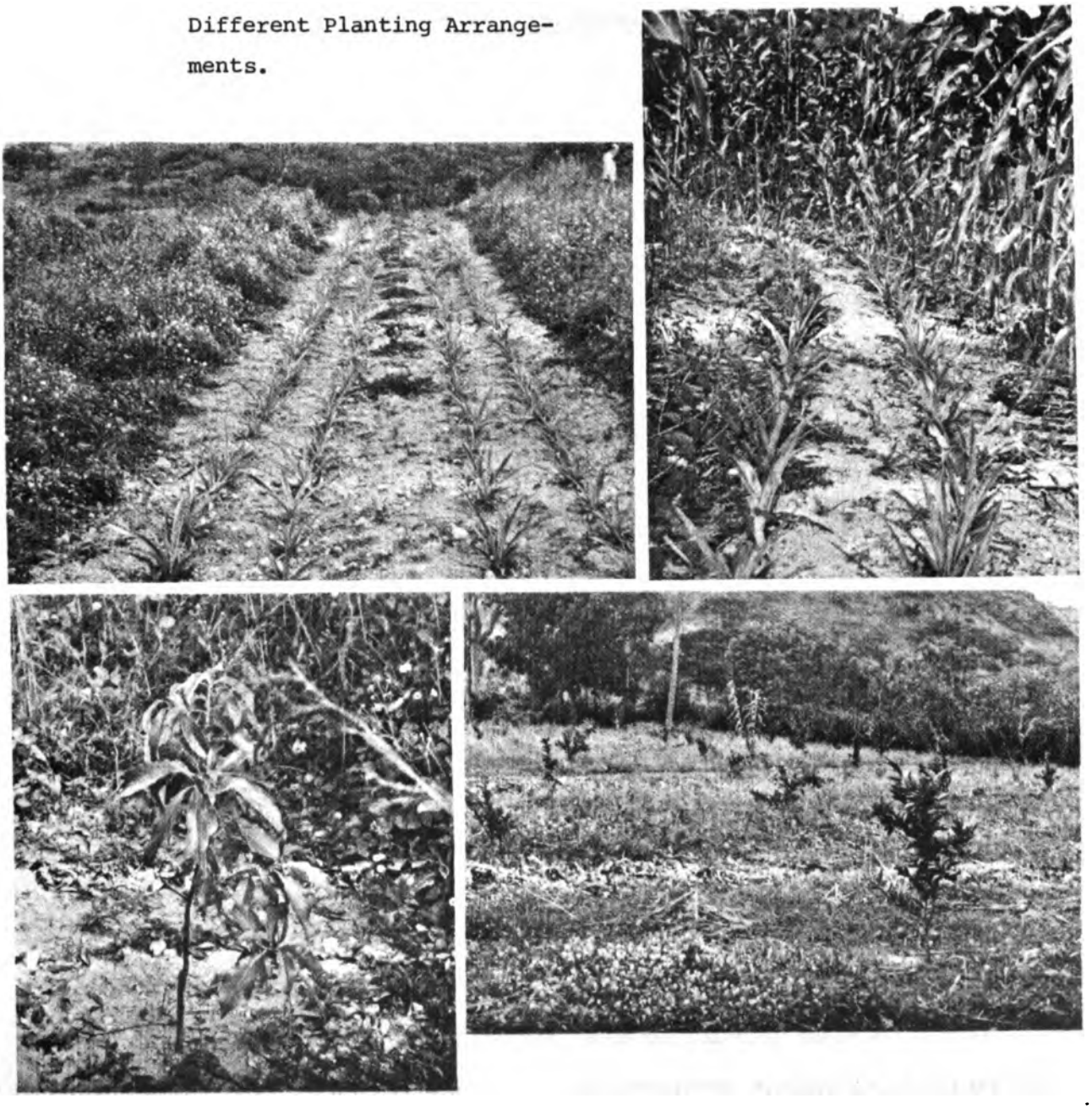
2.2. Introducing New Components to the Production System.

Following the on-farm experimentation method for the last three years, some new components to the maize-sorghum alternative were set into an experimental phase for evaluation both at the methodological and the technological development levels. Plantain, pineapple and some citrus trees were chosen as new components to be introduced to alternate with the annual cropping system (see Figures 1 and 2).

Figure 1: Addition of Plantain to the Maize-Sorghum Production System.

These type of experiments included different levels or treatments in order to gain information, and a fast approximation to optimum levels of crop combination and chronological arrangements. In addition, due to a severe soil deterioration stage, new planting strategies were tested as shown in Figure 2.

Figure 2: Addition of Fruit Trees with Different Planting Arrangements.



Given the long term characteristics of some of the components to be introduced to the maize-sorghum alternative, it has been possible to keep a minimun level of monitoring in these experiments, since they were established in the area of Tejutla. The record keeping of these experiments is expected to be continued provided the socio-political situation in the area improves enough to allow the accomplishment of the action.

2.3. Evaluating the Type and Use of Some Farming Tools and Implements.

As an activity of another CATIE project in the eastern part of El Salvador, a survey of 102 farmers covering the determination of the technological level of some production systems which included maize as a component was carried out in the Tejutla area since 1980. Data on the type and use of farming tools were recorded in order to complement basic information to be used for designing a technological alternative under the direct implementation of the EEC/CATIE project. This activity was the origin of the maize-sorghum alternative and the methodological development for on-farm experimentation.

Once the technical production factors have been studied and analyzed up to the "third approximation" of the maize-sorghum technological alternative, and the coordination with the national institution is such that they are willing to continue applied research activities in a partnership with the EEC/CATIE projects, it was decided to analyze data on farming tools as another potential factor to be improved, not only as a physical instrument, but as an energy use factor which could constitute a leak to the energy maximization process.

With this broad view, the following sets of farming implements were targeted for identification: cropping and harvesting tools, traction equip-

ment, post-harvest processing implements, water collecting instruments, fuel sources, and other home tools. The most popular tools used for cropping and many other activities were: the cuma (kind of curved machete), the straight machete, the metal-tipped stick, the hoe and the hooked knife. In addition, 71% of the farmers do not use any plow instrument and 21% utilize a wood plow.

Transportation of harvested products (maize-sorghum, and beans) is commonly based on human force (24%), animals and oxcart (21%), and motor traction (17%). Transportation of water is based on human force of women and children (85%).

The cuma is the most widely used instrument for weed control while most of the planting is done with the help of the stick; regardless of the slope of the plots under cultivation. The cuma is generally used with the help of a hook, as illustrated in the Appendix A. It seems evident that the use of this type of traditional farming tools produces human fatigue which could be minimized through either the use of some other known manual farming tools or improving some of the existing tools, which implies some additional research on this specific topic. Instruments like the sickle or scythe with an arched handle, manual harvesters, oxen plows, the u-bar for plowing and planting, the handcart and the "chinese cart" are some of the alternative tools which could be introduced or modified in order to improve farming efficiency. This information will be the subject of a deeper analysis by researchers implementing the EEC/CATIE Energy Flows Project.

2.4 The Validation Phase in the Eastern Area of the Country.

The origin and the planning steps of this field activity were already

mentioned. It is actually the continuation of an effort to apply the farming systems research methodology, utilizing the on-farm experimentation method to complete the field research phase. For this reason, the characterization, design, and field trial testing phases have already been completed. In order to provide the technical elements to judge and understand the importance and meaning of this action, a brief summary of the area and the technological profile are presented in this report.

2.4.1. Main Area Characteristics.

Candelaria de la Frontera is situated in the northeast part of the Department of Santa Ana. The altitude varies from 500 to 1000 m.o.s.l. and is administratively subdivided in 11 counties.

Average temperature ranges from 22.5°C (January-February) to 25.2°C (April), reaching a minimun of 17°C (January-February) and a maximum of 34° (March-April). Annual rainfall is 1545 mm, and the periods of higher precipitation are June and August. In July the rainfall level decreases by 7% which is the effect of the dry spell. Potential evapotranspiration has moderated value around 140 mm/month during the rainy season, increasing up to 190 mm/month during the dry months (March-April). Water shortage in the soil is a problem during the period from November to May (see Appendix B).

The population of the area is approximately 12000 people of which 75% live in the country side. Population growth rate is 0.5% for the area, according to the last population census. Approximately 39% of families dedicated to agricultural production rent the land, and 30% of them work as tenant farmers in 2585 has. which are under the management of the Land Reform Agency.

Total land devoted to agricultural activities adds 9588 has., corresponding to 1320 exploitation units which yield an average land area of 7.3 has/farm. Land devoted to crop production represents 22% and more than 50% is in grass. Annual crops take almost 1900 has and 55% of that total is devoted to maize production (Appendix C). Yields are susceptible to improvement although the use of hybrid maize is remarkably high for a small farmer area. These crops are arranged in farming systems which include animal production; the most common farm system has cattle - annual crops - perennial crops (60% of the area). On the other hand, 75% of farm units have annual crops - pigs - poultry - perennial crops. Fruit trees and woodland are frequent components of farm systems, and form part of the family garden.

Approximately one half of the area is classified as having a vertisol type of soil. The other half is constituted by reddish clayee inceptisols and entisols rolling very steeply. Soil class VII is predominant, but classes IV, III, VIII and II are also found in the area (see Appendix D).

The technological level for the maize-beans production system is relatively high in input use: fertilization practices, common use of hybrids, two weed control practices utilizing herbicides very often, and an apparent good care of the crops.

2.4.2 The Technical Recommendation Under Validation

Several types of experimental trials were tested in order to technically improve farmers' technology for maize-beans production. Due to the relatively high input use level, experiments were focused on cost decreasing options, as well as yield increasing possibilities.

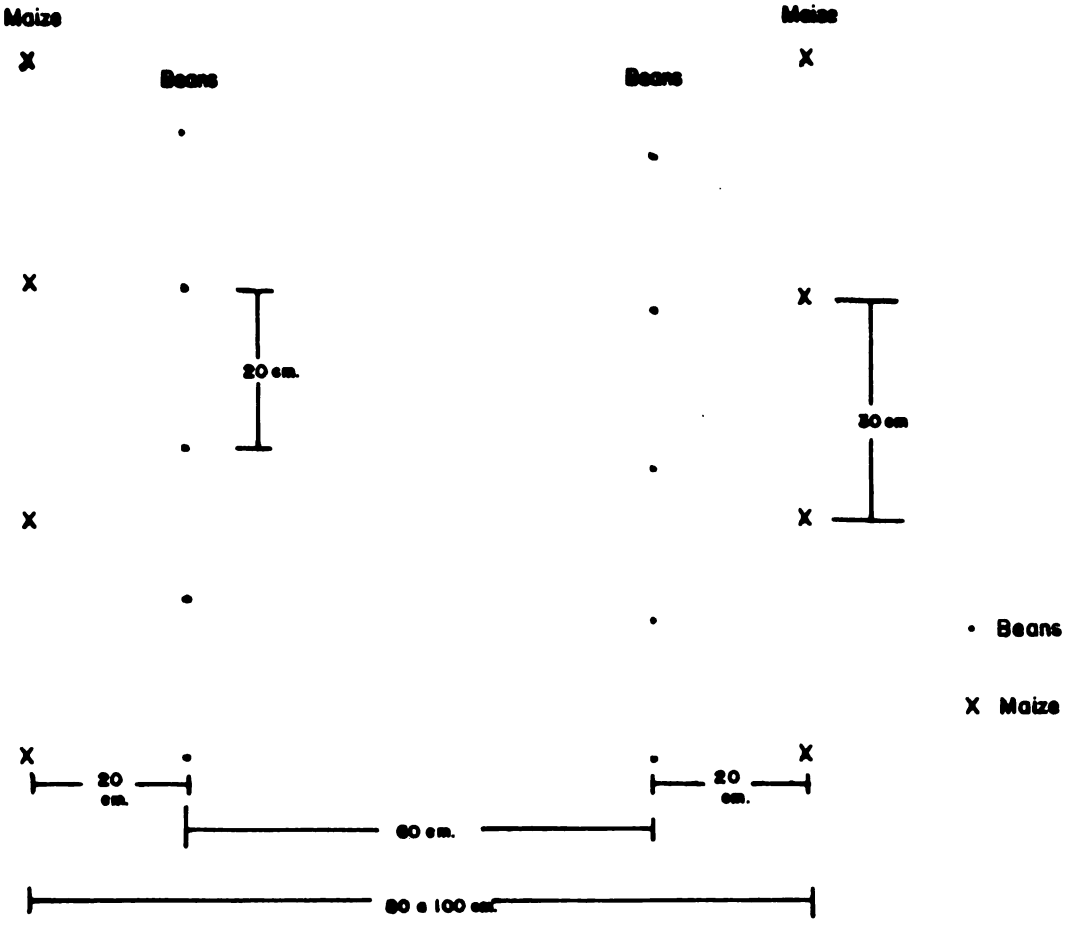
Field results of a two-year period of on-farm research trials did indicate that introducing new varieties to the farmer's own systems is the most promising change in order to increase yields without increasing input use. Consequently, the H-5 hybrid maize and the native beans variety which were used by most farmers in the area, were substituted by the H-11 hybrid maize, and the red Izalco beans variety, keeping all other cultural practices as traditionally performed by farmers. The spatial arrangement of this production system is illustrated in Figure 3.

A total of 26 farmers have validation trials on their farms in an extension of 1000 m^2 of which yields and economic results are compared against farmers' own production systems from which samples will be drawn to gather the needed data for the analysis. Additionally, a whole farm record keeping will be implemented with the same group of farmers in order to form the data base to evaluate the introduction of the technological alternative as a technical change into the farming system.

These are activities being carried out by technicians of the Salvadorian national institution with EEC/CATIE technical supervision. A short training course was offered by the EEC/CATIE team to familiarize national technicians with the use of the record keeping instrument, as well as with the manner of supervising the validation trials.

This final evaluation of the validation of the alternative will complete the methodological phases designed to generate appropriate technology, and the specific evaluation method will constitute the implementation of concepts and analytical techniques that might be a contribution to national institutions for further applications as an analytical tool.

Figure 3. Spatial arrangement of the maize-beans technological alternative for Candelaria de la Frontera, El Salvador.



2.5 Action Plans for El Salvador

According to the present mode of collaboration and joint field action between the EEC/CATIE team, other CATIE projects, and CENTA of the Ministry of Agriculture, action plans for 1984 could be expected to include more involvement in new areas of the country, with the CENTA's production system evaluation division.

CATIE has already been requested for more intensive participation in the training of approximately 190 new technicians who will be hired by CENTA during the next six months, due to a couple of loans from international institutions directed to revitalize the Salvadorian agricultural institutional sector. Action in this direction for 1984 should concentrate on a comprehensive training of selected groups of technicians who will be working in the application of the methodology for appropriate technology generation. Due to the socio-political situation in El Salvador, the field work with these groups was most concentrated in the eastern region of the country which, in turn, has been chosen as the priority area by the agricultural national institution.

A complementary action that comes in order to strengthen this revitalization of the national institution would provide technical assistance to those field teams, in addition to the more formal training. This has to be a permanent action which may last three to four years for the completion of all methodological phases. This time constraint imposes a longer horizon which is beyond the possibilities of the present EEC/CATIE project, even if an extension to the first quarter of 1985 were allowed. Nevertheless, this in-field and learning by doing process is, perhaps, the most effective and lasting manner of institutionalizing all positive results of EEC/CATIE's efforts in the area, and other Central American countries where success has

been achieved both at the farmer and the institutional level. A separate proposal will be presented to the EEC in order to tie these kind of actions in a longer run.

Another activity which is expected to be completed during 1984 is the documentation of the most important methodological and site specific research results. This analytical review includes field action results under the first phase of this EEC/CATIE agreement as well as conclusions of the on-going validation process.

Needless to say, present field activities directed toward keeping farm records, research trials, and validation trials will be continued during 1984 to complete cropping and researching cycles. Specific decisions on these activities will be made as soon as present action results are available for analysis and interpretation.

3. Activities and Progress in Nicaragua

Activities in Nicaragua constitute the main body of action of the EEC/CATIE project. Following original action plans, on-farm validation plots were established during the second cropping season of 1982. Some of them and others with new participants are under evaluation during the complete cropping season of 1983 in the region of Estelí (Estelí, Condega, Pueblo Nuevo, and La Trinidad municipalities). These activities, and the coordination with the national institutions, are the bulk of the actions carried out in Nicaragua. They will be summarized in the following sections.

3.1 Coordination with National Institutions and Definition of Direct Clientele.

It was mentioned earlier that coordination with national institutions is one of the main activities performed by the headquarters team. However, the organization in Nicaragua impose a coordination activity both from Turrialba and the regional levels directed to the national and local levels. In addition, there are two institutions to coordinate research and extension activities, as demanded by the validation of technology phase.

During 1982, direct field work was established with the cooperation of the national research division (DGTA). Through this working mode, most of the farmers integrated into the validation process were members of cooperatives of credit and services (CCS), and some were independent farmers (not associated under any government promoted farmer organization). Direct collaboration with national technicians, supervisors, and vehicles were obtained to allow the settlement of 210 validation plots. This allowed the financial execution of the EEC/CATIE funds to slow down ending the year with a substancial carryover for 1983.

Cooperation with the DGTA included the validation of a technological alternative for common beans (Phaseolus vulgaris L.) developed by the national institution, in addition to the maize/beans, and beans/sorghum-beans technological alternatives developed by CATIE.

For 1983 a redefinition of national priorities and farmers organization took place by central authorities of the agricultural sector. This implied a redirection of field clientele assigning priority to cooperatives of credit and services (CAS). It also brought about the need to reinforce coordination and collaboration with the national Land Reform Agency in charge of these organizations. This cooperative has been very stable and new resources were obtained by this means, affecting the 1983 budget to a relative surplus, since no additional project resources have been supplied

for the EEC/CATIE project during this year.

Presently, field activities are carried out in cooperation with both national institutions, although the cooperation of the DGTA has decreased due to many lost validation plots not recovered due to weather and timing constraints.

3.2 Some Results of 1982 Validation Experiences

During the second semester of 1982, 210 validation plots were established to test technological alternatives for beans/beans-sorghum in alternate strips, and maize-beans in relay under farmers' own management. Due to climatic factors and a redirection of activities in the DGTA, only 107 plots were harvested early this year. Data on all farms activities were collected at the same time, and presently are in the process of analysis since three different recording methods were tested.

A summary of results is shown in Table 2. Total product is estimated in Cordobas as the gross income in order to account for total production at the same time. Data indicate that the technological alternative for sorghum-beans did not generate a different gross income in comparison with the farmers' own control group. Gross income from the farmer's maize-beans plots is greater than the income from the technological alternative plots. In addition, both technological alternatives under validation demand greater labor and cash expenses than farmer's own technology, as detailed in Table 3.

Farmers' results are certainly different from experimental findings obtained in past years. Crop yields of the recommended varieties were low, especially in the case of maize, whose yield was doubled by the farmer control plots. These issues are coincident with the severe dryspell of

Table 2: Production, income, labor and cash costs of validation and control plots. Nicaragua. (per hectare).

	Sorghum-beans in alternative strips				Maize-beans in Relay			
Sources	Farmer Plots n=40	Validation Plots n=48	F Value	Adjusted F value (rainfall)	Farmer Plots n=8	Validation Plots n=11	F Value	Adjusted F value (rainfall)
Gross income (C$)	5084.5	5049.0	1.25	0.42	9118.3	6632.6	4.03*	2.32
Sorghum yield (kg/ha)	188.4	536.8						
Bean yield (kg/ha)	550.9	426.0			1279.9	571.5		
Maize yield (kg/ha)					665.3	661.1		
Total labor (hours/ha)	420.0	606.9	8.08**	7.45**	468.4	783.6	8.68**	7.12*
Other inputs cash costs ($)	1117.4	1953.8	8.68**	47.36***	700.4	930.4	0.08	0.45

* Significant at α = 0.06 ** Significant at α = 0.009 *** Significant at α = 0.0001

Table 3: Income and cost disaggregation for sorghum-beans and maize-beans Validation and Control Plots

Inputs	Sorghum-Beans		Maize-Beans in Relay	
	Farmer's plot (1 ha)	Validation plots (1 ha)	Farmer's plot (1 ha)	Validation plot (1 ha)
Gross income	5084.50	5049	9118.28	6632.56
Cash expenses				
Seed	449.94	636.87	474.18	480.0
Fertilizer	284.02	642.62	103.05	264.18
Insecticide	43.61	230.20	41.47	148.0
Fungicide	0.89	136.31	61.12	30.90
Herbicide	7.50	7.82	20.54	7.28
Miscellaneous	331.44	299.96		
Sub-total	1117.4	1953.78	700.36	930.36
Family labor (hours/ha)	256.6	467.08	305.6	672.72
Hired labor (hours/ha)	163.3	139.79	162.8	110.92
Total labor	419.9	609.87	468.4	783.64
Cost of hired labor	763.27	697.35	846.11	559.1
Net cash income	3203.83	2397.87	7571.81	5143.1

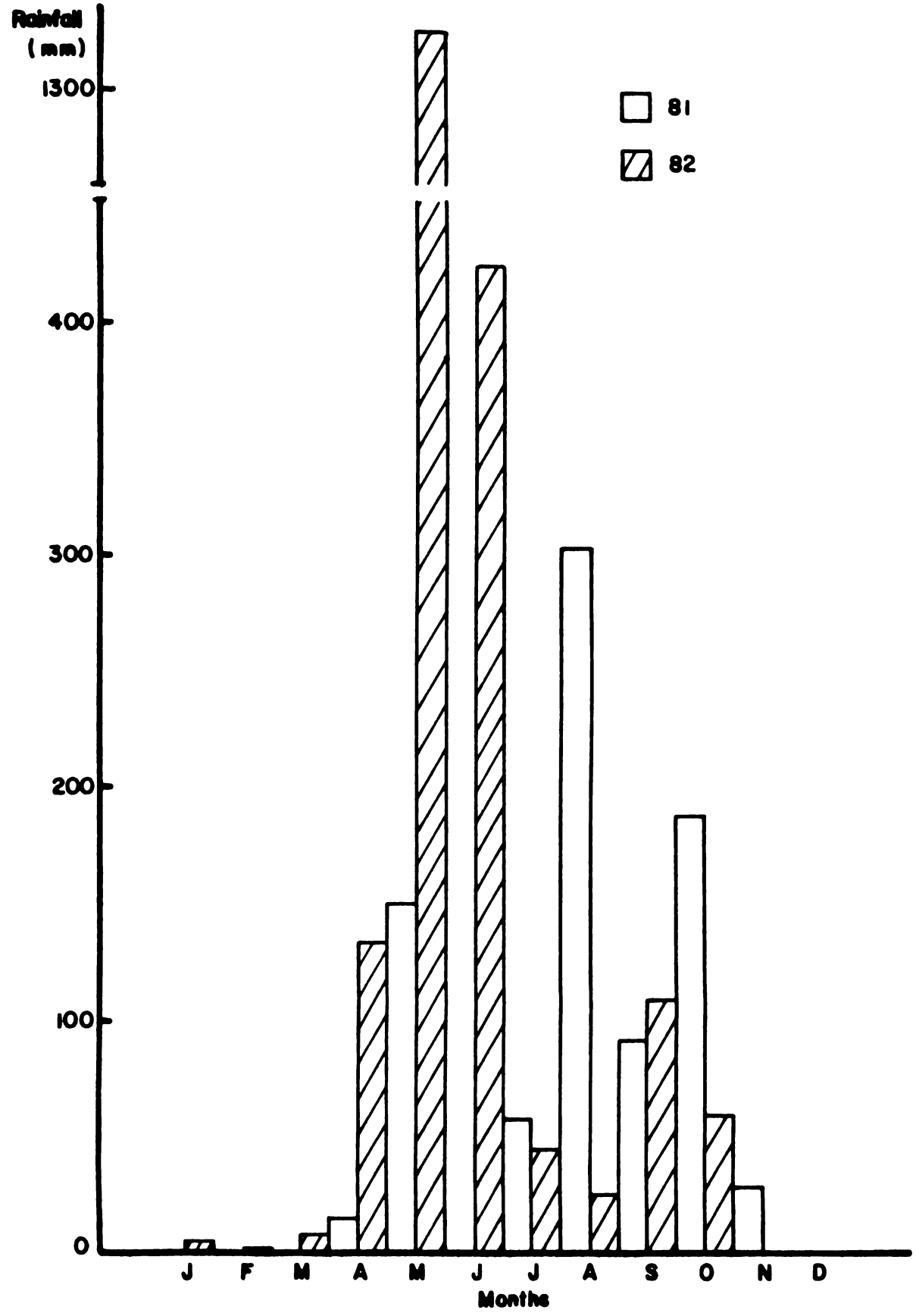
1982, and the low rainfall during the second semester. As a matter of comparison, Figure 4 shows the 1981 and the average monthly rainfall distribution for the four counties where the validation plots were established. The second semester of 1982 was drier than 1981, and July and August were especially dry. This dry spell meant the loss of approximately 65 validation and control plots. In the same token, experimental trials with maize-beans in 1981 were reported with average yields of 3644 kg/ha of maize, and 1020 kg/ha of beans, with the very same production technology used in the validation plots (Agreement DGTA/CATIE/IDRC 1981 Annual Report).

Present actions of the same geographical region includes several validation plots. This time it is aimed to validate the cropping season of the first semester of the year, and will continue to the second in order to test the proposed technology under the climatic conditions in which it was generated. Nevertheless, results reported here are important since it seems that under conditions of dryness and stress, native varieties would resist better, and maize yield would not suffer as much as the improved varieties. In this case, additional costs in fertilization and plant protection do not payoff. This could be one reason farmers do not use significant amounts of some pesticides in their own production lots. Further analysis of climatic data are desirable to estimate probabilities of dry periods' intensity, in order to refine the technological alternatives.

3.3 Field Actions Under Execution in 1983

As mentioned before, present field activities are devoted to complete the validation process of both technological alternatives during both semesters to include all crop components of the production systems. In cooperation with the Land Reform Agency and the DGTA, 150 farms are under study

FIGURE 4. AVERAGE MONTHLY RAINFALL IN 1981 AND 1982. ESTELI, PUEBLO NUEVO, CONDEGA AND LA TRINIDAD, NICARAGUA



with validation and a control lots, and bi-weekly visits to maintain farm records to evaluate the possible impact of introducing the technological alternatives in the farm.

The geographical area is the same for which the dominium of technical recommendations has been established. New farmers have been incorporated in the program to replace some of cooperators during 1982, and they include several cooperatives (CAS), according to the new priorities determined by national agricultural policies.

This validation process in the field is expected to be completed approximately by the end of February 1984, and data analysis will not be finished before the second semester of 1984.

3.4 Planned Action for Nicaragua

Taking into account the present status of field activities, the degree of integration with the national institutions, and provided that an execution time extension for this project will be granted between EEC and CATIE, actions during 1984 will concentrate in three major aspects: analysis of the validation and all farm data, the documentation of the entire project as agreed between EEC and CATIE, and a monitoring activity to study a sample of farms to learn if adoption of technology has taken place on their own action, or the reasons for not adopting the technological alternative.

Data analysis will include comparisons between validation and control plots, as well as, the interactions and competition with all other production systems within the farming system. This will allow for the making of comparisons with cooperative associations and farming units. This analytical process will be carried out in the headquarters at Turrialba just to utilize research facilities.

The monitoring phase will be directed to detect farmer and production association behaviour of production alternative that they have to take this risk to implement, if acceptable to their objective function. This activity will consist of three or four visits during each semester to fill out a form to record input usage and cultural practices of a sample of farmers who were exposed to the technological alternative during the validation phase.

The documentation of the project is already agreed upon between the EEC and CATIE. This will be completed after farmer analysis are finished. In addition, this activity includes the recognition of actions completed by other CATIE projects which are related and planned to maiximize the use of resources and institutional effectiveness.

4. Activities and Progress in Honduras

As mentioned before, the assistance and participation fo the EEC/CATIE project team in the pilot project "Las Flores" in Honduras is a response to two major issues: a. The capacity developed by CATIE during eight years of applied farming systems research with small farmers. This experience - to which the EEC/CATIE project has contributed in several aspects - has been recognized as a suitable approach to generate appropriate technology, and strengthening national institutions by training and integrating researchers and extensionists at the field action level, and b. the request of the Honduran agriculture institution to have CATIE assisting their pilot project which is expected to be the model for the eastern regional division of the national resources secretariat (DARCO).

Actions started in early 1983. Activities already implemented go from the planning and definition of the project up to the design of the second

field research trials to be planted in the middle of September. As a technical background, a summary of the project purposes, main area characteristics, and executed activities is presented in this Technical Progress Report.

4.1 Defining the Project Strategy

The Las Flores pilot project's overall objective is to improve small farmer income level through the use of agricultural and animal production appropriate technology directed toward increasing yields and making a rational use of available production factors. Specifically, the project is aimed at:

a. Developing appropriate technological alternatives to small farmers.

b. Transfering in a massive manner those alternatives, once they have been considered ready for farm application.

c. Training agricultural researchers, extensionists, animal science and irrigation specialists, and other DARCO technicians who are indirectly involved with the project. This training is directed toward the process of generation of technology, and the corresponding transference process.

d. Designing, planning and executing a working scheme to integrate the action of DARCO services and organization, in order to offer a complete service to the small farmer, and to implement the multidisciplinary effort demanded by the farming system research approach.

e. Consolidating a working methodology replicable in other areas in which DARCO has service duty.

For the implementation of activities, DARCO allocates a technical team including three research oriented agronomists, three extension oriented agronomists, and two field assistants. Additionally, an animal specialist works partial time in the area, and another agronomist devotes full time to water management under the advisorships of two experts from the national hydric resource agency.

The EEC/CATIE initial participation focused on the redefinition of some of the named specific objectives, the adoption of DARCO's field action methods to CATIE's farming system research methodology, and the preparation of a financial support proposal for the four years of the estimated project life. USAID was identified as the best possibility for financial support and the corresponding proposal is under study. The EEC/CATIE participation is in the training, and technical assistance items, although some very basic expenses are being covered in order to keep the project running.

As a result of these initial actions, a comparative methodological scheme was defined for direct implementation (Appendix E), and a cronogram of field activities was developed to organize all methodological phases and the corresponding training sessions required for the project personnel, and advisable for other DARCO technical staff members (Appendix F).

Execution of activities has been pursued according to the proposed schedule both in the field work, as well as in the training aspects. Some of the progress achieved in the implementation of the work plan will be summarized in the following section.

4.2. The Characterization Phase

As dictated by the methodology, the next activity after the area selection is the characterization of the area which is expected to provide static information at three different levels: the work area, the small farm within the area, and the specific production systems within the farm to which the research effort will be directed. To accomplish this phase, all known sources of secondary information were reviewed to be characterized at the area level, and a sample of 67 small farmers was drawn to obtain primary information at the farm and production systems levels. Some of the major aspects of the information analyzed in this phase is summarized as follows.

4.2.1. Main Characteristics at the Area Level

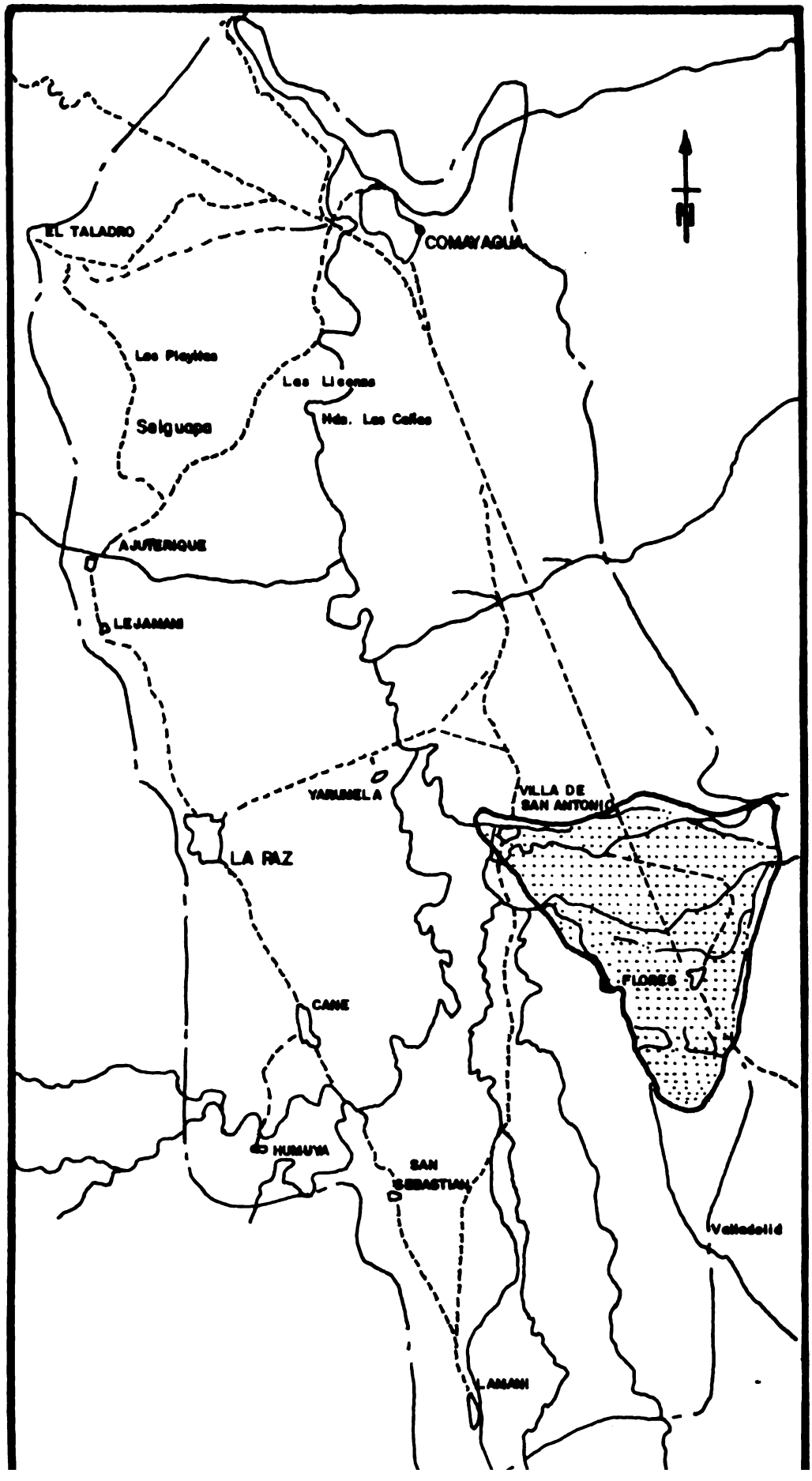
The area is situated in the Comayagua Valley in the east-central region of the country. It is divided into twelve counties which are mostly dedicated to agriculture and animal production exploitations (see Figure 5).

Las Flores has a tropical dry climate with an approximate annual rainfall of 900-1000 mm, and a relative moisture of 72%. It is topographically plane with slopes between 1 and 10%. Soils are not deep, and present acid tendencies range from light to medium (pH 6.0 to 6.5).

Total land area is 3643 ha., of which 504 belong to land reform settlements. Small and medium size farmers manage 92% of all farms, most of them with less than 20 has. (Appendix G). Most farmers are land owners (74%), and some add rented land to their own property (6%); less than 8% of the farmers are planting either loaned or rented land.

Most of arable land is devoted to annual crops which basically are staple grains and vegetables, for this area. Grassland represents approxi-

Figure 5. Location of the Flores working area.



mately 37% of total area, which is an indicator of the importance of the animal production in the area of this project. Average area by land use gives another indication of the farm size. As expected, land in pasture has a greater average area, which is consistent with the nature of the activity. The most frequent annual cropping systems are rice, maize followed by beans, sorghum and some vegetables in the areas in which irrigation is available (Appendix H).

As mentioned earlier, the Las Flores area has two irrigation districts (Flores and San Sebastián). Flores has a potential capacity of 12.5 millons of m^3 to irrigate 4000 has. San Sebastián has an irrigation capacity for 140 has, in which most land reform beneficiaries are settled. However, due to a major problem in the El Coyolar dam, and an apparent ill management of channels, actual irrigation capacity is less than 30% of the potential capacity. In addition, water management seems to be highly deficient at the farm level.

4.2.2. Main Characteristics at the Farm and Production System Levels

At the farm and production systems level, main characteristics correspond to present production technology which is the subject of the changes expected as a result of implementing the farming systems methodology. Tables included in Appendix I provide some indication of the farmer's own technology for both staple grains. In general, maize and beans are grown under technological patterns which can be improved in the short run with relatively few changes. This consideration is based on the farmer's input use and yields. Rice seems to be produced under a more elaborated technology which includes the use of chemical fertilizer, insecticides and herbicides.

There are some farmer research results obtained by the DARCO during past years of work in experiment stations and field plots in the Las Flores and other areas of the Comayagua Valley. Specifically, efforts to test new rice varieties have been made, and partial results show good characteristics and yields of ICA-La Libertad, CICA-8 (4480), and the lines P-896-4-12-2M-1B-1M, P-896-4-12-3-3-1B-1-4 and 1 R-36. These results, however, are partial and applicable only to areas with no irrigation. If the irrigation system is recovered, intensive field research for rice production under irrigation is needed.

Selection of maize genetic material with high tolerance to drought has been another research line during the last two years by the DARCO technical team. In 1981 the most promising results were obtained with the Honduras Amarillo 501 and Honduras Blanco 104 varieties, as compared against the native variety in three different sites. In 1982 the best fields were obtained with Comayagua RM-3 (5399 kg/ha) and PNIA RM-1 (5083 kg/ha) in the area of Palmerola. In the area of Playitas best yields correspond to Honduras Blanco 104 (3506 kg/ha), Honduras Blanco 103 (3227 kg/ha), and PNIA-RM-1 (3139 kg/ha).

Some field test with beans have included new varieties, insect control, and planting density under no irrigation conditions. Promising varieties are: Desarrural (2.56 Tm/ha), Comayagua (2.25 Tm/ha), and Acacia-4 (2.12 Tm/ha in 1981, and 0.88 Tm/ha in 1982).

4.3 Training and Field Activities

According to the working plan presented in Appendix F, training to the Las Flores technical team has been relatively intensive at the beginning of the project activities, as demanded by the farming system methodo-

logy, since field activities follow a pre-established order requiring a set of theoretical and analytical tools for successive execution.

Training has been provided during 1983 through the following short term courses:

1) Concepts and application of systems to farming; 2) Analysis and implementation of characterization of specific areas; 3) Elementary statistical analysis; 4) Applied economic analysis to farming system research. All courses were offered at the DARCO headquarters in Comayagua by the CATIE technical staff. It should be noted that the audience of these training courses includes national technicians who work for other DARCO projects in addition to the Las Flores technical team. Presently, one member of the Las Flores technical team is attending a three months course on farming system research being offered at CATIE headquarters in Turrialba.

Training for the designing of a technological alternative phase has been provided with two design meetings in which the Las Flores team, other DARCO staff, regional research and extension directors, and some members of CATIE staff have participated. The second of these meetings included one day of technical instruction in the areas of irrigation management and research in beans under conditions of irrigation, with the assistance of a consultant for irrigation.

After completion of primary information recording from farmers for the characterization at the farm and production system levels, and the first meeting for technical alternatives design, 37 on-farm research plots were established to study maize-beans and rice under different treatments.

These research trials are completing the biological cycle and will not be harvested before October-November according to farmers' own tradition.

In the second design meeting it was decided that six to ten experimental trials on beans will be planted during September, following farmers' generalized planting schedule. These experimental plots will include irrigation treatments, fertilization levels, and will continue planting density and varieties for irrigation conditions.

Finally, since the completion of the data recording for characterization, a farm record keeping activity, has been permanent in order to collect the basic data for a dynamic characterization and the follow up needed for the validation phase. This activity is performed by bi-weekly visits to each form to up-date record formats containing all farm input/output data, changes in human and animal inventories, and off-farm production activities.

4.4. Action Plans for Honduras

Plans for 1984 in the Las Flores project are already well defined as shown in Appendix F. These actions were planned according to the phase of the farming system methodology, and the training needs for each of those phases.

Provided that the required financial support will be available to the national institution in 1984, working plans could be implemented if the EEC/CATIE project time extension is agreed upon. However, the EEC/CATIE participation beyond 1984 is subject to further analysis since funds will not exist after that time.

Activities that will capture most of the effort in 1984 are on-farm research trials, and the farm record keeping and analysis. These two activities will provide a feed back network for the phase of designing technological alternatives. Complementary training will continue through direct field work participation, although a little formal training may be required.

5. Other Research Activities and Results

The in-field backing activities include some additional operations not only to directly assist the on-going work in the field, but to collaborate with other lines of the CPD, as demanded by the interaction of a multidisciplinary research team. These activities could be summarized in two groups: research in slug control, and analysis of a validation experience. Main results are briefly explain as follows:

5.1 Slug Control Research (Gastropoda pulmonata)

The presence of slugs (fillo mollusca: class Gastropida: sub-class pulmonata) has become a serious problem in Central America to common bean (Phaseolus vulgaris L.) production, which is a very popular staple grain for human consumption. Since the EEC/CATIE field activities in Nicaragua, El Salvador, and Honduras - as well as other CATIE projects - include beans as one of the principal components to the production systems under study, the need to learn about this type of slug and some strategies to protect bean fields brough about the initiation of action on this problem.

In collaboration with other CATIE projects, the EEC/CATIE project has devoted full time of a research assistant who works under the supervision of CATIE's senior entomologist. Their work has been focused on testing the repulsive effect of several plants due to their chemical content. Specifically the chemical properties contained in the seeds of Canavalia spp. and C. enformis (295-758) were tested. Results presented in Appendix J show no leaf or stalk loss in bean plants when extract of the seed of 18 cultivars of Canavalia ensiformis, and two cultivars of C. gladiata were used in a water solution. Low consumption of beans was detected with

cultivars 337078, 279593 and Playa Naranjo. In general, no significant difference was established among cultivars.

The farmer's promising results will continue to be studied in the laboratory conditions during 1984. Particularly, slugs classified as Diplosalenodes occidentale will be treated with seed extracts of Canavalia ensiformis, Nerium oleander (stalk-leaf), and Thevetia peruviana (leaf) to test control effectiveness under field conditions, at different concentration levels.

5.2 The Analysis of a Validation Experience

During 1980-1982, CATIE staff working in the development of the farming research methodology reached the point of implementing the validation phase. It was first tried with a very simple technological alternative developed to control weed and vegetation management in the humid lowlands of Costa Rica. This set of data is still under analysis directed to test the use of some analytical tools that might be suitable for the kind of theoretical analysis that farming system involves. Aspects related to the economic structure of production, biasness of the technological change, monitoring of farmers after validation to assess technological adoption, classification and profile of farmers by adoption of improved practices are some of the methodological and analytical questions to be answered by this type of analysis.

This activity does not receive all the time it deserves due to other duties already mentioned in this technical report. Nevertheless, progress has been achieved in applying some economic analysis, as well as common multivariate analytical instruments. Some technical papers have resulted from this exercise. Evaluation of technicians working in this area and facing the same type of analytical problems will be the final tests for

these procedure proposals.

6. Written Material During 1983

As results of the activities reported here, some written material has been produced either for internal consumption, as training material of as papers to be presented to the scientific community. The following list contains this material which can be requested from CATIE.

ESCOBAR, G. "La Fase de Validación Dentro del Proceso de Generación de Tecnología: Propuesta Metodológica". (The Validation Phase in the Process of Technology Generation: A Methodological Proposal). Turrialba, November, 1982. pp. 17.

ESCOBAR, G., and I. HERNANDEZ. "Criterios para el Análisis Económico Aplicado a la Investigación en Sistemas de Fincas" (Criteria for Applied Economic Analysis to Farming System Research). Turrialba, March 1983. Prepared for the Course "Economic Analysis in Research and Extension" in Comayaguá, Honduras. p. 37.

ICAZA, J. "Validación de dos Alternativas Tecnológicas en la Región de Estelí" (Validation of two Technological Alternatives in the Estelí Region). Paper presented at the XXIX Meeting of the PCCMCA. Panamá. April 1983.

HENAO, J., and G. ESCOBAR. "Definición de Estructuras de Población en Estudios de Areas para Investigación de Sistemas de Cultivo" (Population structure definition for cropping system research at the regional level). Paper presented at the XXIX meeting of the PCCMCA. Panamá. April 1983.

ESCOBAR, G., J. HENAO, and M. SHENK. "Adopción de Tecnología en Pequeñas Fincas de Costa Rica: perfiles y factores de predicción" (Adoption of technology by small farmers of Costa Rica: profile and prediction factors). Paper presented at the XXIX meeting of the PCCMCA. Panamá. April 1983.

ESCOBAR, G., and I. HERNANDEZ. "Análisis Económico en la Investigación de Sistemas de Producción. Aplicación y Conceptos Básicos (Economic Analysis for Production

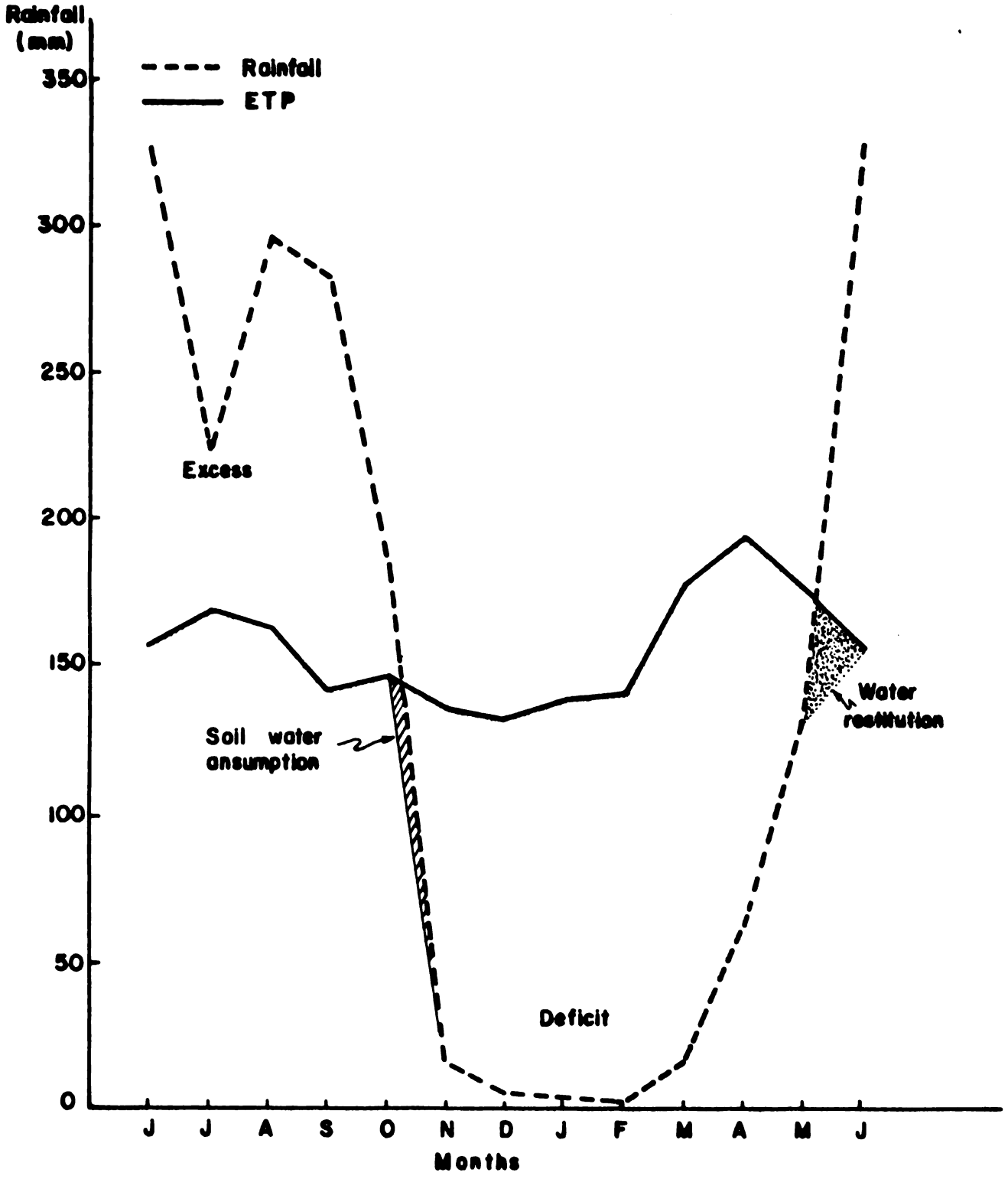
Systems. Application and basic concepts). Turrialba. Prepared for the Course "Research and Development of Technology for Crop Production Systems". Turrialba, August 22-November 26, 1983. pp. 60.

ESCOBAR, G., J. HENAO, and M. SHENK. "Assessing Adoption of Technology Among Small Farmers: Classification and Profile Analysis". Draft presently under discussion. p. 17.

APPENDIXES

APPENDIX A. USING THE CUMA FOR PRODUCTION PRACTICES

APPENDIX B. HIDRIC BALANCE FOR CANDELARIA DE LA FRONTERA

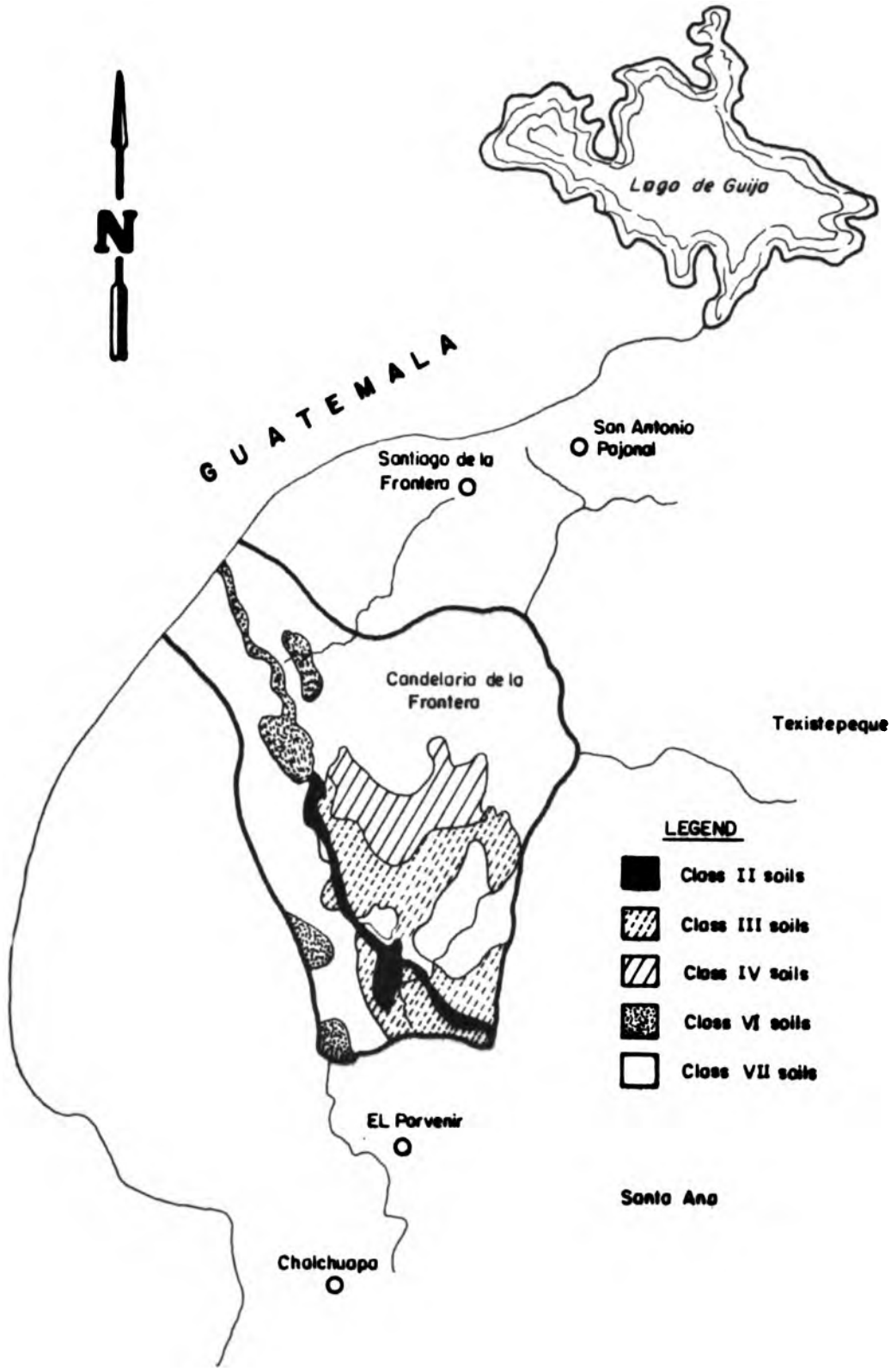


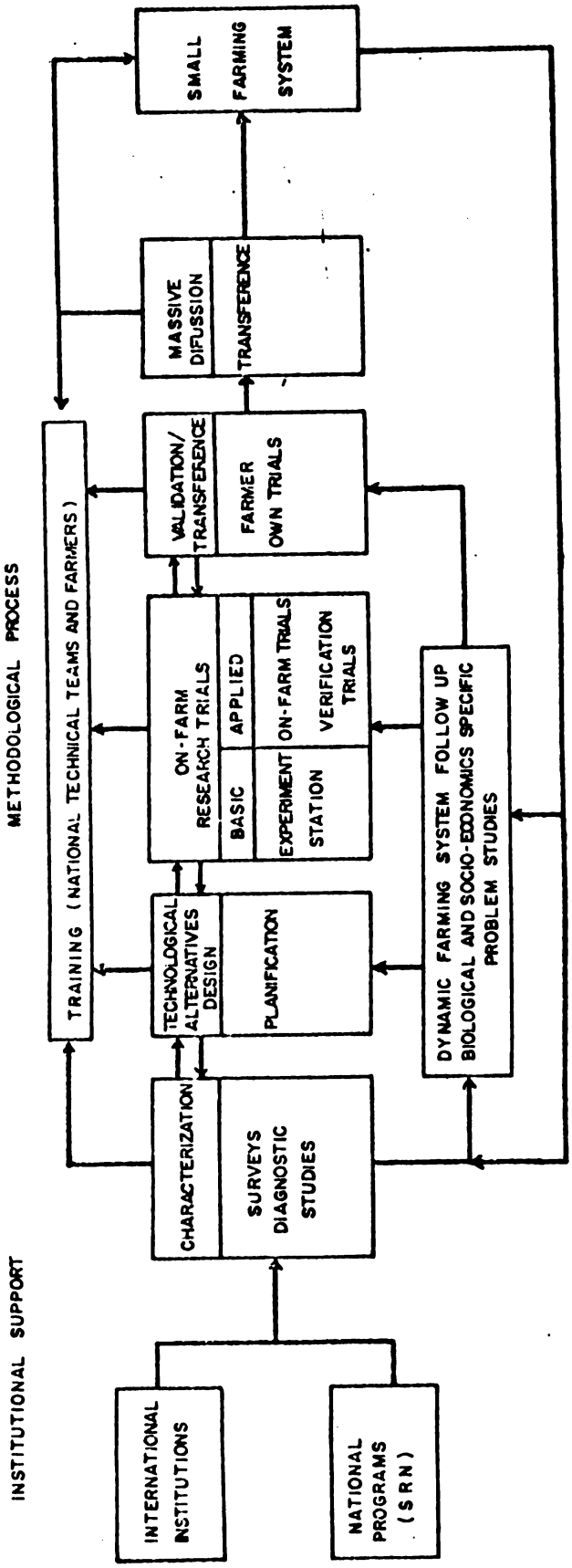
Appendix C: Agricultural land use and distribution of annual crops in the Candelaria de la Frontera area.

Land use	Area (has)	%
Annual crops	1899.5	19.9
Perennial crops	204.8	2.1
Natural pastures	5051.2	52.7
Improved pasture	205.7	2.1
Bushes	1749.6	18.2
Other uses	477.4	5.0
TOTAL	9588.2	100.0

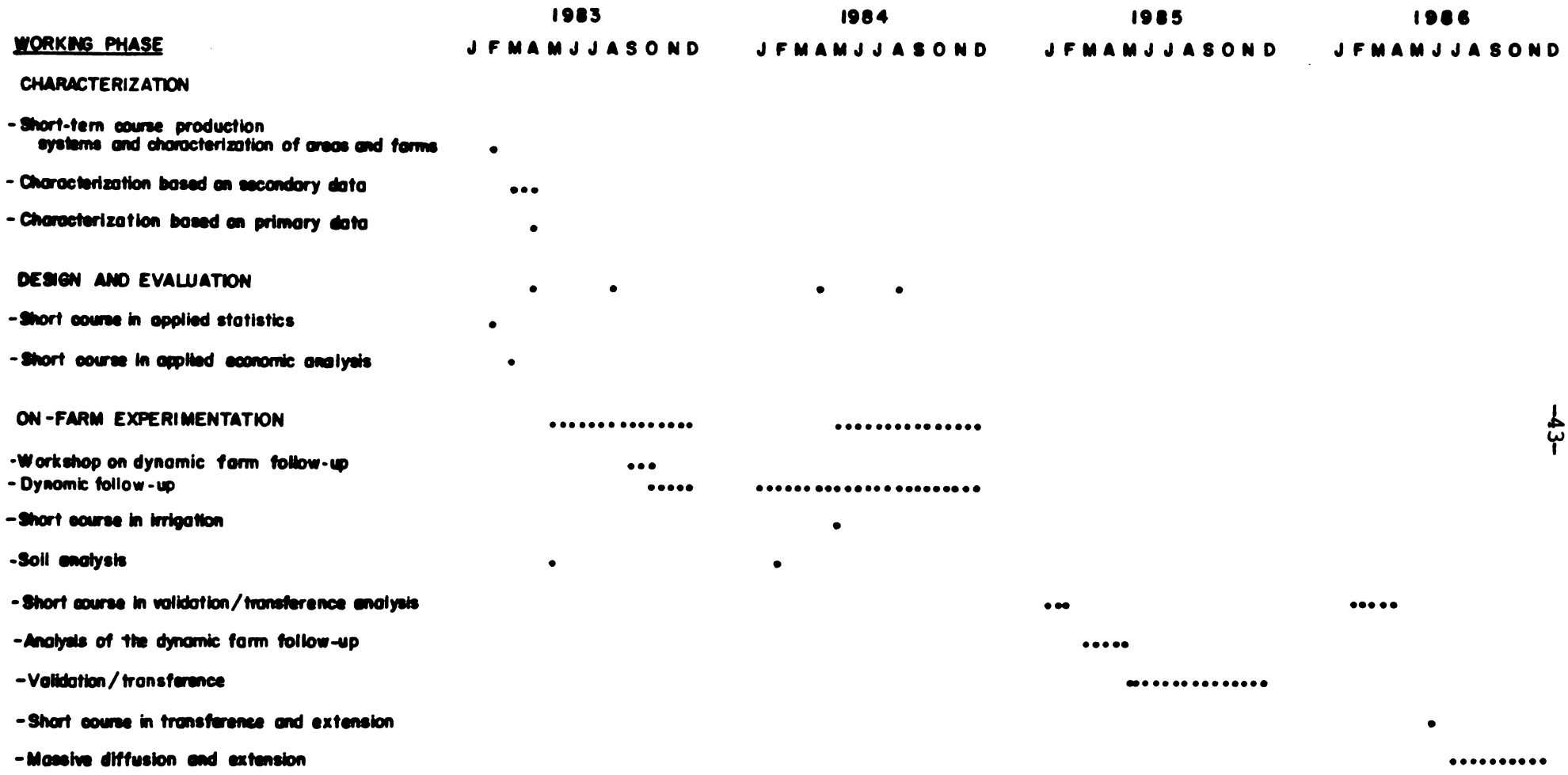
Annual crops	Area (has)	%	Total production Kg	Yield Kg/ha
Maize (hybrids)	829.2	43.7	2281543.0	2751.5
Maize (native)	212.2	11.3	346254.0	1631.7
Beans	69.4	3.6	60239.0	868.0
Rice	31.0	1.6	24795.7	799.8
Sorghum	9.8	0.5		
Multiple cropping	152.3	8.0		
Industrial crops	5.0	0.2		
Other annual crops	61.9	3.2		
Fallow	529.0	27.9		
TOTAL	1899.5	100.0		

APPENDIX D. SOIL USE CAPACITY IN CANDELARIA DE LA FRONTERA





Appendix E Methodologycal flow chart for farming system research for Las Flores pilot project. Honduras



Appendix F Cronogram of field activities for Las Flores Pilot Project, Honduras

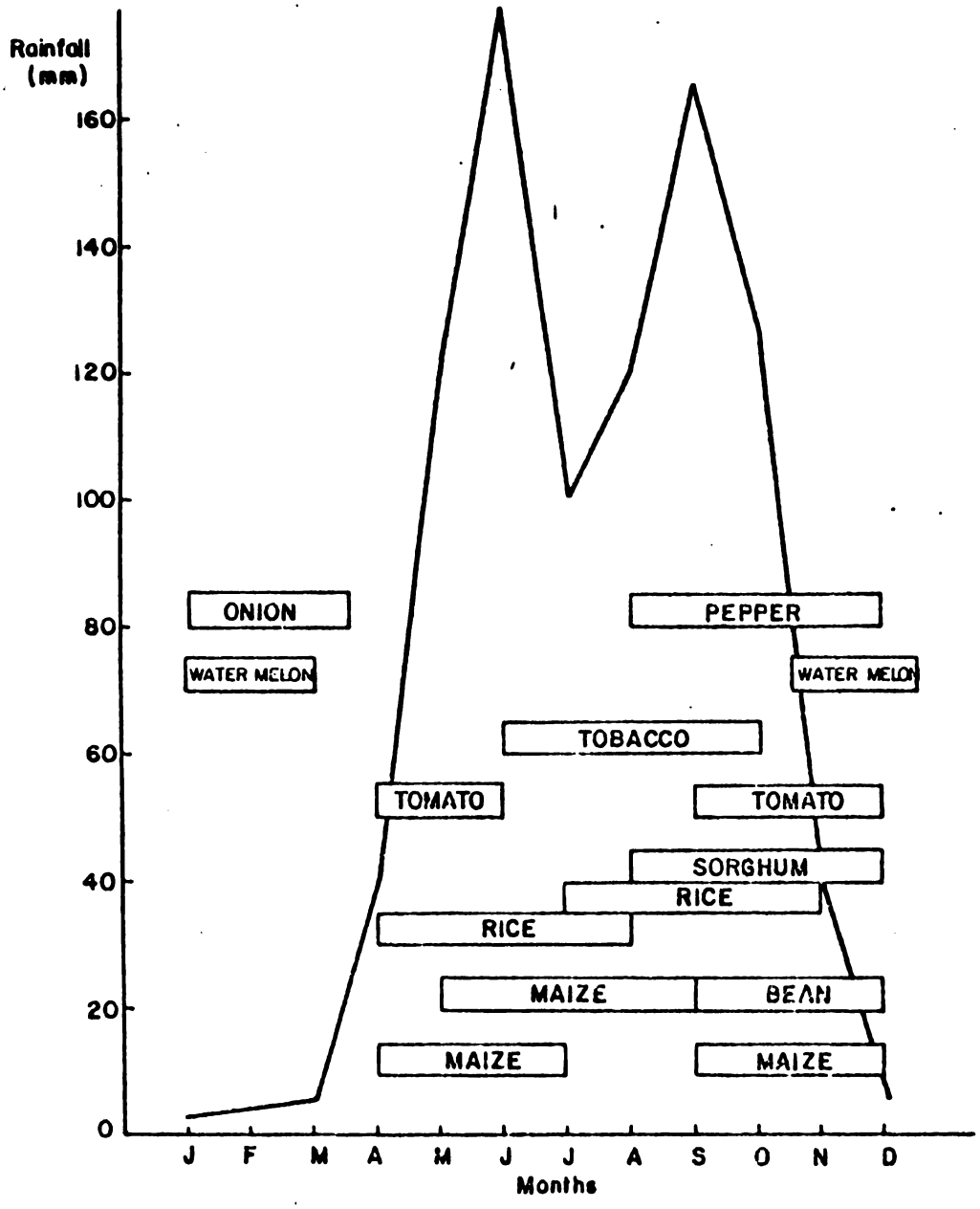
Appendix G: Land tenure and distribution in Las Flores area, Honduras.

Tenure	% of farms	Average size (has)
Land owners	73.9	6.5
Land owners + land renters	5.8	5.8
Land renters	1.5	2.1
Land owners + settlement	13.0	8.1
Land reform settlement	5.8	1.7

SOURCE: Direct survey. Characteristics phase.

Area intervals	Total land area	%	Cumulative (%)
Less than 1.0	15.8	0.7	0.7
1 - 4.9	265.7	11.1	11.8
5 - 9.9	299.9	12.5	24.3
10 - 14.9	111.7	4.7	29.0
15 - 19.9	182.4	7.6	36.6
20 - 24.9	112.0	4.7	41.3
25 - 29.9	167.3	7.0	48.3
30 - 39.9	146.3	6.1	54.4
40 - 49.9	273.7	11.4	65.8
50 - 59.9	-	-	65.8
60 - 69.9	70.0	2.9	68.7
70 - 79.9	-	-	68.7
80 - 89.9	-	-	68.7
90 - 99.9	98.0	4.1	72.8
Over 100.0	613.8	27.2	100.0
TOTAL	2396.6	100.0	-

APPENDIX H. CHRONOLOGICAL ARRANGEMENT OF THE MAIN CROPS ACCORDING TO PRECIPITATION AND USE OF LAND IN FLORES COMAYAGUA



Use	% of total area	Average extension (has)
Annual crops	52.5	3.6221
Pasture	37.29	8.0548
Perennial crops	2.02	0.7942
Fallow	4.45	2.4025
Bushes	2.1	1.81713
Other uses	1.64	1.7472

Fuente : Field Area Survey. march, 1983

Appendix I: Land preparation and input use for staple grains. Las Flores, Honduras.

Crop	Land preparation		Planting		Use of chemicals (%)				Yield (kg/ha)
	Mechanizaded	Oxtillage	Mechanizaded	Mannual	Fert.	Insect.	Fung.	Herb.	
Rice	92.3	7.7.	50	50	73.07	3.8	3.8	30.76	3442.0
Maize	74.37	25.37	-	100	41.79	17.91	1.49	-	1127.0
Beans	71.11	28.89		100	28.88	11.11	-	-	533.0

SOURCE: Field survey. March 1983.

Appendix J: Control of slugs Diplosolenodes occidentale with extracts of seed of 22 cultivars of Canavalia spp.

Cultivars	Leaves	% of consumed	
		Stems	Defoliation
181048	0	0	0
362194	0	0	0
358592	0	0	0
Cabiria	0	0	0
Honduras	0	0	0
364355	0	0	0
362193	0	0	0
1 HR-1	0	0	0
354916	0	0	0
164695	0	0	0
192975	0	0	0
311504	0	0	0
295758	0	0	0
338584	0	0	0
36146	0	0	0
337078	0	0	0
284789	0	0	0
297254	0	0	0
1 HR-2	0	0	0
752	0	0	0
279593	2.77	11.11	13.88
Playa Naranjo	15.27	11.11	15.27
Phaseolus vulgaris (check)	82.76	47.26	82.76

Means consumption in 3 replications after 96 hours.