MINAG

HILLSIDE AGRICULTURE SUB-PROJECT (HASP)

FARMING SYSTEMS RESEARCH AND EXTENSION APPROACH

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Jamaica, W.I.

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PREFACE

This paper is an attempt at sharing the experience the author has gained in Farming System Research/Extension (FSR/E) Methodology as applied in Jamaica with farmers, colleagues and other Agricultural Scientists, Extensionists and Policy-Decision Makers.

FSR/E methodology is not a rigid one but is flexible enough to be modified to the agricultural and institutional conditions existing in different countries and more importantly the farmer clientele who differ in their cultural settings and **goal sets**. Also, it is influenced by the objectives of both the donor and implementing agencies, the length and budget of the programme and more specifically, the views and style of the implementers in the field of assisting small farmers in achieving their objectives.

This paper describes FSR/E Strategy as applied in the Hillside Agriculture Sub-Project being implemented by Research and Development Division of the Ministry of Agriculture with technical assistance from the Inter-American Institute for Cooperation on Agriculture (IICA) in Jamaica.

Section 1 of this paper provides definitions of the Farming Systems and this is followed by a brief outline of the role FSR/E should play in the country's research programme.

Section 2, a general description of the FSR/E programme is given outlining the various stages involved - Diagnosis, Planning/Design, Experimentation, Assessment and Recommendation. This is supported by diagnostic representation of the FSR/E programme outlining the information flow between institutions involved in policy decisions, experiment stations and the on-farm research programme.

In Section 3, there is a detailed description of the FSR/E programme as employed in the Hillside Agriculture Sub-Project, and here I have attempted to highlight how all the components are linked to the farmer groups - Farmers Action Committee Teams (FACTs) which forms the nucleus around which the programme revolves. Emphasis is placed on strong institutional linkages with farmers participation at all levels.

The final section of this paper comprises of supplementary material, primarily, a Project Area Map, an organogram of the MINAG/IICA Sub-Project as well as a glossary of the technical terms in the appendices.

COLLABORATING FARMERS

Collaborating farmers are thinking human-beings. They know the characteristics of their land better than the technician; they have worked it for many years. They are proud and have self-esteem. They are pragmatic: if they invest in their land they expect tangible results so much the better if obtained in the short-run. They keep using "wrong" practices which they believe in although it may be difficult to determine the source of their beliefs. They do not like to waste time. They are appreciative and hospitable. They are sure to obtain better results than the researchers if both use limited resources. They perform various activities in the cropping cycle according to the phases of the moon. To be polite, they may indicate understanding what they have not understood. They are interested, more than anything else, in their current crop or crops. They want to show us how much they know, and they know a lot. They like to ride in cars. They do not bother talking about things that do not relate to agriculture. Their income and education are low.

For these and other reasons:

1. Let's not try to make mistakes either in or beyond their presence.

2. We must not lie to them.

3. Let us be punctual.

4. Let us respect their point of view.

5. Let us not take advantage of their oversights or lack of knowledge.

6. Let us talk less and work more.

7. Let us make them participants in our activities and help them understand what we are doing.

8. We should repeat what they have not understood until they really do understand.

9. Let us treat them as friends.

10. They have a great deal to teach. Let us learn from them.

Lee Roy Gillespie
Translated and adopted from Noticta
November 1978
ICTA, Guatemala.

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I am also very grateful for the support I have had from my colleagues while working as an Agronomist on the Cropping Systems Project and now as a Coordinator on the Hillside Agriculture Sub-Project. Finally, to Colleen Salmon and Maureen Machado who typed and re-typed more drafts than they care to remember.

Thank you all.

PART I

DEFINITION OF FARMING SYSTEMS RESEARCH/EXTENSION

1. Background

The Hillside Agriculture Sub-Project (HASP) is aimed at promoting the growth of perennial tree crops on hillsides and to increase the socio-economic well-being of the farmers of the Northern Rio Cobre watershed area.

HASP is a four year project during which time it will seek to develop economically viable production systems, improve watershed management practices, and farmer organizations which support production and marketing activities.

Selected technologies developed in Jamaica and elsewhere will be tested alongside farmers' practices on their farms. These will include inter-cropping systems and soil conservation measures using a Farming Systems' Research Methodology.

2. Introduction

Over the years, many farmers in developing countries have been exposed to new and improved technologies. However, few farmers are following in their entirety, if any at all, the recommendations made by researchers and extension workers. If and when some farmers do adopt, the adoption rate seems very slow. Why is this so? has been the subject of enquiry for Agricultural Scientists, Researchers, Extensionists and Policy Makers. Some time after the life of a project or Agricultural programme has ended, it is observed that farmers revert to their traditional system of production. Some argue that farmers are at fault, some that extension is ineffective, others that credit arrangements are unsuitable, and some that inputs are not available in a timely way. A less frequently heard explanation is that the recommended technologies themselves are simply not appropriate to farmers. Another explanation is that the goals and objectives of the project or programme are not compatible with the goal sets of the target group (small Farmers) and if they are, the means by which or the path taken to achieve these goals are not appropriate to the low resource environment the farmers have to operate in. For instance, the goal of securing adequate food for family consumption may act as a constraint to the adoption of improved, non-food cash crop practices. It is the linkages and trade-offs between these two sets of goals that have often been misunderstood in past development programmes for small farmers.

In order to help small farmers, one has to first develop an understanding of the farming systems of that particular farmer or farmers who share similar social, economic, environmental and biological conditions, therefore, having similar constraints, which limit production or productivity. Only then should one attempt to develop appropriate technologies that are functional within the low resource environment in which small farmers exist to address these constraints.

3. What is Farming Systems?

It is a unique reasonably stable arrangement of Farming Enterprises that the household manages according to well defined practices in response to the physical, biological and socio-economic environments and in accordance with the household's goals, preferences and resources [1](Shaner et al).

The Farming Systems Research and Extension methodology is an approach to agricultural research and development that views the whole farm as a system and focuses on: (i) the inter-dependence between the components under the control of members of the household, and (ii) how these components interacts with the physical, biological and socio-economic setting not under the household's control.

Farming Systems are defined by their physical, biological and socio-economic setting and by the farm family's goals and other attributes, access to resources, choice of production activities and management practices. [2](Shaner et al).

The Farming Systems Research/Extension approach should not be seen as an attempt to replace conventional research but as a means to complement it. Experiment stations are primarily aimed at developing new technological components such as new breeds or varieties and the screening of new technologies, which require a controlled environment. On the other hand, technological components arising out of experiment stations may be further refined, screened, and evaluated in on-farm experiments for their appropriateness to farmers.

The flow of information between on-farm research and research stations is a two-way system in that information generated by on-farm research is important for guiding experiment stations research. For example, information on farmers' circumstances and from on-farm experiments may provide guidance to the research station on the type or variety that performs well under farmers conditions and that conforms to farmers preferences for maturity, yield, taste and storage quality.

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[1] *Farming Systems Support Project. (1987), "Diagnosis in Farming Systems Research/Extension". Volume 1 (page 1) Farming Systems Support Project (International Programme IFAS, University of Florida).*

[2] *Idem Volume 1 (page 1)*

PART II

DESCRIPTION OF THE FARMING SYSTEM RESEARCH/EXTENSION STAGES

The various components of Farming Systems Research and Extension (FSR/E is not really new to Jamaica but the methodology) is a deliberate approach at organizing the various components of research and extension in a sequential and structured way to ensure the development of appropriate technology for small farmers.

The FSR/E methodology employed by the Ministry of Agriculture/Inter-American Institute for Cooperation on Agriculture (MINAG/IICA) Hillside Agriculture Sub-Project (HASP) involves five stages:-

(i) Diagnosis
(ii) Planning/Design
(iii) Experimentation
(iv) Assessment
(v) Recommendation

1. Diagnostic Stage

This stage usually consists of two steps. The first is the review of literature, i.e., agricultural production systems, existing research results, recommendations, meteorological data, input delivery structures, and other infrastructure in the project area. The second step is to determine the needs and production constraints or problems of the farm family and a thorough understanding of their farming systems, the biological, physical and socio-economic environment within which the farm family operates.

This assessment is determined through various methods of informal, formal, quantitative and qualitative data collection procedures. Diagnosis has often included more formalized surveys for data gathering. However, recent trends are towards informal methods with complementary and focused formal surveys to verify informal results or to explore in greater details some particular aspect of the farming system. The diagnosis does not take place only at the beginning of the FSR/E programme, but is continually carried out to monitor on-farm experimentation, gather new information, conduct evaluations, assess impact, or generate new research directions.

2. Planning/Design Stage

In the Planning/Design Stage, the information gathered during the diagnostic stage is analyzed. Farmers are grouped into homogeneous groups called "recommendation domains" according to various characteristics and problems common to the domain and therefore having solutions which are common to the group.

This approach is suggested considering the impossibility to deal with all farmers individually with the limited resources available. Problems identified during the diagnostic stages are prioritized often using a process called 'ex-ante analysis'. (Mutsaers, 1984) Strategies are then developed to overcome the priority problems, and an on-farm research programme is designed in order to research problems for which no immediate solutions are available for testing on farms.

FSR/E, in principle, tries to introduce changes primarily at the farm level. Agricultural production is often constrained by factors at other levels, such as the transportation system, input supply infrastructure, roads, irrigation and pricing structures. The design stage can therefore include the development of a system whereby problems identified, which are beyond the scope of programme or project, are made known to other research or development agencies or to the appropriate Government Ministry for them to address. Such a system has been established in the MINAG/IICA Hillside Agriculture Sub-Project, where farmers have been organized into groups at each local village within the project area.

When farmers voice their problems at meetings, and the potential solution is beyond the scope of the project, the appropriate resource person from the relevant agency is invited to address the farmers on these issues.

3. Experimentation Stage

Following the Planning/Design Stage, is the setting up of the experiments in the farmer's field to formulate improved technologies under farmer's conditions which are appropriate and therefore adaptable by farmers. The design of these experiments should be simple so that farmers will be able to understand and manage them with less supervision during the verification and evaluation stages. In an experiment, one or more treatments are developed according to the potential solutions defined to address those problems identified during the diagnostic stage. These treatments are compared to the farmers' agronomic practices which is the control plot in a replicate in any one experiment.

4. Assessment Stage.

At this stage, the results of the on-farm experiments are assessed. There are several elements in such an assessment. First, researchers and extensionist discuss the results with the farmers to get their opinions of the treatments. Second, the experiment results must be subjected to both an agronomic evaluation and a statistical analysis. Finally, an economic analysis is essential. This assessment aids researchers to evaluate the results from the farmers' view-point and to decide which treatment merit further investigation and which recommendations can be made to farmers.

As mentioned earlier, diagnosis is not only conducted at the beginning of the FSR/E programme but is a continuous process to further provide information to refine the experiments and generate new research directions. A socio-economic assessment of the FSR/E activities is needed to evaluate the impact of the interventions on the target area. This is in regard to changes in attitudes, productivity, cultural practices, cash flow, living standards of participating farmers and non-participating farmers who benefitted indirectly through the diffusion effect.

5. Promotion/Recommendation Stage

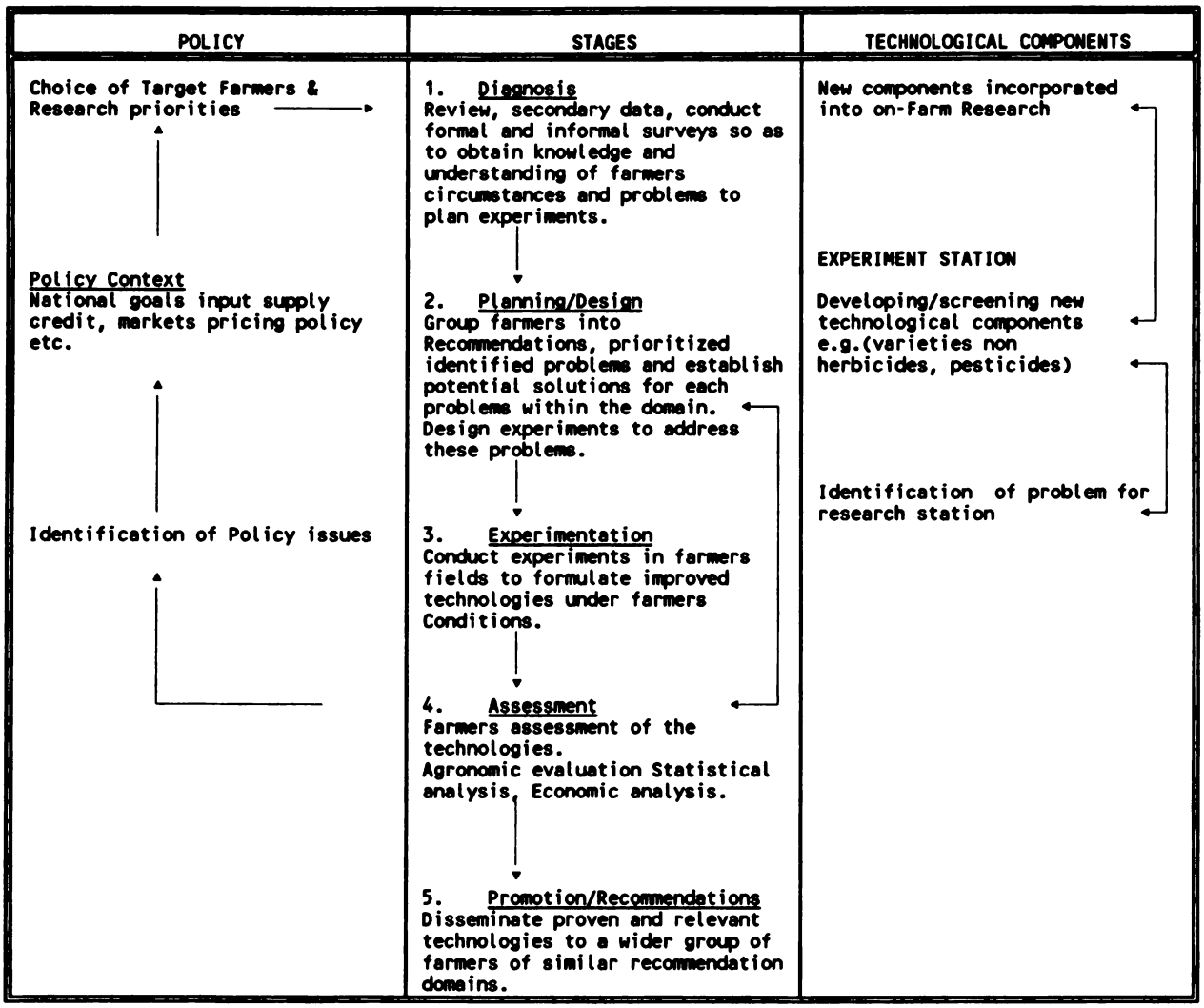
The fifth stage in the FSR/E process is the dissemination of relevant results to a wider group of households in similar recommendation domains via extension and other communication systems.

The dissemination process should only start when participating farmers begin to accept or adopt the technologies and when they begin paying for the cost of inputs and bearing the risk of the interventions. The wealth of information gathered through this programme is relevant not only to farmers but to research stations, other researchers, extensionists and to policy and decision makers for guidance in future agricultural programmes.

In the following diagram, there is a flow chart of the FSR/E methodology which illustrates the different stages and inter-relationships.

FARMING SYSTEM RESEARCH AND EXTENSION PROGRAMME

Stage of On-Farm Research Programme



PART III

FARMING SYSTEMS RESEARCH AND EXTENSION APPROACH IN HASP

1. Introduction

For many years, the small farmer in Jamaica has become accustomed to agricultural projects which offer some form of cash incentives for their participation in projects. It is observed by researchers, extensionists and policy makers that as soon as the project ends, funding ceases and the extension pressure is removed, farmers cease to employ the improved technologies they have been exposed to during the life of the project. This raises concerns regarding continuity. It may be explained in terms of farmers seeing these cash incentive programmes as a source of additional income rather than facilitating the adoption of new technologies, thereby improving productivity and income for their own long term benefit.

In the FSR/E approach, great emphasis is placed on continuity. The strategy is focused on attitudinal changes of the small farmers where the farm is seen and operated as a business, and its profitability can be increased through the employment of new and improved technology. The approach is not to embark upon a drastic change of the existing farming system which could result in rejection and failure due to cultural and social implications. The emphasis is to improve on the components of the existing farming system by developing technologies to overcome some of the constraints to improve productivity. To achieve this outcome, one of the basic steps is to elicit participation of the farmer from the Planning through to the Implementing stage and even through to the Evaluation and Recommendation stages.

2. Data Base Initiation

The FSR/E approach in HASP began with the review of existing literature and information of the project area. This was complemented by a Rapid Rural Appraisal (Sondeo) of the project area conducted by project staff. The information gathered during the sondeo along with the information gathered through the research of secondary data provided a description of the existing farming systems of the area. This highlighted the problems and constraints of the system, and from it a project proposal was written describing the strategies to be employed in addressing some of the constraints identified through the development of improved technologies which are environmentally friendly.

During the Rapid Rural Appraisal, farmers were sensitized to the possibility of a project aimed at addressing some of their problems highlighted during the interviews and those observed on the farms during the Reconnaissance Survey. This was followed up some months later with the organizing of meetings in the local villages, where farmers were informed about the project. At these meetings they were told about the benefits to be derived

from the programme and the strategies that will be employed; one of which was to get themselves organized into groups called FACTs (Farmers Action Committee Teams). This was the beginning of soliciting farmers participation in the project from the Planning and Implementing stages. By so doing, farmers would see the project as their own thereby beginning the process to ensure sustainability beyond the life of the project.

3. Institutional Cooperation (Institutional Linkages)

Another strategy of the project is to have the participation of other institutions to enhance the delivery of services to farmers. By so doing, the project is able to address some of the problems outlined by farmers during the Rapid Rural Appraisal (such as, lack of inputs, planting material, ignorance concerning location of these inputs, high transportation cost to bring these inputs into the communities, lack of technical advice among others).

Some of the institutions involved are:

- Ministry of Agriculture (MINAG)
- Coffee Industry Board
- Jamaica Agricultural Society (JAS)
- Coconut Industry Board
- Jamaica Pimento Association
- Agricultural Credit Bank (ACB)
- Rural Agricultural Development Authority (RADA)

Advisory Committee

The process of institutional linkages has been further strengthened through the organizing of an Advisory Committee. This comprises of a representative from each of the Commodity Boards, JAS, RADA, Research & Development Division - MINAG, Agricultural Credit Bank, IICA, USAID and the Jamaica Pimento Association. The project's objectives and goals are outlined and a mutual understanding about the expectations and responsibility of the participating institutions were arrived at. Meetings were called on a regular basis to offer advice and guidance in refining the interventions implemented on farmers' holdings.

Collaboration is also being established at the local level through RADA Extension Officers, JAS Field Officers and Commodity Boards Extension Officers operating in the project area. In so doing, the field staff of these institutions would be intimately involved in field activities alongside project staff and farmers, so that at the end of the project they could continue to service the farmers. This contributes to a smooth transition of responsibilities from project staff to extension personnel and aids in the sustainability and continuity of the program by existing institutions.

Another strategy of enhance continuity is that the project field staff has established offices at the Linstead RADA Office thereby integrating with RADA staff. To further strengthen these linkages it is intended that project staff will share offices with RADA Extension Officers where they are located in the project area so that farmers will see RADA Extension Officers in the same light as the project staff.

4. Implementation

The Research and Development Division (R&DD) of the Ministry of Agriculture (MINAG) is responsible for the management of the project execution in the field, and IICA is responsible for the administration of project funds and to provide technical and monitoring assistance to R&DD.

Thirteen sub-project personnel have been recruited to implement the project on behalf of MINAG. Five of these staff members occupy offices at the Ministry of Agriculture Head Office and these comprise the Sub-project Coordinator, a Secretary, a Rural Development Officer, Agricultural Economist, and a Plant Protection Officer. Six other staff members are placed at the local RADA office in Linstead which services the project area. The six staff members which are the field team members comprise of the three Agronomists and three Assistant Agronomist. The project area is divided administratively into three areas one of which is the responsibility of an agronomist and his assistant. The other two sub-project personnel are based at the IICA office, and these are the Administrative Assistant and a Technical Coordinator. (an organogram of MINAG/IICA Hillside Agriculture Sub-Project can be found in the appendices).

The Sub-project team is structured to have a multi-disciplinary approach in the execution of the project. The strategy to recruit personnel to implement the project on behalf of MINAG and to have some of the staff occupying offices at the Ministry is to:

(i) ensure institutional strengthening

(ii) have the Farming Systems Research/Extension methodology institutionalized within the organizational structure of MINAG.

(iii) ensure sustainability at the farm level.

It should be noted that all equipment, vehicles and supplies purchased by the project are the property of MINAG and therefore at the end of the project, the Ministry will have these assets to continue the programme. Also, researchers and extension personnel from other agricultural agencies would have gained experience in the FSR/E approach through in-house training and participation at the field level. Therefore, the Ministry would have resource people to continue the programme after project funding has ended.

5. Training of Project Staff

During the first few weeks of implementation, the project staff participated in fort-nightly seminars on Farming Systems Research/Extension methodology. This gave each member an insight of the part he or she would have to play in the FSR/E Methodology and how important each role is in the multi-disciplinary approach in the execution of the project.

The project team has been encouraged to indicate the areas of their training needs and resource personnel is brought in to conduct these training activities. In addition to this, whenever overseas short-term training is identified, which is relevant to the various disciplines of the project staff, every effort is made to sponsor team members to attend.

6. Farming Systems Research & Extension Programme in HASP

As discussed earlier, there are five major stages involved in the FSR/E approach employed in the execution of the MINAG/IICA Hillside Sub-project.

(1) Diagnostic
(2) Planning/Design
(3) Experimentation
(4) Assessment/Evaluation
(5) Promotion/Recommendation

6.1 Diagnostic Stage

A Reconnaissance Survey of the project area was carried out by staff members to familiarize themselves with the terrain, meet farmers and to ascertain the boundaries of the project area. During these visits, the team began eliciting the participation of farmers in the project. From the Reconnaissance Survey, 15 local villages were identified and it was decided to form a farmers group in each of the local villages as against the original plan of three FACT groups for the entire project area.

The advantage of having a group formed in each local village is to reduce the distance farmers would have travel to attend meetings. Another advantage is that problems aired by farmers are more homogeneous within a group thereby making it easier to be dealt with by the project, in other words, this arrangement ensures that the less developed villages are represented and not lost in the priorities of the more established ones.

6.1.1 Farmers Action Committee Teams (FACTs)

Getting framers organized into groups (FACTs) was a deliberate attempt by the project to facilitate the empowerment of the farming community of the project area. This sets the stage for effective representation where farmers needs and problems are made known to the relevant authorities so as to effect policy changes and evoke actions.

6.1.2 Executive Committee

Members of each group are responsible for the selection of its Executive Committee which comprises of a President, Vice President, Secretary/Treasurer, and an Assistant Secretary/ Treasurer. The executive members within each FACT group form our **Local Management Committee (LMC).**

This structure was later changed as the LMC membership was too large and prompt decision was difficult to come by. The new arrangement was to have a representative from the executive committee of each of the 13 groups coming together form the LMC which now comprises of 13 members.

The Executive Committee of each FACT group is responsible for the nomination of farmers on whose farm experimental and rehabilitation work is carried out. Farmers are nominated on a phased basis and those farmers not selected in the first phase will in the meantime benefit from other programmes established in the FACTs.

It should be noted that final selection of the farms for experimental and rehabilitation work is the responsibility of the project staff.

6.1.3 Group Formation

The dates and venues of the first set of meetings to be held in each local village were advertised locally through schools, churches, bars, community leaders and those farmers the project staff met along the way. At these meetings the project team outlined the importance of farmers organizing themselves into groups. This would increase their bargaining power and improve the chances of their voices being heard by the relevant authorities in addressing some of the constraints they are facing.

The objectives of the project were also discussed at these meetings, in addition to how the project activities would be executed and the farmers' responsibilities to the project in order to achieve the desired results. Farmers were told to organize themselves and arrange another meeting for the selection of the executive officers and a draft of the constitution of the group would be drawn up and discussed with them at this meeting.

6.1.4 Nomination/Selection of Beneficiaries (Farmers)

The executive officers selected by the members of the FACT are responsible for the nomination of farmers as beneficiaries of the project. The final decision of selection of any farmer for on-farm trials is the responsibility of both the project team and the executive committee. A number of criteria have to be met by the farmers before he/she is assessed for selection.

These criteria are:

(i) Land Tenure

It is desirous that the farmer owns the land or there is some level of stability in terms of family ownership or long lease arrangement. This ensures that there is no outside interference during the establishment and maintenance of experiments or rehabilitation trials. This criteria helps to ensure that the sub-project has research results and production data for evaluation.

(ii) Age

Farmers should be able to provide or contribute 25 per cent of the labour required to prepare his farm for intervention and be able to provide all the labour required for maintenance of the on-farm trials.

(iii) Health of Nominee

Farmers should be in good health to be able to manage and maintain the on-farm trials so that he himself is involved in the development of correct attitudes in managing his/her farm and also to ensure the adoption of the improved technology.

(iv) Membership in FACT

In order to encourage farmers to organize themselves into groups and to work together, the project provides benefits through the FACTs and not to individuals outside of the group. Therefore, only members of the FACT group can benefit from the project.

(v) Condition of FARM

The strategy here is to select those farms which are in bad condition, where the impact of the intervention would be more pronounced as against those farms which are in fairly good condition as a result of employing proper cultural practices and therefore has very little room for improvement.

(vi) Participants

Only those farmers who are willing to provide or contribute 25% of the labour cost required for preparing the land for the establishment of the on-farm trails and who are willing to maintain these trials are selected after meeting all the other criteria.

6.1.5 FACT Meetings

FACT meetings are held on a regular basis where members of the project staff are present. At these meetings farmers voice their problems and constraints, some of which cannot be addressed by the project. However, these problems are noted and resources persons from other relevant agencies are brought in to address some of these problems. Also at these meetings, requests are made for the type of training they need to improve their competence or skills in various cultural practices in managing and maintaining their farms.

The problems voiced at these meetings are noted and evaluated by the project staff and this information is used to refine and develop interventions to overcome some of the limiting factors to higher productivity of farmers on hillsides.

Once every three months members of the executive committee within each FACT group meet as one group to discuss and evaluate the project. This group is referred to as the Local Management Committee (LMC) and at these meetings the concerns of all the FACT groups are represented and discussed with the Project Management Team.

Data Base Initiation

In addition to the Rapid Rural Appraisal done prior to the implementation of the project in the field, three surveys were conducted to gather information about the project area, the farmers and their farming system.

6.1.6 Informal Survey

This survey was conducted during the first few weeks of the Sub-project implementation in the field. The data collected focussed on cultural practices, land utilization, major crops, marketing, membership in farming organizations, constraints to farmers and willingness to contribute time and labour to the project.

During the Initial stage any farmer met by the project staff were interviewed for the purpose of collecting data to capture what the farming situation was in the project area before any intervention occurred. This strategy was essential as the machinery for the Baseline Survey was not in place, so the informal survey served the purpose temporarily. The informal survey

continued even after the Baseline Survey was completed but only those farmers selected for intervention are interviewed as some of the selectees are not included in the sample frame for the Baseline Survey.

The information gathered in the Informal Survey along with the Baseline Survey will be useful when assessing the impact of the intervention of farmers. The findings of this survey are used to formulate the factors for use in the Baseline Survey, and variables for analysis, as well as to provide information for developing interventions and refining those already established from the Rapid Rural Appraisal conducted before project implementation.

6.1.7. Farmers' Register

A register of the farmers within the project area was compiled. This records the name, location, size, land utilization and number of parcels being operated by the farmer. This register is constantly being up-dated during the project life.

The Farmers' Register is used as a sampling frame from which the respondents for the Baseline Survey were chosen.

6.1.8 Baseline Survey

This survey was conducted after the completion of the Farmers' Register. The Baseline Survey along with the Farmers' Register will be analyzed to provide the base data of the existing farming system before intervention. This data along with the informal survey data will provide the baseline from which the impact of the project can be assessed.

6.2 **Planning/Design Stage**

At this stage, the information from the diagnosis is used in planning an experimental research programme. This includes setting up experiments in farmers' fields to formulate improved technologies under farmers conditions.

It should be noted that the Diagnostic stage does not end with the beginning of the Planning stage, but continues throughout the programme where information on the project area, the farmer and his household, and the farming system is continuously being gathered and monitored, for refining interventions and future experimental research programmes.

A series of decisions must be taken at this stage in planning on-farm experimental programmes. First, it must be determined if farmers in the region are sufficiently alike to allow a common set of experiments and a common recommendation. If there are significant differences among farmers, a division of farmers into more homogeneous groups and the designing of experiments for each group is desirable. It is then decided what problems are going to be investigated and which technological components will be included in the experimentation, the levels, timing and type of inputs or practice to be chosen.

6.2.1 Selection of Experimental Sites

The field team, after receiving from the FACTs the list of names of farmers (nominees) on whose farms experiments will be conducted, visit each farm to evaluate the situation to ascertain whether the farm or site meets all the criteria for selection, and to determine the crop and type of intervention the farmer is interested in.

After careful evaluation of the site, the experiment is designed to fit the actual site and the plan, layout and experimentation is discussed with farmers so that he understands what is being done and feels integrated into the programme. These experiments are designed simply for the farmer to understand what is taking place and to facilitate him following the developments of the components (treatments) being tested against his. It is important that the farmer recognises that he has a stake in all this and even more importantly, that he is made to feel that the research programme is really his.

6.2.2 Weaning Process Farmers

The farmer is reminded that during the experimentation he will be taken through three stages and as he progresses his responsibilities will increase. This strategy is designed to take farmers through a weaning process. At the end it is expected that the farmer would have gained competence and confidence in operating and financing his farm activities at a higher management level and that it will be sustained.

These stages are:-

1. Project Managed/Project Financed
2. Farmer Managed/Project Financed
3. Farmer Managed/Farmer Financed

1. Project Managed/Project Financed

During this phase, the field team manages the trials and this involves close monitoring and supervision of all the activities involved in establishing and maintaining the tree crop experiments. These activities are carried out by the farmer himself under the supervision of the Agronomist. The cost of all seedlings and inputs are borne by the project.

At the end of a year, when the tree crops are established and the farmer has participated in the maintenance activities where it is now a routine operation, the farmer would be ready to move into the second phase of the weaning process. It should be noted that not all farmers will be ready one year after the planting out of the tree crops to go to the next phase; therefore, on recommendation from the field team, those farmers who are ready will be allowed to participate in a workshop and then phased into the second stage.

2. Farmer Managed/Project Financed

At this stage, the activities of the tree crop experiments are confined to maintenance and data collection. This leaves the field team with more time to begin work on a new set of selectees, and the farmer to take up more responsibility for maintaining the plot. At this stage, from his experience and the reinforcement of this knowledge in the workshop, the farmer would request at the correct time, the type and amount of inputs he needs from the field team who would provide such and monitor their application to the experiments.

3. Farmer Managed/Farmer Financed

The farmer will be phased into this stage when the tree crops come into bearing and start to provide an income to the farmer. The field team at this stage will continue to monitor all the operations of the experiments and continue to collect data.

It is expected that at the end of this stage the farmer would have gained competence and confidence in operating his farm at this higher management level and that this will be sustained.

6.3 Experimentation

On-farm experimentation involves the development of technological methodologies from a comparative perspective employing three methods.

1. Farmers Method (control)
2. Improved Method (off-the-shelf technology packages from commodity boards and other agricultural agencies)
3. Alternative Methods (developed from literature reviews)

Comparison will be made on the basis of yield per acre, improved quality (marketable yield), inputs costs, labour requirements, etc.

In establishing these tree crop experiments, the farmers are asked to provide 25% of the cost of labour in preparing the land and the project provides 75%. The farmer is responsible for providing the labour for maintaining crops throughout the project life. These experiments are closely monitored by project staff and data collected by the Economist and Agronomist.

6.3.1 Establishment Trials

All the experiments which involve tree crop establishment are laid out in a complete randomized block design with the blocks arrange along the contour and across the slope. On all farms with establishment trials, there are at least three replicates making the experiments complete, that is, each farm can stand on its own as a complete experiment.

6.3.2 Rehabilitation Trials

For the Rehabilitation Trials, work is done on existing trees. The site is divided into two sections; on one of these, the recommended practices and treatments are employed and the other is left as is, and forms the control plot. In this case each farm represents a replicate comprises of two treatments.

1. Farmer Method (control)
2. Improved Method (Commodity Board recommendations)

The trees from which data will be collected are randomly selected in both sections and marked.

6.3.3 Characteristics to be considered in conducting On-farm research

There are a number of characteristics of agronomic experiments that if taken into consideration when setting up On-farm trails, will allow an appraisal of alternative technologies in a way that parallels farmers decision-making. In the FSR/E approach, these characteristics are:-

1. The experiments should examine relatively few factors (treatments to be tested) at a time. An experiment with many factors will be difficult to manage and may be inappropriate given the farmer's step wise adoption behaviour.

2. If researchers are to compare the farmers' practice with various alternatives in order to make recommendations, then the farmers' practice must be included as one of the treatments in the experiment. Farmers will want to see this comparison in any case.

3. The experiments must address problems that are important to farmers. It may be that farmers themselves are not initially aware of a particular problem (e.g. a nutrient deficiency), but if the research does not lead to possibilities for significantly improving farm productivity, it will neither attract the interest of the farmer nor merit assessment. To do On-farm experiments, one has to have a good understanding of farmers' agronomic and socio-economic conditions.

4. The non-experimental variables of an experiment should reflect the farmer's actual practice. It is sometimes tempting to employ higher levels of management for the non-experimental variables in which case the recommendations made as a result may not be appropriate to the farmer in his low resource environment.

5. Experiments must be planted at locations that are representative of farmers conditions.

6.3.4 Experimentation Strategy

The development of recommendations for farmers must be as efficient as possible. The conditions under which farmers work are diverse in almost every respect. Each farmer has different amounts and kinds of land, different attitudes towards risk, different levels of wealth, therefore different management levels are employed, different access to labour and capital, different marketing opportunities and so on. Because of these differences, farmers respond differently to recommendations. On the other hand, it is very difficult or impossible to make separate recommendations for each farmer.

Therefore, for practical reasons farmers are grouped as best as possible according to similar circumstances they find themselves in and for whom it is likely that the same recommendation will be suitable. Such a group is called the Recommendation Domain.

With the limited resources of the project it is impossible to work with all farmers on a one-to-one basis, so this merits employing the strategy of using the experimental plots as demonstration plots. Farmers from outside and within the project area are brought to these plots to demonstrate the development of various methods being tested against the Farmer's Method.

The interventions (experiments) are established on a small part of the farmer's farm with the intention that it forms the nucleus around which the farmer with his own resources will employ the alternative or improved methods which he was impressed with and intends to adopt in developing his farm. This should result in increased yields and productivity of the farms generally in the project area.

It should be noted that most of the tree crop farms of the project area are very old and with the employment of improved cultural practices on these old trees, some of which are of poor genetic material, will result in limited improvement in the yields. An approach taken to correct this situation is to introduce improved genetic material by way of under-planting the old fields in conjunction with work being done in the Rehabilitation Trials. Therefore, the employment of improved cultural practices on the old trees, some of which are of poor genetic material, will result in increased yields, but production will be further increased later on when the new plants of improved genetic material establish themselves and replace the old ones and the improved cultural practices are employed in managing these farms.

As mentioned earlier, after establishing the trials and working with the farmer for a period of one year he is then invited to a workshop to participate in a management programme geared to reinforcing the improved management practices he was exposed to over the past year. This workshop will involve pest and disease management, weed control, fertilizing and other cultural practices. At the end of the workshop farmers should be able to:

- specify type and quantity of herbicide, pesticide, fungicide and fertilizer to use and when ;
- know how and when to prune and cut back the relevant tree crops;
- identify the various pest and disease problems, and how to effect control;
- carry out other improved cultural practices competently.

6.3.5 Inter-cropping Programme

During the early stages of the establishment of the tree crop experiments, they are inter-cropped with short-term cash crops which provide an income to the farmer while the tree crop is establishing itself. This forms part of the non-experimental variable which reflects farmers practice and forms part of the farming system. Wherever possible, an inter-cropping pattern (cycle) will be developed and economic data collected and analyzed. Successful technology packages developed will be documented with data to support and maybe extrapolated to other areas with similar conditions.

6.3.6 Farm Recordkeeping Programme

Alongside the experimentation work, a Farm Recordkeeping programme is implemented to assist farmers to improve their decision-making process in managing the scarce resources available to them. The data to be used in this programme is being generated from the inter-cropped experimental plots being managed by the farmers themselves. This recordkeeping programme is managed by the project's Economist with assistance from other staff members. This programme is operated on the basis of a pilot project where only a few farmers who meet set criteria are involved in the beginning. These criteria are:

1) Being literate
2) Farm should be easily accessible for demonstration purpose
3) Willing to participate
4) Be a selectee with an experimental plot

A simple system of collecting data by the farmer will be developed, so that he does not see the activity as a burdensome one. He is encouraged to involve other members of his household to assist him, thereby making the activity more exciting.

At various stages of the programme, when some amount of data is collected, workshops will be conducted to demonstrate the programme to other farmers of the project and to present records of cost of production data, yield data etc. in a format which would invoke the interest of other farmers when they see how the data presented can be used to assist them in their decision-making process in managing their farm as a business.

This activity is another strategy being used in the project to bring about changes in the attitude of farmers, whereby they begin to operate their farms as a business.

6.3.7 Farm Supply Stores

Now that the project has made some intervention on the farming community, which involved the introduction of improved alternative methods to the farmers' traditional practices, it means that the farmers are required to operate their farms at higher management levels which involves injecting higher levels of inputs into the farm. For this to be sustainable, these inputs would have to be made readily available to farmers on a timely basis which at the moment is not so. To remove this constraint, the project intends to have established within the project area and managed by the FACT groups, Farm Supply Stores to be operated on a cooperative basis. The inputs will be sold to FACT members at little above cost price so as to lower operational costs ,whereas, non-members will have to purchase these inputs at a higher price to recover operational costs. This strategy serves to encourage farmers to join with the FACT groups thereby strengthening the farming community.

6.3.8 Revolving Loan Scheme

Many farmers in the project area are hard pressed to find cash to hire labour and purchase inputs to run their farms. This came up as one of the major constraints during the diagnostic stage of the project. Built into the project is a Revolving Loan Scheme to assist these farmers with the growing of short-term crops as an inter-crop in the tree crop establishment trials. Farmers are excepted to repay these loans at the end of crop so that new loans can be made to other farmers, enabling the fund to revolve. The loan programme will be managed by the FACT executives along with the project staff.

6.3.9 Training Farmers

This is a very important part of the FSR/E approach in MINAG/IICA Sub-project, and is concentrated in the experimentation stage. The training of farmers involves two types:

1. Formal
2. Informal

The **Formal** type involves having farmers attend workshops and seminars put on by the project staff, and resource personnel brought in when necessary. Farmers' children, through the FACT's and the project, attend agricultural institutions such as HEART Academy, to return later to the project area to apply their newly acquired skills on their parents' farms with support from the FACTs and the project.

The **Informal** type of training involves setting up field days on farmers holdings to demonstrate improved cultural practices such as lining, pruning, fertilizing and the application of herbicides, fungicide and pesticide. Farmers are also taken on trips to visit other farming communities to see and learn other cultural practices.

6.3.10 Market Fair

A problem identified during the Rapid Rural Approach of the project area was marketing and a solution to this problem cannot be found through on-farm experiments. The approach taken here was to establish a Farmers Market Fair, where farmers (member of the FACT) take their produce to a designated area where their produce are sold in an environment similar to that of a fair. Transportation (trucks) is provided by RADA and the Ministry of Agriculture and cost of petrol and subsistence for the driver and his side-men are borne by the farmers who each contribute JA$50.00.

A maximum price is set for each item and participating farmers cannot sell above this set price. The price set for the Market Fair is above the farm gate price the farmer usually gets when selling to higglers on his farm but it is below the prices in local market places. Therefore, both the farmer and the consumer benefit from this arrangement. Each farmer is outfitted with an identification card without which he cannot enter the market grounds. This strategy is employed to keep out higglers and to be able to have some control of the market.

The Market Fair is held once per month and is not intended to displace or disrupt the higgler system but to assist farmers in organizing themselves to solve their marketing problems. Out of the Market Fair, it has been observed that farmers are changing their cropping system wherein, they are beginning to grow more of the crops that have a greater demand. In other words, farmers are producing more of what the market demands and it forms the inter-crop of the tree crop experiments during the early stages of development. Refining of the system is

needed, for farmers to continue with this activity with little, if any assistance from the project team, and that it is sustainable and not a subsidized venture. Out of this venture the project came up with recommendations for an improved marketing system for small farmers.

6.4. Assessment/Evaluation Stages

6.4.1 Statistical Analysis

During this stage all establishment, rehabilitation and management trials will be analyzed statistically to determine if the alternative and improved methods being tested against the farmers' method show any significant difference. Whether there is a significant difference or not, an economic analysis of the trials will be done and interpreted to ascertain what the alternative and improved methods meant to the farmer in terms of cost and income. Costs that vary are the costs of inputs and labour that vary between treatments and farmers will want to evaluate all the changes that are involved in adopting a new practice. In the case where statistical analysis showed that the alternative methods are superior in terms of yield, an economic analysis will show at what extra cost to the farmer was this improved yield achieved and if there was a net benefit. Such results will be developed through the application of Partial Budgeting, Marginal Analysis and Sensitivity Analysis.

On the other hand, if statistical analysis of the results of an experiment indicates that there are no differences between treatments, then the lower cost treatment would be preferred. If there is evidence that treatment yields are probably about the same, the gross benefits for these treatments will also be similar, and the lowest cost method of achieving these benefits should be chosen.

6.4.2 Economic Analysis

Economic analysis will be done on data collected from On-farm experiments established at many locations which are representative of the recommendation domain. Therefore, this would be developed on the "Pooled Data" basis, which is most suitable when such information is to be used for making recommendation for groups of farmers under similar circumstances. In other words, analyzing data from a single farm may give misleading results and not be representative of the recommendation domain and is therefore an inaccurate way of coming up with recommendation for groups of farmers with similar circumstances.

6.4.3. Multi-Period Farm Models

In addition to this, survey data on resources and input-output information on tree crops and other related major production activities will be used in the development of Multi-Seasonal Farm Models. These models will be used to test the feasibility of investment alternatives for tree crop production. The information generated by these models will be disseminated to farmers who will use it in improving the management of his/her scarce resources.

6.4.4 Evaluation

An evaluation will also be conducted during this stage using data generated by the Rural Sociologist, Economist and other project staff throughout the Diagnostic, Design and Experimentation stages to assess the following:

- changes in farmers attitudes
- rate of adoption of technologies by farmers
- diffusion effect of technology generated
- changes in production and productivity
- changes in farmers income and social well-being
- changes in farm management and improved cultural practices
- marketing system developed
- farmers attitude towards working as a group (FACT) and how they have benefitted
- Farm Recordkeeping system
- changes in cropping systems

This will provide information on the sub-project achievements and should provide valuable understanding of the farmer, his farm family, his farm system and the community he lives in. This will give a better insight for future planning and implementation of the Farming System Research and Extension Methodologies. This data will be supported by case studies conducted by the Rural Sociologist and Economist of the project.

6.4.5. Terminal Evaluation

A terminal evaluation will be done to assess the impact of the sub-project on participating farmers and their communities, as well as to compare targets and achievements. This will be achieved by conducting another survey at the end of the project using the same respondents of the Baseline Survey. The questionnaire will be developed by the Rural Sociologist who is responsible for managing the survey procedure in the field and its analysis and interpretation with assistance from other project staff members.

6.5 Recommendation Stage

A recommendation is information that farmers can use to improve the productivity of their resources. A good recommendation can be thought of as the practices which farmers would follow, given their current resources, if they had all the information that is available to agricultural scientists.

Farmers may be able to use a recommendation directly, or they may adjust it somewhat to their own conditions and needs. The agronomic data upon which the recommendations are based may be relevant to the farmers own agro-ecological conditions, and the evaluation of those data must be consistent with the farmers' goals and socio-economic circumstances.

After completing a comprehensive evaluation of the project activities in which the farmers themselves are involved in evaluating the technologies developed, the project team will be in a position to make recommendations as to those technologies that are successful and readily adopted, and can be used by other low resource farmers of similar conditions.

These recommendations will be documented and disseminated by various means for use by farmers, researchers, extensionists and policy makers. At the end of the project when all the objectives have been met, a number of reports will be produced containing recommendations on:

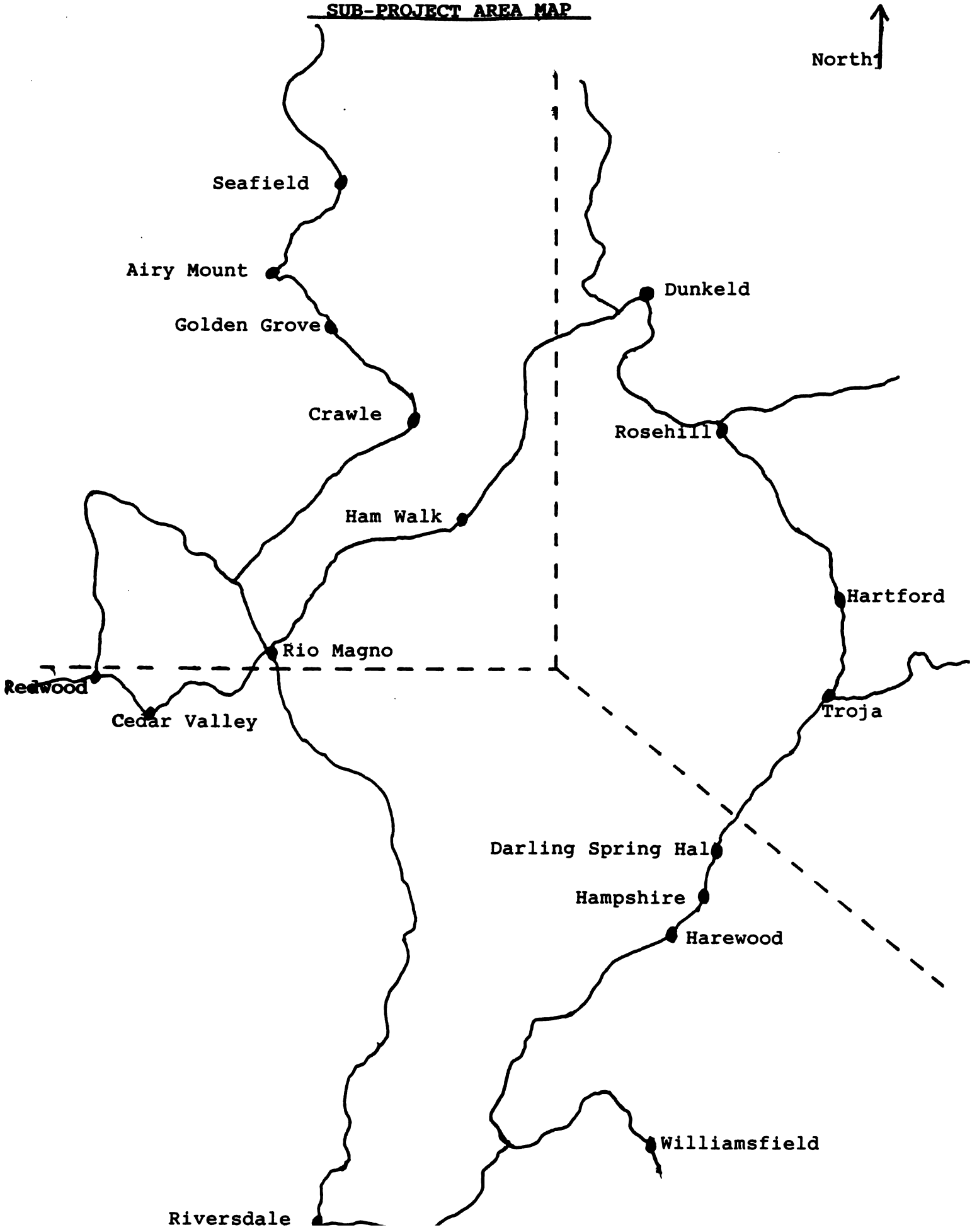
- Economically efficient tree crops based on farming system
- Improved marketing system
- Research, Extension and Agricultural Policy
- A Farming Systems Methodology to be institutionalized within the Ministry of Agriculture Research and Development Division
- Farm Record Keeping System

The project intends to document all its findings and to make recommendations of only those technology packages developed which are being successfully adopted by farmers even after project funding has ceased and the extension presence has been removed. These recommendations may be disseminated to other farmers for improving their socio-economic well-being.

A legacy of this project will be the establishment of some non-traditional tree crops as orchards in addition to the traditional tree crops and these will be there to further enhance research activities.

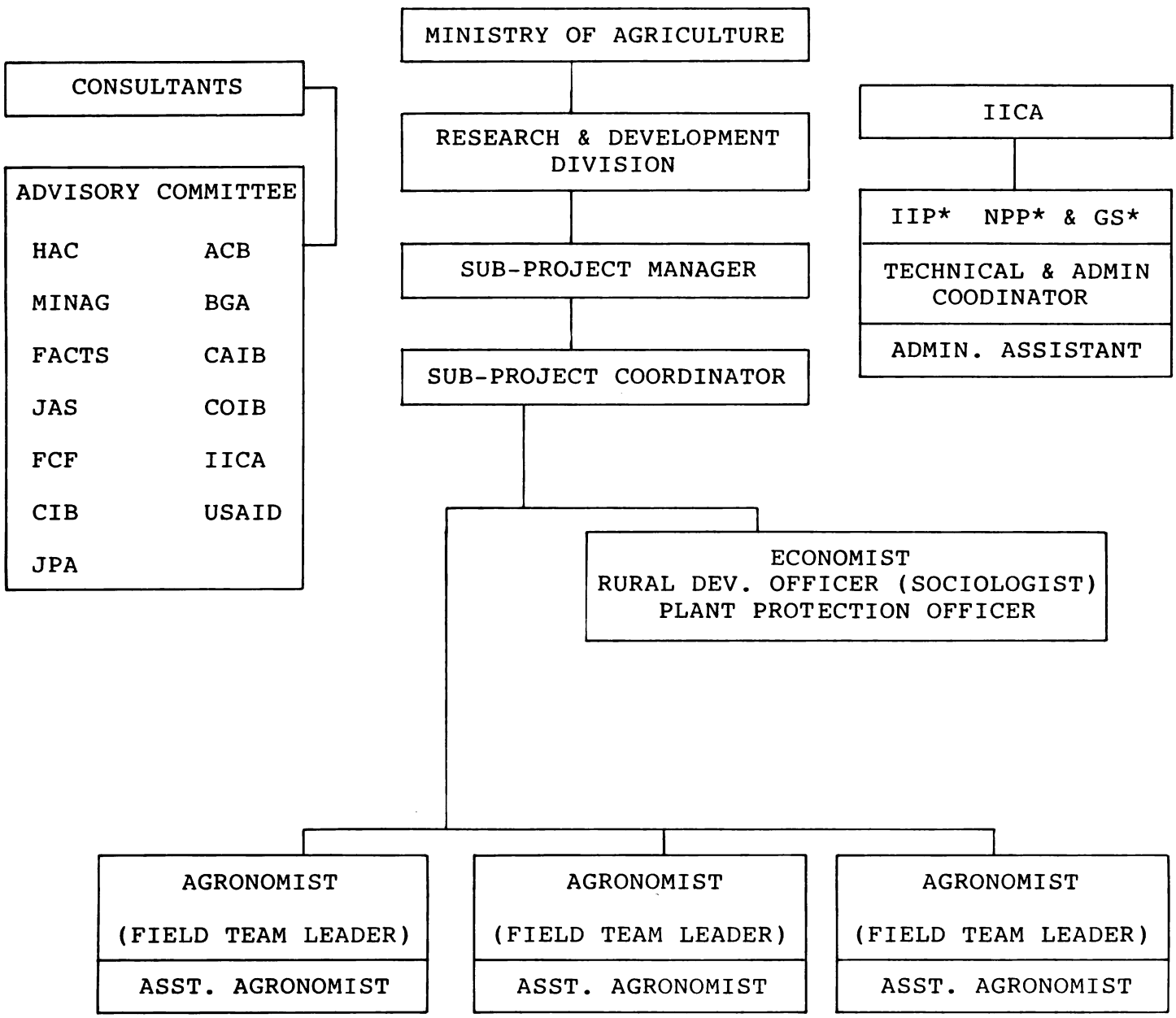
APPENDICES

APPENDIX A
SUB-PROJECT AREA MAP



APPENDIX B

ORGANOGRAM ON MINAG/IICA HILLSIDE AGRICULTURE SUB-PROJECT FOR IMPROVING WATERSHED MANAGEMENT AND INCREASING SOCIO-ECONOMIC WELL-BEING THROUGH FARMING SYSTEMS R & D



APPENDIX C

GLOSSARY

Baseline Survey	A formal survey designed to obtain information on all aspects of a farming systems.
Block	A group of plots similar in certain characteristics, e.g., soil type, fertility, plant stand, etc.
Contour	An imaginary line on the side of a slope which has the same elevation (height) from one end to the other.
Control Treatment	A standard or baseline treatment against which the others are to be compared.
Diffusion Effect	Inter-personal communication network through which newly acquired knowledge of agricultural technologies naturally flow among farmers and families not directly involved in on-farm research.
Environment	Biophysical and management conditions on a farm which affect the response to treatments.
Ex-Ante Analysis	Analysis of the expected biological, economic and/or social benefits of trials and/or treatments choices prior to conducting the trials, in order to make decisions about trial type and treatment.
Goal Sets	The objectives of farmers.
Intervention	A type of "treatment"; a technological or management change from the practice of the "average" farmer in a given domain, designed to solve a production problem.
Low Resource Environment	Used to describe rainfed farming on marginal lands usually on steep slopes where very little inputs, if any, is being applied.
Multi-Period Farm Models	Representation of different cropping patterns over several years reflecting optimal use of resources.

APPENDIX C (continued)

GLOSSARY

Non-Experimental Variables	Factors that do not vary over an experiment and usually reflects farmers actual practice.
Partial Budgeting	A method of economic analysis which compares changes in variable costs and returns to assess the economic benefit of treatment differences.
Pooled Data	Data collected over many locations.
Recommendation Domain	A group of farmers who have similar circumstances and for whom it is likely that the same recommendation will be suitable.
Reconnaissance Survey	An exploratory survey to familiarize oneself with a designated area.
Replicate	A complete set of treatments repeated per plot.
Sensitivity Analysis	Partial budgeting done using input and/or product prices different from those actually observed during the experiment, but which may have been secured in the past or could be expected to occur at given probabilities in the future. It is useful to predict changes in decision-making as a result of changes in prices of products and inputs.
Terminal Evaluation	An evaluation conducted at the end to determine changes.

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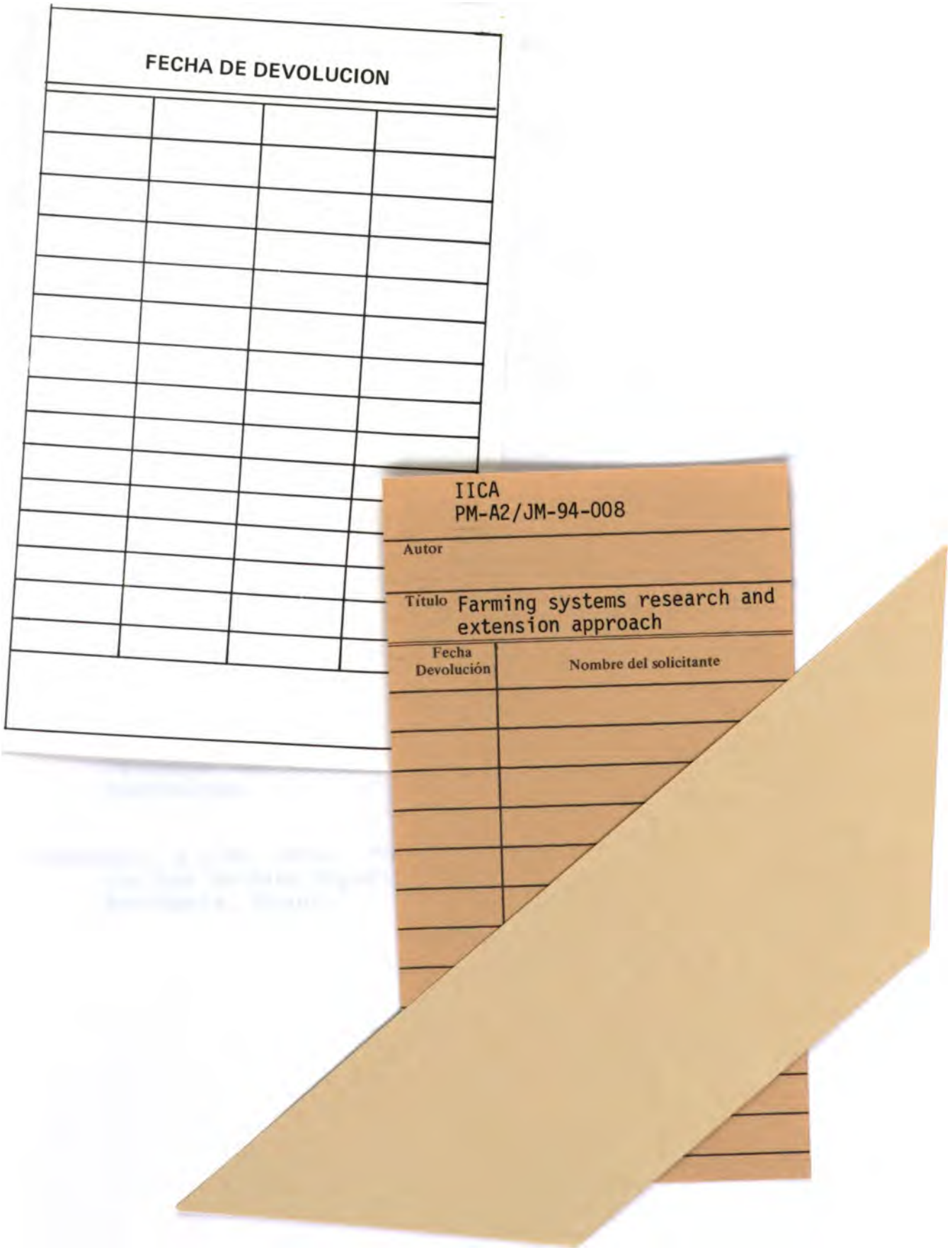
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