ATLANTIC ZONE PROGRAMME

Field reports No. 15

TO BORDEN OR NOT TO BORDEN

Developments in dairy farming in the Atlantic Zone of Costa Rica

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CENTRO AGRONOMICO TROPICAL DE
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PREFACE

The present report is based partly on information collected during a general survey of the agricultural situation in the study area Pococí/Guácimo carried out by a multidisciplinary team in the period October-December 1986 with the aim to select subareas for a baseline study. Further, more specific data were collected by the author during an additional study about dairy farming in the northern part of the Atlantic Zone.

The work was carried out in the context of a diagnostic study of the Atlantic Zone with the objective to identify, amongst other things, the main problems that beset agricultural development of the region, and to formulate agricultural research projects.

The report was prepared by the author in partial fulfillment of the requirements for the MSc degree in animal production of the Agricultural University Wageningen.

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CATIE/UAW

1 INTRODUCTION

The CATIE/UAW/MAG Atlantic Zone Programme in Costa Rica has been designed for a period of 5 years (1986 - 1990). The long term objective is to contribute to a stable socio-economic and ecological development and increased well-being of the population of the Atlantic Zones of Central America and Panama. Dominant structural transformation processes will be investigated, the results may contribute to agricultural policy making and development planning.

The programme started in April 1986, with an exploratory survey, to make a rapid identification of the dominant land use systems, physio-graphic land units, problems and transformations. This identification aimed at the formulation of research items for the baseline survey and the choice of representative study areas.

The objective of the baseline survey is to gain a deeper insight into transformation processes in the Atlantic Zone. Two areas were chosen: the cantons Pococi and Guacimo in the north, and the Sixaola district in the canton Talamanca in the south.

Within these study areas subareas had to be selected in such a way that both deforestation and settlement schemes would be represented.

For the first half of 1987 the following subareas have been chosen from the Pococi/Guacimo study area.

- The Lomas de Cocori and surroundings, 50 km north of Guapiles, covering about 120 km2, with 150 households. In this area the land is deforested by precaristas, bought by urban landlords and subsequently used as grazing land for beef cattle.

- The western half of Rio Jimenez district, 20 km ENE of Guapiles, 55 km2, with about 200 farm households. The subarea has a relatively long settlement history. Railway remnants witness that once large parts were used for plantation agriculture. Nowadays the land is used by small and medium scale farmers for milk and beef production and maize, rice, cassave, cocoa and fruit tree growing. Increasing scarcety of land and changes in marketing possibilities force farmers towards intensification and specialization.

- The IDA settlement scheme Neguev, 25 km ESE of Guapiles, about 55 km2. Neguev was once a large extensive cattle estate and has been subdivided into 310 farms for settlers of various origins. Intensification processing in Neguev, amongst other things from pasture to annual crops, are guided by IDA.

Subareas for the second half of 1987 are still to be selected. Their number and characteristics depend on the experiences of the first half of 1987.

There are three major research components in the baseline survey:

1 The land as natural resource;
2 Land use and farming;
3 Socio-economic and institutional context.

For each component the baseline survey comprises three parts.

1 Surveys and inventories (broad farm survey);
2 Specific studies;
3 Evaluation.

On the basis of data collected so far, further research into major transformation processes will follow.

The presented specific study concerns the land use and farming component, and contributes to the general objective of the baseline survey.
Emphasized were factors that influence management, and consequently developments in dairy farming.

2. METHODS

In the broad farm survey existing lists of farm households were used to select 50 farmers in each sub area.
These 50 farmers have been interviewed. The information collected then, has been used to select farmers for the specific studies.

A division in three types of cattle farming has been made:

1 Beef cattle farming.
This is by far the most important commercial sub system within animal production, it has great importance in Pococi/Guacimo.
Beef cattle farms are usually medium sized (50 ha) up to very large size (1000 +). (Research by Pia van Hijfte.)

2 Small scale farming.
The number of farms of this subsystem is large the sizes are small (usually - 10 ha). Animal production is one of many sub systems of these farms. (Research by Iede Koffeman).

3 Dairy farming.
The number of dairy farms is small. Sizes vary from about 10 ha to over 100 ha.

In practice this division was not always clear, among these groups many intermediate forms existed. Deliberation was needed to place farmers in one of these typologies to prevent exclusion or double use.
The main criterion in distinguishing dairy farmers was, whether they had a clear market orientation concerning their dairy products, even when more income was derived from other cattle products.

In order to obtain variation within the selection of dairy farmers two criteria were used:
1 Do farmers sell milk to Borden, or do they not. (see Chapter 4.5)
2 Do farmers live in an IDA/AID project area, or do they not (see Chapter 4.6)

By using these criteria 4 categories of dairy farmers were created:
1 Farmers outside IDA/AID project areas, who do not sell milk to Borden.
2 Farmers outside IDA/AID project areas, who do sell milk to Borden.
3 Farmers within the IDA/AID project area, who do not sell milk to Borden.
4 Farmers within IDA/AID project areas who do sell milk to Borden.

Because of practical reasons and the need to collect specific information only two farmers were selected out of every category. Farmers of group 1 were selected from farmers in Rio Jimenez. Those of group 3 were selected from farmers in Neguev.

Unfortunately, no farmers of the groups 2 and 4 were available in the broad farm survey. Information obtained from Borden showed farmers of group 2 in Santa Rosa, the extreme east part of the Rio Jimenez sub area, and farmers of group 4 in el Indio, situated in the Pococi/Guacimo study area. It is not part of a sub area.

There were no farmers in categories 1 and 3 who sold milk fluid, all farmers made cheese.

The small number of dairy farmers in the broad farm survey, shortness of information during this survey, and the restricted information obtained from other sources did not allow random choice of farmers within the groups.

At each farm at least one day was spent to interview and observe the farmer during his work. A checklist was used for collecting and arranging data (see Annex 1).

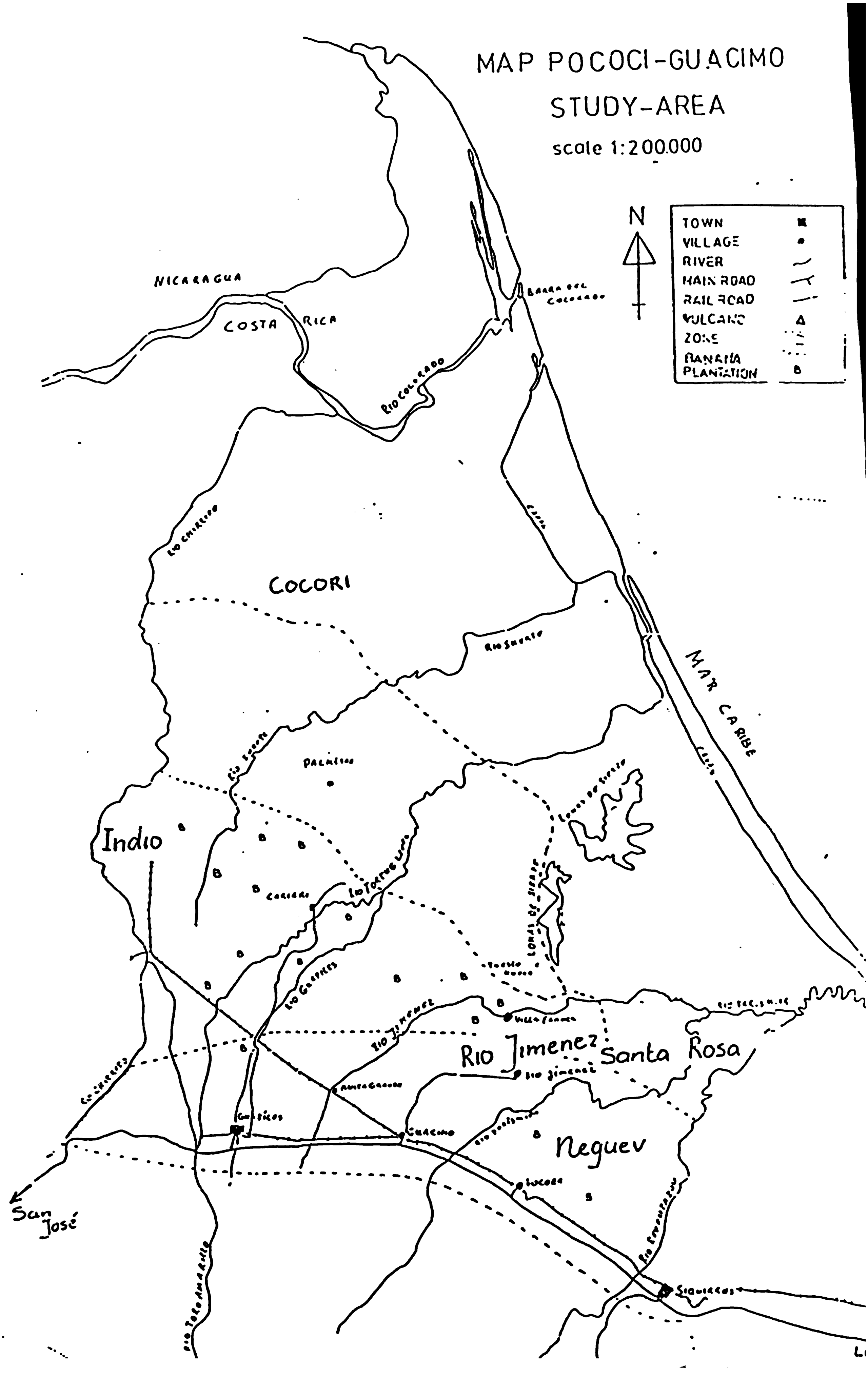
No extended questionnaire has been used, it would take too much of a farmer's time. Besides, sometimes the farmers tended to give distorted information about their farms and their management. By staying and helping on the farm, there were possibilities to check information, and the farmers were more enthousiastic to co-operate.

Information was obtained in a rather short period, this influenced the information given. Farmers especially mentioned the problems they had at the moment. Numbers and amounts of inputs and outputs vary in time, above all in the rapid developping farms.
Farmers, often had not any registration. This sometimes made it hard to gather detailed information, most farmers were not able to produce exact information by heart.

Background information at regional level was gathered by visiting institutions and libraries.
Little statistics of dairy farming in the Atlantic Zone were available, this made it hard to obtain information about the number and total production of the farmers, especially those not selling to Borden.

(Economic influences of world and national policies, and economic distinctions in animal production will be studied by Bert Jan van der Kamp.)

A discription of farmers is given per category in the chapters 5, 6, 7 and 8, after a more general discription of dairy farming in the chapters 3 and 4.


MAP POCOCI-GUACIMO
STUDY-AREA
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N
TOWN
VILLAGE
RIVER
MAIN ROAD
RAIL ROAD
VULCANO
ZONE
BANANA PLANTATION
NICARAGUA
COSTA RICA
RIO COLORADO
COCORI
MAR CARIBE
Indio
Rio Jimenez
Santa Rosa
Neguev
San José

3 DAIRY PRODUCTION IN COSTA RICA

3.1 INTRODUCTION

Dairy production in Costa Rica already existed during colonial times. This long tradition can be the reason Costa Rica is nowadays one of few countries in Latin America that is auto sufficient in milk production. (Camara Nacional de Productores de Leche)

Milk is the fourth most important product in agricultural production (see Table 3.1).

Table 3.1 Crude values of agricultural production in 1983, in millions of colones

product	abs	%
banana	9,479.8	25.0
coffee	7,031.8	18.6
beef	3,404.2	9.0
milk	3,128.7	8.3

Source: Banco Central de Costa Rica, in Camara Nacional de Productores de Leche: Problematica de la actividad lechera.

Milk production has been increased from about 300 million litres in 1980 to about 345 million litres in 1984. About 78% of the farmers produce less than 500 bottles (335 litres) daily, 28% even less than 100 bottles (67 litres) (Camara Nacional de Productores de Leche).
Consumption of fluid milk is estimated 100,1 kg per year per urban inhabitant, 73,8 kg per year per rural inhabitant and a total of 225 million litres. This leaves 120 million litres which is turned into derivates like cheese and ice-cream (Camara Nacional de Productores de Leche).

Important milk processing companies in Costa Rica are Dos Pinos and Borden, who operate on national level. Monte Verde and Coope Leche operate on regional level near Monte Verde and San Ramon respectively.

The most important areas for milk production can be found in the highlands near San Carlos, Carthago, Heredia and San Isidro. In these zones maximal production is in July and August, minimal production during the dry season in March and April.

3.2 THE ATLANTIC ZONE

Cattle production in the Atlantic zone is concentrated in the northern part. Important is the area around Guapiles, Pococi/Guacimo. It is a very new milk production zone. People have more experience in beef cattle farming.

About 5 years ago beef prices dropped, many people started to milk some of their animals to obtain extra income (Romero pers. comm.).

When Borden came the milk market expanded. Many farmers started to sell milk to Borden. They thought milking was easy, Borden bought all their milk. But soon many problems arose about the milk quality, due to lack of hygiene and mastitis. Higher milk quality was demanded. However, many farmers could or would not meet the requirements, and much milk was rejected. Many farmers stopped selling milk to Borden, others have been demotivated to start selling (Pereira, Romero, pers. comm.).

An estimation of the total number of dairy farms and their production can not be made, there are not enough statistics.
However the number of dairy farmers who sell milk to Borden is known, there are about a 120 of them. Most of them live near Guapiles. The total production varies between 8,000 kg in November to about 14,000 kg in March. In November precipitation is very high; cows spend less time eating, there are more health problems, and pastures turn into mud. March is less wet, so pastures and animals are in a better condition (Pereira pers. comm.).

Many farmers in the more traditional dairy areas have financial problems, caused by high production costs, and low milk prices. This does not stimulate investing in dairy production.
As dairy farmers in the Atlantic Zone started recently, many farmers play for safety, before shifting towards dairy production. Others had no interest at all, they favour other products.
A disadvantage of dairy farming is the constant demand of labour. Working on Sundays, and for instance milking twice a day, is regarded unpleasant. Most farmers only milk once a day. Sunday is a quiet day at the Borden collection centre in Guapiles (Pereira pers. comm.).

4 INSTITUTIONAL INFRASTRUCTURE

4.1 PHYSICAL INFRASTRUCTURE

Since the construction of the paved road to Siquirres, three years ago, the accessability of the area has improved a lot. Since then all the important urban centres can be reached by motorway.
The new highway to San Jose, finished in March of this year, is a new important improvement.
Within the area most parts can be reached by gravel roads. Their network is extending, and their quality is improving. But still, there are roads in bad condition. Cocori, one of the sub areas, is too isolated for milk production. The transport costs are too high, and the markets within this sub area are restricted.
Because the area is very new, only the more important and older villages have tap-water, electricity and some other services.

The improving communications cause an increasing number of institutions, and greatly facilitate the operation of the institutions working in the Atlantic Zone.

4.2 RESEARCH AND EXTENSION

There are research facilities on Los Diamantes, the MAG experimental farm. CATIE tests some legumes and grasses there, and on other farms. However extensionists have still to work with many data from elsewhere, for lack of research data of the zone itself (van der Weide '86). There are very few statistics of dairy production in the zone.
IDA agronomists give extension in IDA settlements, MAG in other parts of the zone. Extension from MAG is of little importance. In Pococi there are only two extensionists, who are not specialized in cattle or crops. They have to visit all kinds of small and medium sized farms. Only ten dairy and dual purpose farms are visited regularly.
To extend these services two demonstration farms are being set up. Farmers already obtaining extension, and other persons who are clearly interested, will be invited for short courses. Together with CIAT a demonstration farm of forages, especially pastures and legumes, will be set up (Araya pers. comm.).

The MAG veterinarian gives extension on small farms too. His advice is meant to improve hygiene and to prevent and control diseases in order to prevent contamination to man. He co-operates with the national health programme (PRONASA).
Together with two assistants he vaccinates against brucellosis. However, only 65 % of the cattle farms can be reached. To maximize the number of vaccinations mainly large and accesible farms are being visited.
In cooperation with the "Camara de Ganaderos Atlanticos" he recently started to visit 36 dairy farms, to give information about animal health and management, and to check health and fertility (Fajardo pers. comm.).

The "Camara de Ganaderos Atlanticos" operates in narrow co-operation with Borden. Nearly all the members of the Camara sell milk to Borden, and all the "Borden" farmers are members of the Camara. Mr Pereira, of Borden, is secretary of the Camara. He visits farmers regularly, and participates in giving courses.
The Camara is one of the few cattle farmers organisations in the zone. It can exert some pressure on regional level, like in obtaining extension from the MAG veterinarian and other institutions, and also on national level via the "Federacion de Camaras Ganaderos de Costa Rica", who try to influence policies of the government.

4.3 CREDIT

Cheap credit can be obtained via IDA and BID (International Development Bank). BID loans can be obtained by farmers with medium sized farms or a medium high income and a title on their land. IDA loans can be obtained by farmers within IDA settlement schemes. Their plans have to fit into IDA programmes; credit is linked with extension. Due to lack of finances, IDA postponed new credit supplies for dairy farming.
Other farmers, especially the poorer amongst them, have problems to obtain credit, or have to pay higher interests.

4.4 MARKETING

One can sell milk in 3 ways:
1 in "the Street", the milk is sold unprocessed, sometimes by middlemen, in nuclei, i.e. near banana plantations,
2 as cheese, to grocers and neighbours,
3 to Borden, the milk is collected in Guapiles and processed in San Jose.

The first two markets are steady, extension is restricted. Via Borden the milk production can be increased, but one has to meet many requirements (improvements/investments).

Fluid milk, as other basic products, is a product of the "Canasta Basica"; prices are set by the government, to protect consumers. Fluid milk prices were adjusted now and then (see Annex 3), but in 1986 compared to 1970 they still dropped 34,8 %. The industrial margin even decreased by 59,1 %. To compensate, more free priced products, like ice-cream and milk-powder, were made (la Republica 21-12-1986).

Now, the fluid milk is relatively cheap, and the powder milk is relatively expensive. Especially the poor people without refrigeration facilities or the people living in remote areas can not benefit of low fluid milk prices; they have to buy expensive powder milk. In this way, "the poor subsidize fluid milk consumption by the rich" (la Republica 21-12-1986).
The government thinks the market is saturated, but others think there is not enough spending capacity. By liberating prices, fluid milk will be more expensive, and milk powder will be cheaper. This might stimulate consumption, and besides improve export of milk powder.

Because of decreasing prices, many dairy farmers had financial problems. Per milk unit production costs rose, especially near the cities where many inputs like concentrates, labour and machinery were used, and land prices were high. Because farmers in the Pococi/Guacimo area use few inputs, they will probably have less problems (Romero pers.comm.).
In April milk prices were raised again, farmers got more elbow room.

4.5 BORDEN

Borden (Lactaria Costaricense) is a private company half British, half Costarican. Four years ago, they started working in Costa Rica. When the road San Jose - Turrialba - Siquirres - Guapiles was finished, three years ago, the office in Guapiles was opened. At the start 10 farmers delivered milk, this number increased to a 150, but due to problems with milk hygiene it decreased to the present 120.

When the company started, it bought milk irrespective of the quality. Because milk is processed in San Jose, much milk turned sour during storage and transportation. Every second or third day milk was transported from Guapiles to San Jose, in about 6 hours.

To improve milk quality, Borden demanded the use of concrete floors in the dairy, the use of milk cans and hygienic milking techniques. Farmers who start selling milk to Borden now are obliged to refrigerate their milk and store it in cooling tanks.

Now, when the milk is delivered, smell and taste are examined, and samples are being taken to determine bacterial conditions. There are four grades: E (excellent), A, B ,and C. When a farmer has milk in B or C, milk of the the next day has to pass the bacterial test first, before it will be accepted. When milk has quality B or C again it will be refused.
Once or twice a week samples are taken to measure fat content. Farmers are paid every week an amount of money depending on quantity, grade, fat content and whether the milk has been cooled (see Annex 3).

In November the production is low due to the abundance of rain. The total production is about 8,000 litres a day. During this period quality demands tend to be a bit lower. In March the climate is more favourable and the production can rise till about 14,000 litres.

Mr. Pereira, the man in charge of Borden's collection centre in Guapiles, visits many farms, especially those which had problems with milk quality lately, to find solutions, and to give some recommendations.
Because there is little experience in this zone in milk production and there are many problems, he thinks it is important to give technical assistance.
As there are little facilities given by governmental institutions, he has to make many efforts to do it himself.

In this way trying to sustain and increase productivity, in the sake of both Borden and farmers.
Together with the "Camara de Ganaderos", which includes all Borden farmers, some pressure on MAG can be exerted, to obtain more extension. Pereira thinks in the beginning the aim should be mainly improving quality, and later increasing production.

Borden's milk capacity has increased with 100,000 litres a day, since the new powder milk factory in San Jose was opened.

4.6 THE IDA/AID PROJECT

In Costa Rica many underutilized lands are invaded by poor families. The "Insituto de Desarollo Agrario" (IDA) negotiates with owners to buy their land, and redistributes it among families.
Still much land has not been titled yet. Without title one has little access to credit. Families with little means have problems in starting up.

The project tries to increase tenure security and provides services neccessary for sustained productivity and profitability. It is mainly financed by the Agency for International Development(AID), and is carried out by IDA in three settlements (Neguev, el Indo and Maryland), which were obtained by IDA three years ago.

Since the start of the project land has been divided into parcels, roads have been constructed and community and administrative facilities have become available. Initial subsistence and basic housing have been financed.
In the initial years people have access to credit via the created "Caja Agraria". IDA agronomists support in giving technical assistance.
However, not all farmers receive credit because they have to fulfil certain conditions. Credit is closely connected with technical assistance, farmers have to co-operate in the IDA programmes.
Lately, the credit supply for dairy farming has been postponed; it is now hard to obtain. This can be due to little financial means available, and bad experiences with implementation and repayments of former dairy projects. Farmers, who want to grow products, like chillis and cocoa, receive more facilities.

The implementation of the project will end in September of this year after a period of five years.

4.7 FUTURE

The new road to San Jose meant a considerable improvement in marketing agricultural products.

For Borden the zone has become attractive. Transport costs from Guapiles to San Jose are low. Besides production in March is maximal, where as production in other zones is minimal during

that time.
Borden recently opened a milk powder factory in San Jose. Demands for milk have increased, this might lead to a new impuls to collect more milk.
Shortened distances cause less losses in milk quality during transport, and maybe the strictness on milk quality can relax.
This can be an incentive for farmers to sell (more) milk to Borden.
An other incentive is the higher price farmers receive, due to lowered transport costs. They only have to pay half of the former 1,20 colones per liter (Gonzales pers. comm.).
The roads in the zone itself are improving too. More farmers will be able to transport their milk to Guapiles.
Better infrastructure makes the zone more attractive, and cause landprices to increase. This might lead to intensifying land use, and thus some shifting from rather extensive beef cattle systems to the rather intensive dairy cattle systems.

It seems that more farmers are going to sell milk to Borden, and those already doing this will produce more (Gonzales pers. comm.). Maybe there even might be some shifting in production from the "Mezeta Central" towards the Atlantic Zone (Araya pers. comm.).

However, other products will benefit as well from the improved infrastructure. There will be some competition. Much will depend on how the prices of products will develop, and what activities will be stimulated by the government through research, credit supply and extension.

Many facilities are needed in dairy farming, but there are no indications the government can allocate many of their scarce means to increase dairy production in the Atlantic Zone.

5 RIO JIMENEZ

5.1 INTRODUCTION

The Rio Jimenez sub area can be characterized by a large amount of small farms and relatively intensive land use (see Table 5.1).

Table 5.1. Farm size distribution and land use in the sub areas of the Atlantic Zone Programme.

	-- land division(%) -			------- area (ha) --------			
	-25ha	25-75ha	75+ha	mean	crops	pasture	not used
Rio Jimenez	68.9	22.2	8.9	25.0	9.2	12.9	2.7
Neguev	100.0	-	-	12.8	4.4	5.3	3.0
Cocori	28.0	34.0	38.0	109.7	6.3	40.1	63.3

Broad farm survey, february 1987. Number of farmers interviewed: Rio Jimenez 45, Neguev 53, Cocori 50.

Especially the west part of the area has these characteristics, it is the oldest part of the area. Settling began in the beginning of this century. Due to improvements in the infrastructure the land prices are relatively high.
The reclamation of land spread to the east. Here settling started about fifteen years ago. Land then was very cheap.

Seven out of 45 farmers interviewed in the broad farm survey sell milk or milk products. Six do not sell milk to Borden. They live all over the area. About two third of their farms is under pasture (Table 5.2).

Table 5.2. Land use and number of cattle of farmers in the Rio Jimenez sub area, who do not sell milk to Borden.

	------- area (ha)-------				--------- number ---------					
no.	total	crops	pasture	not used	-1	1-2	2+	bulls (1)	milk cows(2)	use (3)
1	40	15	15	10 (4)	9	5	16	1	6	D
2	40	8.5	31.5	-	20	10	72	2	20	D
3	33	6	26.5	0.5	18	-	17	1	8	D
4	14	10	3	1	3	0	7	0	7	M
5	92	30	59	3	40	40	65	3	22	D
6	60	8	46	6	- 147 (5)		-	2	12	D

(1) All are used for breeding, there are no bulls between 1 and 2 years.
(2) Some farmers mentioned all cows, others only the number milked.
(3) D is dual purpose, M is milk.
(4) This area is rent out to other persons.
(5) The farmer did not know the composition of his herd, he only knew the total amount.

Broad farm survey, February, 1987.

Two farmers were selected: R (no. 2)and M (no. 5).

R and his wife live in the western part of the area near the village of Rio Jimenez. Thirty years ago they started working on

their farm. In the beginning they only grew crops. Bit by bit they could buy more land. During some years they looked after a neighbour's cattle. R really liked cattle and decided to buy some for himself. He bought more land, and the number of animals increased. The area for growing crops decreased, especially recently, because his wife decided not to help in agriculture any more.
Now the farm consists of 40 ha fertile land. R grows 2 ha of maize, 2 ha of cassava 1 ha of rice, 0.5 ha of beans and 3 ha of cocoa. R mentioned to have 31 ha of pasture, but about 3 ha of it is still forest. Pastures have not been improved, except for some pieces with Ratana.
R now has over a hundred cows, Brahman is by far the most important breed used. Furthermore there are two pigs, 3 horses and about 50 chickens.
R does not use hired labour, he works on the farm alone. His wife helps milking the cows and makes cheese.
Near the house there is a little dairy annex calf house with concrete floor. There are two sheds.
R has no machinery nor vehicles.

M lives with his family in the east of the sub area, near Santa Rosa. Twelve years ago he sold his farm in Puntarenas and bought his present farm, attracted by good soils with low prices. The farm consisted of forests and shrubs, but the valuable wood had already been extracted. Bit by bit he cleared the land, to turn it into arable land and pastures. Four years ago he bought more land to turn it into pasture too. The lower parts of this land was swampy, but after clearing it got drier.
On fertile soils he grows crops, maize is the most important one. He grows it on 20 ha of his own land and 10 ha of hired land. Besides this crop he grows 0.5 ha of beans and some fruits. The remainder 62 ha has been turned into pasture, mainly native species and Ratana.
M has about 140 cows, mainly Brahman. Besides there are 3 pigs, 2 horses and about 50 chickens. There is a big corral, a shed and a house. He owns some vehicles, some chainsaws, and a motorized backpump. There is no other machinery , but a team of oxen is used for several activities.

5.2 INFRASTRUCTURE

R lives in the old part of the sub area. Here electricity and tap water are available and roads are reasonably good. M has no tapwater nor electricity yet. He expects to obtain electricity next year. Roads were very bad but IDA has made many improvements.
There are many stores which sell agro chemicals and veterinary medicine. In Guacimo there is a store of MAG, which is cheaper.
Neither R nor M receive technical assistance for cattle. When they have problems they ask for help in the neighbourhood, i.e. the storekeeper of veterinary medicines, or someone who has much experiece with particular problems.
M is a member of the Coope Montecillos in Alajuela, where he can sell his cattle. He was a member of the association of

milkproducers in Santa Rosa (see 6.2), but he left this organisation. R nor M participate in any regional farmers organisation.

5.3 MANAGEMENT

Both farmers grow maize, the most important commercial crop which is sold to CNP. Many herbicides and insecticides are used. A fertilizer is supplied twice per growing period. It is possible to sow and harvest twice a year.
Cassava is another commercial crop grown by R, but it has less significance. It does not need many inputs.
Cocoa is a commercial crop as well, but R does not sell it. Trees are old and suffer from Monilia. The output is very low.
Rice and beans are subsistence crops, not many inputs are used. Harvesting more times a year is possible, but especially the beans suffer from humidity. This crop is not grown in the wettest periods.
Some other subsistence crops are grown on a small scale.

Breeding

Calves have to grow fast, they are sold to be fattened elsewhere. For this reason no dairy breeds are used. Calves of these breeds do not have a high value. Brahman is the most important breed, then there are some Gyrs and now and then one can recognize some Brown-Swiss and Guernsey influences. The bulls used are Brahmans, M has a Gyr bull as well. Both buy bulls on well known farms. M sometimes keeps young bulls of his best cows to see how they develop. He can save 40,000 colones, when he has not to buy a breeding bull.
M has three bulls, R has two. They keep them for many years. R lent one bull to a friend. However the other one can not serve all animals. One group contains many of its daughters. R does not use a bull for cows that are milked. He says their condition suffers from milking, they first have to recover, before being mated. M does not think this is necessary, the cows milked have enough time to recover.
Cows are selected on production of calves. They are culled when their calves have low birth weights, grow slowly or die. Mostly these are old cows or cows that do not produce sufficient milk.
None of these farmers use registration of individual fertility or production, but they may have some idea.
Young bulls are sold after weaning (at 7-8 months of age), when money is needed or production of pastures is getting short. R says he sells animals at about 150 kg for about 10,000 colones. This amount seems rather high. Both sometimes sell older cows for prices between 15,000 and 20,000 colones.

Cattle Groups and Nutrition

In both farms animals are divided into four groups:
-Calves of cows to be milked. These animals spend most or almost the whole day separated from their mothers. M joins the animals during milking till about 2 p.m., then calves are brought to a special pasture. R keeps young calves inside all the time. Mother and calve are joined just before and after milking and at about 2

p.m.. His wife supplements calves with some grass.
-Animals to be milked and some soon to calve. They do not receive special supplementation but some salt. They are kept in pastures near the house.
-Two groups of calves, heifers and cows. These groups are separated to prevent in-breeding. The animals are kept in more remote parts of the farm. They as well are supplemented with some salt.

Pastures
Both farmers have pastures with native grasses and Ratana, what they think to be good grass. They say it is lush, the animals like it and it is very strong. Besides it is sown easily.
The grasslands are divided into 5 and 6 parts respectively, but there is no real rotation. The cattle density is high, especially in R's farm. The pastures do not produce enough, he is aware he has to sell some animals.
The fences are maintained well. Both have some live fences consisting of madero negro and poro. Only when it is within reach animals will eat it.
Weeds are removed by using herbicides (tordon 101) and machetes (long knives). This is done two or three times a year.

Health
On both farms animals look healthy. There are some problems with parasites like ticks and more frequent torsalosis. Treatments are given regularly. Sometimes they treat against internal parasites.
A problem during wet months is sun burn of calves. It is caused by the combination of much humidity and sunshine. R prevents this by accomodating young calves in the dairy, and says he tries to let cows calve during the drier months.
M lost some heifers last year, because of "Pierna Negra", and now vaccinates regularly against it, like R. This vaccination includes Septicemia and "Carbon" as well. MAG vaccinates against Brucellosis.
R lost a bull last year which had tympany; he does not know the cause. Another animal also died in a mysterious way. He thinks people poison his animals. He now guards his animals night and day. Mastitis is not considered a real problem.
R likes treating animals against illnesses and infections; he uses many medicines and antibiotics. He estimates this costs 50,000 colones a year. M reduces expenses by concentrating on vaccinations and treating against parasites, what costs resp. 8,000 and 2,000 colones a year.

Milking and Milk Production
Cows to be milked are kept separated from their calves during the afternoon till the morning, when they are taken to the dairy or to the corral. It is a custom to tie up the legs together. Milking is done by hand, every member of the family helps. One teat is left for the calves younger than 3 months.
R is a the more hygienic milker: he cleans the floor of the dairy before milking and he washes teats with water. M only washes dirty teats and udders. Both do not dry the washed parts. Sometimes muddy water flows into the milk. They do not check

mastitis. They say there are little problems, but they are only able to notice external symptoms.
Animals are only milked for about 4-5 months, calves are weaned at about 7-8 months. Not all animals are milked, for lack of time. Usually they only milk cows which produce more than the average amount and which are gentle. When a good cow comes into production it replaces a cow, that has gone down in production. They have no registration of individual production but know which cows to select. Many cows belong to the same family; M says many of the better animals are descendents of a Guernsey/Brahman cow. Many cows calve during the period from November till February. R tries to spread this, but M leaves it as it is. He stops milking in May, when the production slows down, to dedicate to maize production.
R milks 12 cows, about 3 kg of cheese is made by his wife, to be sold to a grocer. He gets 100 colones a kg. M milks 16 cows, they sell about 4 kg of cheese for 70 colones a kg in Santa Rosa.

5.4 FUTURE

Both farmers have no clear plans to change their management. R would like to introduce chillis and curcuma and improve his dairy, he sometimes thinks about selling to Borden. But his wife does not want this. She thinks they are too old for new things. Besides there is no successor. She wants to sell the farm, and live a quiet life, she has phased out her activities in agriculture. R does not want to sell the farm yet, it still is a very important part of his life.
M wants to buy a maize harvesting machine. If possible, he wants to buy more land for growing maize, or for extending his herd. It depends on a good harvest of maize, and good prices for his calves.
He wants to improve some lower parts of his pastures with Brachiaria.

6 SANTA ROSA

6.1 INTRODUCTION

Santa Rosa is situated in the eastern part of the Rio Jimenez sub-area. The first people came about 10 - 15 years ago from Guanacaste, Puriscal and Puntarenas.
The land is fertile, but not many crops are grown. This is said to be caused by the great amount of precipitation and bad drainage. Crops like maize are only grown on well drained soils. Pastures for "Cria" (rearing cattle), "Desarollo" (developing) and "Engorde" (fattening of cattle) are the most important ways of land use.
Apart from these two animal production activities there are some dairy farms which produce milk that is sold to Borden.

Two farmers were visited (F and J). F bought 95 ha of the farm eight years ago. He cleared the forests, and sold the valuable wood. Since about four years there have been more activities on the farm, he sowed 10 ha of coco-nuts and 3 ha of pejibaye. Last year he sowed 2 ha of plantain. He used to have cattle for rearing calves and for making some cheese. Since about nine months he has been producing milk for Borden.
Sixteen ha of his land is pasture, 2 ha is Estrella, but the largest part is Ratana. The rest of the farm is cleared, but not used because he has not the time nor the money to fence this land yet. He wants to wait till the farm yields more money. Till now he only produced milk, palm hearts of pejibaye and some plantains. Soon he will be able to sell coconuts and fruits of pejibaye as well.
There are about 40 cows, most are crosses of Brahman with Jersey, Guernsey, Simmental and Brown-Swiss. He bought 11 heifers and 13 cows in addition in Guanacaste, they will soon arrive on the farm. Apart from these animals there are 2 horses, chickens and a piglet.
F's family lives in Cartago. He works on the farm together with two employees. They do not have specific tasks. On the farm there are two houses: one used by F and one used by the employees. There are a chicken house, some barns, a dairy with a concrete floor, an open corral (without a roof) a pick-up and a lot of machinery to prepare land for cropping.

J lives near F. He has been an employee and an administrator on the farm for 2 years now.
The owner bought 45 ha of land about 14 years ago, cleared it and turned it into pasture. In a small part Estrella was planted. Some four ha along the river still consist of shrubs and trees. Four years ago he bought 4 ha of pasture sown with Estrella. Real changes in pastures have not occurred during the last few years.
The farm used to be a "Cria"farm. Cows were milked to produce cheese. The whey was given to pigs. Later on milk could be sold to Borden and the pigs were sold.
In December 1986 the owner sold the Brahman animals and bought some dairy cows in San Isidro He wanted to specialize in dairy production. There are about 50 cows now, mainly of breeds such as

Jersey, Guernsey and Brown-Swiss. There are three horses, some chickens and a pig, these animals belong to J.
The farm is not well equipped, there is no machinery nor are there vehicles on the farm, a corral is used to round up cattle. The dairy has concrete parts but does not supply adequate accommodation, and there is a lack of many medicines and chemicals.
The owner lives in San Jose. He has some trucks and hires out machinery in Guanacaste. He does not have time to visit the farm regularly.

6.2 INFRASTRUCTURE

The roads towards Santa Rosa are not paved, but they are in a reasonable condition. People in Santa Rosa have electricity, but neither of the farms visited have been connected yet. Both have motorized pumps to raise water from a well.

An important organisation for dairy production is the association of milk producers, an enthousiastic group of 12 farmers. For selling their milk to Borden, they bought two milk cooling tanks nine months ago. They employed somebody, to examine the milk in a small laboratory.
The association is an important stimulant for development. Information is exchanged and there are talks about the future, for example about growing King-grass to achieve higher milk production per ha. They have plans to move the milk cooling tanks to a more suitable place where they can establish a store in co-operation with MAG to buy their inputs cheaper.
All milk producers are members of the "Camara de Ganaderos de la Zona Atlantica". Via this organisation, and in co-operation with Borden and MAG, they are to a certain extend entitled to technical assistance.

F is active in looking for information. When he has problems with crops, he visits "Los Diamantes" or ASBANA.

6.3 MANAGEMENT

Crops
J cleared 3 ha of fallow land with paraquat to grow maize. He will use a fertilizer and herbicides. The output will be used to start his own farm.
F has many perennial crops. He has 10 ha of large sized coco nuts. He soon will have his first harvest. He has 3 ha of pejibaye. Before Easter he will harvest a lot of its palmhearts. Pejibaye is starting to produce fruits as well. He has a little pejibaye nursery. The seeds are also sown with some insecticides and a fertilizer. Part of the two ha plantain is old enough to harvest. The only other crop that obtains a fertilizer is maize. He has sown about 0.5 ha of it.
Besides these commercial crops, there are many fruit trees, and some subsistance crops.

Breeding

For both farmers higher milk production is an important objective. J's boss changed his Brahman cattle for dairy breeds. However, probably he did not know what criteria to use. Many cows have aberancies, such as bad udders attacked by mastitis, and low fertility.

A Holstein bull of a neighbour of his is used to serve these cows, his own Brown-Swiss bull died of anaplasmosis.

F does not want to specialize completely in dairy cattle; he uses crosses of Brahman with Simmental, Brown-Swiss or the typical dairy breeds. These crosses have the advantage of producing valuable calves, with that they are valuable themselves when culled, and they have less health problems. He now uses a Brown-Swiss bull. When its daughters are old enough to be served F will change it. He bought a young Holstein bull of a very good descent. When this animal develops well, it will be used to breed. If not, another Brown-Swiss bull will be bought.

For both farmers low milk production is the main reason to cull cows. The main cause of low production is mastitis. F actually sells cows with mastitis. J has to wait for the owner to come to decide what to do. Other causes are low fertility or high age. F registers fertility and recently began registrating individual milk production and birth and weaning weights of calves.

Cattle Groups and Nutrition

In both farms there are three groups of animals, more or less in different production units: 1 calves, 2 cows in production and those soon to calve, and 3 yearlings, heifers and cows in calf. F keeps calves in special pastures and joins them with their mothers during milking. In the afternoon they are separated, during the night they are locked in a special part of the dairy. He supplements producing cows with bananas, sometimes mixed with minerals, during milking.

J is not very strict in the division of animals, amongst the production group there are some barren and dry cows and some oxen. He supplies molasses, mixed with salt and minerals, but only during some weeks after the owner comes to see the farm, he brings supplies for a few weeks only. F puts the mixture in an old tyre. In this way animals, who do not really need it, benefit from this supplementation as well.

Pastures

J does not maintain fences very well. Only those to separate the groups. The cows in lactation can reach three meadows. The one with Estrella is hard to get to, because the cows have to pass a muddy river. Most of them are kept in unimproved pastures. Production of pastures, especially of Estrella is in abundance. The number of cows is too small.

F rotates his producing cows over his best pastures. Estrella is highly productive, Ratana is very bad he says. They both use tordon and machetes to clear weeds.

Health

J has a lot of health problems with calves. Many calves die. According to J this is due to drinking infected water from a low

part near the dairy. He supplies some fresh water, but he does not really prevent them from drinking bad water. At the moment he does not have medicines to cure calves. Torsalosis too can not be treated because of lack of means. Other medicines for more occasional problems are available.
F does not have many health problems. He vaccinates his animals, and treats against internal and external parasites regularly. He has a lot of medicines in stock.
Both farmers lost a bull due to anaplasmosis. Mastitis sometimes is a serious problem. In both farms antibiotics are available. But J prefers to cure and prevent mastitis by milking well.

Milking and Milk Production
The way of milking is much more hygienic, than in the Rio Jimenez group. Both farmers clean buckets and milk cans very well, before milking, and clean udder and teats with a wet towel followed by a dry one. F uses a chlorine solution, J`cannot do this, he has no means like that. When the farm was visited, F milked 12 cows, with a total production of 50 kilos (3,4% fat). The cows are in production till the calves are weaned (7-8 months). J milked 7 cows, 2 others had mastitis and 1 recently calved. Total production was 30 kilos (3,6% fat).

6.4 FUTURE

On both farms there are plans to improve productivity. F wants to plant cocoa between plantain and maybe between the coco-nut trees, to obtain more returns from his land. He wants to extend pejibaye till 5 ha, sow some root and tuber crops and increase the number of chickens till about 200 for egg production. The about 60 ha of "chacotales", land once cleared but neglected, will be cleared again and turned into pasture for rearing calves ("Cria").
The 16 ha of pasture is meant for dairy production. It will be improved. Near the dairy he wants to grow some King-grass, to maintain production dung will be used.
The Ratana will be eliminated. Every year he will clear some of this pasture to sow 5 ha of rice. After harvesting, Estrella will be planted in the drier and Brachiaria in the wetter parts. His stock will be extended. He already bought some Brown-Swiss - Brahman crosses in Guanacaste. He bought a young Holstein bull a few months ago. When this animal develops well it will be used for breeding. If not, a Brown-Swiss bull will be used.

J says the owner of the farm has plans to remove the dairy to the other corral to improve hygiene. The old dairy will be broken down, and will be replaced by a brick house surrounded by fruit trees. When this will happen J does not know. The most distinct plans are those to improve pasture, i.e. after harvesting the 3 ha of maize, Brachiaria will be sown.
Soon two bulls will arrive, a Gyr and a Brahman. The owner earned them by hiring out machinery. He hopes to get more valuable calves, and less health problems.

7 NEGUEV

7.1 INTRODUCTION

The farm Neguev was invaded in the late nineteen seventies. It then could be divided into three parts:

a The 944 ha north of the Parismina river near Santa Rosa. Already heavily logged, flat and generally excellent for agricultural activities;
b The southern portion (3300 ha), which already was in pasture and cattle;
c The north-east portion (1100 ha), hilly with poor soils.

Now it is an IDA settlement. It has been divided into 310 parcels, with areas varying between 10 and 17 ha (For landuse see Table 5.1).

Out of 53 farmers interviewed during the broad farm survey seven farmers could be distinguished who sell dairy products. They all live in the southern part of the area. Their farms have an average size of 11.7 ha, 7.7 ha are used as pastures (Table 7.1).

Table 7.1 Land use and number of cattle of farmers in the Neguev sub area.

---area (ha)---					---animals (no)---					
no	total	crops	pastures	not used	<1	1-2 years	>2	bulls (1)	milk cows(2)	use (3)
1	17	0.7	8.3	8.0	9	6	10	0	9	D
2	15	8.3	5.8	1.0	8	0	11	1	8	D
3	10	0	10.0	0	13	4	23	1	8	M
4	10	0.5	9.0	0.5	6	6	14	0	6	M
5	10	1.5	5.0	3.5	4	2	9*	0	1	M
6	10	1.3	6.8	2.0	3	1*	7	1	1	M
7	10	0.8	9.3	0	5	4*	7	1	3	D

* including one male animal not used as breeding bull
(1) bulls are used for breeding.
(2) cows in production; this does not necesarily mean they are milked.
(3) D = dual purpose; M = milk

Two farmers were chosen. They both have been producing for Borden, till last year. Their farms are situated near Milano and consist of 10 ha fertile land.

G (no. 4) had a farm in the Neguev for about seven years. He first lived in an other parcel, but three years ago he changed to his present parcel. This parcel had already been turned into pasture. G made many improvements, he planted Estrella and divided pastures. Now the farm can be divided into three parts: a high part of about 0.5 ha of land of lower fertility, used for fruits, mainly soursop, a lower part of 9 ha fertile land turned into pastures of Ratana and Estrella and divided into 6 parts, and a little part on the opposite side of a river (about 0.5 ha) not cleared because the river overflows it now and then. There

are about 26 animals, the most important breed is Holstein. About 8 years ago he was given a dairy cow by his brother in law in San Isidro. Because transport of only one cow is very expensive, he decided to buy three cows more to transport them at once to Neguev. He never had to use credit to extend his stock. Since three years G lives in Guapiles but visits the farm regularly. He has an employee working on the farm. The employee and his family live on the farm in a house, that was built last year. The man does all the work on the farm, such as milking cows, making cheese and maintaining fences, pastures, fruittrees, animal health etc..
About six months ago, G dismissed another labourer, this man was lazy and neglected the fruit trees and the animals. Soursop did not produce and some animals were attacked by parasites. G. is very content with the present labourer. He pays him C 6,000. a month, and he gives him half of the cheese production, milk and fruits for the house.
In the lower part of the farm there is a corral annex dairy with concrete floor. Near the house there is a waterpump in a little shed.

F.H (no. 3) came to Neguev three years ago. Before that time he worked on his parents' cattle farm in Puriscal. When his parents died, the farm had to be sold. They sold a lot of cattle but kept the dairy cows to start a specialized dairy farm in Neguev. The farm he bought already existed of native and some improved pastures. He fenced in some land to divide it. He sometimes grows subsistence crops. Recently he cleared 2 ha to sow maize together with a neighbour. In exchange he uses some pastures of this neighbour to feed his yearlings and heifers. There are about 40 cows. Besides there are 3 pigs, 2 horses and about 40 chickens. F.H does not use hired labour. He and his wife do all the work. They live on the farm. Part of the corral has a roof and a concrete floor. Electricity is available. No machinery is used.

7.2 INFRASTRUCTURE

Infrastructure is mainly supplied by IDA (see 4.6). G never wanted to use credit, F.H. could not obtain credit for cattle. They say they do not receive much technical assistance from IDA. They receive some assistance from the MAG veterinarian, who vaccinates their cows. G sometimes visits "Los Diamantes" in Guapiles to ask information about diseases in soursop.
They are organized in the association of milk producers but this organisation is not very active any more.
There used to be fifteen milk producers who sold their milk to Borden. They had built dairies with concrete floors, bought milk cows and tried to milk hygienically. In Milano near the IDA offices milk was cooled, and transported to Guapiles by IDA. Transport costs, however, were high and sometimes the milk was rejected, due to low quality caused by mastitis. They tried to organize the acquisition of a cooling tank, to be able to store milk, and thus decrease transportation costs. There were many problems in organisation. Because IDA was not prepared to finance this project, it collapsed. About six months ago it was decided

not to sell milk to Borden any longer. They now produce cheese. F.H sells it in "pulperias" (little stores) in Pocora, G's employee sells it on the farm.

7.3 MANAGEMENT

Crops

Both farmers have little crops. F.H only grows some subsistence crops with little inputs. G grows pineapple, coco, mango, oranges for his own use, between soursop which is sold. These fruits do not need many inputs but clearing weeds and sometimes combatting plagues. Because the former labourer neglected it, it does not produce yet. Now more attention is being paid he hopes the trees will start producing.

Breeding

Cows used are dairy breeds. G uses mainly Holstein, some cows descend from Brahman and Brown-Swiss crosses. Previously he used a Brahman bull, but now he uses a very young Brown-Swiss bull for breeding. This bull was bought on the "Exposicion" in Guapiles; it has very good parents. He intends to buy a little Jersey bull soon from the "colegio".
F.H uses pure breeds and crosses from Holstein, Brown-Swiss, some Jersey and a bit Brahman. Both select cows on milk production, but especially F.H thinks selling calves could be profitable as well. He now uses a Simmental bull, with which he is very content. Daughters certainly will stay on the farm. However, he soon will have to buy another bull, because the present one has been used for about two years now, it's first daughter soon will have to be served.
Neither of these farmers use registration, nor plan calving time, they say calves are born more or less throughout the year. Only male calves are sold; the amount differs per year. G estimates he sells about 3-5 calves a year at an age of about 6-8 months for C5,000 to 7,000 each.

Cattle Groups and Nutrition

Both farmers divide their herds into three groups: 1 calves, 2 heifers and yearlings, 3 cows in production.
F.H keeps some heifers, the bull and the cows with calf within the third group. G includes all these animals in the second one. When the calves are put in the corral at about 2 - 3 p.m., they are separated from their mothers. G supplements his calves with some sugar-cane. During milking mothers and calves are joined.
The other animals only are supplemented with some salt or minerals. This does not depend on which production group they belong to.

Pastures

G has a rather good grassland management. He divides 6 equal parts with well kept live fences of Poro and Madero Negro. Two parts are used to rotate yearlings and heifers, four parts are used to rotate cows in production. There is rotation about every week.
Weeds are in control. Some trees along a little river are used to

give shade. The pastures exist of Ratana and Estrella. However in some parts Estrella has nearly disappeared.
F.H's pastures are being neglected. He divides 5 rather unequal pastures but cows have permanent access to the majority. There are many weeds and the pastures contain little improving grass species. Some Estrella can be found.

Health
G has little problems with animal health. His employee says he controls external parasites and when animals look a bit thin, treats against internal parasites. He says because of these treatments animals can offer more resistance against other diseases. Till now G never had to sell animals because of diseases or deviations.
F.H's calves have many problems with diarrhoea. They are treated against with antibiotics (Emicina), an iron injection and a Ripercol injection against gastro- intestinal parasites. He has medicines against some tick born diseases and treatments against external parasites.
Both do not control mastitis as they did before. They treat against acute forms with antibiotics. When the animal has not been cured, they stop milking and leave the cow with the calf to cure, or to sell it.

Milking and Milk Production
As far as milking is concerned G and F.H are compareble to M (see 5.3). Their dairies are not cleaned nor other precautions are taken, to maintain hygiene.
A difference is, that animals are much longer in production: about 8 months. F.H milks 10 cows with a total production of about 35 - 40 liters. One person needs about 2 hours to do this. His wife makes about 16 kg of cheese per week to be sold for 90 colones a kg. G has 6 cows in production. The employee needs more than an hour to milk them. Two to three kg of cheese are made daily. Besides some "natilla" is made, and as on all other farms, milk is used for family consumption. G estimates total production is about 30 litres a day.

7.4 FUTURE

In the Neguev most dairy farmers diminished their dependency on milk. They shift towards dual-purpose cattle farming and growing more crops. FH is one of these farmers. He will grow 2 ha of maize, and tries to get credit to grow chillis and passion fruit. He will to a greater extent specialize in dual purpose cattle production, to obtain stronger and more valuable calves. He does not intend to decrease his stock, but has no plans to improve pastures either.
G is a bit an exception. He has the farm as a hobby. He improves facilities on the farm to spend some nice weekends there. He will keep specializing on milk production, because he likes it. He wants to extend his dairy stock and will improve his pasture by planting Brachiaria and taking away Ratana.

8 EL INDIO

8.1 INTRODUCTION

El Indio is situated in the west of Pococi, an important banana area. It was invaded in the late seventies by about 20 squatter families, who grew some subsistence crops. The remainder was primarily in forest and bushes, with the commercially valuable timber already removed.
It is now an IDA-settlement with a total area of 4240 ha of which about 3200 ha of suitable land has been divided. People received from 5 to 17 ha.
The red soils in the hilly parts are not fertile and are mainly used as pasture. The black soils in the flat parts are fertile and suitable for crop production.
In el Indio there are many cheese producers. Since almost a year about 20 farmers together have made it possible that their milk could be sold to Borden.

E is one of these farmers. He was born 26 years ago in Guanacaste. He has lived in the Atlantic Zone for about 12 years. The farm belongs to his father-in-law, who received it 5 years ago. Both E and his father-in-law used to work on a banana plantation during the week, and on the farm on Sundays.
Two years ago they decided to settle on the farm. E stopped working on the "bananero", and now works on the farm. Sometimes he earns money by working with his chain-saw. His father-in-law helps when he has not to work on the banana plantation. The mentally disabled brother-in-law helps with some easy tasks.
The farm covers an area of 12 ha of which 2 ha are flat and fertile, the remainder is hilly and poor. About 1/4 ha of the fertile land is used to grow beans and some other subsistence crops. The remainder is forest and bush (about 4 ha) and pasture (about 8 ha), mainly consisting of Ratana, tree trunks and spared trees.
In the low marshy parts there is some Aleman. Between the hills there used to be 2 ha of Brachiaria, but this has been crowded out by Ratana. They are now sowing 2 ha of Jaragua, a pasture of Guanacaste.
About one and a half year ago the Brahman cattle was sold to buy some dairy cattle from farms in San Carlos and Carthago mainly. IDA assisted in buying 8 cows and financed them too. There is a herd of 26 animals on the farm now; 3 cows and 3 calves belong to a neighbour who does not have enough pasture. The breed mainly used is Holstein, but also some Jersey, Guernsey and Brown-Swiss. The bull used is a Holstein/Brown-Swiss cross.
Besides cows, there are chickens and a horse. The cows are milked in a dairy with a concrete floor, which supplies room for 6 cows. Near the house and the dairy there are some wells. E has some buckets and milk-cans, but does not own any machinery or vehicles; they only use a back-pump and a chain saw.

C, 38 years of age, is another "Borden producer" who also used to work on a banana plantation. He received his farm eight years ago, but the first six years he only worked there on Sundays. The

last two years he has completely devoted himself to his farm. C lived alone till a few months ago, when his aged parents, who owned a cattle farm near Cairo, decided to join him.
C has 15 ha of fertile land, 3 ha are used for maize or tubers, 1 ha for fruit trees and subsistence crops, 1 ha forest and bush and 10 ha pasture. This pasture consists mainly of Ratana, but in some parts Estrella can be found. Near the house there are some plots of San Juan and Brachiaria, which can be used for multiplying.
C had Brahman cows and produced some cheese. When he got the opportunity to sell milk to Borden he sold his Brahman cows, and bought dairy cattle, mainly Holstein and Brown-Swiss. Four cows were financed by IDA. There are 33 animals on the farm. Some belong to C's father. The Holstein/Jersey bull is for sale.
The cows are milked in a dairy with a concrete floor. There is only room to milk 1 cow and room for some calves. Some food for the cattle is stored here. Near the house there is a well. C owns a back-pump, a chain saw and a horse cart. Besides cows, there are chickens, a pig, 9 piglets and 3 horses.

8.2 INFRASTRUCTURE

As mentioned in 4.6 IDA constructed many roads and provided community facilities inside the settlement. Till now there is only electricity near the IDA offices. Both C and E expect to have electricity next year.
In el Indio there is an association of 21 milk producers. One of the members lives just outside the settlement. In april 1986 two milk cooling tanks were bought with credit from IDA, to be able to sell milk to Borden. On Monday, Wednesday, Friday and Saturday milk is transported to Guapiles by one of the members of the association (he is paid 1,50 colones per kg).

Both received credit from IDA: C for four dairy cows he bought a year ago, E for eight dairy cows. Interest is 15 %. During the first two years E has only to pay interest over the total amount (140,000 colones). From the third to the eighth year he has to pay back as well (23,000 colones a year).

A year ago the milk producers received technical assistence from IDA. A technician visited the farms regularly and there were some demonstrations with slides about management. Nowadays activities are mainly concentrated on animal health, i.e. vaccinations against Brucellosis, Septicemia, Anthrax and "Pierna Negra".

8.3 MANAGEMENT

<u>Crops</u>
E and his father in law have some subsistence crops, but no cash crops. C grows maize alternated with "Malanga" as cash crops, for which purpose he sometimes has to hire labour. Apart from these crops he has many other annual crops and fruit trees, but they are all for his own use.

Breeding

Both farmers use typical dairy cows, C especially pure breds and crosses of Holstein and Brown-Swiss, E especially Holsteins and some Jerseys, Guernseys and Brown-Swiss cows. C uses a Holstein/Jersey bull which he wants to sell. He has already got some fertile daughters from this bull. He wants to buy a Brown-Swiss/Guernsey bull. E uses a Brown-Swiss/Holstein bull which he bought when it was young for 25,000 colones. It is descended from well-known parents.

They both keep all the female calves. Bull calves are sold at 7-8 months. These calves have a value of about 3000 colones according to E. Brahman calves of the same age would value about 6000 colones.

Cows with low production, mainly due to mastitis, are culled. C will cull some cows, because of low fertility.

E registrates data of fertility and mastitis. He knows exactly when a cow will calve, and registrates data of mastitis (date, cow, quarter of the udder). C does not registrate, he says he knows everything by heart.

Cattle Groups and Nutrition

Both farmers have special pastures for their calves. C keeps the youngest inside. During the milking some milk is left for the calf, the amount depending on its age. He joins mother and calf during the morning, E joins mother and calf after milking for about half an hour. E does not separate the other animals, he says he does not have enough "apartos". C seperates yearlings and heifers as well. Most of these animals are in a neighbour's pasture because there is not enough grass production.

Cows in production receive a supplementation during milking. E uses products of his own farm, i.e. he cuts grass between the beans, and chopps the stem of "yute" (a Musaceae).

C has transport facilities (a horse-cart) and collects waste products of agriculture like low quality bananas, and root and tuber crops, like "Chamol" and Malanga". Like E he uses products of his own farm.

All animals in pasture sometimes are supplemented with a mixture of salt, minerals and molasses.

Pastures

Both farmers have a lot of Ratana. They sowed it because it spreads and produces rapidly. However it did not turn out to be very productive.

E had about 2 ha of Brachiaria ruzi but this nearly has been crowded out by Ratana. He regrets having sown Ratana, even native pastures are better and cause less problems. A little part with King-grass has been distroyed by cows, which broke out. In lower parts he grows Aleman, a grass to be cut. At the moment he sows Jaragua, a pasture he knows from Guanacaste.

C only has some Estrella on the hindmost part of his grassland, it is mixed with Ratana. Near his crops he has a part with pure Estrella and another with San Juan, which can be used for planting in other parts of the farm.

Both say grass production is low at the moment, due to drought during the last few weeks. When rains will start in April or May,

the production will increase rapidly. When there is too much rain, animals do not eat, and pastures turn into mud pools.
C has divided his grass land into 5 parts, E in four. Both think this is too little to have good rotation of cattle over pastures, to maintain them well.
Both still have no live-fences. They say it is hard to obtain cuttings of Poro or Madero Negro, and think they will be expensive.
Pastures are cleared with "machete", Tordon or 2.4 D. E wants to limit the amount of these chemicals, because he thinks it is expensive and it might be toxic for the animals.

Health
Both farmers seem to have little health problems. They bestow great care on their animals. The animals are regularly vaccinated and are given treatment against parasites. Both have many other remedies at their disposal. E estimates the costs of total treatment at about 8000 colones a year.
Occurance of mastitis is checked regularly (California test). When the test is positive, the cow is treated with antibiotics. Cows receive special care during milking. When a cow shows mastitis frequently it will be sold. Both think, prevention of mastits by milking hygienically and with care is very important.
C has fertility problems. He is going to sell 3 cows which did not show heat within 7-8 months post partus.

Milking and Milk Production
Both farmers milk very hygienically. They clean milk equipment with hot water and chlorine solution, wash udders and teats with this same solution, and dry teats with a clean piece of cloth.
C uses calves to prepare most cows to be milked; he says they are accustomed to this. Only a few cows can be milked at once.
His dairy is rather small, he has to prepare, feed, and milk the eight cows one by one. He milks five cows to sell milk to Borden, three are milked by his father to make cheese. One has little production, the other two recently came into production, but lack test on mastitis. C is out of reagent. The total production of five cows is more than 30 litres. The majority of the animals remain in production for about seven to eight months. Some of them longer, this depends on when they are about to calve. C does not registrate, but says he knows everything by heart.
E milks cows without the help of others. His dairy provides room for 6 cows. Udders can be cleaned and cows can be feeded at the same time. He milks six cows with production of about 30 litres (3,6% fat). He has a weekly mastitis inspection.
Both say their milk always turns into grade E or A.

8.4 FUTURE

Both farmers have plans to move their houses nearer to the road, to be connected to the electricity network.
C wants to build a new dairy, entering cows one by one takes too much time. Both farmers have plans to improve pastures. E sows Jaragua. He will sow maize in the flat part of the farm, followed by planting Brachiaria- and Estrella cuttings. He wants to

restore his King grass. He thinks it is better to improve the existing pastures and save some forest. He will probably use the wood in the future.
C wants to clear the remaining forest and shrubs with machinery, which he is going to hire. Estrella and San Juan pastures will be planted. He also thinks he will diminish his area of crops and replace it by pasture. Some parts of Ratana will be cleared by sowing maize followed by "malanga". Later Estrella, Brachiaria or San Juan can be planted.
Both want to make more divisions in pasture, to have a more active rotation scheme.
They want to extend the number of animals slowly; dairy breeds will be used.

9 DAIRY FARMING

9.1 REASONS

To discuss the farming systems a short summary of the farmers visited is given (see Table 9.1).

Table 9.1 A summary of the farms visited (February/March 1987)

	Rio Jimenez		Santa Rosa		Neguev		Indio	
	R	M	F	J	G	FH	E	C
area								
-total	40	92	95	40	10	10	12	15
-annuals	5,5	30	2	3	0	0	0,5	3
-perennials	3	0	15	0	0,5	0	0	1
-nat. pastures(1)	28,5	62	14	33	4,5	8	6,5	8
-imp. pastures	0	0	2	5	4,5	2	1	2
-not used (2)	3	0	62	4	0,5	0	4	1
off farm work	no	no	no	no	no	no	yes	no
equiped (3)	-	o	+	-	-	-	-	-
hire labour	no	no	no	yes	yes	no	yes	no
used breeds (4)	B	B	D	M	M	M	M	M
age and number								
-0 - 2	30	80	22	30	12	17	16	16
-2 + (5)	72	65	18	20	14	23	16	17
breeding bulls	2	3	1	0	1	1	1	1
maintenance (6)	+	o	+	-	+	-	+	+
animal health (7)	+	+	+	-	+	-	+	+
grass product.(8)	-	-	o	+	o	-	-	o
feeding (9)	-	-	+	-	o	-	o	+
milk production				(10)				(11)
-nr. milked	12	16	12	7	6	10	6	5
-tot. production(kg)	30	40	50	30	30	40	30	30
-months in lactation	3-4	3	7-8	7-8	7-8	7-8	9	8
-sell to Borden	no	no	yes	yes	no	no	yes	yes
-hygiene (12)	-	-	+	o	-	-	+	+
plans in dairy production (13)	o	o	+	+	+	-	+	+

1 including Ratana
2 bushes, fallow
3 - little, o reasonable, + well
4 B = beef, D dual purpose, M = milk
5 including oxen, some heifers
6 Of equipment, hygiene, etc., - bad, o reasonable, + good
7 - many, o some, + little problems
8 production is: - short, there are too many animals, o enough, + abundant, the number of cows/ha should be increased
9 - no, o reasonable, + good attention to needs of producing cows
10 3 cows were not milked, because they recently calved or had mastitis
11 3 cows were milked by father to make cheese, 1 has little production, 2 recently calved, and had not been tested on mastitis yet.
12 - low, or reasonable, + good
13 - other activities, o leave it as it is, + raise production

Both farmers in Rio Jimenez obtain much of their income from annual crops. Especially when specialized in maize production, there are high demands of labour during some periods of the year. Rearing cattle requires relatively low inputs of labour, and activities can be postponed to quiet periods. Milk is an extra; the amount of cows milked depends on how much time is left.
R the first farmer visited likes milking cows, he built a nice dairy and even has plans to improve it. He has interest to sell milk to Borden, but his wife holds him back, she does not want to work any more.
Selling milk to Borden would mean more labour. First, because of more precautions that have to be taken during milking. Second, because the production has to go on, also in busy periods.
Hiring labour is considered expensive, both farmers want to restrict this.
Higher demands of labour, the need to change management and consequently to invest, lack of knowledge and increasing risks, are reasons for not starting to sell milk to Borden.

F, the first farmer in Santa Rosa, grows several crops, principally perennials. He does not want to be dependent on only a few products.
Milk is one of his products. Advantages are, unlike with annuals, he now obtains a constant income, and he has not to wait for income for many years to come.
By using dual purpose cattle in stead of dairy cattle, he reduces risks. He thinks there are less health problems, and low productive cows always can be sold for reasonable prices. Besides, profits from selling calves are much higher.
His plans to sow rice, will not be in conflict with dairy farming. High pressure on labour available, will be prevented by using machinery. Growing rice will be part of the pasture improvement.
Although, he does not possess the means to use all his land yet, he wants to use his land intensively to reduce production costs. He chooses to intensify the use of the land close to the farm house first, and later on extend the activities to the outer parts of the farm.
The other Santa Rosa farmer is little concerned in his farm. His economical interests are mainly elsewhere.
Growing crops would mean hiring more labour. There would be risks of faillures, as a result of abundant rainfall and lack of supervision.
In dairy farming, he only has to hire one labourer. He makes little investments.
Still, the absence of supervision and investments, cause insufficient maintenance. This has its effect on fences, the dairy, other capital goods and animal health.
The administrator helps to improve pastures by growing maize on the farm. After harvesting, the area can be easily turned into pastures.

G, the owner of a farm in Neguev, also engaged someone. G has retired, the farm is his hobby. He likes dairy farming and growing Soursop (a fruit tree).

The fact, that he looses money, does not keep him from investing. He can afford it.
F.H the other Neguev farmer has to make a living of his farm. He was specialized in dairy farming. Since he had to stop selling to Borden, he has had problems in obtaining sufficient income. To improve his situation, he wants to grow maize, chillis or passion fruit. He will not invest in dairy farming any more, he will shift towards dual purpose farming.

Farmers in el Indio have no problems in marketing their milk.
Because of low soil fertility, E has not many alternatives for animal production. His farm is small, so he chose to specialize in dairy farming. In this way he has maximal outputs per unit of land.
Because the farm can not yet be exploited completely, an extra income is being obtained by off farm working.
E has few problems in dairy farming and thinks it will be profitable. He has no means for rapid developments; he wants to increase milk production steadily.
Apart from dairy farming C, the other el Indio farmer, grows annuals. He has confidence in dairy farming, he has little problems, and likes to have a continuous income. He has decided to convert crop land into pastures. Then he will no longer have to hire labour in peak periods. Besides, by raising the milk production, the capital goods will be used more efficiently and thus the production costs will decrease.

9.2 MANAGEMENT

Breeding
It is clear that farmers have different objectives in breeding. The Rio Jimenez farmers want to produce fast growing calves. Cows are selected on their own development, and production of calves. In practice this means, they cull infertile cows, and cows with dead born or slow growing calves. These cows are often quite old. But, there is also indirect selection towards milk production. Sufficient milk production is of importance in calf growth, and good milk producing cows are appreciated, they will not be sold.

On the other farms, milk is of much more importance; they want to breed high milk-productive cows. This means that dairy breeds such as Holstein-Friesian, Jersey, and Guernsey and dual purpose breeds like Brown-Swiss and Simmental are being used.

The farmers in Santa Rosa want to reduce problems with animal health, and want to sell their calves and cows for a good price. They use crosses of these breeds with Brahman, or cross their dairy cows with Brahman bulls. These farmers want to maximize profits per unit of labour.

All the remaining farmers have little land, they only use dairy and dual purpose cows to maximize profits per land unit. By alternating the breed of the successive bulls they avoid pure breeds.

The farmer in Neguev has problems in marketing. He shifts towards dual purpose farming, by using more dual purpose bred bulls, or even Brahman bulls in the future.

Health

The farmers visited in Santa Rosa and el Indio are aware of problems, that can be caused by mastitis. They try to avoid these problems by maintaining hygiene, and by checking cows regularly (California Test). Still often the milk of some cows is kept apart, and sometimes cows have to be sold, due to mastitis.
The other farmers do not (longer) consider mastitis a real problem, their milk is not inspected. They do not take precautions during milking.
All farmers cure animals with mastitis by using an antibiotic ("Masticine") or by not milking the cow any more. They say the calf will cure its mother.

Other health problems are parasites, such as ticks, torsalosis, and internal parasites, diarrhoea and sun burn with calves, and more occasional tick born diseases.

Farmers try to remove ticks by using insecticides such as "Nuam", by using "Sevegon" or by hand during milking. Many farmers try to remove all the ticks. This causes loss of premunity against tick born diseases, like babesiosis. Bos taurus species, except Jerseys, have more problems with ticks and tick born diseases. Farmers who already lost animals because of these diseases use "Ganasec" or "Berenil" to cure sick animals.
Torsalosis is often treated against by using old machine oil, "Torsafin", "Laquisa", " Matagusano" or "Nuam". "Atropina" is used when animals are poisoned by insecticides, such as "Nuam". An other product against external parasites is "Nuevon".
Animals with internal parasites are treated with a "Ripercol" injection, with "Sevegon", "Panacur", or "Triver L-10"
Calves with diarrhoea is a problem farmers try to solve by giving them antibiotics "Ripercol" and iron injections. Farmers prevent the youngest calves from getting sun burned by giving them shelter.
Foot diseases were only mentioned by one farmer (R), he did not have many problems with them. He sprays copper-sulphate and formalin solutions on feet to cure animals. Two key informants mentioned foot diseases to be a real problem, especially in wet periods.
"Aceite alcanforado compuesto" is used against lameness. Other medicines used were "Bronquibalsam" for bronchitis or pneumonia, "Emicina" (an antibiotic) for many purposes, "Aricil" for anaemia, "Fureal" for cows with inflammation in the reproductive organs and "Alcamicine" (oxytetracycline) to prevent this. Some farmers inject vitamins ("Vitacom 500").
Because all farmers visited vaccinate against "Pierna Negra" (a clostridium infection), Brucellosis, Septicemia, and "Carbon" (Anthrax), there are relatively few problems with these diseases.

Nutrition

Salt and molasses are generally used to supplement cattle now and

then, sometimes minerals are given.
Few farmers feed calves when they are inside. From the afternoon till the morning many calves have nothing to eat. They only get some milk in the morning.
Only the "Borden farmers" supplement cows in production. They use second quality bananas, roots and tubers, and residues of their own farm, such as grass growing between the beans and stems of a wild banana species. These supplements are given during milking.
Some farmers keep their lactating cows in their best pastures.

Pastures
Many farmers are improving their pastures. Estrella Africana (Cynodon nlemfuensis) is the improving species which most frequently has been used. Productivity is good and it responds well to fertilization. It tolerates some faults in management (Romero pers. comm). Another species used is San Juan (Setaria sphacelata).
In low wet parts farmers use Aleman (Echinochloa polystachya) and Brachiaria (Brachiaria mutica?).
E. the el Indio farmer used an other Brachiaria (Brachiaria ruziziensis) and Jaragua (Hypparrhenia rufa) on his land with the poorer soils.
Many "Borden" farmers have plans to grow King-grass (Pennisetum sp.). It is a highly productive arable forage.
None of the farmers visited used Poro (Erythrina sp.) or Madero negro (Gliricidia sepium) for supplementation. They are used in live-fences by some other dairy farmers.
However, the greatest part of the pastures exists of native grasses or Ratana (Ischaenum ciliare). They are low productive, but they tolerate high cattle density.
To improve pastures and to get rid of herbs, native grasses and Ratana, farmers often grow maize or rice first. The abundant amounts of herbicides used kill these herbs and grasses. After harvesting the land is "clear", and grasses can be sown or planted. On poor soils this method can not be used.
Pastures are kept clear by using herbicides (Tordon 101, Tordon 472 or 2.4 D), or by using a long knife (Machete).
Many farmers want to divide their pastures in many little parts, to be able to rotate animals over their grass land, to improve their grass land management .

Milking and Milk Production
Borden farmers take a lot of precautions before and during milking. They wash the milking equipment with hot water and sometimes with a chlorine solution. They clear teats and udders well. Cows with mastitis are milked last. Milk is stored in a cooling tank.
The other farmers do not take these precautions. Their wifes make cheese immeadiately after milking. R's wife used boiling water to wash the curdled milk. Her cheese was of very good quality.
Milk production is highest from January to April. Many cows calve in this period. The pastures and the health of the animals are better during these months.

9.3 COSTS AND YIELDS

The information given here is not complete and is little quantitative. It was not the objective to estimate production costs. Besides, the quantitative information is sometimes based on rough estimations made by farmers. The restricted research period and the presence of the researcher could have influenced information obtained.

Land

In table 9.1 the availability and the use of land of the eight farmers is shown.
Most land used is flat and fertile. It is suitable and used for many purposes.
Two farmers have hilly land with poor and acid soils. This land is under pasture or has not been cleared yet. Its suitability is restricted to a few crops, such as pineapple, timber, and grass land species which are adapted to these circumstances.
One of these farmers makes a strict division in the use of his land towards its fertility; all fertile land is used for maize production, all other parts for animal production.
Farmers who sell or sold milk to Borden have relatively more improved pastures.

Labour

Milking requires most labour in dairy farming.
Although Borden farmers have more efficient dairies and the individual milk production of their cows is higher, they spend more time in milking. Borden farmers clean milk equipment, dairy and udders very well. During milking they feed their animals and check upon mastitis. After milking they have to bring the milk to the cooling tank. The other farmers do not take these measures.
To collect 30 litres of milk about 2 - 2.5 (wo)men hours are needed on the Borden farms, and 1.5 - 2 (wo)men hours on other farms.
Cheese is generally made by the farmer's wife. She spends about half an hour on this activity.

Other activities are carried out by men.
The time needed to maintain pastures, fences and other goods differ per farmer. It depends on the amount of these goods and on the willingness to maintain them. Borden farmers need more capital to guarantee milk hygiene, tend to divide their pastures into more parts, and use cows and more pastures that are more delicate. They need more attention. This applied to Neguev farmers too. The other farmers have a larger area under pasture.
The maintenance of animal health is more an occasional activity. The time needed depends on the number of cows and the breeds used. This takes 5 - 10 man hours a month. The attention paid to maintenance is shown in table 9.1. Total time spent to maintenance probably does not exceed 35 man hours a month.

Some Borden farmers spend time to collect wastes to supplement their cows.

Intensifying the use of the land takes a lot of time. Many farmers still are clearing forest and shrubs, planting or sowing grasses or making fences. The time needed depends on the age of the farm, the plans a farmer has, and on the amount of machinery he can use.

Capital

A breeding bull costs between 25,000 and 40,000 colones, full grown cows between 15,000 and 25,000 colones animals of about a year between 7,000 and 12,000 colones. Prices depend on health, age, suitability and weight. Brahman cattle is more expensive than dairy cattle. For number and types of animals see Table 9.1.

During milking all farmers use buckets, milk-churns and other small equipment to collect milk. Farmers who make cheese use pans or barrels, coagulant and a press.
Cows are milked in a dairy or a corral. Borden farmers need dairies with concrete floors. They use chlorine solution to clean equipment and udders, they use towels and have means to test mastitis (california test).
Fluid milk is stored in a cooling tank and transported to Guapiles. When no cooling tank is used transportation to Guapiles occurs more frequent. Some farmers near Guapiles do not have to cool their milk, but they receive lower prices (see Annex 3).
Transport cost to Guapiles depend on distance, quality of roads and the amount of milk. The farmers in el Indio pay 1.50 colones/kg.
Milk is transported by Borden from Guapiles to San Jose. Since the new road to San Jose has been opened, farmers have to pay about half of the former 1.20 colones/kg.

Pasture management requires fences: wood or trees and wire. These costs increase when a farmer makes more divisions in his pastures. Especially on the smaller Borden farms this isdone or is planned to be done.
When pastures are improved often machinery is needed. Costs of seeds or cuttings generally are low. They often were given or were produced in little nursaries on the farm.
A long knife, herbicides and equipment to spray it are used to control weeds.

Costs to maintain animal health and to supplement cows remain are illustrated by Table 9.3. Besides or in stead of salt some Borden farmers supply minerals. They often substitute the supply of molasses by wastes of agriculture. Often transport is needed to collect these wastes.

Table 9.3 Estimation of costs and medicines and molasses/salt on the eight farms visited. (X 1000 colones a year)

	Rio Jimenez		Santa Rosa		Neguev		Indio	
	R	M	F	J	R	FH	E	C
medicines	50	10	25	-	6	10	8	-
molasses/salt	18	14	-	6	-	-	-	-

Milk production at the farms visited did not vary very much, 30 to 50 kilos daily. The average production per cow varied from

about 2,5 to 6 kilos a day, and persistance varied from 3 to 9 months (see Table 9.1).
This variation can be explained by the breeds used (dairy cows seem to produce more milk) and the difference in nutrition and animal health. On farms where producing cows were supplemented and grazed in the best pastures the production was highest.

The price of fluid milk is about 16 colones/litre (see Annex 3). To make 1 kg of cheese 9 - 10 litres of milk are needed. Most farmers received about 70 colones/kg, one farmer obtained 100.

First calving is at the age of 40 -45 months, the calving interval is 13 - 16 months (CATIE 1983, van der Weide 1986, Gonzales pers. comm.)
On the larger Rio Jimenez farms the calving interval will be longer because of less attention paid to nutrition. Especially the cows being milked have lower fertility.

When there is no mating control cows calve in January, February or March. M, the second Rio Jimenez farmer, only milks during these months.

Male calves are generally sold between seven and eighteen months of age. There is much variation in prices. Brahmans are worth twice as much as calves of dairy breeds (ca 12,000 versus 6,000 colones at an age of one year).

NOTES
1 US dollar = 60 colones.
When milking in the Rio Jimenez farms is considered as an extra possibility to obtain income from rearing cattle, costs of milk production are: the labour and the equipment needed for milking and losses in calf production. The cows milked have lower fertility and their calves grow slower, because they receive less milk.

9.4 PROBLEMS AND SUGGESTIONS

Institutions
Farmers who make cheese receive low prices for their product. Only R (the first Rio Jimenez farmer) obtained a reasonable price.

Credit for dairy farming was used by el Indio farmers. Without this credit it would not have been possible for them to start up. The absence of a good credit supply outside IDA settlements, and the postponement of credit supplies in settlement schemes are obviously an obstacle for farmers who want to start up.

Many farmers who start selling milk to Borden, have to co-operate with other farmers to share costs of transport and cooling. Besides, information and means can be exchanged then, and contact with institutions can be more effective. For instance, some farmers who are organized, like the Santa Rosa farmers, received extension and assistance from MAG, or were supplied with cheap

credit to buy cooling equipment.
However, many farmers do not want to be dependent. They do not believe in profits, obtained through organisation, because it may imply risks.
This argument seems reasonable, since many organisations collapse. An example is Neguev: many farmers there, even those who did not have any problems with the milk quality, were victim of their dependence on others.
A co-operation only can be started if there is a large group of farmers who are really motivated to create the facilities needed to sell milk to Borden.

An important set back in dairy farming is lack of knowledge. Most farmers have little experience in dairy farming. Research and extension can greatly contribute to the improvement of efficiency. Unfortunately, the demand for knowledge is much higher than the supply of it; the facilities to spread knowledge are scarce.
The main problems for many farmers selling milk to Borden are to avert mastitis and uphold hygiene. An adequate workable solution to this problem can be attained by concentrating extension on these matters first and after that on increasing the efficiency. Here, a good co-operation of Borden with MAG and IDA can be expected, as high milk quality contributes to public health. It would be wise to start with farmers, who sell, or have interest to sell milk to Borden. These farmers are greatly motivated to co-operate.
Better collaboration of institutions and farmers organisations will contribute to better research and extension. This will help farmers to reduce their production costs.

Breeding
There is not much room for genetic selection in dairy farming. Many farmers are extending their herds, they only cull the cows with mastitis, low fertility or high age. Only a few farmers register individual productivity of their cows. Besides, many farmers do not know, which characteristics are important; some farmers even bought low productive cows with aberrancies.
Bulls are often bought on a basis of parental productivity. Because all farmers need their own bulls, the selection intensity is not high. However, artificial insemination is not an alternative, because it requires more organisation and communication facilities. Besides, farmers may have problems to perceive cows in heat.
Genetic material from dairy cows often originates from zones with high altitudes. The high production there is no guarantee for a high production in the low, humid and warm Atlantic Zone. The dairy population in the zone itself is too small, and registration too limited, to contribute to genetic selection.
It seems that the best way of breeding now, is to keep on trying to buy good bulls and cows, and to crossbreed systematically. By extending registration and the farmer's knowledge of characteristics, more room for selection might be created in the future.
Then farmers can mate their best milk cows with dairy or dual

purpose bred bulls to have good dairy descendants. The worst cows can be mated with Brahman bulls to breed calves which are valuable when they are sold.

Health

There are many health problems. They cause considerable losses in production. Farmers use many expensive medicines to cure animals. Because of lack of knowledge or means they do not bestow enough care to prevent diseases. For example treating against parasites before stress periods (calving) is not common. Calf mortality is often caused by coccidiosis and parasites, due to not desinfecting the umbilical cord. When animals are treated against ticks not all of them should be removed. Otherwise the cows looses premunity against tick born diseases.
Farmers who can not bestow enough care to the health of their animals better use crosses of dairy breeds with Brahman.
More knowledge and attention towards preventing the health problems would contribute to decreased production costs, and improved public health.
A good nutrition with attention paid to minerals can prevent many health problems and improve production.

Nutrition

Many farmers have pastures with low productive and low digestable grasses, and do not supplement their animals.
Others, especially those farmers who sell their milk to Borden, try to improve their pastures and use waste products of agriculture.
However, farmers, especially those with restricted areas, can use more of these products and more often; for instance they could supply them at night. Using more of these waste products, can contribute to decreasing production costs.

Pastures

Many farmers want to improve productivity of pastures. However, little legumes are available and used. Only Poro (Erythrina sp.), and Madero Negro (Gliricidia sepium) are used, but these tree species are mainly used in live fences.
Kudzu (Pueraria phaseoloides) recently has been introduced by the "Camara", it is only used by a few farmers.
For pasture improvement improving grass species are used. A problem is that some of them, for instance Estrella (Cynodon nlemfuensis), and Brachiaria (Brachiaria mutica ?), have to be multiplied vegetatively. This means a lot of extra labour.
Ratana (Ischaenum ciliare) was popular, because of its high seed production. For the same reason it is hard to get rid of. It is tolerant to high cattle densities. Maybe this is the reason the Rio Jimenez farmers think it is good, other grass species would not survive their management.
Many farmers want to grow King-grass (Pennisetum sp.) to be cut. It is highly productive. Using it will demand extra labour. Besides, nutrients will have to be supplied, to prevent a decreasing soil fertility. But fertilizers are expensive, and there are little facilities to collect manure.
A problem is that some farmers loose their improving grass

species because of bad management. These grasses then are crowded out by low productive native grasses or Ratana.
To improve their grass land management many farmers think it is necessary to divide their pastures in many little parts to practice rotational or high frequency grazing. The opinions about these systems differ. Opponents think it is expensive, because many fences have to be made, and cows have less possibilities to select what they take in. Problems in continuous grazing are often caused by high stocking rates.
An other way to intensify the use of land is growing fodder crops, possibly within other cropping systems.

Milk and Milk Production
Farmers think milking is a lot of work. By improving their dairies and milking cows without the presence of its calf they can reduce the time spent milking.
Other farmers try to reduce the time needed by taking less precautions during milking.
Higher individual production will reduce the time spent milking per litre.
Because milking hygienic is not easy farmers who need to employ people have problems finding qualified milkers. Often their employees originate from the more traditional milking areas.

9.5 FUTURE

Santa Rosa and el Indio farmers think milk production is profitable. They are increasing their production and think they will be able to reduce production costs. They have many plans to improve their dairy management. Especially on the smaller farms this will mean specialisation and intensification.
The other farmers do not have these plans, they do not want to increase productio, because they can not sell their milk products profitable. Their dairy management will not really change.

10 EVALUATION

The climate in the Pococi/Guacimo study area is not very favourable for dairy farming, it is warm and moist. This causes a restriction towards milk production because of low digestability of forages, many parasites and diseases, and a limited possibility to dissipate generated heat.
However, the quantity of forages that can be produced is high. Their production goes on throughout the year.
In the flat parts of the area soil fertility is rather high. Many crops and forages can be grown. Here dairy farming has to compete with many cropping systems and other cattle farming systems, which have problems and risks caused by the wet climate too.
In the western, northern and eastern part of Pococi/Guacimo there is much hilly land with poor acid soils. Because there are few alternatives, this land is often used for cattle farming. The choice of forages to use is limited and their production is low.

When there is a lot of precipitation trampling down by cattle can cause damages to pastures and soil structure. Little is known about the consequences on long term and the influence of management on these problems.
More intensified dairy farms will withdraw more nutrients from the soil. Probable this amount is low compared to the amount annual and some perennial crops withdraw.
To maintain pastures herbicides have to be used. The quantity is very low compared to the quantity of chemicals used in cropping systems.

Beef cattle farming is rather extensive. Many native grass land species are used, and there is little integration with agriculture. On dairy farms there is a more intensive land use: integration with agriculture is improving and productivity of pastures is increasing. This is important when land is getting scarce or expensive. This is the actual situation in the Atlantic Zone.

On Cria farms (rearing cattle in cow - calf operations) cheese is made. It demands extra costs of labour, but little extra land or capital is required. Cheese production is not very advantageous. Cheese prices are low.
Costs of labour are reduced by milking only the more productive cows and by taking few measures before and during milking. The amount of cows milked depends on the amount of labour that is available at that moment. When other activities need to be carried out on the farm, they are given priority. Dairy farming is of little importance.
Few investments are made and consequently little changes occur in dairy production. The demand for facilities given by local institutions is relatively low. The supply of these facilities is nil. Demands on the quality of products is low. Therefore it is no suprise management of these farmers is not exactly advanced.
Some improvements are made by farmers who take pleasure in dairy farming or have faith in it. An example of these farmers is R the first Rio Jimenez farmer. He built a nice dairy. Personal

circumstances kept him from starting to sell milk to Borden.

Fluid milk production can be profitable. Many farmers have faith in this product. They continue investing to raise their production. There is no problem selling more milk, because Borden wants to buy more milk. Borden recently built a milk-powder factory, their capacity has increased. The transportation costs to San Jose are low, and a higher milk production means relatively lower costs of the collection centre in Guapiles. Milk production in the Atlantic Zone is maximal when production in other zones is minimal and it is minimal in the reverse. This leads to a more constant amount of milk received throughout the year.

Taking the plunge to start selling milk to Borden is an important alteration. It means more contact with and more dependence of institutions and other farmers.
There are insecurities. Milk prices are not high. Farmers have to be able to raise their production and to reduce the production costs to make a living. Improvements take time. The first years of dairy farming farmers have many costs, low production and little experience. The farms are vulnerable then, especially the small ones. On these farms there was less starting capital and there are less alternatives in management. These farmers have to intensify and specialize strongly.
Whether farmers succeed depends on the facilities given to support them. They need extension and sometimes they need credit. However the facilities given by MAG and IDA, such as credit and extension are restricted. Furthermore it depends on their motivation and their co-operation.
In the Neguev the farmers failed. They have to make cheese and therefore look for additional sources of income.
Still many farmers seem to succeed, even those who have little land (el Indio). They seem to be able to co-operate and to adapt to the new technologies.

11 CONCLUSIONS AND RECOMMENDATIONS

In the past two factors were important in dairy farming:
-The decreasing beef prices which is the reason why many farmers started to milk some of their cows. This process began five years ago.
-The improvement of the network of roads to San Jose, three years ago. This meant an important enlargement of the milk market which was first restricted to the farmers' neighbourhood.

Farmers who do not sell milk to Borden often make cheese. This is not very profitable. The farmers use few inputs, and do not invest to raise production. There are no important changes.

In spite of low fluid milk prices, many farmers think selling milk to Borden is profitable. The requirements to milk quality and a tendency to increase milk production and to reduce production costs leads to many changes in dairy management.

The plans farmers make concerning dairy farming and the implementation of these plans depend on:
-Profitability of fluid milk and competitive products.
The milk prices are set by the government. Their policy influences consumption and production, according to dairy farmers organisations in a negative way.
Milking requires much labour, especially on Sundays, holidays and busy periods this can be a problem. Initial costs are high because much capital is required.
-Personal differences.
Farmers have their own preferences. There are differences in accepting the risks of introducing a new product like milk, with problems in upholding its quality. Some farmers are old and do not have a successor.
-Availability of land, labour and capital.
The distribution of these inputs influences the plans which are made. On small farms the use of land is intensified. On the large farms there is a tendency to maximize outputs per unit of labour. The amount of the inputs influences the time needed to realize the plans.
-Market.
Although the milk market in Costa Rica is saturated, Borden still stimulates farmers to raise their milk production to extend its milk powder production for export purposes.
-Physical infrastructure.
The improving networks of roads causes decreases in transport costs for both Borden and farmers. This is an incentive to increase milk production.
-Knowledge.
There are possibilities to reduce production costs by improving the management. A restriction is the shortage in knowledge of both farmers and extensionists. Little research has been done within the zone. The supply of extension is very limited.
-Financiation.
To start up milk production many farmers need credit. Poor farmers and farmers without a title on their land have problems

obtaining credit. IDA postponed the credit supply.
-Organisation.
By organising, farmers can reduce costs of cooling and transport and they have more access to facilities given by institutions.

Institutions working in the Atlantic Zone can contribute to stable development in dairy farming by means of:
-Assigning more means to and increase efficiency and effectivity of facilties such as research extension and credit. Collaboration amongst the institutions and the farmers organisations should be stimulated.
-Stimulating co-operation amongst farmers.

Some topics for research are:
-Problems and possibilities of farmers organisations and co-operations.
-Use of waste products of agriculture: localization, costs, quantity and quality.
-Evaluate legumes, grasses and fodder crops and the role of management towards: productivity, composition, costs, workability, effect on and influence of soil fertility and soil structure, and possibilities of growing them within cropping systems. Special attention should be given to the ccc possibilities on poor acid soils.

12 LIST OF KEY INFORMANTS AND LITERATURE

KEY INFORMANTS:

Viria Araya	MAG extension service, Guapiles
Rodrigo Fajardo	MAG veterinarian, Guapiles
Carlos Gonzales	Camara de Ganaderos de la zona Atlantica, Guapiles
Ricardo Pereira	Borden (Lactaria Costaricense), Guapiles
Franco Romero	CATIE, produccion animal, silvopastoril, Turrialba

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1 CHECKLIST

annex 1

ENVIRONMENT
- climate
- land use and soil fertility
- physical and institutional infrastructure
- farmers organisations
- history
- problems/solutions

FARM
- size, land use and soil fertility
- capital goods
- labour
- problems/solutions

FARMER
- family composition
- age, origen, parents activities
- education/experience
- how the farm was obtained
- labour division and decision making
- contribution in organisations
- use of institutional facilities
- off farm work
- problem/solutions

DEVELOPMENTS ON THE FARM (of former issues)
- important changes
- reasons
- plans/perspectives
- problems/solutions

MANAGEMENT
Health
- diseases/diagnosis
- prevention
- curing
- importance/costs

Groups and Nutrition
- which animals obtain what
- supplementation
- pastures
- problems/solutions

Breeding
- breeds used
- selection criteria/cows culled/calves kept
- use of bulls
- registration
- problems/solutions

Milking and Milk Production
- times a day
- precautions taken
- nutrition
- checking health

- way of milking
- number of animals/time needed
- labour division
- registration
- processing
- marketing
- problems/solutions

Milk Production
- total production
- number of cows milked
- lactation; stadia and persistence
- fertility
- registration
- problems/solutions

Crops and Grassland
- species
- sowing
- harvest/grazing
- parts/rotation
- live fences
- fertilizers, herbicids, insecticides, fungicides
- production
- marketing
- problems solutions

2 ABBREVIATIONS, CROPS, GRASSES AND LEGUMES

ABBREVIATIONS:

ASBANA	Asociacion de Bananeros Nacional
BID	Banco Internacional de Desarollo (Int Development Bank)
CATIE	Centro Agronomico Tropical de Investigacion y Ensenanza
CNP	Consejo Nacional de Produccion
IDA	Instituto de Desarollo Agricola
MAG	Ministerio de Agricultura y Ganaderia
UAW	Agricultural University of Wageningen

CROPS:

Banano	Musa spp.	Banana
Platano	Musa paradisica	Plantain
Cacao	Theobroma cacao	Cocoa
Coco	Cocos nucifera	Coco nut
Pejibaye	Bactris gasipaes	Pejibaye
Guanabana	Annona muricata	Soursop
Maracuya	Passiflora edulis	Passion fruit
Chile	Capsicum sp.	Chilli
Mais	Zea mays	Maize
Arroz	Oryza sativa	Rice
Frijoles	Phaseolus vulgaris	Beans
Yuca	Manihot esculenta	Cassava
Malanga/Chamol	Colocasia esculenta Xanthosoma saggitifolium	

GRASSES:

Aleman	Echinochloa polystachya
Brachiaria	Brachiaria mutica ?
Brachiaria ruzi	Brachiaria ruziziensis
Estrella Africana	Cynodon nlemfuensis C. plectostachyus
Jaragua	Hyparrhenia rufa
King grass	Pennisetum sp.
Ratana	Ischaemum ciliare I. indicum
San Juan	Setaria sphacelata

LEGUMES:

Kudzu tropical	Pueraria phaseoloides
Poro	Erythrina sp.
Madero negro	Gliricidia sepium

3 FLUID MILK PRICES annex 3

ADJUSTMENTS TO INFLATION

Date	Price		
	bottle*		litre
2- 4-1975	C 1.45	(1)	
14- 9-1978	1.67	(1)	
27- 2-1980	2.17	(1)	
23-12-1980	2.48	(1)	
13- 4-1981	2.91	(1)	4.34
21- 9-1981	3.60	(1)	5.37
12- 3-1982	4.98	(2)	7.43
20- 8-1982	7.24	(2)	10.82
8-11-1982	7.55	(2)	11.27
4- 7-1984	7.95	(2)	11.87
5- 7-1986	8.90	(2)	13.28
1- 4-1987	10.77	(2)	16.08

(1) milk with 4 % of fat
(2) milk with 3 % of fat
* Bottle = 67 cl.

PRICES OF BORDEN (LACTARIA COSTARRICENSE, S.A.)
5-7-1986 - 1-4-1987

next page

LACTARIA COSTARRICENSE, S.A.

TABLA DE PRECIO

GRASA %	PRECIO ACTUAL	PREMIO AL FRIO
2.5	11.74	11.99
2.6	11.97	12.22
2.7	12.19	12.44
2.8	12.42	12.67
2.9	12.64	12.89
3.0	12.87	13.12
3.1	12.89	13.14
3.2	12.91	13.16
3.3	12.93	13.18
3.4	12.95	13.20
3.5	12.97	13.22
3.6	13.04	13.29
3.7	13.13	13.88
3.8	13.22	13.97
3.9	13.30	14.05
4.0	13.44	14.19
4.1	13.53	14.28
4.2	13.61	14.36
4.3	13.70	14.45
4.4	13.78	14.53
4.5	13.92	14.67
4.6	14.00	14.75
4.7	14.09	14.84
4.8	14.18	14.93
4.9	14.27	15.02
5.0	14.35	15.10
5.1	14.44	15.19
5.2	14.53	15.28
5.3	14.61	15.36
5.4	14.70	15.45
5.5	14.78	15.53
5.6	14.86	15.61

NOTAS :

1 - A partir de 3.7 se incluye el Premio de Calidad y de Grasa de ¢ 0.50 por Kg. En Calidad Excelente

2 - Los precios de la Tabla son en Calidad EXCELENTE. En A, tienen una deducción del 2 %, en B, 6 %, y en C, 12 %, partiendo del precio en Calidad Excelente.

3 - Premio al Frío rige a partir del 1.ero de Enero de 1986.