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From common ignorance to shared knowledge  
Knowledge networks in the Atlantic Zone of Costa Rica



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**Editorial committee:** A. J. Jansen, B. E. J. C. Lekanne dit Deprez and Q. J. Munters

**Secretariat:** Department of Sociology, Hollandseweg 1, 6706 KN Wageningen, the Netherlands, tel. 08370-84452

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# From common ignorance to shared knowledge

Knowledge networks in the Atlantic Zone  
of Costa Rica

Louk Box (Editor)



Agricultural University

Wageningen

1990

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## PREFACE

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Mr. Mario A. Chaves of El Silencio, Neguev, introduced us to the realities of settlement farming. One of us was his guest for almost half a year and was allowed to share in family life. Others were visitors for the day. All of us learned a lot from him and his wife. Also important for our studies was the information of researchers and extensionists of ASBANA and CATIE.

Through these key informants we built up our own small knowledge network in the Zone. If it had not been for them, our knowledge would still be 'inarticulate' - we would have gathered facts, but might never have understood their meaning. Through them, the studies became what they are. Through them, also, the conclusions are verifiable and we invite others to check our results accordingly. Qualitative studies can be verified just as well as quantitative ones; provided methods and techniques are clear, their verification is even easier. Of course the responsibility for the results is with the authors, and with them alone. If we mention the names of our key informants it is only to give them credit, and allow further study. They can never be made responsible for our observations or conclusions.

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Louk Box



# **I. AGRARIAN KNOWLEDGE NETWORKS: A CONCEPTUALISATION**

Louk Box

Agrarian knowledge can be studied in many ways. This book is based on the notion that people use social networks to transform existing knowledge or generate it. Such networks are sometimes consciously made, as is the case of an extension agency. Most of the time, however, networks are rather informal arrangements between people based on multipurpose social relations.

Take Don Ernesto, a pioneer cultivator in the North of Costa Rica, described in one of the case studies in this volume. He knows a cocoa trader, a cocoa researcher and a soil scientist. These three do not know each other, although they may know of each other's existence. For Don Ernesto, they fulfil an important role in his growing knowledge on cocoa cultivation. With each of the three he maintains multiple relations: the cocoa trader might be a distant cousin, the researcher once visited his banana plantation and the soil scientist was interested in the soils beneath the virgin forest on his farm. None of these relations was explicitly started to help Don Ernesto grow cocoa. However, he does maintain them partially for this purpose.

This book is about the networks which cultivators like Don Ernesto make and maintain. The authors were involved in field research on knowledge generation, transfer and use in Costa Rica. When writing up the observations, they tried to follow a set of notions developed during previous research carried out in the Dominican Republic (Box and Doorman, 1985). This introduction elaborates the terms and concepts used, and applies them to some of the conclusions reached by the individual contributors to this book.

## **Knowledge networks: the approach**

One aspect of a social relation is exchange of knowledge. Although social relations may be based on quite different motives, there are few that do not have this aspect latently or manifestly. Such social relations can be seen as long chains through which knowledge is exchanged or generated. Therefore knowledge chains can be defined as the relatively stable patterns

of interaction and communication by which knowledge is exchanged or generated. Knowledge networks are seen as sets of such chains, focused around one particular object of concern.

Let us take the case of Don Ernesto again. He maintains an informal relation with his cousin. Through this man he knows about cocoa prices and the scarcity of cocoa on the national market. When Ernesto and he meet, one of the subjects they discuss is cocoa. This aspect of their social relation we call the knowledge chain. The social relation is based on more than this exchange of information, but for the present purposes we are interested in this particular aspect. When Ernesto wishes to verify some information he checks it with a researcher with whom he maintains friendly relations. He also hears from the researcher news about new hybrids, appropriate for his soils. This information is in turn checked with a visiting soil scientist. The set of these three relations can be seen as a network, because information is articulated through the multiplicity of chains.

For a network to exist, the following conditions must therefore be fulfilled:

1. a multiplicity of knowledge chains,
2. articulated through a particular actor,
3. regarding a topic of common concern to the participants.

So far, it is the structural aspects of relations that have been mentioned: relation, chain and network. But how do we look at the content of these exchanges, or in other words, what is exchanged? To answer this we follow the work of sociologists who maintain that knowledge generation and exchange can best be understood by relating it to the context in which the construction and reconstruction takes place. From this perspective, scientific knowledge is no different from everyday knowledge; no sharp boundaries exist between the two. Theoretically, our notions are based on the work of Schutz (1962), Berger and Luckmann (1966), and Knorr-Cetina (1981). The sociology of knowledge "understands and studies the *constructed* character of what human beings mean by 'reality'" (Berger & Kellner, 1981: 63). Knowledge can then be defined as being "constituted by the ways in which individual members of society or social group categorize, code, process and impute meaning to their experiences" (Arce & Long, 1988: 5).

Knowledge, in this view, is not the simple set of facts which dictionaries associate with the concept. In our view facts are first and foremost social constructions - they do not have an existence of their own, but are made by people in certain contexts (Knorr-Cetina, 1981: 3). A body of knowledge, therefore, is not made up of facts, but rather by the ideas and values which govern the imputation of meaning.

Scientific knowledge can be understood in terms of the values (or codes)

by which members of the community of scientists attribute meaning to their experiences. The same can be said for cultivator knowledge. It needs to be understood in its appropriate context. Only through such understanding can differences between these two social categories be grasped and misunderstandings between them be eliminated.

The implication of this stance is that agricultural knowledge as such does not exist. What exists are bodies of knowledge relevant to particular agrarian contexts. These contexts may vary widely for different categories of agrarianists. In the Dominican Republic, for example, it was found that extensionists defined problems in cassava cultivation differently from cultivators, researchers and agro-bureaucrats. Even among extensionists differences existed: those depending on cassava cultivation for their own livelihood had different problem definitions from those living a more 'urbane' way of life (Box, 1989). The ideas and values by which scientists defined problems (and thereby the likely solutions) were different from the other categories. Phrased otherwise, their paradigms differed from those used by their partners in agrarian change.

If this is so, one may not assume that there can be a simple flow of information from one category (scientists) by way of another (extensionists) to the end users (farmers). This classical model in extension science has long been discredited (Ashcroft et al, 1970), but the necessary implications have not been drawn. The dominant model in extension practice, the T&V system (the Training and Visit System) is still based on the notion that field extensionists are instructed by specialists in a particular subject matter who in turn receive their information from researchers. Although the score is rather diverse, recent evaluations of the T&V system show that the desired flow of knowledge is often absent (see Wijeratne, 1988; for a different view see Van den Ban, 1987).

We would argue that reality is so different from such models that the time is ripe for another approach. Our model is based on the notion that agricultural knowledge is continuously transformed by cultivators. The pace of change varies per crop, or cultivation activity, but change itself is continuous. In other words, we have no evidence to show that 'traditional farmers' exist, who just repeat what their fathers did. Fieldwork in the Dominican Republic (Box & Doorman, 1985) confirms the findings of other agro-sociological and anthropological studies that traditional subsistence agriculture exists principally in one place: the heads of so called modern agricultural technicians. Recent historical studies show that the same is true of traditional subsistence agriculture in Europe. Bieleman (1987) has convincingly demonstrated that this notion emerged in the latter part of the 19th century with the development of modern economics and agricultural

science. If we take this argument one step further, it means that the locus of change lies primarily within the production conditions of the cultivator. She or he continuously adapts to these conditions by testing out alternatives. Some alternatives are proposed by extensionists, who in turn may have received them from scientists. But the activities of extensionists and scientists are neither a necessary nor a sufficient condition for agro-technological change. The introduction of modern rice varieties in Northern Colombia, for example, took place without extension (Spijkers, 1983). Dominican cassava cultivators did not adopt new cassava varieties, but adapted their own to changing market and soil conditions (Box, 1984). Dominican rice cultivators, small and large, continue ratoon cropping practices despite official sanctions based on research (Doorman & Cuevas, 1985).

This is not to say that technological innovation through research and extension is insignificant. Most rice cultivation in the countries mentioned is affected by technologies developed in international and national research institutes. The same can be said for other important grain crops like maize, wheat and sorghum. In particular plantation crops like banana, technological innovation appears to be even exclusively dependent on such institutes. The same may be said for cocoa and coffee. But the way in which a particular technology is adopted can only be understood by reference to the cultivators' production conditions. If those change, technological adoption will change. A case in point is the adoption behaviour of Dominican rice farmers. Although many of them adopted most of the technology recommended during one growing season, they would 'revert' to local varieties when engaging in ratoon cropping during a next season.

In conclusion, the network approach maybe characterized as describing, analyzing and predicting agrarian technological change in terms of knowledge exchange by cultivators who adapt agro-technology to changing production conditions. If barriers exist to such exchange, knowledge transformation is likely to be slow, partial and locale specific. If knowledge can be easily exchanged through well articulated networks, change can be rapid, total and involve large numbers of cultivators.

## **The studies**

The studies reported in this book cover quite different knowledge networks operative or emerging in the Atlantic Zone of Costa Rica. This area, described in the paper of Pieter de Vries, is geographically, historically,

and culturally different from the rest of Costa Rica. Its lowlands were covered until recently by almost uninhabited tropical rainforests. A major change occurred at the end of the 19th century when the area was opened up by a US banana company which installed plantation agriculture. Black labour was imported and a new society emerged, entirely different from the one on the plateau. Plantation agriculture is characterized by industrial production processes. Knowledge is highly specialized and is generated in particular centers, linked to the respective companies. Knowledge about the Atlantic Zone was largely monopolized by those companies and until fairly recently the Costa Rican government did not share in this. Little was known, for example, about the soils; soil and land use maps were correspondingly poor.

De Vries describes the development of this area, particularly with reference to government intervention in the smallholder sector. With increasing pressure on land in the country, the Atlantic Zone became one of the principal areas of in-migration. The official agency for agrarian development was put in charge of large colonisation projects and attempted to regulate the flow of migrants. De Vries analyzes the policies underlying state intervention and concludes that the social distance between state officials and settlers is large, resulting in poor performance.

Carrillo and De Groot make a detailed study of a state agency concerned with agricultural research and extension: MAG, the Ministerio de Agricultura y Ganadería (livestock). This is a new and inexperienced agency in the Atlantic Zone, which has grown rapidly and has suffered growing pains accordingly. The authors sketch the 'formal knowledge network' operative in the Zone and indicate some of its weaknesses: linkage of the extension agency with cultivators is poor and so is its linkage with research agencies. Agricultural research for Atlantic Zone farming has emerged only recently and is concentrated on particular crops, grown under particular conditions. One cannot expect there to be, therefore, in the near future, a well articulated formal network linking researchers, extensionists and cultivators.

Kruiter describes the classical 'plantation knowledge network' in her study on banana producers in the Atlantic Zone. The picture she sketches is of a closed, rigid and poorly articulated network dominated by US companies. Banana research is dominated by transnational companies, with the national producers' association ASBANA (Asociación Bananera Nacional) unable to provide any adequate counterweight. Extension follows company rules and

is incorporated in formal plantation regulations. Feedback from individual banana producers (or managers of individual plantations) hardly occurs. Secrecy abounds: the network terminates at the company gate.

De Groot discusses the development of the 'cocoa knowledge network' in three areas of the Zone and comes to different conclusions. Although cocoa used to be grown as a plantation crop by the very same banana companies, its trajectory is different. From a fairly closed and stagnant network, it opens up in certain areas. He notes how differentiation occurs. In one area, Cocori, cocoa cultivation is pursued by a few pioneers who build their own networks and experiment without much technical assistance from research and development agencies. De Groot describes the case of Don Ernesto, the cocoa cultivator mentioned at the outset.

Ernesto's situation vastly differs from the one faced by cultivators in the Neguev land-reform area where potential cultivators receive a technological package designed by CATIE (Centro Agronómico Tropical de Investigación y Enseñanza). Field extensionists are involved in drawing up production plans and in requesting credit to realize those plans. Other areas in the Zone may figure somewhere in between these extremes.

On the whole, the cocoa knowledge network can be described as comparatively dynamic, open, and well articulated. An important place in this is taken by CATIE which has engaged in both fundamental and applied research, in training extensionists and in extending its message to lower level agricultural training. De Groot's analysis suggests that a greater understanding of CATIE's role in cocoa development might provide alternatives to state agencies, like the Costa Rican extension service.

Mudde's study gives us an insight into the 'kitchen' of extension workers. He lived for half a year with tenants in the Neguev agrarian reform project and accompanied extensionists during their work. He discusses three cases which may be typical of tenants in the project: the pioneering settler who invaded the land, the subsequent tenants, and the recent entrepreneurial tenants. They have one thing in common with each other and with the extensionists: they have no relevant experience or knowledge to guide them. Mudde suggests that this is a case of common ignorance, which can only be reduced by working together on the articulation of knowledge networks. Extensionists can only be effective to the extent that they have learned from settlers. Settlers can only survive to the extent that they learn from their own and others' experiences, including the ones transmitted by extensionists.

Mudde thus gives us some insight into the emergence of knowledge

networks in a colonisation area. The networks are so dynamic that they might be referred to as volatile with experiences being very rapidly shared by those involved. Extension officers can play an important role if they are prepared to learn from farmers. If common ignorance is not replaced by shared knowledge, disaster may occur.

### **A note on method**

The field studies reported in this book were carried out by students working in the Atlantic Zone Program. This is a joint venture between Wageningen Agricultural University (WAU), the Centre for Research and Training in Tropical Agriculture (CATIE) and the Costa Rican Ministry of Agriculture (MAG) in research, training and development (WAU/CATIE/MAG-program). The studies were among the first sociological fieldwork activities and were performed as part of a baseline study in the first half of 1987.

The students were asked to take part in a sample survey (3 months) and a case study (3 months). The reported work is largely based on the latter but does refer to some results obtained in the former. This means that the nature of the studies is exploratory and that conclusions can only be tentative. In each case serious time limitations existed and thus only a few informants could be interviewed. Later studies will have to verify the impressions gained from this initial qualitative research. Despite these limitations, I feel, nevertheless, that the studies provide interesting clues. They all use the same methodology, which stresses intensive semi-structured interviewing of well chosen key informants. Each student was asked to provide a historical perspective and show the dynamics of knowledge network emergence and articulation. Each of them worked with the same concepts and general orientation. It will be up to following students and staff to criticize the methods and improve the results.

## II. STATE - SMALLHOLDER RELATIONS IN A TROPICAL COLONISATION AREA: AN INSTITUTIONAL PERSPECTIVE ON THE ATLANTIC ZONE

Pieter de Vries

In the Atlantic Zone the smallholder sector and the State are two of the actors responsible for the formation of a regional structure, together with the multinationals, national entrepreneurs and the urban service sector. In this paper, the development of the Zone is analyzed in terms of an historical account of the major events which took place during the colonisation of the region. In this way a picture is given of the context in which the following papers are placed.

First, some remarks are made on the term 'smallholder'. This is followed by an account of the major transformations that have taken place in the region in the course of this century. Attention is given to the role of the state in the banana-industry and colonisation of the Zone. An outline of two major semi-state institutions and their impact on the smallholder sector is then described. Finally, the state's view of the agricultural smallholder problem is discussed.

The paper is presented in descriptive form. It is based on a series of interviews carried out during exploratory baseline surveys of the WAU/CATIE/MAG-program. It is my intention to convey an idea of the issues and conflicts surrounding the 'institutional field' related to the smallholder sector and smallholder production.

The specificity of the concept 'institutional field', is that not the institutions themselves are central but the actors employed by the various agencies. Focusing on actors permits us to place in proper perspective the whole gamut of events showing distrust and rivalry which characterizes so much of the interaction within and between institutions.

### **The smallholder sector**

The story of the smallholder sector in the Atlantic Zone is that of the thousands of migrants, natives, expplantation workers, and their families. All these people, with their different backgrounds, set out to create their own



'space' in order to survive. That is, a 'production space' as cultivators, a 'social space' as a community and a 'political space' as a class. This entailed struggles that had to be fought on different fronts: for land, for a cultural identity and for political representation at various levels.

The concept of smallholder-producer implies three elements:

1. The household, which provides the framework within which the social organisation of production takes place.
2. A high commitment to agricultural activities.
3. A household economy that is not wholly monetarized; i.e. labour, inputs and farm production may be consumed and exchanged without assigning them a market value.

Consequently, smallholder agriculture, or, as it is called in the language of political economy, petty commodity production, does not necessarily exhibit a market logic. This, again, permits us to identify another feature of smallholder production: its subordination to outside forces, implying the payment of rent (in kind, labour or cash) or the production of goods or labour below market values.

To use a global notion of 'smallholder' in the context of the Atlantic Zone is not really accurate because we can distinguish different types of smallholder. They range from highly specialized producers entirely dependent on bank credit and inputs from state agencies, to *precaristas* or squatters on the margins of the forest, largely disconnected from the market economy. Also, there is a category of (often urban) entrepreneurs who seek to make quick profits by investing in land, the planting of new crops, or raising cattle.

The majority of smallholders, however, exhibit two common characteristics. The first is that although they may be dependent on state-agencies for the marketing of their crops and for acquiring inputs and credit, they maintain a certain degree of freedom concerning what they will grow and how they will grow it. Secondly, although one or more members of the household may be involved in wage labour or urban-activities, there is a marked preference for agriculture as a 'way of life'.

## **Transformations in the Atlantic Zone of Costa Rica**

Since colonial times the Atlantic Zone has been of geo-political importance since it belonged to an area of conflict between the colonial powers over control in the Caribbean. An economy emerged there, based on the production of cocoa which developed in a typical boom and bust fashion.

After Independence the Costa Rican government wished to establish a

transport corridor between the coffee-producing Central Valley and the Atlantic in order to reduce the freight costs of coffee. This resulted, starting in 1870, in the building of a railroad. During its construction, the railroad company experimented with the exploitation of tropical fruits, among them, bananas, for export to North America and Europe. When bananas proved to be profitable, foreigners, as well as local small producers started to grow them. Production was sold to a foreign trading company, which would later become the United Fruit Company (UFCO) (see also chapter IV). The banana industry has remained such an important element in the Atlantic Zone that a short historic review is in place here. Attention is also given to colonisation processes and their consequences for land-tenure.

### *The banana-industry*

During the *first* banana cycle (1890-1940) production was highly concentrated in the hands of one foreign company, UFCO. The national producers were largely cornered into a marginal position because they lacked access to the best lands and depended entirely on UFCO for the marketing of their crops.

For this first banana-cycle, a rather simple social structure could be pictured, with UFCO at the apex, exerting control over all activities in the area. Below UFCO there existed a class of medium-scale banana producers operating under insecure market conditions. Below these, smaller banana producers operated, from a wealthy, Limon-based trader class. Lastly an urban/rural proletariat existed, involved in port and plantation activities.

After 1942, UFCO abandoned the plantations, which led to a collapse of the regional economy. Part of the rural population compensated for the subsequent loss in employment by starting agricultural activities. UFCO stimulated this process by leasing plantation land to explantation workers in return for symbolic payments. It also leased or sold lands to national entrepreneurs who established cattle ranches of low productivity. This redivision of land laid the basis for the development of a new agrarian structure.

When the State decided to organize a resurgence of the export-sector in the Atlantic Zone, a *second* banana cycle started. The difference from the first banana cycle was the heavy involvement of the state during this second cycle. The State provided not only capital for the establishment of plantations (through the 'Plan de Fomento Bananero') but also improved the infrastructure. The latter was done through the nationalisation and modernisation of the railroads, the building of new highways and electricity

plants and the installation of urban services. In this way the state hoped to establish a highly competitive (in worldmarket terms) banana-industry. This would increase export earnings and tax revenues.

While the state became more involved in the banana-industry the transnationals, on the other hand (besides UFCO, two other companies had entered the banana-industry) became less involved. They adopted a strategy of backing out from production in areas where labour militancy, smallholder mobilisations and diminishing soil fertility narrowed their profit margins. In that case they sold their plantations to national producers and moved to other more fertile and less conflictive areas. They then concentrated on marketing, an activity that gives them ample opportunities to maximize their returns.

The regional structure became characterized by a tight alliance between State, transnationals and national banana producers. The latter were accorded a cushioning function between labour organisations and plantation interests. The national planters, after an initially successful attempt to operate autonomously in the international market, once again became dependent on the transnationals for the marketing of their product. In fact, the introduction of technological innovations required, even more than before, close vertical integration of production, processing and marketing. Decision-making regarding quality control and the use of particular inputs came to be highly concentrated in the hands of the transnationals (see also the description by Kruiter on the parties involved in the banana sector in this volume).

### *Colonisation and land tenure*

With the exhaustion of the 'coffee frontier' in Costa Rica at the end of the last century a large colonisation movement developed. This process was stimulated by state policies aimed at the incorporation of unused land for productive and geopolitical purposes. These lands, located in areas unsuited to coffee cultivation, provided a safety valve during crisis periods in the coffee economy, when rural employment and landlessness increased explosively. Moreover, the profitability of coffee had led to increasing land concentration, forcing a sector of the population to migrate to other areas. In this way non-coffee producing lowland areas became integrated into the economy under specific conditions. In other words, the smallholder sector became the supplier of foodstuffs for an expanding home-market in the coffee regions and acted as a 'social frontier' with a large capacity to absorb surplus labour. Later, the state encouraged colonisation with the dual purpose of reducing labour costs for the export sector and decreasing

landpressure in other regions in Costa Rica.

Because of state policy to promote colonisation and make remote areas more accessible, land in the Atlantic Zone took on a very particular role. Its value consists of a real and a speculative element. That is, the expectation of increasing infrastructure by the state led to a considerable valorisation of land. This increase in value is prompted by the realisation that the 'physical' agricultural frontier is coming to an end. This is seen in the rapid deforestation that is taking place and in the homogenisation of production conditions all over the zone.

It should be noted that cattle ranching and plantation agriculture, though very different in terms of capital and labour intensity, are structurally complementary, since traditionally, ranches have had the function of providing spare land for banana plantations.

At present several processes are taking place which are transforming the agrarian structure. Among these is a diversification in cropping patterns in areas of smallholder and commercial agriculture and an increasing land concentration for purposes of extensive livestock production. These two processes are fuelled both by a strong colonisation movement and by land-speculation practices. In older settled areas along the railroads a more complex agrarian structure is evolving which includes a sector of medium-sized commercial farms, some of them producing under heavy state assistance.

The precise patterns of land tenure that are evolving in the region are not entirely clear because of the competing expansion of smallholder agriculture with more extensive forms of production. It is, however, clear that the outcome of this process depends on the dynamics of the banana economy and on the capacity of the other regional actors (the smallholder sector and the economic elite) to impose their 'social project'.

### **State institutions in the Atlantic Zone**

The State makes its presence felt and asserts its policy in the Atlantic Zone by means of various state and semi-state institutions. The following two belong to the most important institutions in the Atlantic Zone:

1. JAPDEVA (Junta Administrativa Portuaria y de Desarrollo Económico de la Vertiente Atlántico), the port authority, and
2. IDA (Instituto de Desarrollo Agrario), the colonisation agency.

These two (semi-state) institutions and the role and impact they play in the development of the Atlantic Zone are discussed below. The agricultural research and extension services of the Ministry of Agriculture are not

discussed, since they are dealt with in the subsequent chapter by Carrillo and de Groot.

### *JAPDEVA*

JAPDEVA, an autonomous institution, was established in 1963 as the first regional development entity in the country. The reason for its establishment was that Limon province, although rich in resources, had been neglected by the state in the past because of its banana-based enclave economy and foreign population.

Among JAPDEVA's major achievements have been the construction of a number of roads connecting the region with the Central Valley and the incorporation of vast areas in the province. It has attempted all kinds of activities such as the stimulation of cocoa and oilpalm production and the designing of a regional integrated development plan, but all without much success. Apart from services provided in Limon city and a few activities in the coastal area, JAPDEVA has had little impact on the development of the region.

The reason for that, JAPDEVA functionaries argue, is the scarcity of financial means at their disposal. However, other agencies accuse JAPDEVA of attempting to control all activities, from the designing through the implementation phases, without having enough expertise. They argue, that JAPDEVA should function instead as a coordinating mechanism. As an official of the agricultural planning department said: "JAPDEVA could have achieved much regional impact by ensuring a heavy presence of state agencies in the area and dedicating itself to the formulation and coordination of programmes instead of exerting a kind of institutional imperialism which resulted only in unnecessary duplication". Furthermore, the current state of disarray, in which JAPDEVA is entangled, does not help to improve the image it transmits to the other agencies.

### *IDA*

IDA has a presence in the Atlantic Zone that dates back to the sixties (when it was called ICTO) with the establishment of landsettlement and titling programs. Colonisation was used as a safety-valve during crisis periods in the coffee economy and as a means to decrease population pressure in other regions of Costa Rica. It is within this perspective that we should view the establishment of a colonisation agency like IDA. This agency was not created to solve the land question but to assuage the

consequences of this pattern of capitalist modernisation. But, since the structural causes of such processes were not addressed, the IDA/ICTO policies could not be based on a set of consistent and explicit objectives and lines of action. Nor did the institution have clear prerogatives since it was the judiciary system which resolved all cases regarding land ownership. IDA also did not have sufficient and regular funding. It therefore basically limited itself to conflict-resolving tasks in response to local pressures. It was constantly dependent on the sensitivity of the current political regime to the plight of the rural poor. IDA's strategies were predominantly influenced by:

1. the thrust of smallholders' initiatives at the local level;
2. by the political will of the government to act, and
3. by the availability of foreign funds for the implementation of large-scale programs.

In the early sixties IDA undertook two large colonisation projects, those of Cariari and Bataan. In the 1970's, after realizing that colonisation efforts were expensive and had little overall impact, it shifted attention to titling and the provision of services in frontier areas. In 1975, in response to increasing smallholder mobilisations, it adopted a policy of establishing production cooperatives in accessible areas. Towards the end of the 1970's it started an ambitious policy of colonisation in 'development poles', adopting a comprehensive territorial approach.

At the beginning of the 1980's in the Atlantic Zone, IDA and USAID started a program involving the establishment of three settlements and a vast titling program. The program was the response to a prolonged period of sometimes very explosive land occupation. These land invasions were mostly organized by urban-based political groups involving landless day-labourers, plantation workers and urban dwellers. The settlements were set up as centres of concentrated state directed activity, involving the development of infrastructure (roads, schools, electrical service, etc.), and the establishment of production-related services (credit, extension). It was expected that the growth effects of these settlements would radiate towards the non-served areas.

The style of the program was distinctively top down: it was predominantly directed to the enforcement of state-presence in order to regain political initiative in the region. Although the settlement program was explicitly intended to find viable livelihood alternatives for a large sector of smallholders, the program exhibited from the beginning problems at the implementation level. Great weight was given to cash crop production and the development of profitable cropping systems at farm level. However, little effort was directed towards a keen understanding of the complexities

of agriculture in such a tropical environment. The reason for this was that much effort was expended in gaining the trust of a sizeable sector of the settler population (see also the description of Mudde on the IDA-Neguev settlement in this volume).

Of late the activity of politically motivated farmers' unions in the area has subsided and the field of conflict has shifted towards access to services and the defense of cost-covering prices for 'smallholder crops'. IDA is changing to less *dirigiste* policies, to titling, to the establishment of infrastructure and coordination and control of extension and service activities in selected settlements. Thus, we note that IDA/ICTO has shown radical changes of policy depending on the prevailing political situation. It is the frontline agency for dealing with various types of smallholder-pressure groups and in that respect it has a marked political function.

IDA has been seen by other institutions, especially by the technical departments, as too politicized an agency, too weak in its relation with smallholders, and unable to implement plans according to technical criteria. IDA, in turn, has felt that the other agencies lacked contact with farmers, were not sensitive to local situations, and too easily shifted assigned resources to other (non-IDA) and more prestigious projects.

### **The state's view on the future of the region**

Notwithstanding inter-institutional frictions and distrust, officials express a common view of the region which is imbued with the plans and actions of the various agencies. This view is characterized by the tendency to propose technical solutions, which is very much in line with the stress placed by funding agencies such as USAID (United States Agency for International Development), and BID (Banco Interamericano de Desarrollo) on efficiency and technical and economic feasibility. It is then, within the parameters of such a state project that agencies attempt to attract funds for projects financed by these institutions, or lay claim to the privilege of coordinating larger regional programs.

Within this technocratic view, 'the smallholder question' is seen as the inability of smallholders to produce cost-effectiveness. Such a view sees the situation of the smallholder as having been caused by the continuous channelling of subsidies to grain producers. As one functionary of the national marketing board explained to us: "The problem is not that small-scale producers do not respond to price incentives, but the contrary, that they have been responding too well. And as they have demanded at the

same time higher prices for maize, rice, etc., production of grains has been growing to the point that it surpasses national demand. Last year we lost a large amount of money buying grains that finally we had to sell as animal feed" (since Costa Rican grains are not competitive in the world market).

The price-setting mechanism works as follows: after having made an assessment of average production costs, a mark-up is added which should guarantee a reasonable return to the producer. Consumer prices are established by the Ministry of the Economy after negotiations with the marketing board. Generally the marketing margin is not even sufficient to compensate for the board's expenses. Some time ago, this policy was heavily attacked by the head of the Central Bank who, though he used technocratic language, argued for a 'healthy monetary policy', condemning the practice of subsidizing inefficient activities. Such a view has been warmly supported by international finance and aid agencies. In fact, as a result of a political conflict between a minister of agriculture and the head of the Central Bank, the former was forced to resign.

However, even the most vocal proponents of 'monetary' policy recognize that it is politically not feasible to eliminate state intervention in the grain market. As the same functionary of the marketing board explained to us: "No regime can afford to estrange such a large political constituency, nor is it in the interests of political stability to do so. Truly, the best way to resolve the problem would be to lower grain prices in order to permit the best cultivators to produce for the market, at the same time forcing inefficient producers to scale down production to a subsistence level. In that way production costs would be reduced, and the amount of foreign currency spent on imported inputs and machinery diminished, while the total production would increase". Such a policy, however, would require an entirely new approach to the 'smallholder question' and would mean the abandonment of smallholder-directed production programs. Finally, the functionary criticized IDA for "creating a political constituency for populist regimes, because they (IDA) were unable to guide smallholders on a path towards the achievement of higher levels of efficiency".

### *Transformational agriculture*

In trying to grapple with the socio-economic and technical problems concerning the feasibility of smallholder agriculture, the notion of 'agricultura de cambio' (transformational agriculture) has been introduced. This apparently technical concept has been presented as the great solution for solving the conflict between economic efficiency and social justice. 'Agricultura de cambio' refers to the development of new cropping patterns



at a regional level. The truth, however, is that no precise idea exists of how this transformation might be planned and implemented. It refers predominantly to the incorporation of non-traditional crops, in an ecologically responsible and economically viable way, into existing cropping patterns. Yet, as one functionary of the agricultural planning agency told us: "It is not possible to transform cultivation patterns overnight. To achieve that, it is necessary to make good marketing studies and to understand the agronomic and socio-economic conditions prevailing in the various regions of the country while taking into account the comparative advantages of those regions". In short, she meant that a regional planning system should be created, based on a well-functioning information system and on relevant agronomical research coupled to a capable extension service. And she rightly stressed that such an endeavour could not be accomplished in the short term.

## Conclusions

In the above account an attempt has been made to describe an institutional field in the Atlantic Zone of Costa Rica, oriented to the resolution of the agrarian problems confronted by smallholder producers. To that end, a modified political economy perspective was used. In summary, it can be said that the institutions involved in this field deal in different ways with smallholders, and in the process they develop contrasting views and images of their clients. This perspective points to the need to analyze state-peasant relations, and it is argued that an actor-oriented approach is well suited to such an analysis.

However, what is the significance of an approach based on the study of institutional fields and intervention styles for reaching a better understanding of the ways in which knowledge networks are constructed and reproduced? I do not pretend to give an exhaustive answer to this question as it would demand lengthy theoretical discussion. Nevertheless, a few remarks will be made.

In the first place, it should be stressed that knowledge networks are part of wider sets of social networks of relationships that guide human conduct. Such networks may be based on bounded social units such as kinship, community, region or class, or they may be also grounded in various fields of social and economic activity such as those involved in the cultivation and marketing of a particular crop. In effect, their delimitation, is one methodological problem in network theory (Boissevain, 1974) that has been discussed extensively. Thus, in speaking of knowledge networks we have to

specify the criteria by which we choose to define them.

This is, in fact, a question that has to be dealt with empirically, otherwise the danger exists that we will end up creating functionalist models of extension, that depicts scientists, extensionists and scientists working harmoniously together in order to realize common goals.

Box points out in the introduction that the generation of knowledge is contextually bound, which implies that it should be studied by reaching an insiders' view of the ways in which actors interpret social reality. This means that we should search for indigenous models constructed by the actors themselves. Thus an approach that distinguishes between different forms of knowledge (i.e. cultivators' practical knowledge or scientific knowledge) and takes into account the cultural contexts in which they arise, permits us to inquire into the nature of the presuppositions and social interests that led to the generation of that particular form of knowledge. Moreover, it enables us to introduce 'action' as an important element in the constitution of social reality. In this way a farmer is not merely seen as a 'cultural moron' who adapts automatically to changing circumstances, but may be viewed as a social actor capable of making decisions aimed at changing his production conditions. Thus, in the Atlantic Zone, we see many instances of producers' associations and organisations seeking ways to influence (or even impose) important decisions affecting the production conditions of individual farms.

In short, in speaking of knowledge networks we have to give proper attention to the social units and fields of activity in which they are embedded. In addition we have to take into account the normative framework which regulates the transference and reception of "knowledge". Finally, it is necessary to study the ways in which supra-household or farm organizations affect political decisions regarding the conditions of production (access to credit, roads, technical assistance, drainage works, etc.).

One example that illustrates these remarks is that of cocoa production by blacks in the Atlantic Zone. The view that exists of black smallholders, by white Costa Rican policy makers and extensionists, is that of happy but lazy cultivators with little incentive to increase cocoa productivity. Reality, however, is different. Black families in the Atlantic Zone have developed complex livelihood strategies based on previous experiences with economic uncertainty caused by the boom and bust character of the regional economy. Thus, relatively secure employment is combined with migration and cocoa cultivation. Investing in cocoa production is not attractive so long as economic returns are higher from investing in education. This situation, however, leads to discrimination in the provision of credit and

extension services which would make for high profitability, against an important sector of the agrarian population in the region.

In contrast, white settlers, due to their recent settlement, usually do not have a set of alternatives. Their ownership of land is thus often more ambiguous and participation in regional political networks less widespread. They may be more dependent on outside agents, (banks, extension services) for the acquisition of capital and agricultural knowledge in order to pursue productive projects. The implication of these cultural and material differences is that their perceptions of existing opportunities will be different, leading to different production arrangements (in terms of farming systems), forms of productive organisations (cooperatives, etc.) and the balance between farm and off-farm work.

We may conclude from the previous account that the generation, transfer and application of "knowledge" is anything but a simple subject. Firstly, there is not one body of knowledge but several. Smallholder knowledge is by nature and purpose different from that of agricultural entrepreneurs or scientists. Secondly, the generation and use of knowledge is based on the perceptions, social evaluations and goals of the groups involved. The procedures that are developed for understanding reality differ for each social category. For example, a settler in the Atlantic Zone has usually a different conceptualisation of agrarian problems than an extensionist, or cocoa producer of Jamaican descent. And thirdly, the generation and transfer of knowledge are affected by the availability of material resources such as capital, land and labour. The distribution of these resources is effectively influenced by state policy as we have pointed out in this chapter.

### III. FORMALIZED DISARTICULATION: AGRICULTURAL RESEARCH AND EXTENSION IN THE ATLANTIC COAST

José Miguel Carrillo and Ab de Groot

Research and extension institutions form, together with the farmers they reach, a formal knowledge network. In the Atlantic Zone, such *formal* knowledge networks have a short history, owing to the recent colonisation of the area. Although young, such knowledge networks have developed rapidly in the last decennia. This paper pictures the rapid development of one of the most important actors in such a network: MAG, the Ministerio de Agricultura y Ganadería (livestock).

The following presents an historical review of the activities of MAG in the fields of agricultural research and extension. It focuses on the development of these activities and on the influence that the state has exerted on this process. MAG is not the only actor in formal knowledge networks: semi-state institutions like ASBANA (Asociación Bananera Nacional), JAPDEVA and IDA and private institutions like CATIE (Centro Agronómico Tropical de Investigación y Enseñanza) and the banana companies are also active in these fields. Where relevant, comments are made on their activities, as a comparison to the activities of the MAG.

#### Extension

MAG is the most important actor in the field of extension in the Zone, both in terms of resources and in terms of manpower (Novoa, 1983). The development of extension, therefore, has been strongly related to state policies. It is this development which will be described below. A brief discussion is also presented of some of the other institutions involved in extension, such as IDA, BNCR (Banco Nacional de Costa Rica) and JAPDEVA.

#### *STICA-model*

Agricultural extension in Costa Rica dates back to 1948. Extension at that time was provided according to the STICA-model (Servicio Técnico Inter-

americano de Cooperación Agrícola) which originated in the United States (Novoa, 1983). According to Solano, a subject matter specialist of the extension service, under the STICA-model an extensionist visited all farmers in his area individually. He was expected to advise on all activities going on at the farm. The disadvantages of the model, according to Solano, were that an extensionist did not have a thorough knowledge of all fields, and recommendations were therefore often very general. Furthermore, because the extensionist was expected to visit all the farmers in his area, the frequency of his visits was very low.

### *Micro-zones*

Before 1978, extension in the Atlantic Zone was organized according to 'micro-zones'. The objective of the approach was the integral development of a community. These 'micro-zones' were chosen on the grounds of:

- their accessibility,
- the presence of some basic public services, like water, a school or a health centre,
- farm concentration,
- farmers' interest in extension, and,
- a degree of organisation among the farmers.

The activities of different institutions like MAG, MOPT (Ministerio de Obras Públicas y Transporte) and IMAS (Instituto Mixto de Ayuda Social) were concentrated in these micro-zones, where MAG had a coordinating function and decided where the services of the different institutions should be implemented. Cooperation between the different institutions had a major impact on changes in the zones. However, a disadvantage of the approach was the low coverage of the model, both in terms of number of farmers reached and in total area covered.

Between 1970 and 1980 agricultural extension became more important: the national extension budget increased in that period to an average of 6% per year, which meant an increase in real value (Novoa, 1983).

### *The Training and Visit model*

In 1980 a new extension model, the Training and Visit model (T&V) was adopted to replace the 'micro-zones' approach. This change was motivated by the fact that under this model a greater number of farmers could be reached. Over the years a large number of research results had been gathered which had not reached the farmers of the Atlantic Zone. One hoped to get a better diffusion of these results with the new T&V model

which had been successfully applied in other countries.

In the T&V model, the notion of the contact-farmer is very important. This farmer keeps in contact with the extensionist and is supposed to inform other farmers of the extensionist's message. These contact-farmers were selected on their:

- receptivity to the recommendations of the extensionists,
- contacts with neighbouring farmers,
- level of technological adoption,
- geographical accessibility.

Extensionists were expected to visit between 3 and 5 farmers per day. Visits took place on scheduled days and at set hours and the contact farmers were supposed to have gathered together other farmers ('participants') who could also benefit from extension. In this way, an extensionist should have been able to reach as many as 100 farmers a week. Every two weeks the extensionist received a short period of training in the relevant practices to be extended in the next period.

Farmers were to be visited more frequently by extensionists, thus strengthening the relation between them. Furthermore the number of farmers visited was increased through the incorporation of 'participant-farmers', although this increase was much lower than expected. Some estimates suggest that more than 1,400 contact farmers and 5,000 participant farmers were reached in the Atlantic Zone (assuming 3.5 participant farmers per contact farmer). This figure, however, seems high: in 1984 there were around 6,500 farmers in the Atlantic Zone (Waaijbergen, 1986), so if the number of participant farmers is correct, all farmers of the Zone would have been reached. This is not so since the majority of farmers have never been visited by an extensionist (van Ee et al., 1987). There is also a population of wage labourers in the Zone, some 18,000 of them in 1984 (Waaijbergen, 1986). Even if a proportion of them were employed in agricultural activities and were visited therefore by the MAG, the number of farmers estimated to have been reached remains high. The most likely explanation for this is that the assumed number of 'participant-farmers' is too high. It has not been possible to quantify the effect of the T&V model in terms of adoption of new technology or in productivity-changes because the model was used in this form for less than 2 years (until 1982).

### *Extension after 1982*

The change in government which took place in 1982, also had consequences for the extension agency. The new agricultural policy,

expressed in the plan *Volvamos a la Tierra* (Return to the Land) and in PIPA (Programa de Incremento de la Productividad Agrícola), puts emphasis on higher productivity in the agricultural sector and on diversification of national exports.

According to these programs, transfer of knowledge had to be oriented towards practices and technology which would increase production. Furthermore, transfer of knowledge had to be aimed at those crops that were economically of national importance. The programs were aimed at small to medium-scale farmers. However, 'small' and 'medium-scale' is not defined. Agricultural extension was to focus more on medium-scale farmers than in the past, because "medium-scale farmers show better prospects of obtaining high yields" (Anon., 1983a). This policy is still being applied by the extension agency today.

Although PIPA was formulated in 1982, it took until 1984 and 1985 before the promised resources were made available to the extension service.

With the new government in power, the extension model to be used was to be changed and MAG was ordered to develop a new model. After a period of uncertainty, MAG came up with a model which, according to Solano, was "a kind of T&V" model (see also Novoa, 1983). The T&V elements in the new model were that farmers were to be visited regularly: every two weeks or every month depending on the activity. This also implied a visiting scheme, though not as stringent as the visiting-schemes of the T&V model. Farmers, claimed Solano, were to be selected on the same criteria as in the T&V model. However, Araya, head of one of the field offices of the extension service, mentioned that farmers with bank loans were preferred because "they can follow up the recommendations".

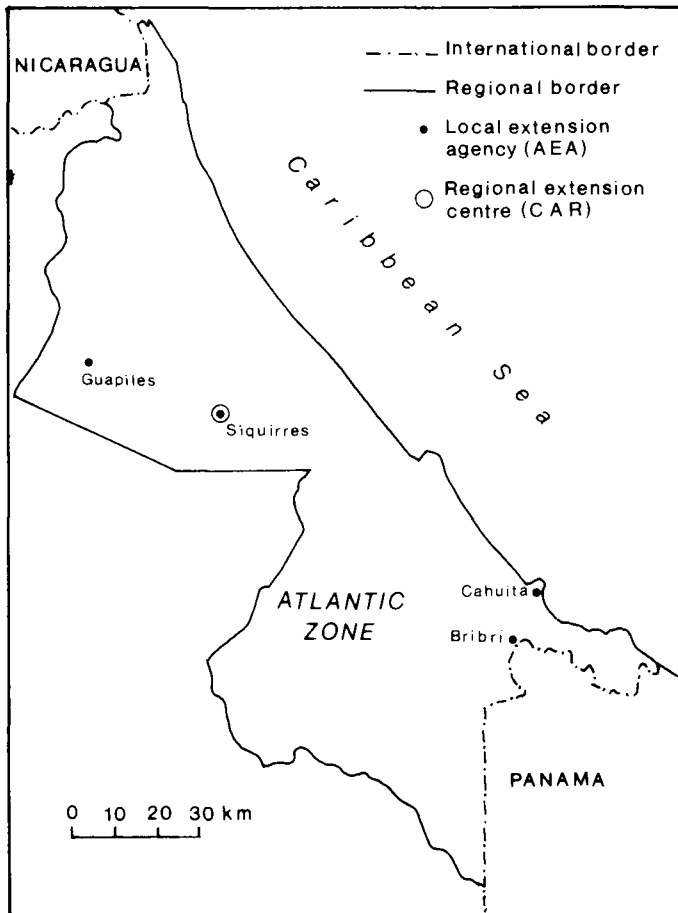
The following elements differed from the original T&V model. In the T&V model, the visits of extensionists to farmers covered only one or two subject matters. Costa Rican extensionists cover up to five different subjects in their visits to farmers. In the T&V model extensionists received instruction every two weeks on what was relevant for the crop or animal for that particular time of year. Extensionists now receive training through courses and through the activities of crop-specialists stationed at the 'Centro Agrícola Regional' (CAR) located in Siquirres. Which crop specialists are stationed at which CAR depends on the crops relevant to the prevailing ecological conditions of a particular region.

In the new model, every extensionist visits 80 farmers per month, which may include, for example, 20 for cocoa, 40 for maize, 10 for dairy cattle and 10 that have for fruit trees.

In the Atlantic Zone there is one regional centre in Siquirres and four extension agencies (AEA, Agencia de Extensión Agrícola) located in

Guapiles, Siquirres, Cahuita and Bribri (see figure 1). In Costa Rica as a whole there are 8 CAR-centres and 52 AEA's (Novoa, 1983).

Figure 1. Extension agencies (AEA's) and the regional centre (CAR) of the Ministry of Agriculture in the Atlantic Zone



Extension is focused more than in the past on groups of farmers through the organisation of field and demonstration days, talks, and demonstration plots. The reason for this is that the extension agency does not have sufficient means to visit individually all farmers in the Zone. By assembling together groups of farmers it was hoped to increase extension coverage. In practice, however, groups sessions are difficult to organize, especially in sparsely populated areas and according to Araya, visits to individual farmers are still the most important form of extension.



According to Solano and van Ee et al. (1987) estimates of the number of farmers reached by MAG extensionists amount to around 10% of the total number of farmers in the Zone. If radiation effects are as meagre as in 1980 - 1982 (which is to be expected, since extension to groups of farmers is still not a common practice), most farmers in the Zone do not receive extension. Farmers are sometimes visited by extensionists of different institutions, leading to a duplication of efforts and a waste of resources.

In 1986 a new government was elected, but this time the same political party stayed in power. The policy towards extension remained virtually the same though some change occurred regarding the priority given to certain crops, and the extension service received a further financial injection in the form of transport and personnel.

### *Other institutions*

Besides MAG, there are several other institutions active in the field of agricultural extension in the Atlantic Zone. These are IDA, JAPDEVA and BNCR (Banco Nacional de Costa Rica). All three institutions give extension combined with credit. This constitutes an important difference to the extension agency of MAG. The state's objective of increasing the level of technology in agriculture, leads, in general, to 'expensive' recommendations (in terms of inputs). Farmers then have to invest more which increases the importance of credit facilities.

IDA extensionists are working in 3 settlement areas in the Zone: Neguev, El Indio and Maryland. Since 1983, IDA has provided extension linked to credit in these areas, *créditos dirigidos*. In that year IDA (formerly ICTO) signed an agreement with USAID (United States Agency for International Development) to develop these settlement-areas, under which IDA would be responsible not only for extension and credit in the areas but also for the infrastructure. All farmers with a *Carta de Adjudicación*, or provisional title to land, have in principle, access to credit and all farmers with credit receive extension from IDA. Extension is given on an individual basis, although IDA organizes some group sessions (Mudde, 1987).

Compared to MAG, extension within IDA is more intensive: IDA extensionists only work on one crop and are required to visit fewer farmers than their MAG-colleagues. The settlements are relatively small making extensionists more accessible to farmers.

## Research

Agricultural research in the Atlantic Zone began in 1942. In that year the United States started an experimental farm in Pococí, where research was carried out on rubber and cocoa. Later, in 1962, this experimental farm became 'Los Diamantes', the research station of MAG in Guapiles. Research on cocoa was terminated in 1962 and a banana plantation was established for commercial and research purposes, though the latter never got off the ground (Kruiter, 1987). From 1964, research on crops such as maize (*Zea mays*) and on fruit trees was started and between 1970 and 1975, a herd of cattle was established. Rice (*Oryza sativa*) was introduced after 1975 though it is not clear to what extent research was pursued during this period.

A large increase in research undertaken by MAG took place after 1980, as can be seen from the summary of the institute's research in Table 1 below, most of which took place at their research station 'Los Diamantes' in Guapiles. The increase must be attributed to the change in policy towards agriculture following the election of a new government in 1982. In that year, a new political party came into power, with ideas about agriculture that differed from those of the former ruling party. The new government set up the ill-fated program called *Volvamos a la tierra* (Return to the Land). In this program agriculture was envisaged as the driving force of economic development of Costa Rica. However, the program did not produce any substantial changes. The aims of the program were:

- to increase the productivity of the agricultural sector, and
- to diversify the agricultural export-package (Anon., 1983b).

Increase in productivity was to be achieved by increasing the technological level of cultivation in several crops. It was with this program in mind that MAG later developed PIPA, the (Programa de Incremento de la Productividad Agrícola) mentioned earlier. PIPA consists of four subprograms:

- research
- transfer of knowledge
- production and distribution of seed, and
- supply of basic inputs.

In the PIPA sub-program concerned with research, priority is given to crops which are of national interest economically and are adapted to the ecological conditions prevailing in the different regions.

For the Atlantic Zone priority was given to maize, vegetables, fruit trees, (e.g. *Annona muricata*) and root and tuber crops (e.g. *Colocasia esculenta*,

*Manihot esculenta*, Anon., 1983b).

Table 1. Research subjects and activities of the Ministerio de Agricultura y Ganadería in the Atlantic Zone since 1942.

period	subject	activity
1942-1962	cocoa ( <i>Theobroma cacao</i> )	?
	rubber ( <i>Hevea brasiliensis</i> )	?
1962-1970	maize ( <i>Zea mays</i> )	genetic screening fruittrees
	genetic screening	spices
	genetic screening	banana ( <i>Musa acuminata</i> )
	pest control	cocoa ( <i>Theobroma cacao</i> )
	pest control	
1970-1975	maize ( <i>Zea mays</i> )	genetic screening
	fruit trees	genetic screening
	spices	genetic screening
1975-1980	maize ( <i>Zea mays</i> )	genetic screening
	rice ( <i>Oryza sativa</i> )	genetic screening
	peach palm ( <i>Bactris gasipaes</i> )	germplasm collection
1980-1986	maize ( <i>Zea mays</i> )	pestcontrol, genetic screening
	root-and tuber crops	pest-and weed control cultivation practices (size of seed, sowing distance) nematode-, virus- and fungicide-control,
	cocoa ( <i>Theobroma cacao</i> )	pestcontrol, genetic and chemical disease-control
	coconut ( <i>Cocus nucifera</i> )	?
	soursop ( <i>Annona muricata</i> )	pest control, genetic and chemical disease-control, fungicide-trials
	macadamia ( <i>Macadamia ternifolia</i> )	phenology
	vanilla ( <i>Vanilla fragrans</i> )	?
	pepper ( <i>Piper nigrum</i> )	propagation
	cucumber	plant density
	rice ( <i>Oryza sativa</i> )	pest control, genetic and chemical disease-control, fungicide-trials
	beans	fungicide-trial

Source: Carrillo (1988)

As can be seen from Table 1, research in the period 1980 to 1986 was oriented to the crops or group of crops mentioned in PIPA. It is also clear from the number of topics researched, that research activity increased in that period compared to the situation before 1980. Much of the research mentioned in Table 1 was executed by MAG in cooperation with other institutions such as ASBANA, CATIE, UCR (Universidad de Costa Rica) and with private enterprises (Carrillo, 1988).

It should be mentioned that 'Los Diamantes' in Guapiles is not the most important institute in the field of agricultural research in the Atlantic Zone. Others, like CATIE, ASBANA and perhaps the banana-companies, are more likely candidates for this qualification. However, since their area of competence is much greater than the Atlantic Zone it would carry us too far to discuss these research centres. For further information see ASBANA (1984) and CATIE (1984).

#### **Research-Extension linkage**

It is likely that most research results have not yet reached the farmers of the Zone and have therefore had no chance to influence its agriculture. The reasons for this are:

- limited transfer of knowledge: extensionists themselves do not receive research results. This is confirmed by De Groot's (1987) observation: In Guapiles, where the extension office almost borders the research station 'Los Diamantes', there is, nevertheless, hardly any contact between researchers and extensionists. Furthermore, there are few formally organized meetings between extensionists and researchers working on specific crops to discuss research topics (Steward, 1985).
- absence of participation by extensionists in research,
- researchers' recommendations cannot always be applied by farmers because they are not feasible or because the required inputs are not available,
- lack of communication between institutions, leading to the duplication of trials,
- scarcity of means, as a result of which trials are not always finished or the results are published too late.

## Conclusion

Agricultural extension and research in the Atlantic Zone have developed rapidly in the last decennia as a result of increasing state influence. Between 1970 and 1980 the national budget for extension increased by 6% annually. After 1982 the state played an ever greater role, with state programs such as *Volvamos a la tierra* and *Programa de Incremento a la Productividad Agrícola*, leading to an expansion of extension and research activities and to the setting of priorities concerning which crops should receive attention. Semi-state institutions, like JAPDEVA and IDA, follow the priorities set in these programs.

Research, undertaken by MAG at 'Los Diamantes' has taken place on a modest scale since 1942, but was extended after 1980 when more funds became available. Research priorities were redefined with research being focused on promising crops.

Other institutions, like CATIE, ASBANA and some private enterprises, are also active and play a dominant role in particular fields of research, such as cocoa, banana and peach palm.

The extension model used by MAG has undergone several changes through the years. Between 1980 and 1982 the T&V model predominated. A change in government led to the model being revised, and this revised model is the model in use today. One aspect which has always played a major role in any changes has been the question of how to increase the number of farmers reached. Between 1980 and 1982, an attempt was made to increase coverage through the incorporation of 'participant farmers'. However, the number reached was far below expectations. The strategy applied by the extension agency today is to give extension to groups of farmers, but again, up to the present this has also not been very successful. It is estimated that only 10% of the farmers in the Zone are reached, and it is especially difficult to organize groups in sparsely populated areas.

The linkage between research and extension has been weak. Before 1986 research priorities were not set in consultation with extensionists. This led to research results which could not always be applied by the farmers in the region, either because they were not economically worthwhile or because the necessary inputs were not available. Research priorities were dependent on the agricultural development program, and were not directed towards solving farmers' problems. In 1986, however, the research and extension service were integrated under a single planning program. More and more research is now based on so-called 'diagnostics' made by extensionists and researchers working in regional teams (Alfaoro, 1989).

Another weakness has been that the different extension agencies are not

well articulated. Several agencies provide extension for the same crop in the same region, without having close contact with each other. It can happen that a farmer is visited by more than one agency, while a neighbour is not receiving any help.

Our conclusion is that formal knowledge networks are not functioning the way they ought to function. Articulation between research and extension activities of the MAG is poor. The number of farmers that are reached by them is too low and the research recommendations are not always appropriate for farmers in the Zone.

The ever expanding smallholder population in the Atlantic Zone makes the establishment of well articulated knowledge networks more difficult, but also ever more necessary. The administrative measures taken to improve the network, have been implemented. It will rest with future studies to indicate the effect of these measures on the smallholder population.

## IV. LOCKED NETWORKS: ONE WAY KNOWLEDGE TRANSFER IN BANANA PRODUCTION

Anje Kruiter

Dole, Chiquita and Del Monte, we know them all; names on the stickers glued to the bananas we buy. These names are the trade marks of subsidiary companies of transnational enterprises. One of the areas in which these companies are active is the banana sector in Costa Rica, one of the world's most productive banana growing regions. In the first half of 1987, I carried out research into the cropping system of the banana (*Musa AAA*) in the Atlantic Zone of Costa Rica. The information for this chapter was gathered from secondary sources and from visits to plantations and interviews with producers, managers, researchers and government officials, during this period.<sup>1)</sup>

The chapter focuses on knowledge networks relating to the production of bananas in the Zone. It gives a survey of organisations and people involved in activities concerned with the production and marketing of bananas, in research, and in the dissemination of results. The contribution of the chapter is an examination of the closed and 'locked' nature of these banana networks.

Research on bananas is the preserve of three transnational enterprises, and knowledge networks are, to a large extent, centralized around them. It is therefore difficult for national banana producers to obtain information. This chapter attempts to explain how such 'locked networks' function and how one way knowledge transfer takes place within them.

### Bananas in Costa Rica

#### *History*

The banana sector in Costa Rica has its origin in the second half of the nineteenth century. In 1884, Minor Cooper Keith concluded a contract with the Costa Rican government which gave him the exploitation rights of the new railroad that connected the centre of the country with the Atlantic Coast (Soto, 1985). This was the beginning of Keith's Tropical Trading Company, an enterprise that would soon produce, buy and sell bananas (see also chapter II) and would be the first to bring bananas to the

Boston market. At the end of the nineteenth century the crop was grown on plantations of 100 to 150 hectares and also by small farmers on plots of about 5 hectares (Finders and Thielen, 1986). The latter sold their production to Keith's company and in this way small-scale production disappeared from the market.

In 1899 Keith's Company fused with the Boston Fruit Company, and the United Fruit Company was born. This company enjoyed a monopoly position in the Costa Rican banana sector until 1954 when anti-trust laws in the United States made it possible for other companies to enter the sector (Finders and Thielen, 1986).

From the beginning of commercial banana-growing in Costa Rica a large transnational enterprise controlled production, transport and marketing. This is still characteristic of the situation today.

Since the sixties three large transnational organisations, United Brands, R.J. Reynolds Industries and Castle and Cooke Inc., have controlled the banana sector in Costa Rica. Most of the 70 or so plantations in the Atlantic Zone were established along the railroad to Limon (see figure 2 and 5) between 1965 and 1970, not only by transnational enterprises but also by Costa Ricans.

### *Production and importance*

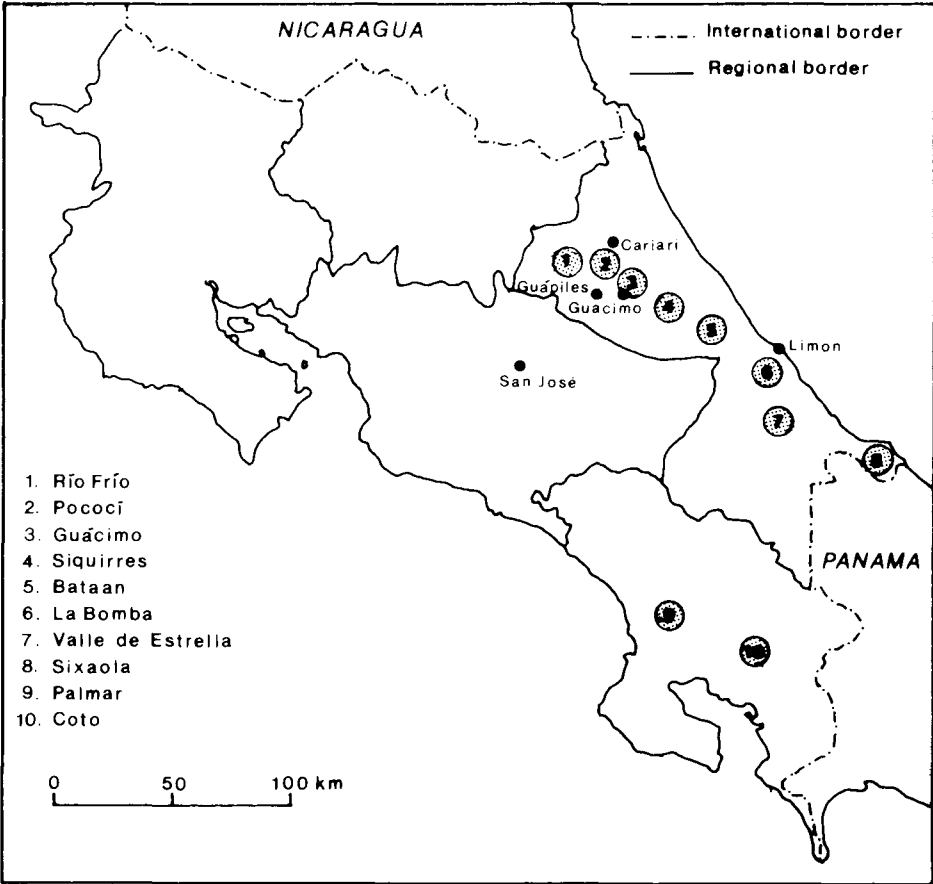
The humid lowlands of the Atlantic Zone of Costa Rica are pre-eminently suitable for growing bananas. Temperatures are high and thanks to high and regular rainfall, the area is one of the few in the world where bananas can be grown without irrigation (Soto, 1985).

Plantation yields are high: a production of more than 2,000 boxes of 18.14 kilograms (=40lbs) per hectare a year is not exceptional. Real production lies even higher. At least 30% of production never reaches a box because of the very high quality control exerted over bananas for export (Rivera Gonzalez, 1986). Rejected bananas go either to the internal market or serve as fodder for pigs and cows.

Although the production of a number of plantations is decreasing, Costa Rica is still one of the world's most important banana producers. In 1983 it was the world's biggest exporter, with more than 52 million boxes. This corresponds to about 16% of world export production (Pardo, 1984). At present Costa Rica is exporting about 48 million boxes yearly which is equivalent to production in countries such as Colombia, Ecuador, the Philippines, Panama and Honduras.



Figure 2. The main production-areas of bananas in Costa Rica

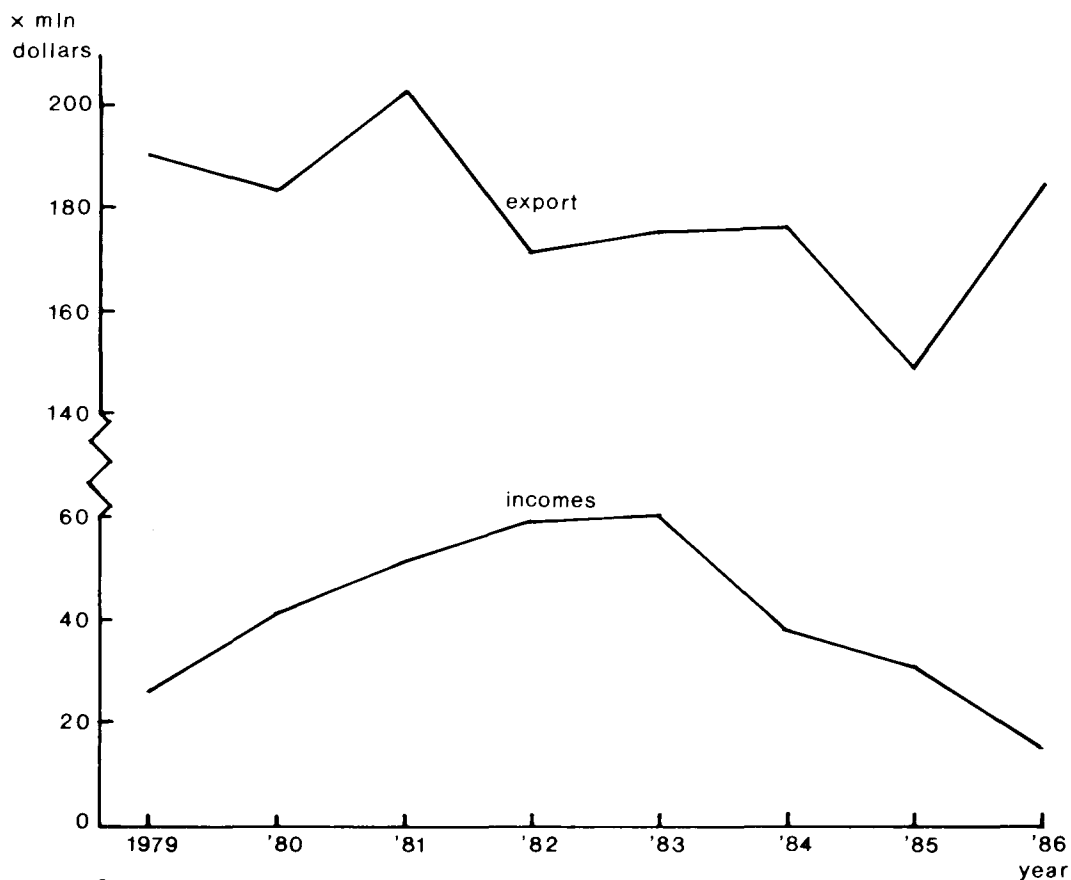


Source: Castro, 1974 and author

Banana production is of major importance to the Costa Rican economy. Together with coffee, bananas are the main export, valued at more than 184 million dollars in 1986. That is 18% of the country's total export value. But more important is the income Costa Rica gets from export taxes, though these tax revenues are subject to strong fluctuations (see figure 3).

Such fluctuations are not so much caused by variations in output as they are by large differences in tax rates. Decreasing tax rates are influenced by the changing power relations between transnational enterprises and the Costa Rican government.

Figure 3. Value of banana exports and income from taxes in Costa Rica, 1979 - 1986



Apart from being a major source of income, the banana industry holds first place in the country as a source of employment. The number of men and women working on the plantations is estimated at 25,000 and indirectly another 21,000 people are employed because of the presence of the industry (Pardo, 1984). Its presence has had and still has a great influence on the size and composition of the population of the regions where it is established. One investigation in the cantons Pococí and Guacimo shows, for example, that men are more numerous than women owing to male immigration to such regions. Between 1963 and 1973 more than 15,000 people from all parts of Costa Rica went to the Atlantic Zone to work on the plantations (CATIE, 1984).

In summary, it can be said that the presence of the banana industry in

the Atlantic Zone has been and still is determining for the development of this region.

## **Knowledge networks**

### *Actors involved*

In discussing knowledge networks in the banana sector, it is important to firstly introduce the several *actors* involved in production, transport, marketing, research and extension activities. These are:

- the transnational enterprises
- the national producers
- the small-scale producers
- ASBANA, and
- the State and the banks.

### *The transnationals*

In Costa Rica's banana industry three transnational enterprises are active: Castle and Cooke Inc., R.J. Reynolds Industries and United Brands. They are large conglomerates that have subsidiary companies in various countries. Table 2, below, summarizes the information on them. Transnationals in the industry work through a number of subsidiary companies, of which COBAL (La Compania del Atlántica), BANDECO (Banana Development Company) and Standard Fruit Company (SFC) or 'Standard' as the Costa Ricans call it, are active in the Atlantic Zone.

Bananas are only a small part of their activities. Their interests range from fruit to many kinds of industries and their turnover runs into millions of dollars (Finders and Thielen, 1986).

While national producers only grow bananas, the transnationals are involved in every activity concerning banana production. They (a) produce on their own plantations (about 60-65% of the area under banana cultivation), (b) buy bananas from the national producers, (c) have an extension service that provides these producers with technical assistance, and (d) they have a large research apparatus for the support of banana production, not only in Costa Rica but in other countries.

Table 2. Summary of transnational enterprises and their subsidiary companies active in the banana sector in the Atlantic Zone of Costa Rica, with their trademarks and export quota.

Transnational Enterprise	Subsidiary Company	Trademark	Quotum
United Brands (before 1969 United Fruit Company)	Cobal	Chiquita	13%
R.J. Reynolds Industries	Bandeco	Del Monte	40%
Castle and Cooke Inc.	Standard Fruit Company	Dole	37%

(Source: ASBANA, 1984, and author)

Besides production, extension and investigation, the transnationals also (e) transport and (f) market bananas, 60% to the United States and almost 30% to Germany. These companies possess all that is needed to export bananas: cold-storage ships, harbour facilities, trucks and train wagons, ripening rooms and lastly, the contacts. This implies a strong dependency of national producers on 'the company'. Figure 5 gives an overview of all the plantations in the Pococí, Guacimo and Siquirres districts is given.

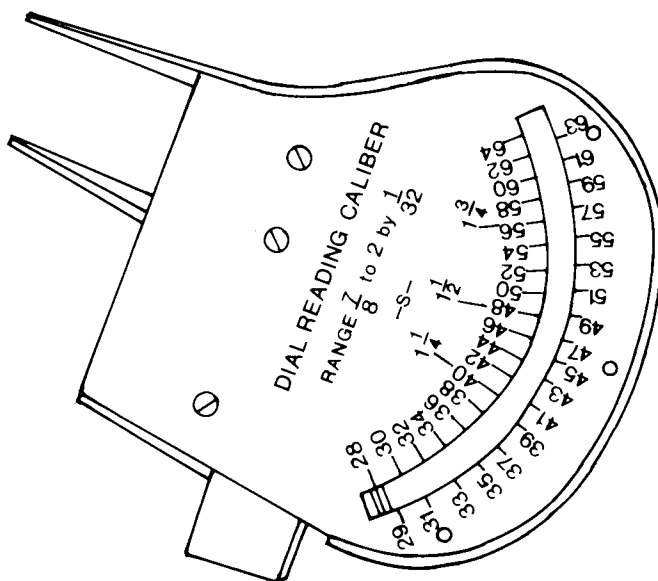
### *The national producers*

The national producers are mostly Costa Ricans, but include some foreigners, who established their plantations in the Zone in the sixties and beginning of the seventies, some years after the return of banana production from the west coast to the Atlantic Zone. They produce on large plantations of 100 to 500 hectares which makes them owners of about 35 to 40% of the area under banana cultivation in the Atlantic Zone. Some of them also have interests in other sectors, coffee, for example.

The problem for the national producers is that they cannot market their produce themselves. They all have sales contracts with one or other of the three transnational enterprises. That is why they are also called *productores asociados*, associate producers (Pardo, 1984), or local producers (Finders and Thielen, 1986). Their sales contracts with *la compania* implies more than just selling bananas and receiving the money. The transnationals stipulate when the bananas must be harvested and how many. A system of

coloured ribbons attached to the fruit enables the transnationals to estimate the returns of every harvest. The national producers, therefore, cannot always deliver their entire banana harvest, which means wasting part of their production. The transnationals of course have their own plantations and if they can fill their cold-storage ships with their own bananas they do not buy those of national producers. Furthermore, the transnationals give out 'directives' on the management of the plantation and stipulate norms for quality. These norms stipulate the size, diameter (see Figure 4), colour and also the quality of bananas, to make sure the fruit is in the right condition at arrival in the importing country.

Figure 4. Instrument to measure bananas



The national producers are brought together in *La Camara Nacional de Bananeros*, which played a role in the establishment of ASBANA. Since then, however it has lost its function as defender of the rights of the banana producers in Costa Rica, and exists only pro forma.

There is always a representative of the transnational present at the packing-factory during harvesting. These people also visit the plantations regularly to give technical assistance, for example, spraying against *Sigatoka Negra* is also in the hands of the transnational. Since both ASBANA'S extensionists and a BANDECO representative visit the plantation during harvest time, it would be interesting to know to what extent they have

contact and exchange information, either directly or through the Cooperariari manager, for example. Such contacts are not clear. During my presence at the packing factory, I never observed any conversation between them. Below is a description of one national banana-producer, Cooperariari, in more detail.

### *COOPERARIARI*

Of the fourteen plantations belonging to national producers which ASBANA took management of in 1971, five are still in ASBANA care. When you mention to managers of other plantations that you have visited one of these five plantations they will shake their head compassionately or start to chuckle and invite you to 'their' plantation so they can show you how a plantation should be run. To them it is obvious why the ASBANA five are still not out of problems; their managers do not know how to manage a banana plantation and the ASBANA technicians are not really good at it either. The fact that production in many of the plantations in the Atlantic Zone is decreasing, is something they will not mention.

Cooperariari is one of these five ASBANA plantations. It is a special case, because it is a cooperative of 69 people. They came as colonists to the Cariari area, in the sixties, when they cut down the forest and constructed a 200 hectare banana plantation and a 30 hectare cattle-breeding farm.

Visiting the plantation during the harvest you will see the usual activity on a plantation at this time; people hard at work in the field and at the packing factory. The plantation is run by one of the 69 owners, who follows ASBANA's orders. He excuses himself. There is no luxurious office like some other plantations possess to receive guests, and he has to delegate someone else to answer my questions; he has to go. There is not even time for a cup of coffee. There are problems with the cattle and he has something to discuss with the ASBANA people. ASBANA's extensionists visit Cooperariari each time when bananas are harvested, that is about 3 days a week. The bananas are sold to BANDECO. During the harvest a BANDECO representative is also always present at the packing factory. He keeps a sharp eye on the quality of the bananas. The high quality norms cause a lot of wastage. Cooperariari would like to reduce this by exporting second quality bananas. But for doing this they need another contract with BANDECO, and until now BANDECO has shown no interest.

One of the manager's assistants explains to me that Cooperariari's production is still too low. Harvesting about 1700 boxes, three times a

week, is not enough. They blame such low production on management problems, insufficient fertility of the soils, too many rejected bananas and diseases such as *Sigatoka Negra*. But like most other national producers, the owners of Coopecariari do not see any point in experimenting on their plantation to find solutions. They lack the money, the time and the expertise to conduct research. And even if they did not, they claim "our research would be nothing compared to that of ASBANA and BANDECO". So, that leaves them with no other choice but to place their hopes with ASBANA and *la compania*.

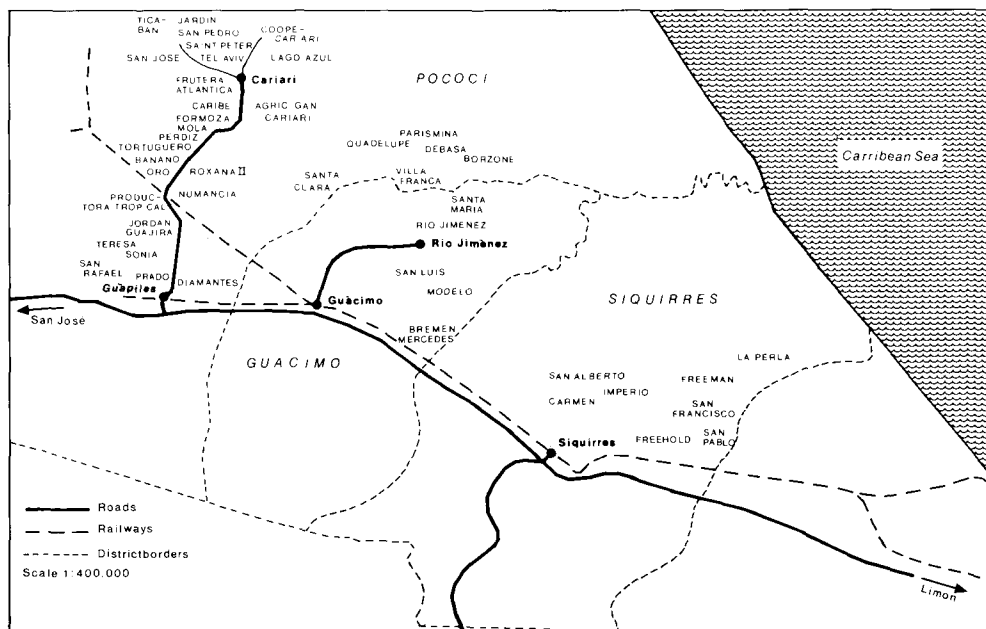
### *Small-scale growers*

Apart from those banana plants grown as a homestead crop, some cultivate bananas on small plots that measure from 3 to 5 hectares. These bananas are not produced for the market but for home-consumption and especially as fodder for cows and pigs. Because of the enormous amount of wastage from the plantations, this type of production is only found in areas remote from plantations like, for example, in the pioneering areas in the north-east of the country. For this reason there are only a small number of such growers. This type of production distinguishes itself in several ways from the plantation way of producing. Fertilizers and remedies are hardly ever applied; a system of cutting down part of the trunks is not maintained even though all trunks of the banana plant, independent of size, will deliver a bunch. A variety of the 1930's, *Gros Michel*, is mostly cultivated which is very high and is not resistant to Panama disease.

ASBANA is a semi-state organisation, jointly established in 1971 by the state, the banks and the national producers. It was established when national producers were performing poorly at the end of the sixties. Their production was low and one has the impression that they did not have sufficient experience of banana growing. When the banks got into problems because loans could not be redeemed, ASBANA was set up. It aimed to give national producers technical assistance and took over the management of 14 plantations that were doing badly.

ASBANA is financed by a levy of \$0.05 dollars on every box of bananas that leaves the country. This amounts to about 2 to 2.5 million dollars a year. In comparison, in 1981, 42 million *colones* (about 1.2 million dollars at that year's exchange rate) were spent in total in Costa Rica on agricultural research (Stewart, 1985).

Figure 5. Banana plantations in the districts of Pococí, Guacimo and Siquirres (Costa Rica 1987)



Source: author

Bananas are of major importance to Costa Rica. There is no other activity that provides so much income and employment. It is little wonder, therefore, that the Costa Rican government is preoccupied with the welfare of this sector. This preoccupation led to the foundation of ASBANA, and also to *state* negotiations with the transnationals about prices to be paid to national producers. And, together with the *banks*, the state is and has been working on several credit and establishment programmes. The newest program intends to raise exports to 60 million boxes in 1990, to extend the area under cultivation to 8,000 hectares and to create employment for an additional 6,000 people. All credits for national producers are provided through ASBANA.

But the government sees itself confronted by the three transnational enterprises, whose activities have a major influence on the development of



the banana sector. In setting priorities the government is forced to consider the interests of these enterprises. That makes a choice between, for example, union demands for higher wages and better protection for employees against applied chemicals on a plantation, and the desires of the transnationals for cheap labour and low production costs, a difficult one. Also the state cannot insist on less intensive production, which would exhaust and contaminate the soil less heavily. If it did so the transnationals would threaten to shift production to other countries.

### **The importance of research**

Before the sixties, bananas were grown until the soil was exhausted. A new area was then cleared, drainage-canals were dug and banana trees were planted. The old area was left fallow, or was 'given' to labourers as a wage in kind, or cacao was planted. Nowadays, plantations are compelled to remain in the same production area because of a new transport system that makes the presence of a packing factory at the plantation necessary. In addition, good soils are getting scarcer. This makes constructing a new plantation every five to ten years too expensive.

With this new situation, research into the use of fertilizers, nematicides, insecticides, fungicides, and herbicides developed quickly. The application of large amounts of these inputs became more important. Soils were studied because they needed different fertilizer mixtures, and leaf-analysis became important because of *Sigatoka Negra*, the most important disease in banana production. Combatting this disease, which attacks the leaves of the banana plant, is responsible for 10% of the costs of banana production (Kruiter, 1987).

But extensive research and the present enormous levels of inputs cannot prevent the soil from becoming exhausted. There are indications that treatment causes a serious disturbance of soil fauna. Several plantations in the Atlantic Zone, constructed at the beginning of the sixties, are now experiencing decreasing outputs. Solutions to these fertility and pest problems are of vital importance.

The competitive nature of the industry puts even stronger pressure on research. Commercial cropping systems are all characterized by the importance they give to research into all aspects of production and marketing, but this is even more important for sectors where competition is strong, as in the banana industry. Strong competition exists in Costa Rica between the different banana producers, but in addition, the Atlantic Zone, as a production area, has to compete with other areas in the world.

Knowledge is therefore of vital importance, and that means constant experimentation and the search for cheaper production systems. Attention is here given to how the various interest groups are involved in the generation and spreading of knowledge.

In every country where transnationals have established their plantations they have set up research centres, primarily concerned with applied research, such as soil and leaf analysis. Such research is directed towards providing advice on the amount and composition of fertilizers and to remedial treatment. Besides these regional research centres, the transnationals also have research institutes for more fundamental research. This is about the limit of our knowledge, since the research of transnationals is very closed, and certainly not accessible to an investigating student.

The national producers have very little involvement in banana research. A few of them cooperate with ASBANA's research efforts by experimenting on their plantations. Others rely on their transnational for any new management strategies and orders.

The case of the small producers is a rather strange one. Even though their production system differs considerably from the plantations, their knowledge is nevertheless gathered from the latter; either by working there themselves, or through friends, family or neighbours who are employed on the plantations.

ASBANA's research into the cultivation of bananas started in 1979 when it became obvious that good extension was not possible without it. At the moment this research is very practical and mainly geared to answering questions from the extension service, but ASBANA is rapidly extending its research facilities for fundamental research. Most of the 2 million dollar budget however is spent on research into crops other than the banana. In 1975 ASBANA started a policy of diversification. This meant research into a number of crops and activities that could have a future in the Atlantic Zone, such as soursop (*Annona muricata* L.), peach palm (*Bactris gasipaes* H.B.K.), coconuts (*Cocos Nucifera*), oranges (*Citrus sinensis*), cacao (*Theobroma cacao*), plantains (*Musa AAB*), crocodiles and *Tilapia* spp.

ASBANA is in a difficult position concerning banana research. As soon as research results are applied in practice, they are immediately picked up by the transnationals since their extensionists are regular visitors to the plantations. Another difficulty is that research results cannot always be applied because of restrictions in the sales contracts of national producers. An example of this is the research in planned harvesting. With this production system it is possible to plan the harvest time in periods when prices are high. But since national producers can only sell bananas when

the transnationals want to buy, being able to produce in this way is dependent on the transnationals. And this entails new arrangements with the transnationals over the prices they pay to national producers.

The opinions of national plantation owners, or rather their managers, regarding ASBANA vary. Most of them claim that the establishment of ASBANA was urgently needed, considering the troubles of the national producers, but for some, ASBANA's research and technical assistance has been disappointing. They do not think that it adds anything to the advice they get from 'their' transnational. Others, however, have a great deal of praise for ASBANA's nematodes research, for example.

Except for ASBANA there are no other state organisations involved in activities related to the banana sector. 'Los Diamantes', the research station of MAG in the Atlantic Zone, has a banana plantation on its grounds. This plantation was layed out for research purposes, but never really got off the ground. The plantation is now maintained mainly for employment reasons.

## **Discussion and conclusion**

Several actors such as researchers, extensionists, national producers and traders are involved in the process of generating, transferring and using knowledge relating to the production and marketing of bananas. Sometimes, knowledge networks exist involving these parties, and in such a case, the network is articulated through the contacts between representatives of the different groups.

Banana-knowledge networks in Costa Rica do not link up groups of producers, researchers, extensionists, or traders. The dominant position of the three transnational enterprises leads to knowledge networks being centralized around them and to a much lesser extent around ASBANA. As a result of high competition between these enterprises these knowledge networks are poorly articulated. No exchange of information or cooperation takes place, resulting in a rather rigid structure of generation and transfer of knowledge, in which it is difficult for the national producers to obtain information.

In capitalist agriculture in rich countries, characterized by strong competition, as in the Netherlands, producers are usually involved in research and research decision-making. Producers may even sit on research committees, visit research station field days and take part in the application of research programmes. In these sectors, feedback between researchers and cultivators is of great importance.

In the Costa Rican banana sector this two-way communication is lacking. National producers receive research results in the form of management advice. They are hardly involved in the development of the recommendations. The absence of experimentation by national producers is striking; they do not see the need to start trials on their own plantations. Transnational enterprises are very restrictive with regards to knowledge transfer; feedback is limited to the field reports made by company officials.

Considering ASBANA's policy of diversification and the restricted budget for banana research it is obvious that this is not the government's first priority, even though Costa Rica really does not lack the expertise to do such research. Why? Two reasons come to mind, although they do not form a complete explanation. Firstly, as already stated, banana production and marketing was and is in the hands of huge transnational companies. The Costa Rican state or the national producers never succeeded in obtaining the status of an equal partner with the three transnationals. Secondly, as long as national producers are unable to market their product independently there seems little purpose to spending a lot of money on banana research. Having a sales contract with a transnational means managing the plantation according to their rules. ASBANA's banana research tries to strengthen the competitive position of the national producers. But considering the enormous research potential of the multinationals, ASBANA is a dwarf among giants. Besides, all ASBANA's research results are published, while transnational research centres keep them secret as long as they wish. ASBANA's policy is to investigate banana on a modest scale and spend the rest of their research potential on other crops that might have a future in the Atlantic Zone and can provide an alternative for, among others, those national banana producers who cannot keep up with the demands of an ever changing banana industry.

The result is that Costa Rica's banana sector invests little in its own knowledge potential and has to rely heavily on the transnationals and their willingness to provide the national producers with research information. This one-way communication pattern has to suffice for the time being - it certainly suffices for the immediate interests of the multi-national companies. It is certainly not in their interests to create a group of well informed producers who can decide for themselves what options to choose. This puts Costa Rica in a difficult position; competing with the kind of banana research that the transnationals engage in, is perhaps not possible, but on the one hand, being actively involved in banana research seems the only chance of the state and national producers in the industry to achieve a more competitive position. We therefore argue in favour of extending national banana research and encouraging greater producer involvement in

this research, to facilitate a more intensive two way flow of communication between researchers and producers. Banana knowledge is just too important for Costa Rica and Costa Rican farmers to leave its development to a few company researchers and other officials. Considering the problems facing the banana sector, there is much research to be done. ASBANA could seize the opportunity to strengthen its position and involve national producers in its research. Open networks may open up unknown opportunities.

## **Note**

- 1) Researchers attached to research stations of the transnational enterprises could only be interviewed during accidental or informal meetings (local bar) outside plantation boundaries. I was never given the opportunity to visit a transnational plantation.

## V. COCOA-KNOWLEDGE NETWORKS:

### THE EMERGENCE OF FORMAL AND INFORMAL ARTICULATION

Ab de Groot

In the Atlantic Zone of Costa Rica, cocoa was considered a crop with only minor problems until 1978. In that year, however, a fungus disease attacked and reduced national production by more than 80% (SEPSA, 1982). Control of this fungus is only possible when the cropping system of cocoa is thoroughly changed. This means frequent checking of the plantation for infected fruits and the use of higher yielding, but also more demanding, cocoa hybrids. In short, a new cropping system based on a new cocoa technology.

An important element for the successful adoption of this cropping system is the knowledge cultivators can obtain about the new cocoa technology. This paper discusses what this knowledge is and of how and to whom this knowledge is transferred.

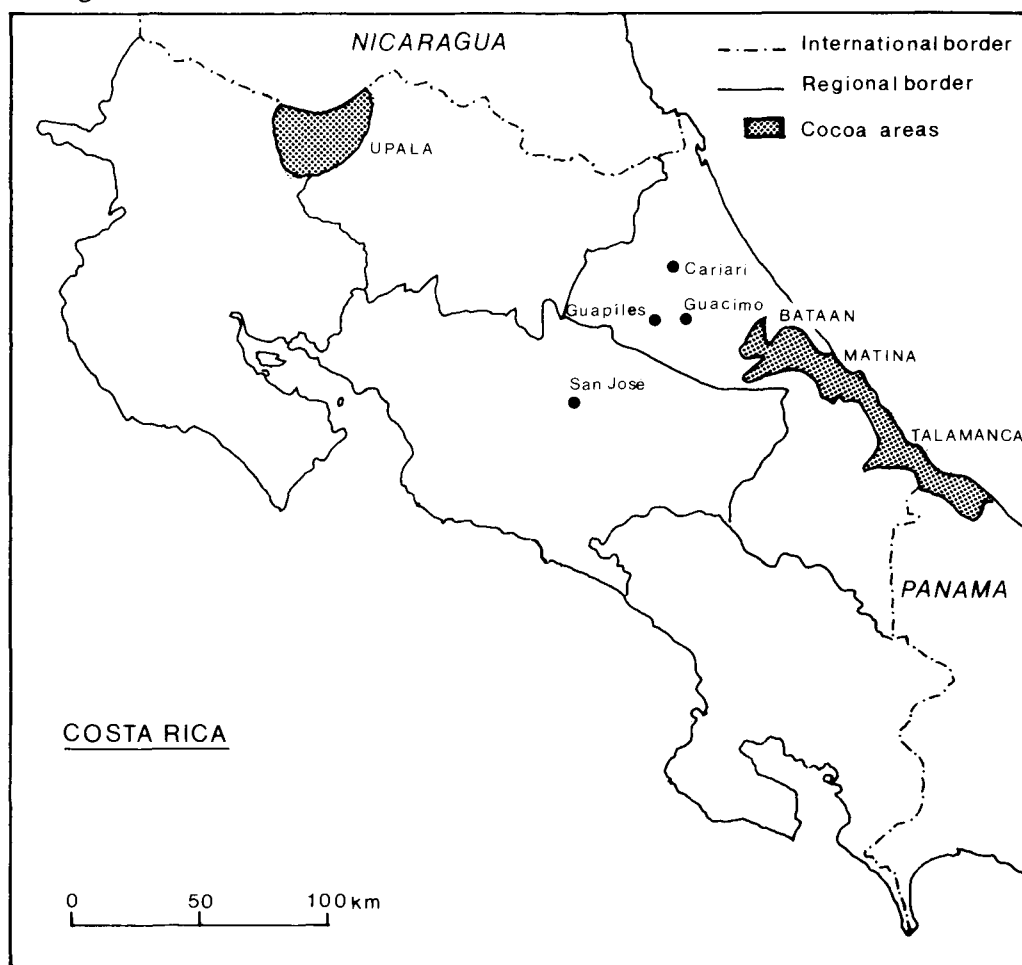
The subject is studied through the concept of knowledge networks. The aim of this paper is to give some insight into the functioning of these knowledge networks as they relate to cocoa in the Atlantic Zone. Analyzing the role different actors play in the networks and the priorities they set, helps to clarify how the networks function. The importance of cocoa knowledge networks for this book lies in the fact that they are open networks: in principle all actors can contribute to or obtain knowledge from them. In this, the cocoa industry differs from the banana industry in Costa Rica discussed earlier by Anje Kruiter.

The research which forms the basis of this paper was carried out from January 1987 to July 1987, mainly in three areas in the northern part of the Atlantic Zone (see Figure 6). These areas (Rio Jimenez, Cocori, and Neguev) were selected because they are representative for this part of the Zone.

The research was set up through a series of interviews with the representatives of the groups of actors involved in knowledge networks about cocoa. The interviews focused on the priorities these actors set, the contacts the actors have and the knowledge they obtain from or transfer to other actors in the network. In addition, a description of the cropping system of cocoa in the three research areas was made. Information for this

was obtained partly from a broad farm survey held by the AUW/CATIE/MAG-program at the beginning of 1987.

Figure 6. Traditional areas of cocoa cultivation in Costa Rica



Source: adapted from Hall, 1984

Further information was obtained by interviewing 3 to 4 cocoa cultivators in the different areas. This description aims to give a picture of the cropping system at farm level and to show the differences between cultivators' practice and official recommendations. Further insights were then gained through a case study of an experimenting cocoa cultivator. This case study presents an example of an informal knowledge network and highlights the fact that cultivators can also be very active, both in the

transfer and in the generation of knowledge. The case also shows how difficult it can be to obtain knowledge in the absence of an institutionalized, or formal knowledge network.

## History

Cocoa (*Theobroma cacao*) has been grown for over 400 years in the Atlantic Zone of Costa Rica (Villa, 1949), but only became an important crop in the region after 1900. Around that time people from the Caribbean islands migrated to the southern part of the Atlantic Zone, bringing with them their own cropping system in which cocoa had a place as a cash-crop. After 1940, the declining banana industry provided a new impetus for the crop: many cultivators previously engaged in bananas, now turned to cocoa as an alternative source of income (Hall, 1984). Some banana companies themselves also started growing cocoa on a large scale, but stopped when it proved to be uneconomic. These developments led to cocoa becoming restricted mostly to the southern part of the Zone, to Talamanca, Matina and Bataan (see Figure 6). In the northern part, which was colonised much later, cocoa is a relatively new crop.

According to Villa (1949), cocoa was traditionally grown with a minimum of care. This was confirmed in interviews with cultivators who had worked in cocoa plantations during the fifties. According to them, cultivation was limited to harvesting, weeding and occasionally pruning. Disease control, fertilisation and the maintenance of shade-trees was not practised. These cropping methods did not alter much until recently. According to Enriquez (1982), the technological level used in cocoa-cultivation was still very low around 1980: fertilisation, pruning, regulation of shade-trees and sometimes even weed control did not belong to the normal routines.

In 1978, an event took place that changed cocoa cultivation completely. In that year *monilia* (*Monilia roleri*), a fungus disease, entered Costa Rica. This fungus attacks the cocoa fruits and is capable of reducing the yield to almost zero. The only effective way of controlling it is to cut off the infested fruits by hand. A technical package involving the use of more tolerant cocoa-hybrids is also an important measure against *monilia*.

The presence of *monilia*, made cultivation much more labour- and capital-intensive. The increase in labour is caused above all by the weekly checking and manual cutting out of infected fruit. Capital intensification is caused by the use of hybrid seed and its more expensive maintenance: hybrids only realize their high yield potential when they are well maintained (fertilized, pruned, checked for diseases other than *monilia*,



etc).

Within the space of a few years, cocoa cultivation has changed from labour-extensive to labour-intensive and from low to high input levels. For cultivators this means a drastic shift in their cropping system. To adopt the new cocoa-technology, access to knowledge about the new cropping system is of great importance.

### *Cocoa knowledge networks*

In the Atlantic Zone there are five categories of actors who are, in one way or another, interested in cocoa production. These are: policy-makers, cultivators, researchers, extensionists, traders. Except for the traders, all the other actors are involved in the generation, transfer and/or use of knowledge concerning cocoa. For this reason the knowledge networks to be discussed are considered to consist of policy-makers, researchers, extensionists and cultivators.

Two types of knowledge networks can be distinguished. First, there is the institutionalized or *formal network*. It is characterized by a top-down approach: knowledge is generated by researchers, passed by extensionists and used by cultivators. In this formal network, institutions like MAG (extension and research) and CATIE (research), play an important role.

Besides the formal network there also exist extensive *informal networks*. In these, cultivators are the most important actors. They obtain knowledge through their own cultivating experience, through informal contacts, from other cultivators and from researchers and extensionists. In addition, some cultivators are engaged in actual experiments with cocoa and in that way generate knowledge. These 2 types of networks and their participating actors will be discussed below.

### **The formal knowledge network**

#### *Policy-makers*

The Costa Rican government has been trying for years to influence cocoa production through setting up programs aimed at increasing national production. A higher national production would stimulate the cocoa processing industry and increase export earnings. A higher production would also increase the income of cultivators and provide more jobs (SEPSA, 1982). In the past, these programs have not had much effect at farm level, because the necessary finances for implementation were not

available (Anon, 1977; Enriquez, 1982). However, the last program, started in 1982, was an exception. To reach higher production levels, the technological level of the crop needed to be raised. The program aimed to achieve this by increasing the use of hybrid seed, fertilisers and other inputs, and because the new cocoa-technology demanded high investments, the supply of credit to cultivators was reckoned to be the most important instrument of the program. The program also aimed to expand cocoa research and extension (SEPSA, 1982).

Policy-makers and researchers have good contact with each other, witnessed by the fact that the last government program, for example, was set up in cooperation with researchers from CATIE. In addition the government has set aside finances for cocoa-research and the production of hybrid seed (Anon, 1983a). The government keeps in contact with extension agencies through the credit these agencies supply, the finances for which come from government. The largest extension agency (of MAG) is a government institution.

### *Researchers*

Research on cocoa in the Atlantic Zone is pursued by several institutions, the most important of which is CATIE, an international research institute. An overview of the trials which are performed by CATIE, or in cooperation with CATIE by other research centers, is given in Table 3.

Table 3. Overview of the research conducted by CATIE or in cooperation with CATIE (by MAG or Desarrollo Cacaotero), from 1979

research subject	'79	'80	'81	'82	'83	'84	'87
genetic improvement	xxx	xxx xxx	xxxx xxxx	xxx xxx	xxx xxx	xxx	xxx xxx
cultivation practices	x		xx	x	x	x	xxx xx
others					x	x	xx

Information for the Table was gathered from interviews and from the Annual Reports of CATIE, 1979-1984. Sometimes only the results were mentioned, while in others the start of the experiment was also given. Because of this, and because of the fact that some trials were mentioned

in a number of Annual Reports, it is possible that certain trials have been counted more than once. However, the table is accurate enough to indicate the research trends.

As the Table shows, research has been, and still is directed towards the genetic improvement of cocoa. The most important selection criteria have been the level of production and tolerance to diseases such as *monilia* and *Phytophthora palmivora* (CATIE, 1979-1984). Only during more recent years, has research given some attention to other aspects of cultivation (SEPSA, 1987), such as providing shade and fermentation. In addition to CATIE, and in cooperation with them, MAG and two cocoa-processing companies, also conduct research on cocoa. The companies participate in the research because they will benefit from higher national cocoa production: at the moment, in order to make full use of their processing capacity, they must import cocoa, and this is more expensive than buying Costa Rican cocoa.

In addition to research, CATIE and one of the cocoa-processing companies, also engage in the production of hybrid seeds. Because hybrid seed is an important component of the new cocoa technology, CATIE is in a key position for its generation and dissemination (SEPSA, 1982).

Apart from CATIE being well articulated with government, as mentioned, through its research, CATIE is also well linked with the different extension agencies. CATIE trains, for example, almost all extensionists with respect to cocoa. The insititute's researchers sometimes assist extensionists on field days and provide them with literature on particular topics.

### *Extensionists*

In the Atlantic Zone, four agencies provide an extension service for cocoa: MAG, IDA, JAPDEVA and BNCR. The last three agencies give extension linked to credit, so called *creditos dirigidos*. MAG is the only agency which also gives extension to cultivators who do not have credit for cultivating cocoa. Its aim, however, is to reach as many cultivators as possible with credit because, as Araya, head of one of the field offices claims, "it is those cultivators who can follow the recommendations". In most cases, farmers have to have an *escritura*, a deed, which provides proof of ownership of their farms, before they are considered for credit. Only IDA provides credit without such an *escritura*. Many cultivators, especially in recently colonised areas, do not have an *escritura* and therefore cannot apply for credit. Because extension for cocoa is often combined with credit, many such cultivators have access to neither credit nor extension (SEPSA, 1987).

The extension work of the different agencies is directed towards the adoption of the new cocoa technology package. This can be seen, for example, from the rate of adoption that MAG aims to reach for some cultivation practices seen in Table 4.

Agencies which provide extension in combination with credit, aim at the same elements as MAG, but do not make the difference between practices which cost money (such as fertilisation) and practices which mainly cost labour (such as *monilia*-control). Cultivation practices which cost money are more difficult to adopt when farmers have no loan or insufficient means of their own, while it should be possible for all farmers to adopt practices which cost mainly labour.

Table 4. Goals for adoption rates of MAG with regard to some cultivation practices in cocoa cultivation

cultural practise	adoption rates (in %)
1. use of hybridseed	25
2. increase of plantdensity	25
3. use of fertilisers	20
4. <i>Monilia-control</i>	50
5. shade regulation	30
6. drainage	25
7. pruning of trees	50
8. combat of pests	20

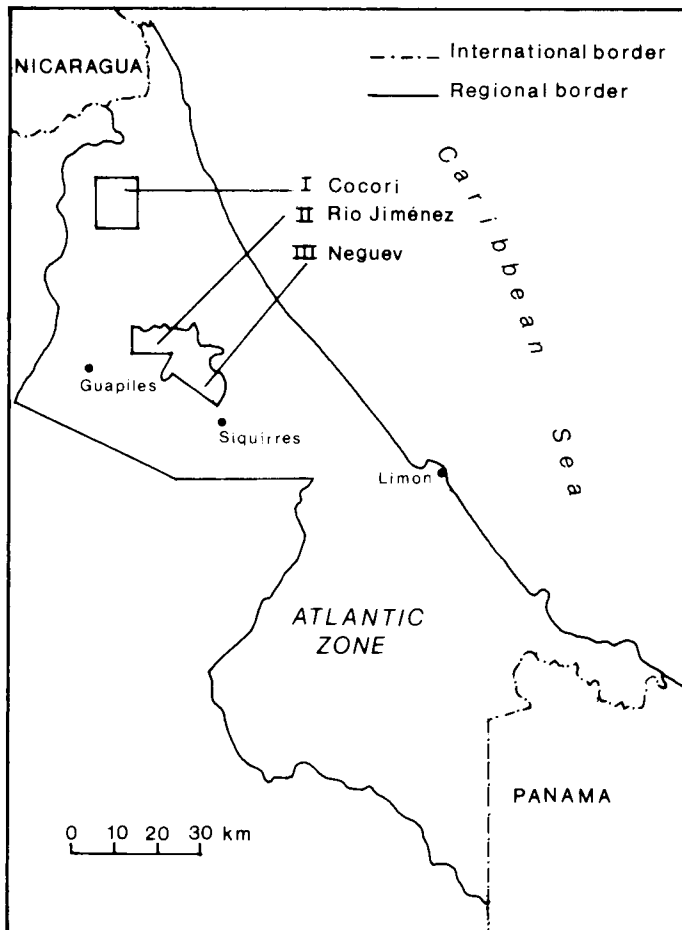
Source: Araya, pers. com.

Contacts between extensionists and researchers are good: almost all extensionist have followed a course at CATIE. Extension agencies do not have much contact with other research centres, nor with the research department of MAG. They maintain contact with the government through the credit scheme, which provide government credit expressly for cocoa modernisation (SEPSA, 1982). The degree of contact between cultivators and extensionists is determined by a number of factors. First it depends on the ease of access cultivators have to credit and extension, but the agency and the degree to which it is active in a certain area, also plays an important role.

## Cultivators

Cocoa-cultivation was studied in practice, in three areas of the northern part of the Atlantic Zone (Rio Jiménez, Neguev and Cocori, see figure 7). Differences exist in the cropping system of cocoa between these areas. The question is whether, and how, such differences can be attributed to bottlenecks in the transfer of knowledge. For this reason a short description of each area will be given. Then, the technological level of cocoa cultivation in combination with the functioning of the networks, is discussed.

Figure 7. The research areas Rio Jiménez, Neguev and Cocorí in the Atlantic Zone



Source : Mudde, 1987

*Rio Jiménez* is the oldest of the three areas and has the longest agricultural tradition. Keeping cattle and growing maize are the most important farming activities. Almost 70% of the farms have an *escritura* which is high compared to the other two areas. Among 49 cultivators who were interviewed in 1987, fourteen grew cocoa. Only three of them named cocoa as one of their three most important crops. Most cocoa plantations were abandoned or were no longer maintained. The cocoa-production of these plantations was very low due to *monilia* (base-line survey of AUW/CATIE/MAG-program, 1987).

The contact between extensionist and cocoa cultivators in *Rio Jimenez* is poor: although there are three extension agencies working in the area, only a few farms are visited for cocoa. The new technology is used only by a few cultivators and the use of hybridseed is not widespread. Although a lot of farms have an *escritura* and therefore have access to credit, not many have applied for it. A number of factors can be held responsible for this. First, cultivators in the area have witnessed the devastating effect of *monilia* and are probably cautious to invest heavily in a new cocoa technology which still has to prove itself. Furthermore, cocoa has always formed only a small part of farm activities in the region and is probably easily replaced by, for example, an expansion in maize cultivation.

*Neguev* has a much shorter agricultural history than *Rio Jimenez*. Before 1978, it was a large cattle ranch and a great part was covered with forest. In that year *Neguev* was invaded by *precaristas* who started to cultivate the area. A few years later the settlers got help (in the form of extension and credit) from IDA, a semi-government organisation (as described by Huub Mudde in chapter VI).

Of the 52 cultivators interviewed, nine were growing cocoa. For all these farmers, cocoa formed one of their three most important crops (base-line survey of AUW/CATIE/MAG-program, 1987). Cocoa had been planted a few years earlier, after IDA started an extension and credit program for the crop. Almost all cocoa cultivators participate in this program. In contrast to cultivators in other areas, cultivators in IDA-settlements do not have to have an *escritura* to be considered for credit. Not only do almost all cultivators have extension and credit for cocoa in *Neguev*, but extension is also more intensive than in the other areas: an IDA extensionist needs to visit fewer cultivators than extensionists in other agencies. Results of research are widely spread among the cultivators: all cultivators used hybrid seed, applied more fertilizer, and maintained the cocoa-trees better, than in the other areas.

In 1987, cultivators in *Neguev* had not yet witnessed the effects of *monilia*, which can be one reason for the large number of farmers growing

cocoa. Another reason is that, in contrast to Rio Jimenez, Neguev is not very suited to growing maize (because of infertile soils), nor for cattle (due to small farm sizes). Farmers in the area were looking for new crops to make a living. Therefore IDA's cocoa was most appropriate. Some extensionists explain the high adoption rate in areas, like Neguev, by the fact that the farmers do not have a background in cocoa growing. They do not need to change old ways of cultivating but start from scratch and are therefore more willing to adopt recommendations.

*Cocori* is an area where colonisation was in full swing in 1987. Most of the forests are rapidly being turned into land suitable for agriculture, especially pasture. Some settlers have already lived in Cocori for 15 years, but most came to the area during recent years. Keeping cattle is the most important commercial activity, while crop cultivation is mainly for household consumption, with the exception perhaps of maize. Cocori is the most isolated of the three areas: there are only two roads, in bad condition, which give poor access to the area. There is no electricity or piped water and institutions such as government or banks are not present. Of the 51 cultivators interviewed only three were growing cocoa in 1987 and their groves were still very young. For two of the three cultivators cocoa formed one of their three most important crops. In Cocori two extension agencies are active (JAPDEVA and BNCR), but they visit few farmers. Most settlers in this area do not yet have an *escritura* (base-line survey of AUW/CATIE/MAG-program, 1987).

Some cultivators do use elements of the new technology, such as hybrid seed and new cultivation practices, even though they are not linked with the formal knowledge network. Like in Neguev, cocoa is a relatively new crop in Cocori. Another similarity with Neguev is the fact that in this area also, cultivators seem to be looking for a cash-crop. Keeping cattle is not so profitable, while growing maize, another important cash-crop, is difficult because of the isolated position of the area. The big contrast with Neguev is the fact that in Cocori only a few cultivators have access to credit or extension and those who do not, must obtain information through informal networks.

### **Informal knowledge networks**

The subject of this section is a the functioning of an informal network and the actors involved. It draws heavily on a case study of an experimenting cultivator (Box, 1988), Don Ernesto, to illustrate how knowledge transfer and generation in an informal network can take place. Attention is given to

how Don Ernesto build up his information about cocoa, whom he approached for this, and how the experiments he is conducting, originated.

### *Don Ernesto's network*

Don Ernesto has lived in Cocori since 1983 and has a farm of 200 hectares, which makes him one of the larger-scale cultivators in the area. However, what makes him different from the other cultivators of this group is the fact that he does not keep cattle: most of his land is still covered with forest and he wants to keep it that way. Other points of difference between Don Ernesto and the cultivators of Cocori are his level of education (he has a degree in agronomy and in geology) and his relative financial independence (he owns part of a banana-plantation). Furthermore, Don Ernesto has activities outside the field of agriculture, such as a sawmill. This makes him rather a special type of cocoa-cultivator, who does not depend exclusively on agriculture. Although Don Ernesto may not be representative for Cocori, this does not make the study of his case any the less interesting for a description of knowledge transfer. The aim of this case study is to show the functioning of an informal network.

In 1984, Don Ernesto decided to grow cocoa. His reasons for this were that cocoa was a profitable crop, adapted to the wet climate of the area. He and his wife are very concerned about the rapid deforestation taking place in the area. Most of the deforested land is turned into extensively used pasture. They think that the cultivation of cocoa makes better use of the land and at the same time may form an alternative for cattle farmers. When he started growing cocoa he did not know anything about the crop. In order to obtain information he first turned to a government planning bureau (SEPSA). There he was told about government plans for cocoa and about the availability of credit for the crop. When he went to the banks, however, he found out that such credit is only for smaller-scale cultivators. Without credit, he had no access to the formal knowledge network.

To obtain knowledge about cocoa Don Ernesto now turned to the place where he had bought his hybrid seed: CATIE. There he talked with a researcher and with the manager of the experimental farm about the best site for growing cocoa and about how to raise the seedlings. Don Ernesto still has contact with this manager. Through him, Don Ernesto also obtained a copy of a book about the cultivation of cocoa. Don Ernesto also maintains contact with a researcher from a cocoa processing company. This company is engaged in the production of cocoa and in the production of hybrid seed. The researcher is an old friend of his whom he had met during his agronomy studies.



With MAG, Don Ernesto has had contact once. When the cocoa needed pruning, he asked advice from a friend of his who worked as an extensionist with MAG. After this friend left the organisation, he did not continue to seek help from them.

Don Ernesto also has contact with several other cultivators, outside the Cocori-area. From some of these, the more experienced ones, he obtains knowledge. While he reckones he need to learn a lot about the crop, other cultivators in Cocori, for whom cocoa is a new crop, see him as the expert in this field, and come to him to ask for advice.

Don Ernesto is not the only cultivator who is gathering knowledge through informal networks. For example, cultivators in Neguev said they had visited CATIE, when they were not satisfied with the information they got from IDA. The extensiveness of informal networks probably is best illustrated by the example of hybrid seed dissemination. Knowledge about hybrid seed is widely shared among cultivators. This knowledge is transferred through informal contacts between them and not through contacts with representatives of the formal network. Cultivators who have never had contact with extensionists about cocoa (the majority) know about hybrid seed, its supposed tolerance against *monilia* and the place where one can buy it.

Sometimes information transferred through informal networks is wrong or incomplete. One farmer thought that by using hybrid seed, he would have no more trouble with *monilia*. What he did not know was that with hybrids, frequent control and the cutting out of infested fruits is also necessary. In general, it seems that through informal networks, parts of the information on new technology spread easier than others. While hybrid seed and its qualities are widely known, the cultivation practises such as *monilia* control, the frequency of this control, the need for shade and the need for fertilisation are not well known. These practices are just as necessary for high production as the hybrid seed.

### *Don Ernesto's experiments*

Don Ernesto also experiments with his cocoa. Experimenting is not a logical thing to do for a cultivator. It costs him time and labour, and often also production. For Don Ernesto, these disadvantages are compensated for by the fact that the experiments form another source of knowledge. He feels he has to experiment, for according to him, the recommendations of research and extension do not hold for Cocori, because Cocori has a much wetter climate than the areas where most of the research is done. The knowledge he obtains this way, he wants to use in the future expansion of

his grove.

Don Ernesto's experiments originated more or less by accident. During the establishment of the grove everything did not go according to plan. For example, Don Ernesto is comparing the growth and production of different hybrids and is able to do so because he sowed hybrids of only one kind on each plot, a different hybrid per plot. The recommendation is to mix the different hybrids, because this gives a higher genetic variability and increases disease resistance. However he was not told this when he established the grove. Thus, only through this 'mistake' he is now able to compare these hybrids.

It was in similar fashion that he started experimenting with different kinds of shade-trees. At the time he transplanted the young cocoa-trees he did not know that he had to have adequate shade ready to protect the plants. When he was told afterwards that this shade was very important, he started to select fast growing species that would provide temporary shade rapidly. From this selection, some trees served this purpose well and will be used again as temporary shade. Don Ernesto is experimenting likewise with trees that must provide more permanent shade. He is forced to do this because the species recommended are not indigenous to the Cocori-area.

Another experiment of Don Ernesto's is the comparison of two different soil types, one which is fertile but has a high groundwater table, and one which is infertile but has a low groundwater table. When the plantation was established, not enough land was cleared to plant all the seedlings. So Don Ernesto planted some of the seedlings in an area which was easy to clear but has a higher groundwater table. He is now observing the cocoa to see what effect the table and the fertility of the soil have on the cocoa.

The fact that the conditions for these experiments were created by accident or necessity is a remarkable feature: it were the circumstances that provided their start. However, it took an inventive cultivator who was in need for knowledge to use these circumstances in his advantage. How these experiments originated, however, is less important than the effect they may have. They may lead to, for instance, a choice of hybrids and shade trees adapted to the specific conditions of Cocori. In that way they will contribute to the transformation of the cropping system in Cocori: already several neighbours have started planting cocoa, thereby drawing on Don Ernesto's knowledge and experience, gained through his contacts and experiments.

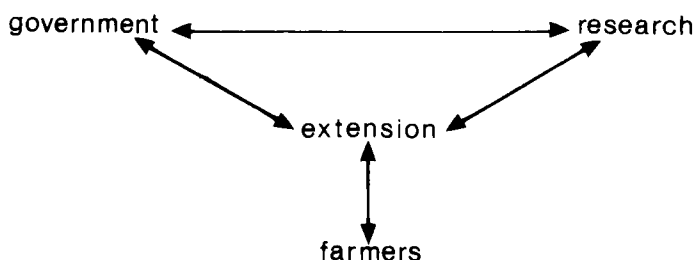
Don Ernesto is not the only experimenting cultivators I met. A cultivator in Neguev used shade trees other than the recommended ones and these trees served their purpose very well. Another cultivator, not living in one

of the areas, cuts the fruits of the plantain, a plant very often used to provide temporary shade for cocoa. When the fruits of plantain grow, the plant often collapses under the weight of the bunch of fruit, damaging the cocoa in its fall. It is exactly for the fruits, that plantain is recommended as a shade tree by research and extension, because it gives the cultivator an additional income during the first years when cocoa does not bear fruits yet. This shows that cultivator practice and research findings do not always link up. That same cultivator also had another experiment: he is not convinced of the superiority of the CATIE-hybrids above his own seed. Out of curiosity and out of discontent with the high price of hybrids, he planted some hybrids and some of his own cocoa together to see if there would be any difference in production. By this he was helped by an JAPDEVA extensionist.

## Conclusions

The formal knowledge network can be described diagrammatically as follows: Contact between policy makers, researchers and extensionists are well articulated within the formal knowledge network. These three (groups of) actors aim, with regards to cocoa, at the same goal: increasing cocoa production through intensification and modernisation of crop cultivation. The formal network is top-down oriented: the research priorities and therefore the extension recommendations are an outcome of the national policy, with not much room for feedback of cultivators.

Figure 8. Schematic overview of contacts within the formal knowledge network of cacao



The articulation between these actors and cultivators (mainly through extensionists) and the rate of adoption of the new technology differs from area to area. The determining factors are the access cultivators have to credit and thus to extension, and the importance cultivators give to a crop like cocoa. In Rio Jimenez, the technological level of the cropping system is still very low and this corresponds with the importance farmers give to cocoa: although they could be considered for credit they do not apply. It is likely that in Rio Jimenez cocoa has been displaced by expanding existing activities (maize) or starting new ones (root and tuber crops). Another factor could be that cultivators in Rio Jimenez are cautious to invest in cocoa because they have witnessed the damage that *monilia* can cause.

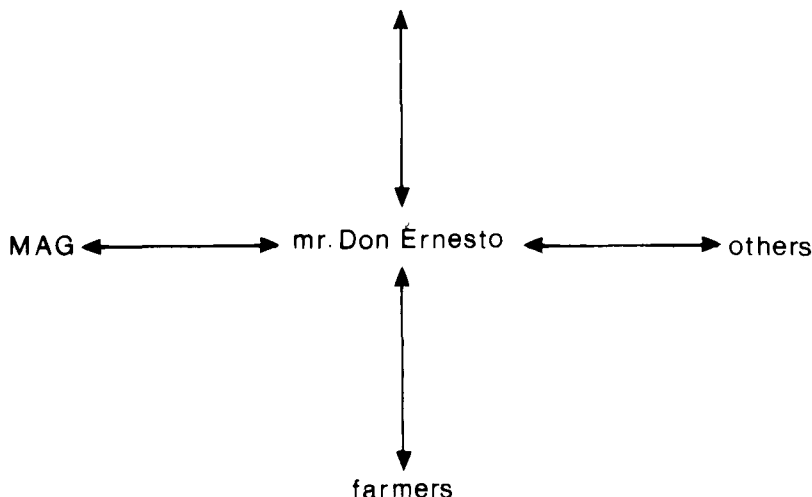
In Neguev, the technological level used in cocoa cultivation is the highest of the three areas. The agricultural situation in this area is much more dynamic than in Rio Jimenez. Cultivators are looking for cash-crops and in Neguev maize and cattle are not good alternatives. In that context, it is understandable that a lot of cultivators participate in the credit and extension program of IDA.

In Cocori, the technological level is higher than the level used in Rio Jimenez. Here also the agricultural situation is much more dynamic. Cattle and maize are an alternative for some cultivators, but the isolated position of the area remains a problem. Unlike cultivators in Neguev, cultivators in Cocori do not have easy access to credit or extension. Especially in this area cultivators try to obtain information through informal networks.

There are differences between the priorities of government and research and extension, and the priorities of farmers. Government, research and extension aim at an intensive cultivation of cocoa. For most cultivators, however, cocoa is only one of their activities, and cultivating cocoa according to recommendations could be at the expense of other activities. It seems that the technological level for which government, research and extension are aiming, is at the moment too high for a large group of cultivators.

Besides the formal network, extensive informal networks exist, based upon informal contacts between actors. In the informal networks studied, cultivators are the most important actors: they take the initiative, both with representatives of the formal network as well as with other cultivators. Figure 9 gives the contacts of Don Ernesto as an example of an informal network.

Figure 9. Contacts of Don Ernesto, concerning cacao  
CATIE



The case of Don Ernesto showed that obtaining knowledge through informal networks can be difficult. Even for Don Ernesto, who has a good education, contacts, and more means at his disposal than other cultivators, it was hard to obtain the necessary information. This case and also the experiences of other farmers show that even elementary information, such as the provision of shade, may not get transferred through the informal network. The case suggests that it is harder to spread information on cultivation practises through informal networks than, for example, information about hybrid seed.

Within these informal networks, information based on the cultivators own experiences or experiments may be exchanged. Such experiments are not always consciously designed but may originate by accident or out of necessity, as in the case of Don Ernesto. One thing which the experimenting cultivators in this paper have in common is the fact that they started experimenting out of dissatisfaction with the knowledge the formal network offered. The knowledge they generate through these experiments may contribute to changes in the cropping system in the Zone.

The introduction stated that the knowledge networks of cocoa can be regarded as open ones: all actors can freely obtain from or contribute knowledge to the different networks. Although there exist different networks side by side, they are not separated, as is the case in the banana-industry. For example, Don Ernesto obtains knowledge from the formal network through his contacts with researchers. In reverse, although to a limited extent, knowledge is transferred to the formal network from

informal networks. The cultivator who is comparing hybrids with his own seed is assisted by an extensionist, while the cultivator in Neguev who planted a different kind of shade tree, is well known by the extensionists of IDA and is considered to be a good cultivator. This interaction between networks, and especially between formal and informal networks, is the opposite of knowledge transfer in the banana-industry, where knowledge transfer is restricted to the knowledge network of one banana-company, and the approach to knowledge transfer is strongly top-down. The generation, transfer and use of knowledge concerning bananas are activities belonging to one group of actors. In the cocoa industry the different knowledge networks are, or at least can be, articulated with each other. In the formal network the approach to knowledge transfer is top-down, but in informal networks this is often not the case. The generation, transfer and use of knowledge is not restricted to one group of actors: an example of this are the experimenting cultivators, who are generating knowledge and exchange information through informal knowledge networks.

## VI. KNOWLEDGE GENERATION AND EXCHANGE IN THE NEGUEV SETTLEMENT

Huub Mudde

The previous paper focused upon cocoa cultivation in the Neguev settlement. This paper deals with changes in agricultural knowledge in the same area, focusing on the articulation between the formal knowledge network of agricultural extensionists and the informal knowledge network of tenants. The central theme of the paper is the rapid change that has taken place from common ignorance among inexperienced cultivators and rural extensionists to shared knowledge about appropriate crops, varieties and cultivation practices.

The paper is based on research on the interaction between rural extensionists and tenants in Neguev. Information was gathered by in-depth interviews with tenants and participant observation of extensionists. Following the method, the paper uses case studies as the basis for essential argumentation.

The extensionists in Neguev work for IDA. It is the only government institution actively operating in Neguev, where it has a regional office. Each extensionist is responsible for a program of rural extension which covers one activity such as cocoa or cattle, coupled with credit (*creditos dirigidos*).

The paper starts with an overview of the most relevant issues of Neguev's history. An insight is then given into the functioning of an informal knowledge network through a description of the way in which three different tenants make use of knowledge. Subsequently a formal knowledge network is described dealing with the way IDA extensionists attempt to transfer agricultural knowledge to tenants and with the problems they meet. The paper concludes with some comments concerning knowledge generation and exchange in the Neguev settlement.

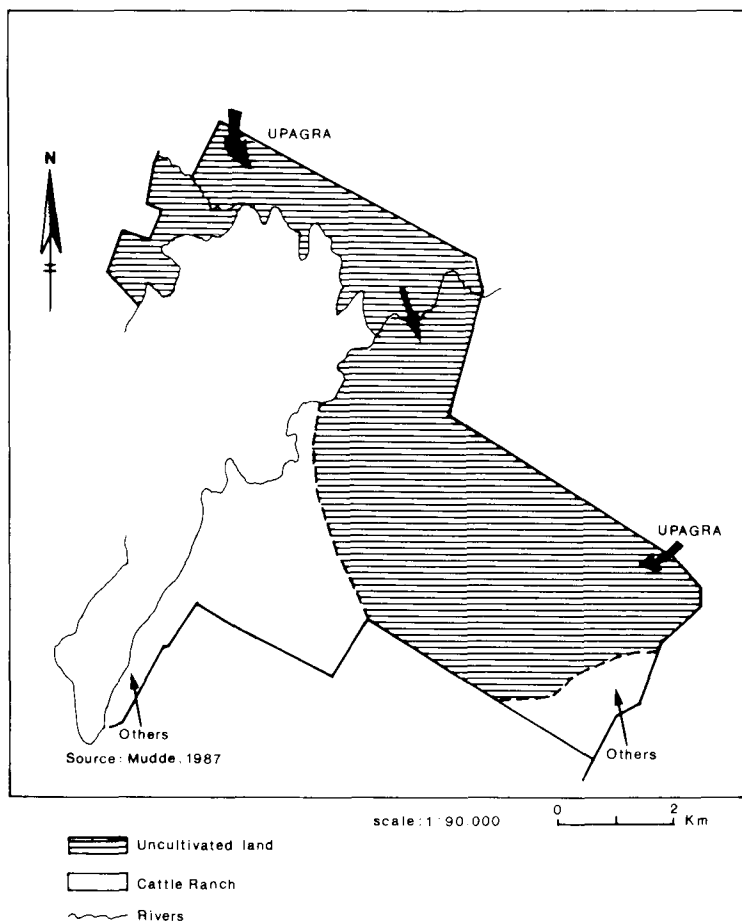
### History

Until the end of 1978, Neguev was private property. Large parts of the area were uncultivated and the rest was used for extensive cattle ranching.

A radical change in the situation was precipitated by a group of poor settlers when they invaded Neguev at the end of 1978. These *precaristas*, as they are called, laid claim to the land and wanted the government to buy

it for them (see figure 10). The invasion was organized by the 'Union de Pequeños Agricultores de la Zona Atlántica' (UPAGRA), who represented the farmers in their negotiations with the state.

Figure 10. The invasion of Neguev in 1978 by groups of UPAGRA and other precaristas



The Costa Rican government, represented by IDA, bought the land, after heavy public pressure. IDA then divided it into 318 plots of 10, 15 and 17 hectares and took responsibility for their allocation. The *precaristas* of Neguev thus received legal status as tenants of an IDA settlement.

The settlers, organized by UPAGRA, were reluctant to cooperate with IDA, because they objected to such large-scale government intervention in the division and allocation of the land. Their resistance led to several



violent confrontations with the police, which had a negative impact on the image of both the union UPAGRA, and the IDA.

Until 1983 there was little further government intervention. In 1983, however, a USAID financed development project was initiated which had a profound impact on Neguev. IDA became responsible for its implementation and had to take care of:

- the improvement of infrastructure (schools, bridges, roads)
- rural extension
- a credit program and
- social support (social worker, education, etc.).

A regional IDA office was built and national personnel were contracted to implement the new tasks. Among them were nine rural extensionists and a veterinary surgeon, all of whom were expected to maintain regular contacts with the tenants, in spite of the fact that only a small group of tenants was interested.

The newly engaged IDA staff were ignorant of the social and agricultural situation of the Neguev area. There were two important reasons for this: they originated from other parts of Costa Rica and the majority, having just finished college, had little practical experience. The majority of Neguev tenants were also ignorant of the agricultural possibilities the area offered them. Like the rural extensionists, they originated from other parts of Costa Rica as can be seen from Table 5.

Table 5. Place of origin (per province) of 53 tenants of Neguev (1987)

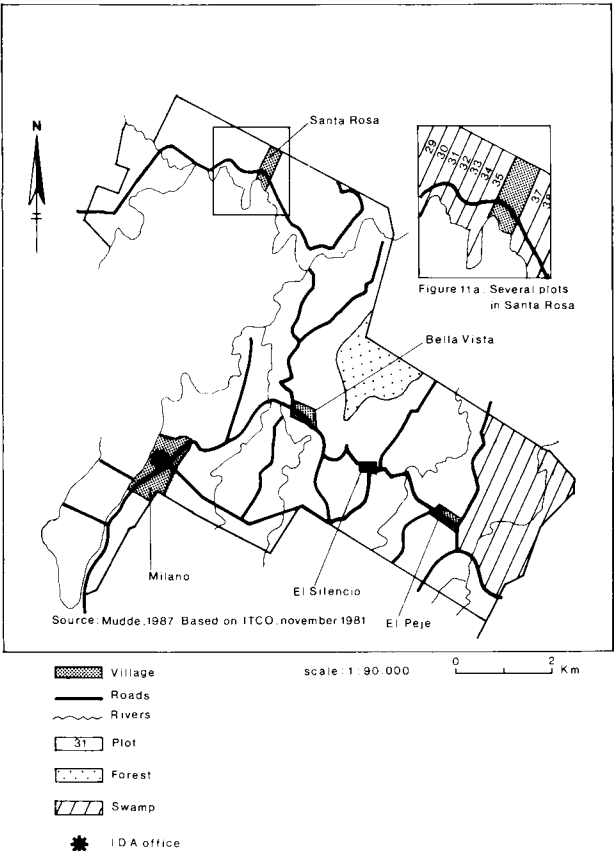
province	number of tenants
Guanacaste	18
San José	11
Alajuela	2
Limon*	7
Heredia	2
Puntarenas	6
Cartago	5
foreign	2
Total	53

\* Neguev is situated in the province of Limon.

Source: Broad Farm Survey, WAU/CATIE/MAG-program, 1987

The recent history of Neguev is typified by rapid social and agricultural change. By 1987 it was completely different from the extensive cattle ranch it had been in 1978. Occupied and cultivated by hundreds of families and visited by extensionists, Neguev had become a rural community on the move (see Figure 11).

Figure 11. Neguev with it's villages, main roads, rivers and IDA office



### Tenants making use of available knowledge

Each tenant has his own ideas of how he wants to develop his plot. His specific problems and prospects will be related to these ideas. The type of information a tenant looks for is likewise dependent on his particular situation. One tenant will use information gathered from his own experience and show no interest in knowledge provided by IDA extensionists, while another's agricultural knowledge is primarily based on information obtained

from these IDA extensionists.

Three cases of Neguev tenants will be presented here, each differing in the way they make use of knowledge provided by IDA extensionists. The three cases illustrate informal knowledge networks in Neguev and show the ignorance of tenants when they first settle. Though the cases may not be seen as representative, in many respects they are similar to those of other tenants.

### *The loser*

Mr. Matilla is 50 years old and lives alone in a pleasant cottage. He is one of the landless farmers who invaded Neguev in 1978. Before that time he had worked as an employee on a bean farm. When Mr. Matilla started to cultivate his plot he had little agricultural experience and was acquainted with neither the potential nor the limitations of Neguev for agricultural activities. His purpose in invading Neguev was to obtain a plot of land where he could farm independently and where he could make a living. He developed his farm slowly, making use of the money he earned working mornings on the land of other tenants.

In 1983, Mr Matilla was visited by an IDA extensionist offering him the chance to grow cocoa and palmheart (*pejibaje*) with credit. Mr. Matilla thought that this might be a good opportunity to develop his plot and decided, therefore, to begin with two hectares of palmheart. This was a big failure. The young plants delivered by the extensionist were too fragile to survive a hot period. According to Mr. Matilla the rural extensionist had proved of no help to him. Nowadays the IDA extensionists nurture the young palms better and cultivate them carefully in plastic bags.

Despite the negative experience he had had, in 1984 he planted a hectare of cocoa with credit from IDA. He still has this cocoa on his farm, but it is in poor condition. Again Mr. Matilla claims that IDA extension is of little help because the field officers have so little practical knowledge.

A year later, another extensionist came by and asked Mr. Matilla if he was interested in cultivating tubers. Convinced of the expertise of this extensionist he agreed to sow one hectare of them. However, the extensionist had obviously no knowledge of the soil conditions on Mr. Matilla's plot, for it was not at all suitable and everything was lost. Mr. Matilla blames the rural extensionist for this failure and is refusing to repay the credit he received from IDA for this activity.

Mr. Matilla prefers to work with cattle. He has about 15 head and would like to buy more, but IDA does not approve and refuses to give him

further credit. Their main argument is that Mr. Matilla's agricultural activities are financed by IDA credit and that he has considerable difficulty repaying it.

Speaking with several extensionists at the IDA office about Mr. Matilla, I discovered that none of them knew that he could neither read nor write, while year after year they had given him written directions. The general opinion at the office about him was that he worked hard but had severe problems because he did not follow their recommendations.

At the time I interviewed him, Mr. Matilla had lost all confidence in IDA extensionists. He mentioned a lot of reasons for his negative attitude: "They give little information about when I have to pay my interest; they will not finance more cattle; they have little practical knowledge; they visit me rarely; if they visit me, they only stay for a minute and write a recommendation on paper; they do not keep their promises; they are never there when you need them and they are only interested in money."

So, sighs Mr. Matilla, IDA is a trap for farmers, and it does not help the poor ones. Shortly after I left Neguev, Mr. Matilla sold the rights to his plot to get rid of the IDA and his debts. The ignorance shared at the outset had not been remedied, little knowledge exchange had occurred and the distance between Mr. Matilla's world and the world of extension had not been bridged.

### *The independent tenant*

Mr. Montana is 66 years old and head of a large agricultural family. He and his wife have 17 children of whom five still live at home. Mr. Montana is a farmer to the backbone. He is very proud that almost all his children work in agriculture, and he said to me that he would like to die working his land.

The family Montana came to Neguev in 1982 when they bought a plot of ten hectares. Before that, Mr. Montana had taken care of a farm in the Central Valley of San José. He had been responsible for its management and had worked almost independently. During that period he had saved some money from which he bought two oxen. This was the main input for the development of his plot in Neguev. He ploughed all his fertile land and worked with other farmers on their land. He invested the rest of his earnings in building a house with a huge zinc roof.

In 1984, a neighbour sold his plot to Mr. Montana's oldest son. Since then, the Montana family has owned one large farm of 20 hectares. Its fertile areas are dense with crops, and on the pasture land one can see

cattle grazing. Near the two houses and creeks coolness can be found in the shade of some large trees.

Mr. Montana has financed almost everything on his farm himself: Just a few head of cattle are financed by IDA and he is repaying that loan. His relation with IDA is therefore limited to the repayment of this debt. If Mr. Montana has agricultural problems he does not consult IDA extensionists but visits some of his old friends in the area he comes from. He states very clearly that he does not need the IDA extension service, because he knows things quite well himself. He is also of the opinion that IDA extensionists have only recently developed a useful level of knowledge; they had little practical experience when he came to live in Neguev. In fact several extensionists came to ask him for information rather than vice-versa.

In one interview we talked about the migration of tenants from Neguev. Mr. Montana said that many tenants could not make a living out of their plot and therefore left. He highlighted a few possible reasons for their failure:

- lack of investment capital. He was lucky that he owned two oxen
- bad soils that needed high inputs and
- scanty knowledge of local agricultural possibilities by both tenants and IDA extensionists.

He, however, thanks to his capital, household labour and agricultural craftsmanship, has managed. He was able to overcome the knowledge gap and shared his experiences not only with neighbours, but also with extensionists. Common knowledge emerged.

### *The entrepreneur*

Mr. Navaro is 25 years old, married and the father of two children. He was raised in the national capital where he attended school, college and even four months of university. In November 1985 he bought a plot in Neguev on which he started to build a small house. An older sister gave him the money for the investment.

When Mr. Navaro started in Neguev, he had little agricultural experience, but he had gained some knowledge from working on an older brother's farm. Another brother drew his attention to the opportunity to buy a plot of land in Neguev. This brother worked at the IDA office there and this provided him with a useful entrance. Even the chief of the IDA in Neguev passed by to welcome him, and introduced him on that occasion to the possibility of obtaining credit for cocoa and palmheart.

After attending own of IDA's meetings Mr. Navaro decided to cultivate two hectares of palmheart. He spoke about it with the relevant extensionist

and began to clear the land. After a short time he disagreed for some reason with this extensionist and withdrew from cooperating with him. On the already cleared land he now decided to grow cocoa, completely financed by IDA. He has now extended these two hectares to three and a half.

Mr. Navaro has big plans for the future. In about ten years time he hopes to make a living as a trader, and hopes to accumulate the capital he needs to start a business by developing his land. By that time he plans to have his children attending college in the national capital and he will hire a labourer to take care of his land. He uses the knowledge of IDA extensionists as much as possible, attending meetings and frequently passing by the office. He calculates how much credit he needs and pays his interest on time. Despite his positive attitude towards the IDA's extension service, he realizes that the extensionists have only partial knowledge. He has a clear strategy towards them, however, which includes keeping them as friends and helping them where he can. According to Mr. Navaro they have the resources he needs to develop his plot.

The information Mr. Navaro obtains from the IDA is not the only information he uses. He actively seeks information from friends, family and others. His family is especially of great help to him, not only as a source of information (his oldest brother is an experienced farmer), but also as a source of material benefits. They have helped him with a van, capital, dairy cows, seed and a telephone.

Recently Mr. Navaro started to grow pineapples. The whole project is financed by a brother without IDA interference. In 1988, he bought the long awaited pick-up truck to start his activities as a trader and to sell his own produce in nearby markets.

Mr Navarro is the modern manager type. He exploits all his assets and knows that information is essential. He is at the hub of some informal knowledge networks and easily links these to the formal networks of research and extension.

### **Extensionists transferring knowledge**

IDA extensionists frequently meet tenants during their work. Each meeting can be seen as an interaction between two actors from different knowledge networks. An example of one particular interaction allows one to see more vividly the relation between formal and informal knowledge networks. I therefore present and analyze here one such example to show the articulation and knowledge transfer between networks.

## The Red Pepper

The extensionist in charge of red peppers *Capsicum Frutescens* visited a tenant who was planting out young pepper plants. The extensionist had delivered these plants the week before (with the help of an assistant and myself) and had recommended - both in oral and written form - the distance there should be between plants. Planting them too close would harm the branches and thus production. At the time the tenant listened attentively, nodded and accepted the recommendation without question. I understood clearly what the extensionist had recommended and could read without problems the extensionist's note.

Nevertheless, when we arrived the second time at the tenants' plot, he was planting the red pepper closer than had been recommended. The extensionist was surprised and asked the tenant why he didn't follow-up the recommendation of last week. He defended himself by saying that he was planting them as recommended in the extensionist's note. So, the extensionist said for the second time how close he had to plant his red pepper and wrote him out a second note. The tenant accepted this, again without question or further comment. We drove away after handing over the written recommendation some five minutes after we came.

Once in the pick-up the extensionist told me that this tenant had severe financial problems. These had been caused by his participation in an IDA pigs-project four years previously. It had failed, but the participating tenants had to pay back the IDA credit. Apparently it was this tenant who had drawn the extensionists' attention to the possibility of growing red peppers in Neguev. The red pepper program is now IDA's most successful activity.

## Exchange of knowledge

IDA's main objective in Neguev is to help tenants to become modern, entrepreneurial farmers. It is the task of the extensionists to transfer to tenants the necessary technology. The general idea is that IDA extensionists have the agricultural knowledge that tenants seek. They know what is the best for tenants whom they assume to be ignorant.

As a result, extensionists believe that it is best for tenants to follow their recommendations. They do not think in terms of an exchange of agricultural knowledge, but rather about one-way traffic to the tenants.

In the past few years, extensionists have found it difficult to fulfil their tasks; a few extension programs have even failed. The pig-project mentioned in the case study illustrates these failures and their consequences for an individual tenant. The extensionists themselves give several reasons for these failures, of which the most important are:

- lack of confidence in IDA's extension, partly as result of a negative attitude towards government intervention (see section on **History** regarding the early violent confrontations);
- ignorance of the rural extensionists over the area and its tenants and the poor ability of some of the extensionists concerned;
- agricultural ignorance of tenants and
- lack of capital to follow-up the recommendations by extensionists.

The problems that occur over the transfer of knowledge appear to be mainly the result of common ignorance.

The cases show that tenants have relevant agricultural knowledge and that IDA extensionists are not without failings. This runs contrary to the idea extensionists have about the transfer of agricultural knowledge.

Each interaction involves a confrontation of tenant knowledge with that of the rural extensionist. It is evident that through interaction both parties become wiser and more informed and develop a certain degree of shared knowledge. Apparently, in 1987 not much common knowledge existed, for the cases show that despite the passing of several years, problems of knowledge exchange remained. The four general problems mentioned above, still existed.

I believe that the problems the IDA extensionists face in their attempts to exchange agricultural knowledge will decrease as common knowledge develops. They should also decrease as IDA extensionists are able to intensify already existing relations with a particular group of tenants. Their ability to do this is dependent on several factors. Firstly there is the location of the IDA office, which is not at all central. Since transport is a scarce resource for both tenants and extensionists, it is easier to interact with those tenants who live near the office.

Secondly tenants who receive IDA credit will be visited regularly because of the IDA extensionists responsibility for handling the disbursement and repayment of such credit. It is their task to calculate how much and when each tenant will receive credit. Again because of the lack of transport several extensionists will travel together, providing tenants with an opportunity to come into contact with several of the extensionists and the extensionists the opportunity to see which farmers might be interested in their various projects.

A third factor affecting contact is the diversity among the client population,



and the procedures adopted by IDA extensionists. They attach great importance to written recommendations, but not everyone can read them. Some tenants will therefore have problems in understanding the recommendations and may therefore seek less contact. An even larger limitation is that IDA extensionists offer a uniform technological package, not adapted to the wishes of individual (or groups of) tenants. Another factor is the differences in development strategies to be found between the different tenants and those of the IDA. IDA policy aims to transform tenants into entrepreneurs, while this is only one strategy among many that a tenant may choose.

Finally, a tenant needs to invest a great deal to be able to follow the recommendations of IDA extensionists. Even with credit this investment is too high for many.

## Conclusion

The information presented in this paper shows that articulation between the formal knowledge networks of IDA extensionists and the informal knowledge networks of Neguev tenants has basically changed since the establishment of the Neguev settlement. The most important change has been the generation of knowledge through the exchange of information between extensionists and tenants. In 1978, there was a general ignorance regarding appropriate crops, varieties and cultivation practices. By 1987, IDA extensionists and tenants had gained considerable relevant agricultural experience.

The cases in this paper illustrate that appropriate agricultural knowledge is developed and exchanged through experience and the regular interaction of extensionists and tenants. A tenant will also acquire agricultural knowledge from other sources, from family, friends and others relevant contacts. Nevertheless it is worth noting that IDA extensionists form about the only source of institutional agricultural knowledge in Neguev.

The farmers who invaded Neguev in 1978 are not the same tenants that occupied Neguev in 1987. A large group of tenants were unable to develop their plots and have left. One important reason for this is perhaps related to IDA policy which promotes the transfer of a uniform package of technology, thereby excluding a large group of tenants from appropriate opportunities and agricultural knowledge. Those tenants with little access to other knowledge sources will be marginalized and probably disappear.

Whether or not a tenant will have regular contacts with IDA extensionists depends, among other things, on whether he has confidence in

government policy and particularly in the knowledge provided by IDA extensionists, and whether the tenant has need of IDA credit. It seems that tenants who have bought a plot in the last two years, have more private capital and consequently do not rely so completely on IDA facilities.

A tenant who uses neither IDA credit nor its rural extension service is not doomed to fail. There always exist a group of tenants who prefer autonomy, and others who are able to obtain comparable resources from elsewhere.

This paper is an illustration of evolving knowledge networks, which rapidly emerge in a desert of common ignorance. It shows that knowledge networks develop through communication between the actors involved. It also gives an insight into the possibilities and difficulties that arise in knowledge generation and exchange by rural extensionists and farmers. It illustrates clearly the need to recognize the importance of farmers' knowledge in agricultural development.

## ABBREVIATIONS

AEA	Agencia de Extensión Agraria
ASBANA	Asociación Bananera Nacional
AUW	Agricultural University Wageningen
BID	Banco Interamericano de Desarrollo
BNCR	Banco Nacional de Costa Rica
CAR	Centro Agrícola Regional
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza
IDA	Instituto de Desarrollo Agrario
ITCO	Instituto de Tierras y Colonización
JAPDEVA	Junta Administrativa Portuaria y de Desarrollo Económico de la Vertiente Atlántico
MAG	Ministerio de Agricultura y Ganadería
MOPT	Ministerio de Obras Públicas y Transporte
PIPA	Programa de Incremento de la Productividad Agrícola
SEPSA	Secretaría Ejecutiva de Planificación Sectorial Agropecuaria
UCR	Universidad de Costa Rica
UFCO	United Fruit Company
UPAGR	Union de Pequeños Productores de la Zona Atlántica
USAID	United States Agency for International Development
STICA	Servicio Técnico Interamericano de Cooperación Agrícola

## GLOSSARY

A **knowledge network** is a relatively stable pattern of communication and interaction among persons sharing a common interest.

A **knowledge system** is the theoretical model applied to the knowledge exchanges through social networks regarding a particular realm of human activity.

A **cropping system** is a theoretical model referring to a particular set of crops, soils, weeds, pathogens and pests that transforms solar energy, water nutrients, labour and other inputs into food, feed, fuel and fibre.

A **farming system** is a theoretical model referring to a decision making and land-use unit comprising the farm household, cropping and livestock systems, that produces crop and animal products for consumption and sale.

A **farmer** is a person who depends for his/her livelihood on agricultural activities, practised on his/her own account and not as a wage labourer, and who maintains a corresponding lifestyle.

A **cultivator** is the person who selects, breeds and promotes particular qualities of a species making it into a crop.

A **smallholder** is an agricultural producer working under conditions of minimal access to production resources.

A **settler** is a person who starts agricultural activities on land where agricultural activities have not taken place recently and which is occupied to gain some type of title to the land.

A **tenant** is a person who rents or leases land. (In the text the term refers to tenants of agrarian reform projects).

A **squatter**, *precarista*, is a settler without adequate title to the land.

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