

# Sociologists in agricultural research

Findings of two research projects in the  
Dominican Republic and the Philippines

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The purpose of this series is to report on ongoing research at the Agricultural University Wageningen, primarily by staff and students of the Department of sociology and the Department of rural sociology of the tropics and subtropics.

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# **Sociologists in agricultural research**

**Findings of two research projects in the Dominican Republic and the Philippines**

**Louk Box and Dirk van Dusseldorp**



**Agricultural University**

**Wageningen**

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# CONTENTS

LIST OF TABLES AND FIGURES	vii
<b>1. INTRODUCTION AND SUMMARY</b>	<b>1</b>
Major observations and conclusions	3
- Institutional settings: the differences	4
- Some findings	4
- The position of sociologists	7
- Recommendations	9
<b>2. ADAPTIVE AGRICULTURAL RESEARCH PROJECT IN THE DOMINICAN REPUBLIC, 1981-1985</b>	<b>11</b>
1. Objectives and Organization	11
- Introduction	11
- Researchers network: starting the study	12
- Farmers' organizations: keys to cultivator knowledge	15
- The teams: triangulating knowledge	15
- The core team: social agronomy in practice	16
- The seminars: definitive triangulation	17
- Organization: the sociological dimension	18
2. Rice Research: conditions, constraints and adaptations	19
- Introduction	19
- Production levels	21
- Technology adoption	22
- Cropping systems	22
- Sowing out of season	23
- Late transplanting	24
- Adaptive research	24
- Trials	25
- Conclusions	26
3. Cassava: varietal change and erosion	28
- Varietal change	28
- Trials	31
- Erosion	32
- Conclusions	35
4. Extension: a world apart	36
- History repeated	36
- Separate worlds	37
- The cultivators	37
- Extensionists	38

- Ministry officials	39
- Researchers	40
- Conclusion	41
5. Women, cassava and rice	41
6. Adapted machinery: the Votex rice thresher	43
3. THE ROLE OF SOCIAL ANTHROPOLOGY/SOCIOLOGY IN AGRICULTURAL RESEARCH, THE PHILIPPINES, 1982-1986	47
1. Objectives and organization of the project	47
2. Major findings and comments	48
- The on-farm cropping research methodology in IRRI	48
- Cropping systems versus farming systems	50
- Introducing sociological components in on-farm cropping research	51
- Description of a research site	53
- Designing alternative cropping patterns	55
- Testing	55
3. Collecting and presenting sociological data	56
- Case studies in conjunction with surveys	56
- Selection of units for analysis	59
- Types of case studies	59
- Requirements of the interview schedule	60
4. A systems approach and the construction of models	60
5. Some organizational aspects	63
- Position of sociologists in agricultural research institutes	63
- Sociology in international agricultural research institutes	63
REFERENCES	65

## LIST OF TABLES AND FIGURES

Map 1.	The Research Sites where the Adaptive Agriculture Research worked in the Dominican Republic	14
Table 1.	Categorization of 242 rice farmers of the Mao and Nagua regions in the Dominican Republic, AAR 1983	21
Table 2.	Yields (ton/ha of paddy), cropping intensity as % of area that would have been sown if entire plot had been double cropped and income of rice plot (in DR\$; 1DR\$ = 0.70US\$) per category of 242 farmers surveyed in AAR, 1983	21
Table 3.	Average yields (ton/ha of paddy) and % of area sown with traditional and semi-dwarf varieties, per category, in El Pozo and El Aguacate Land Reform projects in the Nagua region of the Dominican Republic, 1981-1983	23
Table 4.	Frequency of use of different cropping systems, as % of total per category, in three land reform projects in the Dominican Republic, 1981-1983	23
Table 5:	Average age of seedlings (in days) per category of farmers, of 392 transplanted harvests, in three land reform projects in the Dominican Republic, 1981-1983	25
Table 6:	Percent of transplanted harvests per age category of seedlings, of 392 transplanted harvests in three land reform projects in the Dominican Republic, 1981-1983	25
Table 7:	Summary of the results of six trials on late transplanting of rice, executed in El Pozo de Nagua, D.R. 1984	27
Table 8:	Time elapsed since last trying out a new cassava cultivar, in % of respondents of AAR survey among 247 cassava cultivators in Moca and Sierra regions of the Dominican Republic, 1983	29
Table 9:	Varietal traits of recently introduced and "classic" vs. actually cultivated and discarded better cassava cultivars in the Sierra region of the Dominican Republic	30
Table 10:	Cassava yield losses due to root deterioration in the year preceding AAR survey (in % of respondents)	31
Table 11:	Quantity of eroded soil and yields (both tons/ha) of 8 treatments included in the 1983 and 1984 AAR erosion trials. Monción, Dominican Republic	34
Table 12.	Those to whom cassava cultivators turn when they want advice on their crop. Responses of 112 cassava cultivators in 1983 in the Moca and Monción regions	38
Table 13.	What do cassava cultivators speak about when they turn to an extension officer? (Responses of 139 cultivators in 1983 in the Moca and Monción regions who indicated that they have spoken to an extension officer in the past)	38

Table 14. Main problems in cassava cultivation as perceived by cultivators (n=134) and extension officers (n=16) in the Moca and Monción regions of the D.R. 1983-1984	39
Table 15: Losses (% of potential yields) of different forms of rice harvesting in the D.R., AAR, 1984 (with the exception of data for large combines)	45
Table 16: Operational and real costs (including adjustments for losses and impurities) of 4 forms of rice harvesting in the D.R., AAR, 1984. In DR\$ (in 1984 1DR\$ = 0.35 US\$)	45
Figure 1: Sociologists in agricultural research institutes in relation with their potential roles	8
Figure 2: Design of the Adaptive Agricultural Research crop and site selection (1981-1985)	13
Figure 3: Components of on-farm cropping systems research methodology	49
Figure 4: Flow chart on decisions relevant to paying the irrigation fee in the service area of a deep well pump	62



## 1. INTRODUCTION AND SUMMARY

In the first decades of the green revolution a raging debate took place, in which the social sciences in particular, emphasized the bitter harvests and perverse developments that could occur, in part, from the new high yielding varieties developed at the international research stations (Feder, 1983).

It cannot be denied that the new high yielding varieties at least in the beginning and in certain countries created a more skewed income distribution between rich and poor farmers and between regions with favourable and unfavourable production conditions. On the other hand, the spectre of large scale famines expected over longer periods, did not emerge in Asia as it is now emerging in Africa. This does not mean that the present availability of food in Asia guarantees the disappearance of hunger among the poor. Far from it. However, food must first be produced in sufficient quantities before one can start distributing it fairly, albeit the way food is produced has its effects on its distribution. Both aspects therefore have to be considered in conjunction.

It should also be realized, that in the mandate of the international research stations, the emphasis has shifted from maximal production to production with less risks, which will favour poorer farmers. Attention is also now shifted to areas where the production environment is more hostile. Recently sustainability has become an important issue in agricultural research policy. The main argument hereafter, is not whether research stations should not do their utmost to develop new techniques and varieties that will increase agricultural production in the developing countries, but that they should be aware of the consequences that the introduction of new varieties and techniques are likely to have in specific situations. Until now research stations often failed to indicate the possible social and economic consequences that their findings might have on the various categories of agricultural producers. In the case of the International Rice Research Institute (IRRI), their on-farm cropping system research was more an effort to prove that their new findings were applicable, than to assess the effects of their introduction into rural society. This could be explained partly by the fact that there were, at that time, no social scientists (sociologists and cultural anthropologists) fully employed.

It is against this background that, in 1981, the Directorate General for International Cooperation of The Netherlands, asked the Department of Rural Sociology of the Tropics at the Agricultural University, Wageningen, to start a research project on the potential role that the social scientist could play in agricultural research stations (SILO, Sociologische Inbreng in Landbouwkundig Onderzoek). A decision was made to start the research programme in two different locations and two different kinds of agricultural research institutes. One of the locations, from 1981 to 1985, was a regional research station in the Dominican Republic, Centro de Desarrollo Agropecuario, Zona Norte (CEN-

DA). The other location, from 1982 to 1986, was in the Philippines in the International Rice Research Institute (IRRI).

The underlying assumption for this decision, considering the great variety in social circumstances, was that the likely role for the social scientist in international research stations, would be to develop adaptive research methodologies and introduce sociological variables into the agricultural research process, and to develop methodologies for assessing the social consequences of new technologies in a given social environment. The role of the sociologist in national and regional stations would be, among others, to make actual assessments of the social impact of these new varieties and techniques and function as a intermediary between cultivator and researcher.

Terminology used:

- The term *sociologist* is used in a broad sense and includes anthropologists. We employ the terms interchangeably with social scientists and are aware of the fact that economists, agronomists and political scientists use methods from which we have drawn freely. The borderline between agro-sociology and social agronomy is long and vague. Much of our work could indeed be called social agronomy (the discipline which describes, analyzes and predicts socio-cultural phenomena in crop-cultivation) (Van Dusseldorp & Box, 1990).
- The term *cultivator* is chosen to focus on all those who are engaged in crop cultivation, including farmers and labourers, women and men, rural and urban producers. We understand a *crop* to be a product of a plant or animal species, which is considered to be useful. *Cultivation* usually includes domestication of the species and the subsequent adaptation of its production to changing ecological and socio-economic conditions (Box, 1988).
- *Knowledge networks* are the relatively stable patterns of communication and interaction which are employed to exchange relevant information. The term will be used interchangeably with 'knowledge systems' even though we are aware that differences in usage exist between the two (Box, 1989).
- *Adaptive agricultural research* is that type of applied research aimed at explicitly linking cultivator problems to technology development taking cultivator conditions and local knowledge as its starting point.

The research proposal of 1981, indicated three main questions for which answers had to be found.

The first was: Can sociology generate knowledge that can be used directly for action leading to the development and introduction of new crops and technologies, that will result in higher agricultural production, and that will, at the same time, also benefit small farmers? We shall use the distinction between knowledge for action and knowledge for understanding, first made by Scott & Shore (1979). Knowledge for action is problem-oriented, applied in nature and therefore of limited value to the solving of particular problems. We do not prefer one type of knowledge over the other, in our methodological discussions on the status of case studies and adaptive trials, for example, we found that the requirements for 'understanding' were paramount. Obviously these do not

apply when drawing up recommendations for extension-campaigns, when knowledge for action is called for.

The second question was what data have to be collected, and which methodologies and theories used, in order to provide the knowledge mentioned under the first question.

The last question to be answered was, where should sociologists be placed in the organizational and administrative framework of agricultural research stations, in order to guarantee that they can work efficiently and effectively. In other words, to guarantee that the knowledge they produce is relevant, accessible, and intelligible to the various groups of potential users such as small farmers, agricultural scientists, extension agents and policy makers.

It is important to note that since 1980 an interest in farming systems research has emerged. A growing amount of attention is being given to the way in which farmers themselves are experimenting on their plots, and to developing a dialogue between the experimenting farmers and experimenting scientists. The outcome of research in these fields will have its influence on the research policies of agricultural research institutes. It also makes clear that the presence of social scientists, especially in national and regional research stations, is of importance for the development of new techniques and varieties adapted not only to the biological but also to the social and economic environment.

A summary is given below of the major findings and recommendations resulting from the two research projects, with special attention to the methodological aspects of the introduction of the social sciences into agricultural research. For more detailed information on the findings, one is referred to the original reports and papers. These reports are available on microfiches at IDC bv, Microfilm Publishers (see references).

The authors are responsible for the major observations and conclusions even when these are based on the reports and publications of especially dr. F.J. Doorman and dr. A. Polak who have done much of the fieldwork.

In this publication we do not discuss our findings in the light of existing literature. This was done in other publications (Box, 1988; Van Dusseldorp and Box, 1990; Doorman, 1991).

### *Major observations and conclusions*

The two research projects were implemented in completely different social and institutional environments. We learned quite rapidly that the original research design had to be adapted to these situations or would be discarded as irrelevant by the institutions we worked in. These adaptations led to quite different designs. Although general comparisons can be made, the reader should be aware of the differences first.

discussions with cultivators or farmers' association leaders. In our view case studies can best be done in conjunction with adaptive trials. Adaptive trials, it must be emphasized, are to be understood as experiments in which mutual adaptation has taken place, i.e. cultivators have adapted their experiments to 'scientific' conditions (ie. trial design allowing statistical analysis); and scientists have adapted their experiments to cultivator conditions (ie. trial design adjusted to dominant production conditions). Adaptive trials in the Dominican Republic were therefore defined differently from the general usage in International Agricultural Research, where they are understood to be the local or regional trials intended to adapt a technological package already developed (Box, 1988).

The Dominican studies showed one other interesting phenomenon that runs counter to 'common sense' notions among agricultural scientists and extensionists. It is commonly believed that the way scientists define technological problems corresponds with the definition of those problems by extensionists and other agro-bureaucrats. Our data indicate that this is not the case. Both the cassava and the rice researchers in the Dominican Republic, viewed problems quite differently from extensionists and other government officials. Box and Doorman (1985) have shown that the perception of problems is strongly influenced by available solutions. Researchers, for example, are strongly 'variety' oriented, expecting great results from new varieties and the corresponding packages. The same was observed by Polak in IRRI, when studying land classification. The perception of farmers and IRRI scientists differed markedly. Extensionists are much more 'input' oriented, expecting solutions from fertilizers, pesticides or fungicides. These views contrast again with those found among different categories of cultivators. There is ample reason to assume that at IRRI, corresponding differences in views occur, though we have not studied them.

Where did we fail? The following points come to the mind:

1. Lack of comparability: the institutional and socio-cultural contexts of our studies varied so much that we adapted to them and thereby reduced comparability of methods and techniques, as well as research results.
2. Lack of impact: we found it hard to change the institutions we worked for. Although we participated in decision making at various levels we could not establish stable sociological or anthropological units in these institutions. Incidental social science studies, however, are done to a larger extent than before but we do not know to what extent we influenced this.
3. Lack of continuity: our methods were discontinued when we left; even though certain activities proceeded on a smaller scale we cannot claim success, in sustaining the effort; research funding was not secured and we had to suspend activities after about four years in each site which proved to be too early.

On the whole, we feel that our impact was heavier among cultivators than among scientists, more in awareness raising on the differences between them than in building institutions for bridging such differences.

The studies lead us to suggest, that knowledge networks between cultivators, extensionists, researchers and other parties need more articulation. This can be done by involving social scientists in the agricultural research enterprise. How they can be involved is the subject of the following section.

We can now briefly answer the questions we asked ourselves in 1981:

1. Can sociologists generate relevant knowledge? Yes, provided solid bridges are built between both cultivators and fellow agro-researchers. Such knowledge is at present still not valued, though.
2. What methods can best be used? A mix involving first qualitative case-studies, followed by both adaptive trials and sample surveys to test particular findings and elaborate on them.
3. What is the best organizational place for sociologists to work? We find that sociologists need to work both in, and outside research institutes to be effective. Inside, to cooperate with fellow scientists in applied research; outside, to confront technological change from cultivators' perspectives to link findings with mainstream social science theories and methodologies and to take part in the public debates on government agricultural policies.

We further explore the organizational position of sociologists in the following section, based on our findings and oriented to what we consider useful.

### *The position of sociologists*

From here on, observations will be focussed on the position of sociologists in agricultural research stations, and on the agricultural research process. (For an elaboration of these comments see: van Dusseldorp & Box 1990). This does not mean, that in the wider context of transferring knowledge from one knowledge system to another, sociologists cannot play an important role; in extension organizations, for example. The experiences obtained in the two research projects confirm that the position of sociologists in agricultural research institutes, is not an easy one. When they are involved at all, they are in most cases junior partners and often are called in at the later stages of the research process or are only asked to fulfil the role of accommodator. In this last position, sociologists are expected to indicate how the behaviour of farmers or the structure of rural societies could be adjusted in order to facilitate the introduction of new agricultural technologies.

There are several reasons why the process of integrating sociologists into agricultural research institutes is making only slow progress.

Firstly, the complexity of interdisciplinary research is often under-estimated. This is especially the case when it concerns disciplines involved with completely different processes, resulting in different theories, methodologies, and a different way of presenting their findings. Even in agricultural faculties with a sociological department, the relation with technical disciplines is not an easy one.

Secondly, sociologists can fulfil various roles in the agricultural research process. Figure 1 identifies ten such roles. The sociologist can sensitize agricultural scientists to the social aspects that determine agricultural processes, and can train them in the use of some of the sociological methods relevant for agricultural research. He or she can fulfil the role of translator of farmers' perceptions of their environment and the way they have and do create their own local knowledge, or make information available that is locked up in sociological research reports. The sociologist can become an ex-post-evaluator observing the impact of new technologies on rural society, or an ex-ante-evaluator assessing beforehand what the impact might be of new technologies. As an accommodator the sociologist can help to formulate the measures that have to be taken in order to make new technologies beneficial for most of the rural population and not only for the happy few. Or as a scout, by indicating what kind of technologies could be of importance for the future development of a rural society. Should new technologies require new patterns of cooperation a sociologist can give advice on how such new ways of cooperation might be created. Finally he or she is able to analyze the social aspects of the organization of research institutes and of communication in research processes.

Thirdly, the organizational position from which the sociologist can perform a specific function varies (Figure 1). It is important, from the beginning, to make clear which role the sociologist should perform in a specific agricultural research project. Otherwise problems will arise (van Dusseldorp & Box, 1990).

*Figure 1: Sociologists in agricultural research institutes in relation with their potential roles*

Role of sociologists	Position in Agricultural Research Organization		
	Inside		Outside
	International Institute	National Institute	
Trainer/Sensitizer	X	0	XX
Provider of methods	X	0	X
Go-between/translator	X	XX	0
Monitor/evaluator	X	XX	X
Assessor Social Impact	X	XX	X
Analyzer of indigenous knowledge	X	X	X
Accommodator	X	XX	X
Scout	XX	XX	0
Developer of group technology	X	X	X
Analyzer of agr. research	-	-	XX

XX best position  
 X good position  
 - bad position  
 0 not likely

The contribution of sociologists in agricultural research, can lead to conclusions, that question the social significance of new technologies or the output of research institutes. Such a contribution is not always appreciated, and certainly not at a time when it is difficult to obtain financial resources.

Fourth, it is understandable, because of financial constraints, that agricultural research institutes will prefer to keep their technical staff at an optimal level, and will, therefore, be disinclined to appoint sociologists, a type of scientist with whom they are not very familiar.

Fifth, it is inadvisable to introduce inexperienced sociologists into an agricultural research process where they will have to work with disciplines from a completely different scientific background and culture. Unfortunately, however, experienced and able sociologists are often not interested in taking up a position in the agricultural research process, for several reasons. They are seldom interested in translating social theories, the indispensable knowledge for understanding, into knowledge that can be used for action. Another danger they fear is that, while locking themselves up in agricultural research stations, they will lose contact with the main stream of developments in their own disciplines.

However understandable such reasons, there remains the fact that the findings of agricultural research often have a profound impact on cultivators and rural society. Therefore it is necessary to find ways of integrating sociologists into agricultural research and into the institutions where this takes place.

### *Recommendations*

There are several fields in which action can be undertaken and in some of them progress has already been made.

Training seems one of the most important fields.

First, we recommend that universities and courses, make sociologists familiar with the research approaches in the technical and biological sciences. At the same time they have to be trained in the translation of general sociological knowledge into knowledge that can be used for action and is understandable and acceptable for other disciplines.

Secondly, technical and biological scientists must be made aware of the potential *social consequences* of their research. They must be able to recognize the most important sociological variables in the agricultural production processes which they want to influence. This kind of training should start in the universities. At later stages, post graduate courses can be of importance, such as the International Course on Research in Agriculture (ICRA) in Wageningen and Montpellier. Good interdisciplinary research, however, is only possible when the actors in this process are well versed in their own discipline. This rather obvious remark is made because there are tendencies to overrate the necessity of knowing how other disciplines work at the expense of a good training in one's own discipline.

Though much emphasis is laid on *interdisciplinary research*, this complicated process itself is rather understudied. More attention to this field could be given by sociologists and social psychologists. We recommend that research councils commission evaluative studies which analyze the role of social scientists in agricultural research.

There is a wealth of *social science information*, on the way agricultural production processes are embodied in the context of rural societies. This information is often hidden in books and articles that are not directly relevant or intelligible to the technical sciences. (See for example Rhoades, 1984; de la Rive Box-Lasocki, 1982). To gather and systematize this information and interpret it for other disciplines is an important task of sociological research institutes, provided that they have scientists who are able and willing to do so. Extra funding for this activity might be necessary and international agricultural research donors (CGIAR) could profit from the results.

Taking into account the problems encountered in introducing sociologists into agricultural research institutes, it seems that '*parachuting*' them in such institutions is not very effective. It would be more worthwhile to develop long-standing relationships between sociological research stations and sociological research institutes. This would also diminish the problem of personality clashes, which often take place in interdisciplinary research activities, and which can determine whether sociology remains a part of the agricultural research process.

Sociologists can perform several roles in the field of agricultural research. Some of these can best be performed within agricultural research stations, others much better in positions outside such stations as is indicated in Table 1. In the two research projects it was demonstrated that the development of adaptive research methods is an important function sociologists can perform, preferably in international or one of the main national research stations. It is necessary, as mentioned earlier, for timely agreement to be reached on the roles the sociologist will be expected to play. There is always the possibility that sociologists will involve themselves in research, which is relevant from their point of view. Such studies, however, may be beyond the mandate of agricultural research institutes and should be carried out by research institutes involved in studying the process of rural societies.

Sociologists, in other words, are still ill-prepared to join other scientists in planning and performing adaptive agricultural research. The call for better training is only slowly being implemented.

The same is true for agro-biological scientists who need to look beyond their paradigm when engaging in adaptive research. Training institutes in poor countries like the Dominican Republic need far more support in this respect. An investment greatly needed at a time that most potential crop land is already in use, that sustainable food production is under great strain and famine is faced by millions of former food producers. A paradox we may not permit.



## **2. ADAPTIVE AGRICULTURAL RESEARCH IN THE DOMINICAN REPUBLIC, 1981-1985**

### **1. Objectives and organization**

#### *Introduction*

The aim of the Adaptive Agricultural Research (AAR) programme in the Dominican Republic (D.R.) was two-fold. We wanted to understand the possible role of sociologists in agricultural research, and develop methods and techniques relevant for such research. At the same time we wished to contribute to such research by being a full partner in it. The first objective was in line with the aims of the SILO programme, as outlined in the Introduction. After all, we were funded by Dutch Aid to find out what sociologists could actually do in regional or national agricultural research institutes.

But simply making observations on what sociologists and anthropologists could do, appeared rather sterile and counterproductive. From Grace Goodell, we had learned that mere speculation about the role of social scientists in agricultural research is hardly what other scientists are waiting for. From Peter Hildebrand we had learned that contributions must be to the point: clearly delimited, efficient and contributing to the solution of the problems that face agro-biologists and farmers. We therefore placed a great deal of emphasis on actual contributions to the work of our colleagues in these institutes, and to the work of experimenting farmers. On the basis of these contributions we would later be able to generalize on the contributions social scientist could make.

The selection of particular research problems therefore obeyed the following criteria:

- researcher's needs: fellow researchers suggested the crops, the geographical areas and an initial definition of the problem. Cassava researchers suggested an inventory of varieties, for example, giving them an idea of currently used cultivars in the Sierra region. In so doing we became part of these researchers' networks.
- cultivator's needs: given a particular crop and a suggested area, we located farmers' organizations. With their leaders, we reviewed the researchers' suggestions and problem definitions. This created a relation of trust and we became part of these farmer's networks.

In addition we formulated three perspectives, leading us to problem selection:

- a historical perspective, in which we placed the researchers' and the farmers' definition of the problems. We came to understand these problems in terms of the changes which had occurred in cultivation conditions for cassava and rice, such as soil fertility or markets. We studied cultivators' biographies,

for example, to find out how cassava cultivation conditions had changed over time and how the producers adapted to these changing circumstances.

- an adaptive perspective, which meant being able to translate cultivators' problems into research problems. It also meant being able to translate cultivators solutions into technical recommendations. Experimenting rice cultivators, for instance, developed a way of transplanting rice late in the season; we checked if it could be made into a recommendation for the extension service.
- a knowledge network perspective, meaning that we were interested in studying the ways in which knowledge circulates or is transformed in the networks linking the various actors (cultivators, extension agents, researchers, ministry-officials and middlemen).

In conclusion, the Dominican study aimed at a greater understanding of the changes taking place at the level of the individual cultivator. We selected changes which were relevant to both the cultivators and researchers concerned with rice and cassava production. Specific adaptations were studied from a historical perspective which examined the exchange and transformation of knowledge. In so doing, we attempted to show that cultivators continuously contribute to agrarian technology. Technological development, in other words, needs to be studied from a wider perspective than just the formal institutions (research, extension, training) involved.

We learned a lot from anthropologists, economists and agronomists doing comparable work. We had the benefit for example of G. Goodell's pathbreaking anthropological work at IRRI and R. Rhoades breaking the soil at CIP. Economists like P. Hildebrand, N. Quezada and J. Lynam were willing to spend their time and creativity with us and so were agronomists like C. Lopez, F. Cuevas and G. de Bruyn. Many of these actively contributed to our thinking and our way of doing adaptive research in the Dominican Republic.

The 'we' in the Dominican Republic was a large team of Dominicans and Dutchmen (see the following section under 'core team'). The cassava studies were directed by L. Box, the rice studies by F. Doorman.

#### *Researchers network: starting the study*

Three principal partners were involved: cultivators, crop scientists and social scientists. At all times during the research we tried to design methods and techniques for bringing these three together.

The research was carried out on two crops: cassava and rice. Cassava, the poor man's crop: grown on poor soils by poor cultivators for poor consumers. Although one of the world's most important staples, it is also one of the most neglected crops (Cock 1985). Contrast this with rice, its richer sister: grown on rich soils, by better-off cultivators for better-off consumers. Rice has become one of the best studied crops, with one international research institute (IRRI) exclusively dedicated to it, as is argued by Van Dusseldorp in Project 2.

For each of these crops we selected two principal research areas, one enjoying good conditions and the other providing a poor environment. In the case of cassava the poor or unfavourable environment was the Sierra (or Central Mountain Range, Map 1) selected for its comparatively hostile conditions for cassava cultivation. Moca in the rich Cibao Valley presented good or comparatively 'rich' cultivation conditions.

In the case of rice we started out in El Pozo, a site which had experienced large investments in infrastructural works for rice cultivation. The negative case was El Aguacate, where rice cultivators were left to themselves in the swamps. The study was replicated in the comparatively favourable environment of Laguna Salada, which provides the third case. The set up of the research is given schematically in Figure 2.

*Figure 2: Design of the Adaptive Agricultural Research: crop and site selection (1981-1985)*

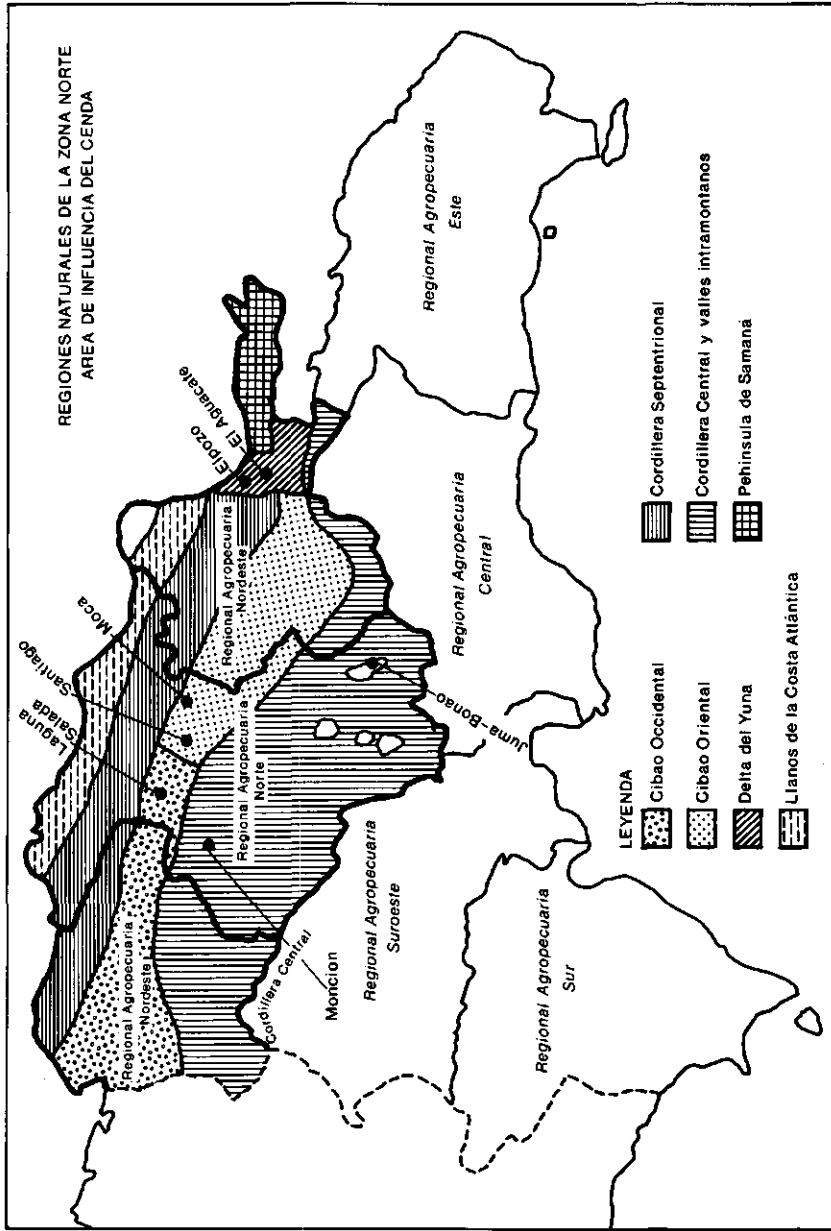
SITES		
crops	'poor'	'rich'
'poor' (cassava)	Sierra	Moca
'rich' (rice)	El Aguacate	El Pozo
		Laguna Salada

The sites were selected in close collaboration with our colleagues in the respective research institutes. The cassava research was done in the Centro de Desarrollo Agropecuario, Zona Norte (CENDA), the Agricultural Development Centre for the Northern Zone. CENDA has its central offices near Santiago, the country's second largest city. It is an agro-industrial town in the heart of the rich Cibao Valley (see Map 1).

In the sixties, CENDA was the focus of a large-scale FAO diversification project. When we first joined the institute in 1980, the equipment of the original project, and many of the personnel were still around.

The rice research was done in close collaboration with ISA and CEDIA. ISA (Instituto Superior de Agricultura) is located near CENDA and is the Agricultural College associated with Santiago's Catholic University, Madre y Maestra. ISA's name is associated with several rice varieties introduced over the past decade. Most modern varieties, however, stem from the national rice research institute, the Centro de Investigación de Arroz (CEDIA), located in Juma, Bonao. Close links were made with this institute, and the field studies in El Pozo were actively supported by CEDIA's field station there (Map 1). CEDIA, is an internationally respected research centre, which has profited from technical assistance from Taiwan (Box, L. ed., 1985).

Map 1: The Research Sites where the Adaptive Agricultural Research worked in the Dominican Republic



### *Farmers' organizations: keys to cultivator knowledge*

Organizations of (or for) farmers were identified in each of the sites. In the case of cassava this proved to be relatively easy. Dominican colleagues introduced us to the Federación de Agricultores Guaraguano of Monción, which incorporated the local farmers' associations located in the central part of the Sierra, where the country's bitter cassava cultivation is concentrated. With the help of the Federation's leaders, we defined the problems we wished to study in cassava cultivation and the corresponding geographical area.

The same approach was followed in Moca, where a Dominican sociologist (A.Checo) introduced us to the Moca Federation of farmers' associations. Moca is the area where most of the country's marketed sweet cassava is cultivated. Its federation was known for its active defense of small farmer interests; its leaders had at various times faced imprisonment. Beside this federation of small farmers, there also exists an interest group for the richer farmers of the area. We did have occasional contact with them, but defined our problems and the research site in Moca on the basis of the small farmers' federation.

The small rice cultivators were not as well organized as the richer farmers. They were all located in agrarian reform projects which 'provisioned' farmer organizations. In fact this meant top-down approaches to farmer organization. Farmers were enticed by the agrarian reform agency IAD, to form associations at the local level, based on the proximity of their plots. Such associations could mediate in credit application or the provision of other goods and services. In El Pozo and Laguna Salada some strong associations emerged; in El Aguacate the degree of organization was much lower. Problem definition was therefore more influenced by local leaders in the respective areas; site definition was based on agrarian reform project boundaries.

Research problems and research sites were suggested by fellow researchers, but defined by cultivators or their leaders. The social scientists took the initiative for the study and brought these two groups together. For most of the participants this was the first time that such a study had been done and that the knowledge of both groups was brought together.

### *The teams: triangulating knowledge*

Three partners: cultivators, scientists (or 'technicians') and social scientists. Through these three, agrarian change was mapped out or 'triangulated', both at the level of the individual farm and on the national level.

At the level of the individual farm we formed a team of three: the cassava or rice cultivator, the crop scientist and the social scientist. Each of the three could contribute a particular expertise. The cultivator informed the other two about the cultivation or 'cropping system', plus the transformations in it over his or her life time. Through a biographical analysis a set of factors affecting

change (problems) was constructed. The crop scientist interpreted these factors and tried to relate them to his or her own expertise, translating them into scientific terms.

The social scientist mediated between the first two, thus reducing the social distance which lies at the root of so many misunderstandings and mutual misgivings. Moreover he related the farmers' problems to his expertise on the socio-economic conditions of cassava and rice cultivation in the country.

We thus triangulated; we zeroed in on agricultural problems from our three perspectives and tried to locate the problems. We not only triangulated at the farm level, but we extended our concerns to the site and regional levels. This process of generalization was done through farmers' federations (cassava) or local associations (rice). In formal and informal meetings with these leaders the social scientist (and, if possible the crop scientist) would redefine the problems at a more general level. In so doing, we obtained a verifiable and verified image at the respective organizational level. The basic triangle was maintained as much as possible: the team always being formed by a cultivator, a crop and a social scientist.

In terms of the various roles proposed in the introduction we:

- *analyzed* local knowledge among rice and cassava cultivators
- *scouted* for changes in rural society
- developed *team-work* methods involving cultivators, thus following as a broker or *translator* between local and scientific knowledge networks.

To a lesser extent we provided *methods* (case study and adaptive trial design), we *trained* and evaluated social or agricultural *impact*. We analyzed agricultural research, but did not do so systematically when working in the respective institutes.

#### *The core team: social agronomy in practice*

Adaptive Agricultural Research (AAR), for a number of reasons, had its headquarters at CENDA. Most important probably was that the team leader (Dr. L. Box) had struck up informal contacts with CENDA's Director (Ing. L. Peralta) and ISA's Director (Dr. N. Quezada). Peralta was interested in cassava research, and Quezada suggested that it be started in the Sierra region. Peralta subsequently suggested that another crop be involved with a different technological trajectory than cassava; it became rice. Quezada allowed his senior rice researcher (Dr. F. Cuevas) to become involved in the rice study and his senior cassava specialist (V. Castellanos MSc.) to take part in the cassava research. Wageningen University gave Ir. F. Doorman a special grant to do agro-sociological research on rice cultivation.

In this way core teams were formed for cassava (Box & Castellanos) and for rice (Cuevas & Doorman) on the basis of close collaboration between Dominican and Dutch scientists. For the Dominicans this was the first time they had worked with sociologists. For the Dutch sociologists it was the first

time that they worked with Dominican scientists. Social agronomy, the meeting point of crop and social science, had to be discovered; once discovered, it had to be developed.

Both crop teams started with a review of the literature. In the case of rice this proved to be easy, since Cuevas had kept an accurate record. For cassava nothing of the kind existed. Dominican researchers did not refer much to previous work in the country, be it their own or that of their colleagues. Box and Castellanos therefore conducted a review which showed that cassava research had gone on for about half a century, albeit highly disjointed and largely unnoticed.

The core team was then expanded with an economist (L. Perez, lent by ISA), an anthropologist (B. de la Rive Box-Lasocki, M.Phil. who contributed her own time), a secretary and an extension scientist (Ing. A. Naut, lent by the Ministry of Agriculture). Later on a specialist in trial maintenance was hired and a varying number of field assistants. About half of these assistants were Dutch graduate students who played a key role in the success of the AAR. They did interviews and case studies and monitored on-farm trials. What started as an activity of a core team of four in 1981, expanded in 1983 into an activity involving up to 24 researchers and assistants, involving five institutions.

All the while close contacts were maintained with the resident CENDA and CEDIA staffs. These contacts were not always good. Suspicions arose about the quality of the research, about the intensive contacts with farmers and the premise that farmers needed to be seen as contributors to technological change. Moreover the research institutes faced acute problems of finance and organization, resulting in a lack of research coordination. Although the core team was represented on the Centers' staff and at its monthly meetings, research coordination was far from ideal. Social agronomy started its long voyage towards full recognition in a small research institute.

### *The seminars: definitive triangulation*

The research organization would not be complete without mention of the yearly seminars we held. For three years we invited all our informants to come together and discuss our results. In 1982 and 1983 we had a hard time getting our cultivator informants to speak out. Information acquired in semi-structured interviews would be presented, contested by verbose technicians (researchers and extensionists) but not elaborated by cultivators, who might have been just as verbose during interviews. Apparently we had succeeded in reducing social distance during the interviews, but not in the seminars.

In 1984, therefore, we organized a closing seminar for a selected number of our informants in which we gave a prime role to the cultivators. They were to report on their conclusions first, invite all participants to their experiments and draw the conclusions from the two days of meetings. This worked out better. Cultivator knowledge was more articulated than on previous occasions and

discussions took place on a more equal footing. The social scientists did maintain their role of broker, and did contribute socio-economic expertise; they were able, however, to withdraw into the background. The same was true for the technicians.

During the final seminar suggestions were made for stronger farmer organizations. In this respect we did not establish much. No requests were received for the funding of farmer organization activities, for example. Neither did change occur with regards to any formal representation of farmers in the research institutes we worked with. At CENDA a few larger-scale farmers remained on the Center's Board. Little changed at CEDIA also.

Although support was given to individual associations for various activities, we had not been able to transform the structure of agricultural research organization affecting rice and cassava cultivators. But maybe that was too much to ask for.

### *Organization: the sociological dimension*

What was the organisational position of the sociologist in AAR? In this particular research the sociologists had an atypical position because they had directed it. But even so, some generalizations can be made.

Firstly, it was useful to reduce multidisciplinary complexity to bi-disciplinary cooperation. The sociologists reduced the complexities of multidisciplinary research by involving only two key disciplines: crop science and sociology (or anthropology, as was argued in the introduction). The cooperation was geared to the development of a specific adaptive approach in agricultural science. The generalizations are therefore limited to this particular context (two disciplines, one adaptive approach). Given these limitations, it appears that sociologists can be equal partners in this type of research. Crop scientists contribute agronomic expertise - social scientists contribute socio-economic expertise in the (re)definition of cultivator problems.

Secondly, accept that there are many roles for the sociologist and assure that minimal qualification is assured for each. The sociologists apparently fulfilled different roles: teamleader, expert, broker, contributor to a new interdiscipline (social agronomy), trainer, methodologist, and evaluator of research and development projects. In each phase of the research a different mix of these roles existed. For planning purposes, it is useful to know what roles are called for at what moment. On the whole, we would argue that in the type of research we did in the Dominican Republic, there is a place for an experienced agro-sociologist during most of the stages of an adaptive research programme (including the field trials!).

Thirdly, the sociologist will have to strike a careful balance between contribution and critique. We felt that the first should come before the latter, leading some of our sociology peers to remark that our work 'showed all the signs of being acritical of technocratic approaches'. Since this criticism is generally



made from the comfortable distance of North Atlantic academia, one should not be overly concerned. Most of them have not taken the trouble themselves to try and come up with alternative technologies. Even so, their charge may be relevant; agricultural science in many poor countries is worlds apart from the cultivators. Sociologists should point this out and provide bases for criticism if and when they are adequately informed about possible alternatives.

Fourthly, sociologists will have to work under the same organizational and financial constraints as other agricultural researchers. This may mean that intensive interviewing (which we were able to do), long field visits (which we could afford) and various seminars (we organized three major ones) are not possible and that alternative and cheaper techniques need to be designed. On the other hand, just involving a sociologist without adequate resources may be another case of organizational white-wash. Center directors are quick to refer potential critics to the resident sociologist with the remark: 'we have hired someone to take care of your problem'. Sociologists need to be aware of this misuse of their presence; it happened various times during our work in the Dominican Republic.

Last but not least, sociologists need to be well trained in the particular field or crop they deal with. Preparation for the cassava research had taken four long years. The rice research was able to profit from a programme which Wageningen jointly ran with CIAT for six years. If the sociologist, however, comes 'fresh' to the field, he will be returned in the same way and another opportunity for bi-disciplinary research will have been lost. This training can only partially be offered in universities; much of it needs to be on an ad-hoc basis. There is ample reason to believe that formal training can be improved by confronting tropical crop agronomists with more social science in their curriculum (at present next to nothing in most Latin American agricultural colleges). Is it needless to repeat that sociologists and economists need to know the basics of crop production?

## **2. Rice research: conditions, constraints and adaptations**

### *Introduction*

The rice research component of the AAR was executed in three projects of the Instituto Agrario Dominicano, the Dominican Land Reform Institute. Two of these, El Pozo de Nagua and El Aguacate de Arenoso, were situated near the town of Nagua, in the north eastern part of the country. El Pozo and El Aguacate were chosen for reasons of comparison. Among officials involved in promoting rice production, El Pozo is known for being a relatively successful project, with acceptable production levels and a fairly high rate of adoption of new technology. On the other hand, El Aguacate is considered a backward area, although it has similar ecological conditions (a precipitation of about

2000mm per year and fertile soils with high nitrogen levels). Little use is made of new rice technology, and production levels are accordingly low. The third research area was the Land Reform project Laguna Salada, in the arid north western region of Mao. In spite of low precipitation and salinity problems, farmers there are known to reach acceptable production levels by means of an intensive use of modern inputs.

However, many farmers do not follow the rice research institute's recommendation to double crop their fields with the high yielding semi-dwarf varieties, but instead stick to the 'traditional' tall variety, called Mingolo, which is ratooned instead of double cropped.

These three projects were selected at the request of rice researchers and production development officers. Two basic questions underlined this request:

- Why did farmers in El Pozo successfully adopt the new technology and why did the farmers in El Aguacate not do so?
- Why had the farmers in Laguna Salada stuck to ratooning their tall variety Mingolo, instead of cropping CEDIA's high yielding cultivars?

In the following, we will try to answer these questions and indicate other findings. We will do this by first presenting some general conclusions, and then elaborate the data on which those conclusions are based.

The rice farmers investigated, beneficiaries of the Dominican Land Reform Agency, form a fairly homogeneous group as far as land tenancy and crops sown are concerned. Nevertheless, there is a high degree of differentiation among them as regards production levels and income derived from rice farming. This differentiation is based on access to crucial resources in irrigated rice farming, i.e. access to water, machinery for land preparation and credit, and differences in drainage and levelling conditions in plots. Classification of farmers according to production conditions results in considerable inter-class differences in variables such as yields, cropping intensity, use of hired labour and incomes.

Differentiation in production conditions already came to the fore in the selection of informants for our case studies. On the basis of those case studies, a rudimentary system of categorization of farmers was developed. However, as this system depended largely on the evaluations of the researchers, it was not applicable to the farmers included in the survey, executed in the second phase of the AAR. A system was, therefore, developed in which each of the five production conditions mentioned were scored according to the values of specific survey variables. The total of the five partial scores determined the category of each respondent. Four categories were identified: ranked from A to D; good, fair, poor and very poor production conditions.

Table 1 presents the distribution of the 242 respondents over those 4 categories. It shows a clear relationship between production conditions and the project's reputation as regards production levels. In El Aguacate, the project selected for its low production levels, almost two thirds of the farmers work in

poor to very poor conditions, while this figure is less than 20% for El Pozo and only about 5% for Laguna Salada.

*Table 1. Categorization of 242 rice farmers of the Mao and Nagua regions in the Dominican Republic, AAR 1983*

Project Category	Laguna Salada		El Pozo		El Aguacate		Total	
	no.	%	no.	%	no.	%	no.	%
A (good)	18	31.6	38	30.2	2	3.4	58	24.0
B (fair)	36	63.2	65	51.6	19	32.2	120	49.6
C (poor)	3	5.3	23	18.3	29	49.2	55	22.7
D (v.poor)	-	--	-	--	9	15.3	9	3.7
Total	57	100.1	126	100.1	59	100.1	242	100.0

### *Production levels*

What is the influence of the 5 factors used for categorization, on real production levels? Or, in other words, what is the effectiveness of the method used for distinguishing farmers on the basis of their success in rice production? Table 2 shows, that on three key variables, namely yields, cropping intensity and income, there are indeed considerable differences between the four categories.

*Table 2. Yields (ton/ha of paddy), cropping intensity as % of area that would have been sown if entire plot had been double cropped and income of rice plot (in DR\$; 1DR\$ = 0.70US\$) per category of 242 farmers surveyed in AAR, 1983*

Category	Yields*	Cropping	Annual income of
A	4.1	86.6	1738
B	3.3	61.6	1040
C	2.1	45.2	609
D	2.0	27.4	169
Total	3.3	62.8	1095

\* Preliminary data

The data presented in Table 2 tend to confirm our hypothesis concerning the differentiation of Land Reform rice farmers, as well as the causes of that differentiation. Differences in production conditions and key variables such as

the ones presented, may well have implication for the generation and transfer of new, adapted rice technology.

### *Technology Adoption*

The degree to which new technology is adopted, diminishes as production conditions deteriorate: in the 'lower' categories (C and D) recommendations are followed to a lesser degree than in the higher ones. In some cases, recommendations are not followed because farmers do not wish to do so, for instance, in the use of CEDIA's varieties as opposed to traditional varieties, and in double cropping versus ratooning.

In other cases, concerning the age of seedlings at transplanting, preferential data for establishing a second crop, and double cropping as opposed to single cropping, for example, farmers are not able to follow the recommendations.

In our case study research, we found a considerable degree of non adoption as well as partial adoption of the new technology package. The adoption of the core of this package, CEDIA's high yielding varieties (HYV's), was limited to two groups of farmers.

Firstly, more than half the farmers in Laguna Salada preferred the traditional tall variety, Mingolo, to CEDIA's HYV's, because Mingolo yields a good ratoon while HYV's do not. This preference for Mingolo was observed among farmers of all categories, and was thus apparently unrelated to a farmer's production conditions.

Secondly, many farmers with unfavourable production conditions in the Nagua area were found to prefer the traditional tall variety Inglés, to CEDIA's HYV's. Because Inglés has a higher tolerance to adverse conditions such as drought and flooding, and incurs lower production costs, this reduces the risk of not being able to repay credit. Although HYV's have a higher potential, this is rarely realized in unfavorable conditions. As a result, differences in yields between traditional varieties and HYV's are minimal. Since production costs of traditional varieties are lower, equal yields result in higher benefits. The increase in the use of traditional varieties, and the decrease in yield differences as conditions become less favourable, is shown in Table 3.

### *Cropping systems*

There are many other instances in which CEDIA's recommendations are not followed by farmers, but within the limits of the present report it is not possible to discuss all of them. We will therefore concentrate on three particular topics. All three topics have the same infra-structural problems as their main underlying causes: a lack of control over the supply of irrigation water, and a shortage of machinery for land preparation.

*Table 3. Average yields (ton/ha of paddy) and % of area sown with traditional and semi-dwarf varieties, per category, in El Pozo and El Aguacate Land Reform projects in the Nagua region of the Dominican Republic, 1981-1983*

Category	Yields (ton/ha)		Area sown (%)	
	Traditional	Semi-dwarf	Traditional	Semi-dwarf
A	2.6	3.8	10	90
B	2.3	3.3	22	78
C	1.9	2.1	40	60
D	2.0	-	80	20
Total	2.2	3.2	25	76

The first case concerns cropping systems. Apart from the already discussed Laguna Salada farmers who prefer ratooning (because of, as they claim, less work and lower production costs, leading to higher benefits), the cropping system preferred by most farmers is double cropping. Nevertheless, many in the lower categories only sow one crop a year (Table 4), as shortages of water and machinery cause long delays in establishing the first crop.

*Table 4. Frequency of use of different cropping systems, as % of total per category, in three land reform projects in the Dominican Republic, 1981-1983*

Production system Category	Double Crop	One crop + ratoon	Single Crop	Not Sown	Total
A	57.7	24.7	14.7	2.9	100.0 n = 170
B	41.6	21.3	29.5	7.6	100.0 n = 353
C	25.4	8.5	59.4	6.7	100.0 n = 165
D	0.0	0.0	96.3	3.7	100.0 n = 27
Total	40.1	18.3	35.4	6.2	100.0 n = 715

### *Sowing out of season*

Delays in land preparation and in the supply of irrigation water may lead to sowing the second crop out of season, that is, after the 15th of August. Officials actively discourage this practice, because unfavourable climatic conditions (low temperatures and solar radiation, strong winds) may reduce yields and even lead to crop failures. Awaiting water or tractors, many farmers experience such delays in establishing their crop, that sowing the second crop before the 15th August becomes impossible. As the alternative is losing an entire cropping

cycle, they sow anyway, taking several measures to limit yield losses to as little as possible. These measures, or adaptations, consist firstly of sowing varieties, both tall and semi-dwarf, which are more tolerant to the adverse climatic conditions of the winter months. In the second place, some cultivation practices are used to offset the poorer tillage of plants that is said to result from sowing out of season. Plant density and fertilizer application are increased, or seedlings may be planted in an inclined position (see also Doorman & Cuevas Perez, 1984, Appendix A:C6).

### *Late transplanting*

These same adaptations are used in the case of another problem resulting from the delays in getting for water or tractors, namely that of the late transplanting of seedlings. Although CEDIA's recommendation, and the preference of most farmers, is to transplant seedlings before they are 45 days old, in many instances farmers' fields are not yet ready for transplanting when the seed-bed reaches that age. Table 5 shows that the average age of seedlings is well above those 45 days, especially in the lower categories (with the rather peculiar exception of Category D, where, since only seven harvests were included, the representativeness of the data is doubtful). Table 6 demonstrates, that in fully one third of the 392 transplanted harvests inventoried, seedlings older than 45 days were used.

### *Adaptive Research*

In the Dominican Republic, recommendations concerning technology usually presuppose total control over production conditions. Due to the lack of attention given by researchers to agronomic problems caused by constraints in production conditions, there is no appropriate advice for farmers facing such problems. The development of adaptive technology, directed at countering yield reductions caused by such constraints, could be beneficial for those farmers working under sub-optimal conditions.

Two clear examples of the lack of technology for problems that result from constraints in production conditions, are the above mentioned sowing out of season and late transplanting. However, there is no official advice on what to do when, because of delays in land preparation or the supply of water, these recommendations cannot be adhered to. Extension agents faced with this dilemma, usually recommend, in the case of sowing out of season, not to sow the second crop at all. In the case of late transplanting, they advise farmers to discard seedlings older than 45 days, and either make a new seed-bed, buy seedlings elsewhere, or seed directly.

*Table 5: Average age of seedlings (in days) per category of farmers, of 392 transplanted harvests, in three land reform projects in the Dominican Republic, 1981-1983*

Category	Average age of seedlings (days)	
A	45.2	(n=100)
B	50.4	(n=206)
C	55.4	(n= 79)
D	42.9	(n= 7)
<b>Total</b>	<b>49.9</b>	<b>(n=392)</b>

*Table 6: Percent of transplanted harvests per age category of seedlings, of 392 transplanted harvests, in three land reform projects in the Dominican Republic, 1981-1983*

Age category (in days)	Harvest %
Less than 46	64.8
46-60	22.4
61-75	5.4
76-90	6.4
More than 90	0.8
<b>Total</b>	<b>100.0 (n=392)</b>

Obviously, for farmers these are unattractive alternatives. In the first case it means foregoing an entire cropping cycle, implying single instead of double cropping. In the second case, at best, losing the investments made in the establishment and maintenance of the (first) seed-bed. Making a new seed-bed will cost time and money, usually neither of which is available. Contrary, therefore, to the technician's recommendation, farmers do sow out of season and do transplant late - making the adaptations described above.

### *Trials*

We decided to select the problems of late transplanting for the third phase of the AAR project: trial research. The reason for selecting this particular topic was that late transplanting was a fairly widespread problem that, according to technicians, led to considerable yield reductions. Nevertheless, no research had been done as to what measures could diminish its negative effects.

In cooperation with the rice research institute and the Agricultural College of Santiago (Instituto Superior de Agricultura, ISA) we thus evaluated, first, the actual production losses caused by late transplanting, and secondly, the effect of farmers adaptations in limiting these losses. Our goal was to develop a small technological package based on the more successful adaptations made by farmers, combined with solutions to the problem offered by science. By extending such a package to farmers facing late transplanting, we thought a contribution could be made to raising production, especially on farms with less favourable production conditions.

In 1983, a total of 8 trials were established by ISA, CEDIA and AAR agronomists and students in three different regions of the Dominican Republic. At ISA, in Santiago, a series of 6 trials was executed in which seedlings of the medium-late Juma 57 variety, that were 40, 60 and 80 days old were compared. Surprisingly, highest yields were obtained with the 60 day old seedlings. These

yields were significantly higher than those of the 80 day old seedlings. However, there were no differences between 40 and 60 and 40 and 80 day old seedlings (see Rosario & Rosario, 1984). The latter results led to the preliminary conclusion that the use of 60 and 80 day old seedlings of the Juma 57 variety, under conditions such as those at ISA, could well be feasible.

A trial established in El Pozo by a Dutch agronomy student, under AAR responsibility and ISA and CEDIA supervision, yielded similar results. Here, no significant differences were found between Juma 57 seedlings of 38 and 73 days old respectively. However, a trial executed by a CEDIA agronomist in CEDIA's experimental station in Bonao, in the central region of the D.R., yielded quite contrary results (Perez, 1983). Here, the variety Juma 51, with a medium long cycle, resulted in yield reductions of almost 50% in comparison with 30 day old seedlings.

In 1984, a second series of trials was initiated. A total of 6 trials was executed by Dutch students, under the supervision of CEDIA, ISA and AAR agronomists, in El Pozo de Nagua. Apart from Juma 57, one other variety and two promissory lines, all with a medium short growing cycle, were included in the evaluation. The results, presented in Table 7, indicate that in 3 out of 6 trials, the use of plants up to 106 days old of Juma 57 did not result in significant yield reductions. The same result was obtained with the use of 80 day old seedlings of the variety ISA 21 and the lines J 258-BA-6-1-1 and J 282-9-1-6. On the other hand, the use of 116 day old seedlings did result in significantly lower yields, although the 17% reduction was less than might have been expected.

Two of the 6 trials resulted in significant yield reduction for 75 day old seedlings, as compared to 45 day old ones. These results contradict the outcome of many of the other trials, where seedlings of up to a 106 days yielded equally to seedlings transplanted on time. The explanation of this apparent contradiction might well be due to two factors. First, the seed-beds were fertilized, while those of the other trials were not. In the second place, both trials suffered from drought, while in the others the supply of irrigation water was no problem.

Apparently, the older seedlings were affected more than the younger ones by one or other of these variables, or by a combination of them. Additional research, especially on seed-bed management, will have to determine the validity of this preliminary conclusion.

### *Conclusions*

What general conclusion can be drawn from these results? Under specific circumstances the use of old seedlings is indeed feasible; in these cases farmers do right to actually use them. The recommendation of rice technicians to discard a seed-bed over 45 days old does not always seem justified, and should be re-examined.



Table 7: Summary of the results of six trials on late transplanting of rice, executed in El Pozo de Nagua, Dominican Republic, 1984

No. trial	Varieties/lines	Age seedlings	Adaptations evaluated	Yields old seedlings (kg/ha)	As % of yield young seedlings	Comments
1	Juma 57, ISA 21, J 258 BB6-1-1, J 282-9-1-6	36, 80	Plant density	5340.5	98.0	No statistically significant differences between yields or densities; Juma 57 and J 258 yielded significantly more than ISA 21 and J 282.
2	Juma 57, J 258 BB6-1-1	36, 116	Plant density	5450.5	83.3	Significantly lower yields for 116 day seedlings.
3	Juma 57, ISA 21, J 258 BB6-1-1	60, 80	Plant density	5382	108.2 (% of 60 days seedlings)	J 258/80 days yielded significantly more than Juma 57/60 days.
4	Juma 57	48, 75	Plant density	2944	74.5	Significantly lower yields of 75 day old seedlings. Trial affected by drought.
5	Juma 57	46, 77	Fertilization	3231.5	69.6	Significantly lower yields of 77 day old seedlings. Trials affected by drought.
6	Juma 57	47, 106	Plant density	4920.5	94.3	No statistically significant differences.

The results also indicate that farmers' adaptations to late transplanting did not work. Yields of older and younger seedlings were equal or differed, independently of variations in plant densities or fertilization. Thus, two hypotheses underlying our research were in fact rejected. The first one was that late transplanting resulted in considerable yield reductions, and the other that these reductions were at least partially offset by farmers' adaptations.

What were the consequences of these outcomes for the original objective of our research, i.e., the identification of topics that rice research could focus on? We recommended more research into why under specific conditions late transplanting does reduce yields. If an answer to this question is found, the way will be prepared for developing a set of recommendations as to what to do in case of a late transplant. We think that in the short run farmers can be helped if extension agents adjust their recommendations according to our findings. That implies a new approach to late transplanting, with less emphasis on discouraging the use of old seedlings, and more flexibility in the allotment of credit, water and inputs to farmers using them.

### **3. Cassava: varietal change and erosion**

Two regions were selected for the AAR cassava research. The first, the Sierra, is a mountainous area with a low annual precipitation and poor soils, situated about 60 km. west of Santiago. The unfavourable ecological conditions, and poor access to the D.R.'s main markets have led to bitter cassava becoming a major crop in the area. Harvested tubers are processed into "*casabe*", a kind of flat bread which can be stored for long periods of time. *Casabe* is made both for the national market and for export, the latter mainly to Puerto Rico and the Dominican community in New York.

The second research area is quite the opposite of the Sierra. The region around the town of Moca, 30 km. to the east of Santiago, has good access to both of the major markets of Santiago and Santo Domingo. The area is widely known for its fertile soils and generally favourable climatic conditions. Major crops are plantains, beans (*Phaseolus vulgaris*) and sweet cassava, the latter being grown almost exclusively for the fresh food market.

In the following we will present the main findings of our case studies, survey and trial research.

#### *Varietal change*

A preliminary inventory of cassava cultivars in the arid Sierra region around the town of Monción, yielded 60 different cultivars, suggesting a far greater diversity than previously assumed by researchers and extension agents (L. Box, 1984, IDC, B.3). In the Moca region also a wide array of varieties was found.

Cassava cultivators were found to experiment with new cultivars, replacing old ones according to changes in production conditions.

On the basis of our case studies, we concluded that the traditional image of the small cassava cultivator, implying not only minimal changes in cultivation systems over long periods of time, did not correspond with reality. Many cultivators were not only found to adopt new varieties rapidly if they were convinced of their advantages, but also to engage themselves in the selection of these new cultivars. Several case study informants were found to have small plots, often in isolated corners of their fields, where a collection of old and new planting material was kept. There, they would experiment with new materials, comparing their characteristics with those of cultivars already used.

The impression of cultivator flexibility in the use of different cassava varieties was confirmed in our survey. Data from a representative sample of 242 farmers from both regions indicate that almost 50% of the respondents in the Moca region and 43% in the Sierra, had tried out a new variety during the last five years. In some 80 to 85% of these cases, the results of the experiment had led to its adoption. About 65% of all respondents had experimented with a new variety in the 10 years preceding the survey (Table 8).

*Table 8: Time elapsed since last trying out a new cassava cultivar, in % of respondents of AAR survey among 242 cassava cultivators in Moca and Sierra regions of the Dominican Republic, 1983*

No. of years	Moca	Sierra
0- 2	27.8	15.0
3- 5	20.9	28.3
6-10	18.3	25.2
11-20	20.0	22.8
20+	10.4	8.7
don't know	2.6	0.0
	100.0 (n=115)	100.0 (n=127)

Declining soil fertility and an increasing importance of commercial cassava production are major changes in production conditions that have taken place in recent years. This has led to a search for cultivars which give satisfactory yields in poorer soils, are of sufficient quality to meet the demands of the fresh food and 'casabe' markets, and have shorter growing cycles.

Table 9 shows that successful new varieties usually have in common a high yield potential, also in poor soils, a short growing cycle, and acceptable market value. Recently introduced varieties, generally rejected, scored low on the first and last characteristics. Low market value was the main reason why one of CIAT's "super varieties", CMC40, was unacceptable to Dominican cassava

growers: CMC40 was found to be neither fit for the fresh food market, nor for 'casabe' production (Box, 1983:42, Appendix A, A.3).

Table 9: Varietal traits of recently introduced and "classic" vs. actually cultivated and discarded better cassava cultivars in the Sierra region of the Dominican Republic

Recently introduced	Actually harvested	
	yes	no
Recently introduced varieties	<ul style="list-style-type: none"> <li>+ higher yields</li> <li>+ short cycles</li> <li>+ tolerates poor soils</li> <li>+ starch content</li> <li>+ market value</li> <li>- taste</li> <li>- tolerance to delayed harvest</li> </ul>	<ul style="list-style-type: none"> <li>+ yields</li> <li>+ short cycle</li> <li>+ taste</li> <li>- tolerates poor soils</li> <li>- market value</li> <li>- resistance root rot</li> <li>- availability of planting material</li> <li>- degeneration planting material</li> </ul>
Classical varieties	<ul style="list-style-type: none"> <li>+ acceptable yields</li> <li>+ tolerance to delayed harvest market preference</li> <li>- cycle long</li> <li>- tolerance to poor soils</li> </ul>	<ul style="list-style-type: none"> <li>+ taste</li> <li>+ tolerance to delayed harvest</li> <li>- tolerance to poor soils</li> <li>- cycle</li> <li>- market value/preferences</li> <li>- degeneration of planting material</li> </ul>

Source: L. Box, Cassava cultivators and their cultivars, 1983.

Surprisingly, one of the principal conclusions of our case studies, namely the perceived decline in soil fertility, was not entirely confirmed in the results of the survey. In the Annual Report of 1983, we reported that of 117 respondents from the Moca area, 44.1% reported a decrease in yields, while 39% asserted that in the last harvest from their main plot, yields had increased as compared to those of the first harvest. In the Sierra, results were more in accordance with the conclusions of the case studies. There almost 30% of the 119 respondents claimed higher yields, as opposed to 56.1% that confirmed out hypotheses of decreasing yields. Why this partial contradiction between case study and survey results? Farmers invited to our closing seminar, held in November 1984, suggested that the phrasing of the survey questions might have been wrong. The term "yield" (*rendimiento*) might by some farmers have been interpreted as yields in money, i.e., proceeds from cassava cultivation, rather than yields in weight of tubers. If this is correct, the survey data on this particular question

are of limited value - and the problems involved in the correct phrasing of questionnaires are demonstrated once more.

Recently introduced cultivars are less tolerant to delayed harvesting (the "piggy bank" function) than older ones. The problem of keeping cassava in the ground is mainly due to increasing problems with root rot, both in the Sierra and in the Moca region. Wet root caused by an excess of water, is predominant in badly drained, heavy soils of the Moca area, while "*sancocho*", a physiological deterioration due to sudden changes in humidity and temperature, is more common in the Sierra. Few researchers or extension agents were familiar with the latter form of root rot (Box, IDC, B.2).

The importance of root deterioration as a constraint on production levels is indicated in Table 10: Approx. 40% of the survey respondents reported yield losses as a result of root deterioration; in Moca, mainly to wet rots; in the Sierra, mostly through "*sancocho*".

Table 10: Cassava yield losses due to root deterioration in the year preceding AAR survey (in % of respondents)

	Moca	Sierra
no losses	56.8	61.7
losses due to wet rots	30.5	18.0
losses due to " <i>sancocho</i> "	11.9	20.3
No reply	0.8	0.0
Total	100.0 (n=118)	100.0 (n=128)

Although no estimates were obtained as to the extent of the losses (i.e. as % of total production), it may be assumed that these are considerable. One of the main indicators are the low production levels reported by farmers, especially in Moca. The survey results indicated average reported yields of only 5.4 tons/ha in this region, as against 5.7 tons/ha in the Sierra.

Both figures are low, but the fact that yields in Moca, in spite of its reputation as the most fertile agricultural area in the Dominican Republic, are even lower than those in the Sierra, is thought provoking.

### *Trials*

To obtain information on the causes, extent and possible solutions for the wet rot problem in the Moca region, we started a series of adaptive on-farm trials. Their execution and analysis were impeded by numerous problems, among others, a lack of laboratory materials, problems of communication between Dominican agronomists and Dutch agronomy students and unfavorable

weather. The research results presented below, should only be interpreted, therefore, as preliminary findings, to be used as indicators for future research.

In 1983, a trial was started in cooperation with CENDA agronomists to evaluate the effects of preparing the land in ridges as a means of diminishing root rot problems. A farmer's plot was selected in which the previous year all cassava had been lost to wet rot, caused by an excess of water in the badly drained, heavy soil. However, as a result of unusually low precipitation during the cropping cycle, no root rot occurred in the trial. But despite the absence of rot, the ridges did result in yields some 33% higher than those of the treatment without ridges (23.4 vs.15.8 tons/ha) This might indicate that the loosely structured soils of the ridges is conducive to tuber development, while the heavy texture of less well prepared, level terrain inhibits it.

A study directed to identifying the pathogens causing root rot was started towards the end of 1983. After selecting the plots of four farmers with root rot problems, plant material of two of the most widely used varieties in the Moca region was sown. Plants were harvested at 8 intervals during the cropping cycle, usually one and two weeks after periods of heavy rainfall, and brought to CENDA's laboratory for analysis. Traces of the pathogens *Fusarium* spp, *Rhizoctonia* spp, *Phytophthora* spp and *Erwinia* sp were found. Unfortunately due to a lack of laboratory materials, it was not possible to establish which of these actually caused the rot. Thus, several potential pathogens were encountered, but future research will have to establish causal relationships.

The pathogen-identification experiment was combined with a trial directed at evaluating the resistance of three different local varieties to root rot. No significant differences in yields were obtained. However, a "classic" variety proved to have a significantly lower percentage of rot than a more recently introduced one. Thus our hypothesis that newer varieties are usually less resistant to root rot than older ones, was confirmed. Nevertheless, as emphasized before, these results as well as those of the other trials, can only be considered preliminary indicators for future research.

### *Erosion*

Deterioration of soils and an increase of the area under production has led to an increase of cassava cultivation on the hillsides of the Sierra, resulting in a major erosion problem. The main erosion control system currently advocated by the regional development institute Plan Sierra, consisting of small lateral drains emptying into a larger longitudinal one, does not seem very well adapted to the production conditions of small-scale Sierra farmers. Preliminary results of a set of trials using erosion measurement plots, indicate that cropping systems based on partial tillage may be a cheaper and probably more effective alternative.

The erosion trials were started in 1982, by a Dutch agronomy student, who evaluated the effect of inter-cropping cassava and beans as a measure for

erosion control. The outcome, reported in our Annual Report of 1982, was that inter-cropping, in spite of better soil coverage in the first months after sowing, does not necessarily reduce erosion. It may in fact increase it if, as was the case in this particular trial, heavy rainfall occurs just after the harvest of the inter-crop. In close cooperation with the soils department of CENDA, the erosion trials were continued and expanded in 1983 and 1984. The new focus was on partial land preparation, i.e. strip cropping, which was compared with erosion control systems involving contour and longitudinal drains. Results of the four treatments included in the 1983 trials were presented in the corresponding Annual Report. Two treatments which included drains, actually resulted in increased erosion as compared to the control (traditional land preparation), but partial tillage, leaving a one meter wide contour strip unploughed after each five meters planted with cassava, more than halved the amount of eroded soil.

In 1984, some major changes were made in the trials. The measuring system was changed from barrels, in which both soil and water were collected, to open collector ditches, where only the soil was collected. Thus, it became possible to take measurements only once a month, instead of after every major shower. Sampling problems, related to the difficulty of creating a homogeneous composite of soil and water in the barrels, were also eliminated with this adjustment.

In the second place, it was decided to eliminate treatments with drains, both because such systems are difficult to evaluate in erosion plots only five meters wide, and because the results obtained had not been very promising. Instead, after consulting with the farmers involved in the trials, and researchers (particularly Dr. R. Howeler of the Soils Dpt. of CIAT's Cassava programme) we decided to introduce a new treatment fertilization and a more intensive form of strip-cropping. In the latter, untilled strips of about 80 cm wide were left between each double row of cassava plants, planted at 60 cm between rows. The different treatments of the 1983 and 1984 trials, together with the results of the corresponding erosion and yields measurements, are presented in Table 11.

In general, it can be observed that the treatments including zero tillage strips (3, 5, 7 and 8) have much less erosion than the other treatments. The exception is treatment 7; however, this treatment was established on a plot where in 1983 one of the treatments with drains had been laid out. The presence of loose soil (used to fill up the drains) and the fact that weeds had not yet established themselves in the strips in the first two months after sowing, explains the 55.8 tons of eroded soil measured in this period, which was almost 90% of the total of 62.3 tons. Change of treatments probably also influenced the measurements of treatments 5, 6 and 8. The results can therefore only be considered preliminary. A repetition of the entire trial, should yield more conclusive results.

Table 11: Quantity of eroded soil and yields (both tons/ha) of 8 treatments included in the 1983 and 1984 AAR erosion trials. Monción, Dominican Republic

Treatment	Eroded soil (tons/ha)		Yields (ton/ha)	
	1983	1984	1983	1984
1. Lateral and longitudinal drains + strips above lat. drains, no fertilizer	24.1	--	5.4	--
2. Lateral and long. drains, no strips, fertilizer	68.0	--	5.9	--
3. Strips of 1m wide every 5m, no fertilizer	1.9	11.8	6.0	6.3
4. Control, ploughed parallel to slope, no fertilizer	4.4	65.9	6.9	9.0
5. Strips of 1m wide every 5m, with fertilizer	4.4	23.2	--	10.3
6. Control ploughed parallel to slope, with fertilizer	--	159.6	--	8.8
7. Double rows with strips, no fertilizer	--	62.3	--	2.4
8. Double rows with strips, with fertilizer	--	12.2	--	6.8

Fertilization 38 kgs/ha of NPK

Slopes of 13-14% at top of measurement plot, 16-20% at bottom

Effective precipitation (corresponding to measurements) 1983: 447mm.

Precipitation 1984: 1018mm.

In spite of the problems with the changes in treatments, we do think that the data obtained give a clear indication of the erosion limiting potential of the strip treatments. This statement can be justified by looking at the erosion measurement data from the period after the first two months of the 1984 cropping cycle. It may be assumed that by that time, the influence of the changes of 7 and 8, with quantities of eroded soil of 4.6, 3.6, 6.5 and 3.9 tons/ha respectively, were clearly superior to the control treatments 4 and 6, with 21.2 and 22.8 tons. However, yields were inferior; in fact, in this respect only treatment 5 (strips with fertilizer) could compete with the two traditionally prepared plots. Yields in the double row treatments, even with application of fertilizer, were so low that the feasibility of this form of erosion control, in arid infertile regions such as the Sierra, seems limited. In general, fertilization was found to increase yields considerably, with the exception of the two traditional treatments. Differences in soil fertility may be the cause of this phenomenon; according to the farmer who managed the trial, the plot with application of



fertilizer was less fertile to begin with than the plot without fertilizer. There were also indications that fertilizer use had a positive effect on erosion control: in the treatments with strips and fertilizer (5 and 8), erosion during the last 8 months totalled 3.6 and 3.9 tons respectively, in those without it (3 and 7), 4.6 and 6.5 tons. However, in the grand total these differences have little significance, due to the fact that most erosion occurs in the first months of the cropping cycle. Future trials would hopefully indicate whether fertilizer application could also limit erosion in this crucial first stage of plant development.

In conclusion, it may be stated that our erosion research, in spite of all the difficulties encountered, did produce some promising results. Partial land preparation with untilled strips every five meters, perhaps in combination with fertilization, appears to offer a good perspective on diminishing erosion in the difficult conditions of the Sierra. Moreover, this system seems more adapted to farmer's economic conditions than the drains advocated by Plan Sierra, because minimal costs. Although some extra costs may be incurred in weed control, these may be offset by a lesser investment in land preparation.

Although initially Plan Sierra officials were quite skeptical of the results of the trials involving the drains treatments (one official even threatening to publish a paper refuting them) a constructive dialogue was created after a presentation at the office in San Jose de las Matas. It was concluded that systems with drains are apt for terrains where the water from the lateral ditches can be drained in land well protected against erosion (forests, for example), or in drains with a good cover of natural vegetation. These possibilities, though limited in the area around Monción, do exist in other, more moist parts of the Sierra. For the more arid regions, the potential of strip-cropping was recognized, and interest was expressed in participating in and expanding the trials.

### *Conclusions*

All in all we conclude that:

- Varietal change was a common phenomenon, commonly acknowledged by cultivators and generally ignored by scientists. The same was true for the 'root rot' phenomenon, indicating the great distance between the respective knowledge networks.
- Adaptive erosion trials were designed, involving local knowledge, although too early to lead to acceptable erosion control measures; the trials did provide a linkage between cultivator and scientific knowledge.
- Sociologists provided in both cases the link between the knowledge networks through a role-mix of sensitizer, method maker, broker and scout.

of women. By technological adoption we refer to the use of new varieties, the use of fertilizers, the use of new machinery or technical equipment and to the development of new infrastructures such as irrigation, drainage and roads.

Keeping within the geographical limits of the general research project, we delimited the study in the following way:

1. The study of the production of '*casabe*' (flat cassava bread) in the sierra region, especially in Monción and San José de las Matas.
2. Female participation in rice production in the region around El Pozo de Nagua.

'*Casabe*' is a traditional crispy flat bread that has been eaten since pre-colombian times, and accompanies several meals. In spite of the parallel use of bread, '*casabe*' is still widely used in the D.R., and is even exported to New York for the half million Dominicans living in that area.

We chose to work on the production of '*casabe*' because it is a traditional occupation of women and has remained so. Moreover, the commercial production of it uses a high proportion of female labour. In the regions mentioned we found a great variety of '*casabe*' factories - there were factories which used about thirty employees, others which functioned only with family labour and yet others that were organized on a cooperative basis. Though the division of labour did not vary much from one factory to another, the working and the payment conditions did. We tried to pay special attention to this problem. We further found that in the processing of cassava there were few successful technological changes which concerned the work of women.

There were some attempts made to improve the working conditions, but these did not prove to be very successful. These were concerned particularly with the size and shape of the ovens and chimneys built to reduce the smoke in the working area. However, some mechanical rasps and presses were developed which were successful. These were almost exclusively used by men.

In the region of El Pozo de Nagua, in the area of a land reform project, we found that women work in rice production in two ways. There were women, the '*parceleras*', who in their own right received plots of land, a '*parcela*', on which they could cultivate rice. They did this themselves, with the help of family members and hired labour, or with the help of a foreman. Whether the women carried out the work on themselves or not, they were always the ones who administered it and who organized getting credit from the local bank, which is only given to the beneficiary of the plot.

There were another group of women, the '*jornaleras*', less fortunate, who were not able to obtain a plot of land. With urgent economic needs, and in a situation in which there were few income generating activities, some women started working the rice fields as day labourers, mainly in the harvesting and threshing of rice. This is not considered women's work in the Dominican Republic.

Women, just like the men, we discovered, are willing and able, whenever possible, to apply new technology. There has been a socio-economic adaptation, for in the D.R. women have adapted to new technologies at the same time as they have adapted to a change in the division of labour - doing what is still considered by many to be a man's job. Women have gone into rice production as farm managers or if not possible, as wage labourers, because in their situation this has offered them the best economic alternative. In this sense we speak of the socio-economic adaptation of women. Once again, economic needs change social norms, and women adapt to them. Moreover, they seem to do well in their new tasks.

Women work outside of the house because they have to. The financial contribution of women to the family is of the utmost importance, even if this is small. In the case of women baking '*casabe*', their income satisfied weekly needs. This was important, because their husbands - mostly small farmers - earned money over longer intervals. In the case of women working with rice, where more than 60% were heads of households, the woman's income was even more important; their families depended upon it.

We therefore suggested to officials of the government who are responsible for the distribution of land and the means of production, to take women more seriously into account as beneficiaries of the land reform. The women who have benefitted from it have shown that they are capable of managing or even working the land, they are also considered good credit-risks and it is said that their incomes benefit more directly their own families.

The Dominican land reform laws do not mention women as possible beneficiaries, but neither do they exclude women. The land is given to the head of household, yet 30% of Dominican households are headed by a woman, a fact which the law does not seem to take into consideration. These laws should be modified to take more account of reality on this point. Particular attention should be given to female headed households who are among those in the greatest need. The increasing economic participation of women in the rural sector, shows that a certain change is taking place in the division of labour as a response to rural poverty. It further represents the capacity that women have to adapt to new and deteriorating socio-economic situations. More emphasis on women could serve as a stimulus to small-scale farming which would serve to reduce rural poverty.

## **6. Adapted farm machinery: the VOTEX rice thresher**

The VOTEX Ricefan is a small, portable rice thresher, developed by the Dutch company Vogelzang BV, in cooperation with the Department of Agricultural Machinery of the Agricultural University of Wageningen. Early in 1983, with funding from Dutch Aid, two machines were sent to the Dominican Republic for testing under the specific circumstances of the rice producing

Perhaps even more important, substitution of labour is limited, especially in comparison with the large combine. And last but not least, the VOTEX also has potential for use with other crops, especially sorghum.

On the basis of the positive results of the evaluation, it was decided to look into the possibilities of producing the VOTEX in the Dominican Republic itself. To that purpose, a project involving Dominican institutions, the International Agricultural Centre and Dutch Aid was formulated, in which 60 threshers were constructed partially in Holland and partially in the D.R.

### **3. THE ROLE OF SOCIAL ANTHROPOLOGY/SOCIOLOGY IN AGRICULTURAL RESEARCH, THE PHILIPPINES, 1982-1986**

The introduction of social scientists into agricultural research stations is not always an easy affair. Their vehement and not always balanced criticism on the green revolution (Feder, 1983), is one such reason. In the International Rice Research Institute (IRRI), which accepted the idea of a joint research programme, some of the staff members were surprised and not so pleased that, after the stay of the cultural anthropologist Grace Goodell, a sociologist was again allowed to work in the institute. Those who have read her very entertaining but also rather critical 'Letters from the barrio', will have some understanding of their reaction. But it gives some indication of the general atmosphere in which the research project started.

#### **1. Objectives and organisation of the project**

It was decided that the senior cultural anthropologist Dr. A. Polak, kindly made available by the Amsterdam-based Royal Institute of the Tropics, would be located in the agricultural economics department and would become a participant of the cropping systems multi-disciplinary team.

His main tasks were:

- a) To develop methods and procedures to provide a sociological dimension to the description of cropping systems sites, in order to facilitate the design of better adapted new technologies and their evaluation;
- b) To contribute to the evaluation of constraints to adoption and the consequences of technologies already designed and tested.

In other words, the main objective of the project was to find out whether it was possible to include sociological components of Zandstra, Price, Litsinger and Morris's "Methodology for on-farm cropping research" (Zandstra et al, 1981).

Three locations were decided upon for the location of the field activities. The first was in Ilo Ilo, where IRRI had finalized an on-farm cropping research project. The second was in Solana, in the Cagayan valley, where an ongoing reasearch programme existed. Unfortunately this location had to be abandoned due to a political situation that made sociological research practically impossible. The third location was in Guimba, in the Nueva Ecija province, where IRRI was starting a new on-farm cropping research project in an area irrigated by tube wells. It was hoped that by studying the on-farm cropping research methodology implemented by IRRI, in three different stages of implementation, it would be possible to gain some insight into the question as to what phase in the methodology being implemented sociological components could be best introduced.

some of the researchers when, on the Solana site, the IRRI varieties could not cope with the extremely adverse physical environment. They thought that the site was a failure. Only at a later stage was it seen that the outcome of the research executed at this site gave clear indications for further research.

Thirdly, the participation of the farmers was very limited. This was partly due to the great influx of technically capable personnel. Another most likely reason was, that although attention was given in the methodology to socio-economic aspects, the discipline to obtain the sociological and cultural data was lacking. But such data are important for finding out how farmers and their families can be induced into active participation.

Fourthly, there was a tendency to lay too much stress on extensive and time-consuming surveys. These resulted in descriptive material that gave only a limited insight into the sociological processes that were determining production activities. It was a general criticism of the on-farm cropping research programme that it was too descriptive and did not give enough insight for making extrapolations for the future.

Fifthly, just the appearance of IRRI, a powerful organisation in the Philippines, already changed the situation on a site. A clear example was the Guimba site. Due to the fact that IRRI was working in the area of the deep well P27, technical problems were solved more quickly than would otherwise have been the case. It also became impossible for the management of this pump irrigation scheme to deny water to those farmers not paying their water duties, but who were cooperating with IRRI.

### *Cropping systems versus farming systems*

When the research project started, IRRI still had a cropping research programme. Later it was changed into a farming systems research programme. It will become clear that these two systems are part of a hierarchy of systems, starting from the cell with its subsystems, via plant systems at lower levels, to at the higher levels household, village, regional, national and international systems.

The farming/household system is the most logical choice for research when it comes to influencing the decision making of farmers on the use of new production technologies, because that takes place at this level of the system. When it comes to the testing of new varieties, it seems that the cropping system is the most appropriate level for observation and analysis. It remains closest to the tasks of agricultural research stations. When higher systems are selected as the main entrance point for research there is the danger that elements are introduced in the research process that can better be analyzed by other types of research institutes. But whatever level is chosen, in the final analysis, higher and lower levels cannot be neglected if a new technology is going to be beneficial for farmers under specific conditions. It is, however, important that the social and economic disciplines in agricultural research

stations limit their research to those aspects that are really relevant for the decision making process in agricultural research policies. Detailed market research, village studies or in-depth research on power patterns could be better performed by other institutions.

From the foregoing, it becomes clear that the entry point in the hierarchy of systems, has consequences for the role of the social sciences in agricultural research stations.

### *Introducing sociological components in on-farm cropping research*

#### Site selection

Polak (1981, IDC, C.7) noted that the selection of research sites was dealt with very casually. The selection of research sites goes in two steps. First the target area has to be chosen. In this decision, policy makers have a considerable say. Within the target area, research sites then have to be selected. It is crucial that such sites are representative for large areas (recommendation domains). Such areas have to have important characteristics in common. However, homogeneous areas in a physical as well socio-economic sense are, in most cases, small and not very relevant for agricultural development. It is therefore important that a selection of the most crucial characteristics is made. This can lead to vivid discussions in multi-disciplinary teams.

It is not only important that the research site be representative for the target area, it is also necessary to assess whether it is possible to develop methodologies: a) to later test promising alternative cropping patterns in the target area and/or b) to identify and bring about specific institutional requirements for the adoption of new cropping patterns tested by the farmers.

For the site selection and description, Polak indicated five categories of sociological criteria that should be taken into consideration (1985, IDC, C.7). A summary of these sociological criteria, including some comments, follows:

#### 1) Cultural identity and variation

To indicate cultural identity and variation is important because the way people are likely to act, for example, with regard to agricultural production techniques, and in institutions of importance for agricultural production, is largely determined by the operating norms, which are in turn derived from cultural values.

Differences in language or dialect can be a first indication, but it does not guarantee that the same norms are being used. Sub-groups in a society, be they classes, casts, or categories differing in socio-economic status, may display considerable differences when it comes to their operating norms. These differences need to be identified as early as possible. In the beginning, secondary sources and open ended interviews with key-informants are the best instruments for discovering initial indications of the existence of such differences.

of the physical environment and institutions relevant to their agricultural production processes.

It was observed in Guimba, for instance, that the land classification of the farmers did not coincide with the land classification of IRRI. Due to certain values, such as favouring the growing of rice above all other crops, and certain attitudes, such as avoiding risks by growing different crops or varieties at the same time, different properties were attributed to various land categories than those given by IRRI. Insight into a farmer's motives is essential for assessing the acceptability of alternative cropping patterns.

#### 2) Farmers' needs

A study of the felt needs of several categories of farmers, makes it possible to identify components relevant for existing farming systems. In Guimba there was a strong need for a reliable source of irrigation water. The way they tried to satisfy this need in the various stages of the growing season, gave an indication as to how they would behave when new cropping systems were introduced.

#### 3) Possibilities of other organizational arrangements

When new forms of cooperation are needed for an effective introduction of alternative cropping systems, it is important to identify the relevant components. Potentially important components in the Guimba research site were: a) factional strife affecting the irrigation association and water distribution, b) differences in power and wealth influencing access to water, c) ways of servicing debts by the farmers (not paying irrigation fees was a common option), d) power interruptions upsetting water delivery schedules.

#### 4) History of farmers' technology

In Guimba, farmers have been experimenting with direct seeding instead of the traditional transplanting. They did not think that direct seeding was giving the desired results, but they still continued with the experiments. From discussions with the farmers, it appeared that the following components were of importance in their considerations: the wages of transplanters, the cost of herbicides, and the time available for crop establishment.

On the basis of a preliminary analysis of these components, certain consequences of newly designed cropping patterns could be indicated. When particular cropping patterns were selected for testing, it was also possible to indicate research priorities for the social scientist. In Guimba, it was clear that the institutionalized decision making of farmers regarding equitable and efficient water distribution was a research item with a high priority.



### *Designing alternative cropping patterns*

After 2-3 months when the description of the research site is finished, the design of alternative cropping patterns is done via a workshop which lasts for 2-3 days. According to the methodology (Zandstra et al, 1981): three levels of feasibility should be considered during the design phase: the biologically feasible, the technically feasible, and the economically feasible alternatives. Polak (C7, 1986) suggests adding two levels of suitability as well:

a) Only when the designed cropping patterns are also acceptable to the farmers they will be implemented. A first assessment of their social acceptability can be made by the sociologist. This can be done on the basis of the information gathered on what motivates farmers in their decision making process. In Guimba, for instance, six criteria which influenced farmer decision making were selected;

- adaptability to the specific conditions of the farmers' fields;
- distance of the fields from the house;
- availability of labour;
- preference for growing rice;
- avoiding risks by growing several rice varieties or crops at the same time;
- expected possibilities for selling upland crops.

But the final answer has to be given by the farmers themselves. It is, therefore, not only important that site researchers, advanced cropping systems researchers and subject matter specialists are involved in this workshop, but that farmers and local officials also take part in the design of alternative cropping patterns.

b) Another aspect that should be taken into consideration during the design phase, is the existence and avoidance of the adverse consequences of alternative cropping patterns for high-risk groups. The question of the degree of neutrality in growing modern rice varieties is still under debate. But the issue, as such, has to be scrutinized carefully.

### *Testing*

The selection of particular cultivators' fields is based, in the methodology (Zandstra et al, 1981), mainly on the physical properties and location of their land. But from a sociological point of view this is not enough. It is also important, for farmers, coming from different socio-economic categories, to be involved in the testing of new cropping patterns. These should preferably be farmers whose households have been selected by the social scientist for case studies.

Another problem needing attention, is the representiveness of the testing that takes place at IRRI on-farm cropping research sites. During the testing period, the technical and biological feasibility are tested in trials that are managed by the researchers. It is assumed that, except for the farmer's decision making that has been taken over by the researchers, all other

circumstances are the same. However, as mentioned earlier, in Guimba, the mere presence of IRRI on that site, changed a crucial element in the situation, namely the availability of water and its distribution.

When it comes to testing the social acceptability of the new technology the following observations can be made.

- Firstly, there was an overwhelming presence of IRRI personnel, all interested in making the research a success in the sense of proving that the IRRI technology was acceptable.
- Secondly, there was the proximity of the trials managed by the researchers, which not only gave the farmers far more information on the new cropping systems than they ever could obtain under normal conditions, but also gave them clear examples of how to perform each activity.
- Thirdly, there was also some kind of psychological pressure which made it difficult for the farmers under such circumstances to refuse the new cropping system offered, at least during the testing phase.
- Fourthly, the trials are carried out, initially, on only small parts of the farmer's land. It is only when a cropping pattern is introduced on a larger scale that it becomes possible to measure its social acceptability.

For the last two stages of the on-farm cropping research methodology, pre-production evaluation and production programmes, no specific recommendations were made by Polak. This was for various reasons. Firstly, the experience of IRRI with these stages was limited. Secondly, in the most important research site, Guimba, the process had not yet reached these stages. Thirdly, time was not available.

### **3. Collecting and presenting sociological data**

Social scientists in agricultural research stations face the task of having to present their data in such a way that they are intelligible and acceptable to other disciplines, and that the data can be merged with the data of the other disciplines in the interdisciplinary analysis. In performing this task effectively, sociologists have to be aware of some methodological problems.

#### *Case studies in conjunction with surveys*

One of the problems is that the social scientist is expected to present his data in a quantitative form, in well-organised tables. The survey is the most logical instrument available to sociologists for answering this demand for quantification. However, there are several important dangers in rushing too early into large and often resource-devouring surveys.

In the joint research programme in IRRI, special attention was given to this methodological aspect. Hereafter, a summary is given of some of the

observations and recommendations made by Polak on the basis of his experiences in some of the research sites, especially in Guimba, and presented in his report "Case studies and interview schedule surveys: A social anthropological approach to data collection in farmer oriented agricultural research" (Polak, 1981, IDC, C.6).

The main argument is that before starting surveys, it is important to do some in-depth research in the form of case studies, for the following reasons:

a) At the beginning of a research process it is not yet known which factors are relevant for the acceptability of new technologies, and what the potentially negative consequences of such technologies will be, for so called high-risk groups. This can lead to a situation where the outcome of predetermined questions is irrelevant. It can also result in long questionnaires, tiring the respondents and resulting in loss of reliability in the collected information.

b) Interview schedule surveys can give an answer to the prevalence of certain factors (how many/how much), and can help to determine correlation coefficient types of relationships. But before seeking this quantitative information, an insight is necessary into why various categories of farmers react in different ways. This is needed in order to explain, and if possible predict, these reactions.

c) When a researcher starts to use a questionnaire too soon he runs the risk of collecting information that lacks validity. Validity refers to the degree to which scientific observations and information actually measure what they purport to measure. The main reasons for the lack of this validity are:

- Respondents have the tendency, when it comes to sensitive issues, to give answers that refer to a situation as they think it should be, but which may not reflect the actual situation or their actual behaviour. It is also important to note that between cultures and social strata there are great differences when it comes to the categories of information that are considered sensitive.

- Another problem is that the meaning and connotations of the concepts used by the respondents may differ from those of the researcher. For instance the word 'risk' may have a different meaning for the farmer to the way it was intended in the questionnaire. As a result the farmer's answers will not reflect his thinking.

d) When the researcher is not sufficiently acquainted with the respondents situation, the reliability of parts of the information may be endangered. Lack of information with regard to the local situation can lead, for example: to asking the wrong questions; to formulating good questions in the wrong way; or to asking them at the wrong moment. This is often the case with issues where the respondents are afraid that the correct information could harm them, for example, in giving information regarding the ownership of land or animals that are liable for taxes.

e) Scheduled interviews are conversations of only a couple of hours or shorter, based on a rather rigid schedule of questions between persons who scarcely

know each other. It is obvious that under such circumstances it is difficult to create the atmosphere of trust and mutual understanding necessary for obtaining reliable answers.

In order to avoid the problems mentioned above the use of the case study approach at the beginning of the research process is strongly recommended. A case study is an empirical inquiry that investigates phenomena within their real life context, when the factors relevant for these phenomena are not clearly evident. This approach zooms in on social units as a whole and is suitable to answer "how" and "why" questions about events for the following reasons:

- a) Case studies provide better circumstances for creating mutual trust between informants and investigator. Only when the informant trusts the investigator can highly valid and reliable information be obtained.
- b) Multiple forms of information gathering are used in case studies ;
  - Observation. It is important that the researcher goes into the field to see what agriculturally relevant activities are carried out by the various members of the household and under what circumstances.
  - Open interviews. Via open interviews it becomes possible to discuss with members of the household why they decide to undertake specific agricultural activities.
- c) The case study makes it possible to pay a number of visits to a household. This puts the researcher in the position of being able to check the reliability of the information obtained and to compare the outcomes of observation and interviews. Preparing in advance an interview guide is recommended, in order not to miss potentially interesting issues. Contrary to the interview schedule, the interview guide contains no predetermined carefully formulated questions but only topics for discussion. During the case study the researcher is free to delete subjects that are irrelevant and to add topics that seem to be meaningful.

In on-farm cropping research there are several stages in the case studies. In the first stage the case studies have to lay the basis for the interview schedule survey. However important the information derived from the case studies may be, it gives only an in-depth view in a limited number of households. The survey, through a representative sample, must give an indication of the frequency of the most salient characteristics of the households included in the case studies, that occur in the research site. This means that the first stage of the case studies have to be concluded in a couple of weeks.

At the design stage of the methodology, it is essential that some of the households involved in the case studies are represented at the workshop. This makes it possible to follow closely their decision making process. At the workshop itself it is not likely that all the factors influencing the reactions of the farmers will be explicitly indicated.

The stage of testing the case studies, can again provide an in-depth view on the factors influencing the decision making process within households, when it comes to the introduction of new production technologies.

#### *Selection of the units of analysis*

The unit for action, when it comes to changing cropping patterns, is the household. It is logical, therefore, that the unit for collecting and analyzing data should also be the household. From which community the households are selected is determined during the selection of the research site. Within this given community/research site, about 10 families should be selected. The households selected should reflect the range of different socio-economic categories in the research site. Special attention must be given to high risk categories. It is important to consult with the other disciplines involved in order to find out in which locations in the research site they are going to start farmer-managed trials. Households that are going to be involved in these trials can then be included in the case studies. It is possible that during the research process some of the households will have to be replaced by others. Timely consultation with the other members of the research team can minimize this problem.

Selecting households from a community outside the research site can also be considered, in order to use them as a control group. This can be important for observing the behaviour of high-risk groups. However, time constraints will need to be taken into consideration here.

#### *Types of case studies*

Several types of case studies were used in IRRI; on-farm cropping research.

- The apt illustration. This is the description of a rather simple event in which the operation of some general principle is clearly illustrated, for instance, how, when and why a wife of a small farmer is engaged in transplanting rice.
- The analysis of a social situation. A social situation is a of events which the researcher is able to construe as connected with each other and which take place in a relatively restricted span of time. For instance, the description and analysis of a meeting of farmers and extension officers where the latter are explaining the advantages of high yielding varieties.
- The extended case study. Such case studies deal with a sequence of events over quite a long period, where the same persons are involved in a series of situations. This makes it possible to get an insight into the processes of change taking place in a household. This type of case study can be used in the stage of testing alternative cropping systems.

### *Requirements of the interview schedule*

The list of questions should:

- be brief, preferably not more than 3-4 pages, in order to avoid lengthy periods of interrogation that can lead to irritation with the respondent, - affecting the validity of the answers and resulting in a long period needed for verifying that the data-yield is valid and reliable information;
- inspire the respondents to give accurate answers;
- yield facts and figures which relate to a representative sample of the group studied.

It is only possible to reach these requirements when the researcher is fairly well acquainted with the local situation via case studies.

The foregoing shows that through a well chosen mix of several types of case studies and a survey, it is possible for sociologists to provide, in on-farm cropping research, a timely insight into ongoing social processes relevant for agricultural production processes, and a quantification of their most important indicators.

#### **4. A systems approach and the construction of models**

In his reports, Polak (IDC, B.15, C.7, C.8) indicates that the production function " $Y=f(M,E)$ " introduced by Zandstra et al (1981, p.3) is not as clear as its mathematical form suggests and its practicality is doubted  $Y$  = plantgrowth and crop yields;  $E$  = environment;  $M$  = management of cropping systems. He advises a further elaboration of the concept of system for the following reasons:

"For changing effectively and efficiently an existing cropping system, the system as a whole has to be considered. A systems approach is eminently suitable to cover all relevant components and their states and their interrelations, by enabling us:

- a) To construct a representation of the farming and cropping systems under study. In such a model the components, their states and their interrelations, first have to be identified and then described quantitatively and qualitatively with a degree of precision which has to be improved in the course of the research;
- b) To design, on the basis of an initially hypothetical model of the existing farming and cropping systems, alternative cropping patterns, which are seemingly more profitable and acceptable to the farmers, taking into account the actual biophysical, technical, economic and social conditions. In testing the designed cropping patterns, the hypothetical model has to be refined;
- c) To identify, in good time, on the basis of the model, possible negative and positive consequences of what seem promising cropping patterns;

d) To integrate the work of participating scientists belonging to different disciplines, by assigning them their proper places in the model." (Polak, 1986, IDC, C.7;378,379).

For the constructions of models that can be used for the prediction of events relevant for the effective implementation of new cropping systems, the social scientist must have an insight into the major social processes that can influence the decision making processes pertaining to the realisation of these events. For quantification, it is necessary to find indicators or factors that reflect these processes. This information can be derived from several types of case studies.

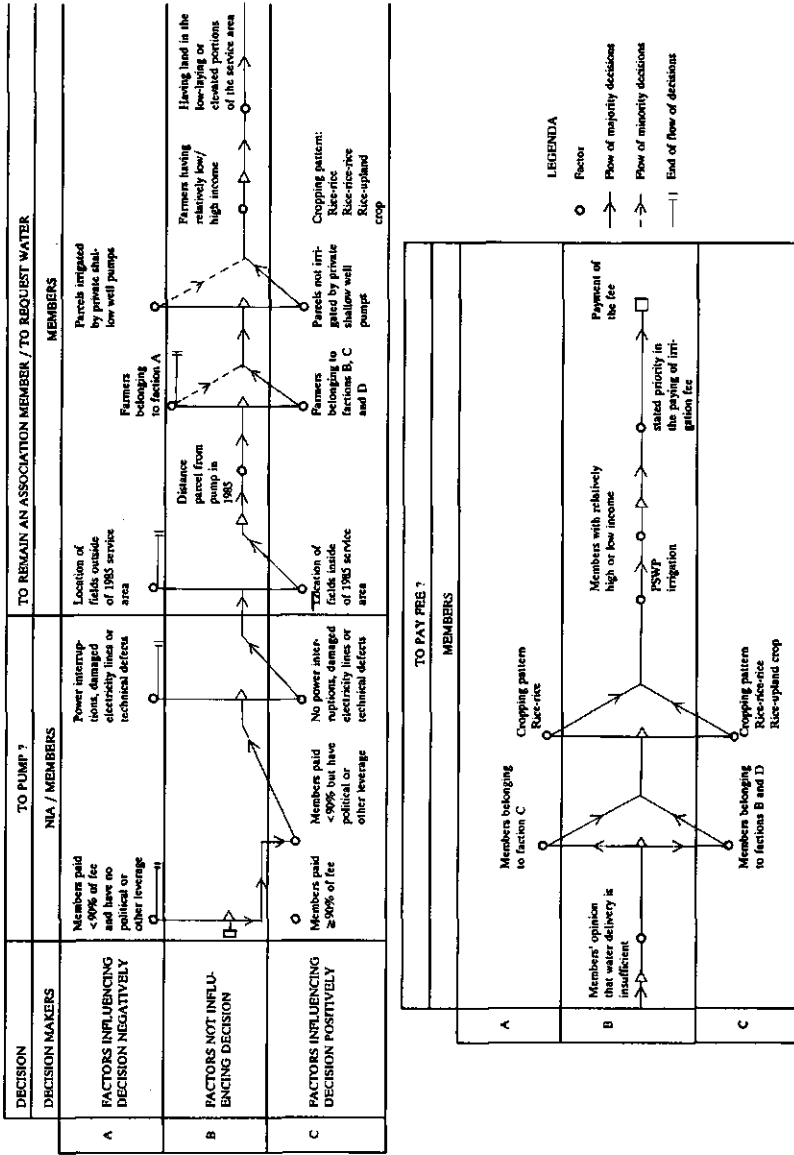
For the construction of simple mathematical models Polak (1986, IDC, C.4, p.11-13) gives the following suggestions. As it is not known on the basis of the case studies whether these factors reflect the general tendencies in the research site, a scheduled interview survey has to follow. The quantitative significance of the factors can be analyzed by drawing up tables combining events to be predicted. Examples are the location of plots and the payment of water fees, the membership of tillers and their cropping pattern, etc.

The results of the case studies and survey should be summarized in a flow chart. Such a flow chart was constructed for the decision making process relevant for the paying of irrigation fees in the service area of the deep well pump P-27 in the Guimba area (Figure 4).

The flow chart and the tables have to be translated into a model which can generate relevant predictions. Relationships between relevant factors and the events to be predicted, have to be quantified by computing conditional probabilities for the base line period. These conditional probabilities are then used on initial data of a following period for which hypothetical predictions have been generated by applying the product rule for dependent events. The hypothetical predictions can be generated with a calculator, an electronic spread sheet or a simple computer programme. Polak, Agmata and Bobbink (1986, IDC, C.5) demonstrated the application of this procedure in the document "Predicting farmer's decisions on membership of an irrigators association and payment of the irrigation fee: A trial". The effort of Polak to introduce mathematical modelling in the presentation of sociological data for the use of making predictions, is laudable.

Such efforts should continue, because it can be expected that mathematical models in agricultural research will become important. However, some caution in this field is required. A model is only relevant when the quantitative data base is adequate. The collection of such a data base requires scarce resources. It has to be realised that simple predictions can also be made, even in a quantitative way, on basis of qualitative information. Social scientists must not be tempted into a position whereby they begin to use models just to keep up with the technical disciplines, when, with their qualitative instruments, and with less resources, they can do the same job just as well.

Figure 4. Flow chart on decisions relevant to pay the irrigation fee in the service area of deep well pump P.21.



Source: Polak et al (IDC, C-5)



## 5. Some organizational aspects

### *Position of sociologists in agricultural research institutes*

One of the objectives of the research project was to obtain some insight into the optimal location of sociologists in an agricultural research institute.

As mentioned earlier, Dr. Polak was attached to the agricultural economics department of IRRI and became a participant of the cropping systems multi-disciplinary research team. It seemed the most logical position. It was interesting to observe that most of the relations with the technical disciplines were not problematic. With the economists there was good cooperation, certainly in the beginning, but there were also tensions for various reasons. The most obvious one is that there is a potential overlap between the sociologist and the rural economist. This can lead to the feeling, by an already established discipline, that the sociologist is intruding in his field of expertise. Another problem can arise when the sociologist obtains information from his informants that questions the accuracy of some of the economist's assumptions. An example of this was when farmers said that they were not interested in the growing of a crop proposed in the new cropping systems, because the prices in the period after harvesting were not attractive, while the information of the economist indicated otherwise. A request to the sociologist to make a new assessment of the local market prices was not directly accepted. In view of the fact that the number of sociologists in agricultural research institutes will be very limited, most likely not more than one, it is not realistic to suggest a special sociological department. The logical placement at IRRI for the sociologists therefore, will be in the department of rural economics. It is, however, necessary to make a clear delineation of the fields to be covered by the two disciplines right from the beginning. It is also important to indicate those areas where a certain overlap cannot be avoided and to find solutions for a sound cooperation.

Another important aspect is the necessity for information, obtained from farmers by the sociologists, to be taken seriously by all other disciplines. This can partly be realised through joint fieldtrips.

### *Sociology in international agricultural research institutes*

The sociological knowledge for understanding has a wide range of applicability. However a typical characteristic of sociological knowledge is that it is time and place specific. The place specificity also holds true for the findings of agricultural research. However, for the social sciences this problem is more pressing. This means that the sociological contribution in international research institutes, is mainly limited to the development of methodologies and approaches that, with some adaptations, can be applied in other countries.

The development of such methodologies requires field research. The results of this research are, of course, of relevance to the country in which it takes place.

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