ATLANTIC ZONE PROGRAMME

Field reports No. 3

EXPLORATORY SURVEY IN THE ATLANTIC ZONE OF COSTA RICA

Animal production

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CENTRO AGRONOMICO TROPICAL DE
INVESTIGACION Y ENSEÑANZA - CATIE

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1. PREFACE

This report is the contribution of the Department of Tropical Animal Husbandry to the Exploratory Survey carried out by the Wageningen Agricultural University in the Atlantic Zone of Costa Rica.

The author is post-graduate (BSc.) student of the Department of Tropical Animal Husbandry of this University.

The report was written in cooperation with Dr. Ir. G. Zemmelink of the same Department. It is the result of observations and information collected during the Exploratoy Survery supplemented by literature studies.

The research fullfilled during the Exploratory Survey will be part of the author's studies at the Department of Tropical Animal Production.

I gratefully acknowledge the cooperation and advice of all members of the exploratory survey team especially Dr. Ir. G. Zemmelink, and the key informants listed in Annex 4.

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CHAPTER 3. SUMMARY.

The (MAG-CATIE-)WAU Exploratory Survey consisted of studies on literature, visits on institutions and to representatives of institutions and the field survey having reference to the Atlantic Zone in Costa Rica.

In the Atlantic Zone the area of pastures increased from 71.000 ha. to 233.000 ha. in the period 1973-1982. In the same time the herd of cattle increased from 80.000 to 265.000 head with an average increase of 14 % per year. These enormous increases are of great influence on the development of the Atlantic Zone.

An evident relationship between animal husbandry and deforestation exists.

The new road of San-José-Guápiles and the activities of Lactaria Costarricense will be of strong influence to livestock production.

Institutions like CATIE, the extension services, and participants in the marketing of beef and milk are functioning with the agricultural production process.

Dairy farms, cow-calf operations and fattening of cattle, producing for the (inter)national market or not, as pig-holdings are existing livestock production farm types in the Atlantic Zone.

Livestock production farming and its economical aspects, social connections with the influence of banana-estates, deforestation and changes of soils under influence of animal production are making multidisciplinary research feasible.

The choice of the surroundings of Guápiles and Guácimo, Northward, and the Sixaola area creates the possibility to study about issues like farm management, marketing and extension about animal deseases and forage-supply under wet low-land conditions for animal production.

CAPITULO 3. RESUMEN.

El (MAG-CATIE-)WAU Diagnóstico Exploratorio fue compuesto por estudios de la literatura, visitas a instituciones y sus representantes y el diagnóstico al campo en cuanto a la Zona Atlántica en Costa Rica. La área de pastos aumentaba de 71.000 ha. hasta 233.000 ha. durante el período de 1973-1982. Al mismo tiempo la cantidad del ganado aumentaba de 80.000-265.000 cabezas, con el promedio de incremento de 14 % por año. Estos incrementos enormes son de grande influencia en el desarrollo de la Zona Atlántica.

Existe una relación clara entre producción animal y deforestación. La nueva carretera San José- Guápiles y las actividades de Lactaria Costarricense van ser de grande influencia en la ganadería del futuro.

Instituciónes como el CATIE, la extensión, los participantes en el mercadeo de la carne y leche cooperan con los campesinos en el proceso de producción agraria.

Fincas con ganado de leche, fincas de crianza y engorde del ganado vacuno, produciendo para el mercado (inter)nacional o para el autoconsumo, tantos como chancherías, existen como sistemas de producción pecuaria en la Zona Atlántica.

La explotación de una finca ganadera y la economía de la finca, las conecciones sociales y la influencia de las fincas bananeras, deforestación y los cambios de suelos influída por la ganadería, crean la possibilidad de investigaciones multidisciplinarias.

La elección de los alrededores de Guápiles y Guácimo, al Norte, y la área de Sixaola, crea la possibilidad para'Producción Animal' estudiar temas como explotar fincas, el mercadeo, extensión sobre enfermedades y producción de forrajes en la zona húmeda baja para la producción animal.

HOOFDSTUK 3 SAMENVATTING

De (MAG-CATIE-)WAU Exploratory Survey bestond uit literatuurstudie, visites aan instituties en diens vertegenwoordigers, en de veld-survey met betrekking tot de Atlantische Zone in Costa Rica.
In de Atlantische Zone nam het areaal van graslanden toe van 71.000 ha tot 233.000 in de periode van 1973-1982. Tegelijkertijd nam de veestapel toe van 80.000 runderen tot 265.000, met een gemiddelde stijging van 14% per jaar. Deze enorme stijgingen zijn van grote invloed op de ontwikkeling van de Atlantische Zone.
Er is een duidelijke relatie van veeteelt met ontbossing.
De nieuwe weg San José-Guápiles en de activiteiten van Lactaria Costarricense zullen de veeteelt in de toekomst beïnvloeden.
Instituten zoals het CATIE, de voorlichting, en deelnemers aan marketing van melk en vlees werken met de boeren in het agrarisch produktieproces.
Melkveebedrijven, opfokbedrijven en mesterijen van rundvee, al dan niet voor de (inter)nationale markt producerend, naast varkens-houderij zijn als veeteelt bedrijfssystemen aanwezig in de Atlantische Zone.
Veeteelt bedrijfsvoering en economische aspecten ervan, sociale verbanden met de invloed van bananenplantages, ontbossing en veranderingen in de bodem onder invloed van veeteelt maken multi-disciplinair onderzoek mogelijk.
De keuze van de omgeving Guápiles en Guácimo, noordwaarts, en het Sixaola gebied geeft voor veeteelt de mogelijkheid onderwerpen als bedrijfsvoering, marketing en voorlichting over dierziekten en de voervoorziening in het natte laagland voor dierlijke produktie te bestuderen.

CHAPTER 4. INTRODUCTION.

4.1 History of the program.

In march, 1984, the Agricultural University of Wageningen (WAU) established contact with the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE) in Turrialba, Costa Rica. This contact intended a cooperation on multidisciplinary research on rational use and protection of the natural resources of Costa Rica.
In april, 1985, CATIE and WAU proposed to develop a diagnostical study on the Atlantic Zone, starting with a sondeo-like survey, followed by base-line studies in selected sample areas. Based on these studies further multidisciplinary research will be formulated on themes of agricultural and livestock production, supported by soil-science, forestry and socio-economics.
In april 1986 agreements between CATIE, the Costa Rican Ministry of Agriculture and Animal Production, and WAU were signed.
The Atlantic Zone is defined as the (planning region) Huetar Atlántica plus the Puerto Viejo district, and the Turrialba canton.
The Exploratory Survey took place from april-july 1986, the base-line studies will start in september 1986.

4.2 Short history of the Atlantic Zone.

In the beginning of the colonial period of Costa Rica the Atlantic Zone was considered of low importance because of geographical isolation and lack of natural resources. The state of independence of Costa Rica was reached in 1821. From that time onwards Costa Rica started to grow coffee in the Central Valley. Because of the need for a harbour on the East Coast for the export of coffee to Europe, a railroad from San José to Puerto Limón was constructed. Negroes, originating from the Caraibean and indians lived in the

Atlantic Zone to cultivate cocoa and work on the new banana plantations at the end of the nineteenth century. These people were however not permitted to enter the Central Valley.

In 1882 the train could reach Guápiles from Limón but further construction was stopped because of bad soil conditions. The construction to Carthago was continued to begin with banana plantations.(1884) Negroes and South-East Asians worked on the railroad construction. (CATIE 1986, Hall, C 1980)

The every 10-20 years shifting banana plantations moved between Guápiles and Limón, constantly searching for better soil-conditions. In 1913 firstly the Sigatoka (Mycosphaerella musicola) and later the Panama-desease (Fusarium oxysporum) attacked the bananas. (Hall, C.1980) In 1926 the United Fruit Company had only 25% of its original banana area in production and in 1938 it abandoned the Atlantic Coast to go to the Pacific Coast. From that period the Costa Rican government started to legalize land invadors, called 'precaristas'. In 1956 the Standard Fruit Company started South of Puerto Limón using a more resistant banana variety 'Giant Cavendish'. The great importance of crop-diseases for the Atlantic Zone was shown once again about eight years ago when a fungus (Monilia roreri) invaded the cocoa plantations, reducing the yield to a fraction of what it used to be. (MIDEPLAN 1984)

In 1974 a new road was opened between San José and Limón that brought in a new invasion of immigrants. A shorter and much quicker road between San José and Guápiles is expected to be completed next year. It may be assumed that this road will again lead to a strong impuls to the area.

CHAPTER 5. OBJECTIVES OF THE EXPLORATORY SURVEY.

5.1. General objectives for all disciplines.

The exploratory survey should identify and map the most important physiographic land units, farming systems and institutional activities in the area. Based on such maps and discriptions, the sample areas for the base-line survey will be selected, after composing criteria and collecting sufficient information, as well as formulating topics which will need further in-depth study in and after the base-line survey.

5.2. Specific objectives for the animal husbandry discipline.

The objectives for the animal husbandry representative are as follows:

a) Describe the status of animal husbandry in the Atlantic Zone in quantity and quality to demonstrate the possible importance of the sector.

b) Describe the most important farming types with emphasis on the animal production aspects.

c) Develop criteria for the choice of sample areas to be used in the base-line survey.

d) Choose based on the above, sample areas.

e) Define possible research topics and possibilities for inter-disciplinary research for the later stages of the program.

CHAPTER 6. METHODS AND WORK PROCESS OF THE EXPLORATORY SURVEY.

6.1. General methods.

Several disciplines participated in the exploratory survey. Soil science, forestry, agronomy, animal husbandry, sociology and development economics are the most important ones.
Preparations in Holland included: bibliographical filing, interpretation of areal photographs and preliminary discussions for the development of a checklist for the work in Costa Rica.
Activities in Costa Rica included: visiting institutions in San José, Turrialba and the Atlantic Zone, meetings with key-informants, literature studies, multidisciplinary field-work during two weeks by interviewing farmers and people with agricultural interests, by sondeo method, evaluation of data in a work-shop, and presentation of the results to representatives of important agricultural institutions.
The multidisciplinary sondeo-type field-work stimulated the interaction between the different disciplines and formed the basis of possible collaboration in the future research. In the field, the discipline represantatives rotated between two or three teams every day. Some interviews on farms with cattle were carried out by teams in which Animal Production was not represented. Similarly the Animal Production representative collected information about crops, forest etc.
For the checklist see annex Nr. 16.5 and for detailed results of the interview annex Nr. 16.6.

6.2. The composition of criteria for the choice of sample areas.

Information collected by individual teammembers was summarized in so-called A-4 papers. In the papers the major findings and

conclusions per discipline were given for plenairy discussions on June 16-18. See annex Nr.16.7 .
The combined results of all disciplines were summarized in a short paper for discussion with representatives of various Costa Rican institutions on June 20, at CATIE, Turrialba.
Items for the composition of criteria for the choice of sample areas were representativeness, variation in farm-types, on-going change, and possibilities for interdisciplinary work.
For Animal Production this meant : a progress or decline in quality and quantity of animal production, interrelationships with crop-cultivation, geological and socio-economical aspects, and importance of animal production in the farm-types.
Other disciplines added the criterium of distinguishness of local administration units. A maximum of 1500-2000 km^2 was mentioned to be possible to map in a soil-type description. For farming system research no farmer population data and so no area size maxima were available.
The criteria formulated and the choosen sample areas are discussed in chapter 12.

6.3. Constraints in the survey research.

1) Preparations, field research and multidisciplinary reporting had to be done in very short time periods.
2) The planning- and organisation structure and difference in experience and background of the teammembers diminished the development of balanced multi-disciplinary teamwork.
3) Necessary means were not always available at the required time.

See chapter 12 for final procedure.

CHAPTER 7. ANIMAL HUSBANDRY IN COSTA RICA AND THE ATLANTIC ZONE.

7.1 The importance of the sector of Animal Husbandry.

The most important Costa Rican agricultural products are coffee, bananas and beef. Other important products are cocoa, sugarcane, maize, beans, rice, fruits and milk. See tables 7.1.1-7.1.3. Production volume, export values as well as land-use data indicate that cattle farming, especially beef-cattle farming, is the third agricultural activity after the perennial crops coffee and banana. (Exception is the magnitude of the area of sugarcane.)
To compare the importance of crops and livestock in the Atlantic Zone it has to be taken into account that less or no sugarcane, and almostly no coffee is cultivated in this area. On relative basis, cocoa, maize and rice are more important in the Atlantic Zone. The importance of livestock production in terms of pasture area is shown in table 7.1.1. The area of pasture in the Atlantic Zone increased from 71290 ha. in 1973 to 232.928 ha. in 1982. See table 7.1.4. In the same period the number of cattle increased from slightly more than 80.000 to 265.300. This represents an increase of 14.2% per year. $((3.312)^{1/9})$ It implies immigration of cattle from other areas, because such increment in herd number cannot be obtained by natural growth. In calculations for projection of increase in cattle numbers between 1980 and 1985 with low and high levels of extraction, SEPSA estimated growth data for the total Costa Rican herd of 7.1% or 2.3% respectively. (SEPSA 1980, p. 30) The actual value for the period 1973-1982 was 3.3%. Even with low extraction rates one cannot reach the 14.2% mentioned in table 7.1.5. for natural growth of the herd in the Atlantic Zone. Data, regarding to herd composition are shown in table 7.1.6. In the region of Huetar Atlántica the ratio females to males is much higher than in other areas. This could be explained by impor-

tation of females from other areas to the Atlantic or transfer of males at a younger age from the Atlantic Zone for fattening elsewhere. Field observations suggested an emphasis on cow-calf operations in the Atlantic Zone in comparision with fattening. Farmers confirmed that regularly young cattle are transported to Alajuela for fattening.

The social importance of animal husbandry is evident, especially in the Northern part of the Atlantic Zone. Untill about 1980, the government stimulated the sector actively. In Costa Rica cattle ranching is a symbol of social rank, like that which followed the coffee owners in the time of glory of this product. (Thrupp L.A. 1980) Even now cocoa-fields, which were recently cleared because of Monilia fungus, are converted into pastures. Deforested land is quickly occupied with cattle, sometimes after growing some maize.

The relative small importance of the poultry sector is demonstrated in table 7.1.7. Big poultry farms only exist in the Central Valley. (Murillo, M.R. 1981 p.7) See also table 7.1.8. Nevertheless many farmers in the Atlantic Zone, especially the smaller-ones, have some poultry for autoconsumption.

The same study (IDA 1982) shows that pigs are kept on about half of the farms in the regions where banana-companies are strongly present and less in other regions. It is suggested that pigs are not kept for commercial reasons, but for autoconsumption. (IDA 1982 p.18) Many of them are fed on bananas.

In 1980, Costa Rica became autosufficient on pig products for internal consumption. Because of highly priced cereals intensive growing of pigs isn't very economical. Even prices of agro-industrial by-products increased very strongly after liberation of price-setting in 1981. (Peña, M 1985 p.2) In the Northern part of the Atlantic Zone some specialized pig growing farms exist, but just a few. (CNP Guápiles, personal communication)

7.2 The role of cattle farming in deforestation.

As mentioned in paragraph 7.1 there is evidence that the area of pastures in the Atlantic Zone grows very rapidly as well as the number of cattle. At the same time, forests are disappearing rapidly too. The two processes ars indeed closely related. Areas under arable cultivation didn't increase that much. These changes are older than the last decennium. Table 7.2.1. shows clearly the conversion of forest into grasslands. It is more difficult to say why this trend occurs. G.Hartshorn et al. (1982) suggested that cattle production created demand for land elsewhere, thereby increasing also the demand for forest land to be cleared. By farmers large extensions of Costa Rica are considered to be unfavorable for agriculture, but are considered more appropriate for cattle-raising. (See also answers of farmers in the interviews, annex nr. 16.6) Under the actual conditions and methods of production and with the increased pressure on the land due to demographic growth and other forces, crop cultivation is not often seen as a stable, optimal land-use activity. Even under Tropical circumstances with high rainfall and sun radiation, pasture can be seen as some kind of fallow. On the long run forest converts into annual crops and then into pasture or bananas. The bananas will finally be abandoned and become forest- or pastureland again. Those pasture areas remain pastures when the land is not very suitable for crop cultivation. This situation could be constant if not with growing parcellation, more and more grasslands will be converted into crops. The crops sometimes will be exchanged by the fallow of pasture. (See settlements of IDA like Neguev, El Indio; and old banana areas like those in Rio Jiménez and Maryland (near Carmen)).

There are considerable problems with soil degradation and low productivity in agriculture in whole Costa Rica. These problems

arise as a consequence of increasing intensity, over utilization, absence of soil conservation measures, insufficient land area and factors which may be outside of the control of the farmers themselves. (Thrupp L.A. 1980 p.41) The speed and intensity of replacement of annual crops by pastures (after deforestation or banana cultivation) reflects regional differences in the physical factors of production. Farmers usually don't use much fertilizers on their maize-lands. While the more extensive agricultural exploitations, and those which have more capital, grow pastures immediately after deforestation or after a short transitory period of crops, for the small farmers, pastures usually take a predominant place very slowly. The small farmer most often grows crops untill near exhaustion, or untill a point when he has to start using fertilizers. Then, minimum farm size to ensure subsistence for a family with only cattle, would be approximately: for milk production at least 10 hectares, and for beef-cattle at least 60 ha, depending on environmental conditions. (Spielmann 1972: in Thrupp L.A. 1980) The milk producing farms usually situated in more accessible regions and having smaller sized exploitations, are normally more intensive. In recently developing regions like Guápiles soil-scientists will have to follow the probable soil condition-changes.(Thrupp L.A. 1980 p.142-146)

Cattle farmers tend to enlarge their pasture area rather than to improve their management. (R.Molina pers. com. ++) Some soils cannot carry many animals for long times. (Carillo pers. com.) See also chapter 10. Five to six years ago pasture lands were much better in the Atlantic Zone than now. (F. Romero pers. com.) There is an increase in the amount of so-called improved pastures. (R. Pereira pers.com.) A large part of this areas is however Ratana

++ for the list of interviewed persons see annex nr.16.4

pasture.(Ischaenum ciliare) See table 7.2.2. In the statistical data Ratana is included under improved pasture but according to specialists it is a very poor pasture, with low production and supplying little more than maintenance requirements for the animals. The most important improved grass is Estrella Africana (Cynodon nlemfluensis)(A. Vargas pers. com.) Grasses like Estrella Africana require management. Without management of the improved pastures there even will be the danger of development of pastures in a negative way. (M. Gomez pers. com.) Extension of pastures on poor soils also could mean a relative decline of pasture quality in an area. What becomes of recently deforested land with pastures depends on soil-conditions, grasslandtype and management. Knowledge of farmers, loggers and big land-owners and the sequence of land-use systems prepare the future of natural resources.

7.3 Economical problems of the sector of animal production in Costa Rica and the Atlantic Zone.

In 1981 Costa Rican exports of beef started to diminish because of Australian quality competition that got stronger. This was because of the total pressure on the international beef market, after cut backs in milk production and large scale slaughter of dairy cows in the EEC and USA. Beef price setting and quality control is done by the government. Prices of beef depend on the international market and are not calculated on costs of production. In Costa Rica itself meat is too expensive in comparision with income levels, so the internal market is limited (C. Jiménez pers. com.).See also table 7.3.1. Presently beef prices on the international market are not very attractive and don't stimulate exports. (Morales Matamores E. et al. 1985) Some recover may be possible, five or ten years from now, but it depends on slaughter of dairy cattle on other continents, according to Mr. M Leiva

(pers. com.) In the USA, main client for beef from Costa Rica, there has been a strong anti-campaign against beef consumption. (R. Pereira pers. com.) Huge beef cattle farms like 'La Cabaña' of 1400 ha.,disappeared because of high costs and low revenues. (R. Molina pers. com.) In the Atlantic Zone, the quantity of farmers that choose meat or milk as their main production purpose could be equal now, but socio-economically milk would become more important.(A. Amador pers. com.) Milk production is more attractive for a small farmer because of regular income. (M. Leiva pers. com.) See also paragraph 7.1.

On the other hand the government stopped milk production promotion in the Atlantic Zone because of national over-production. The most difficult year was 1982-1983 because of a milk donation from the USA to school alimentation programs. Another disencouraging factor is that the government does not follow the inflation by increasing milk prices. Decreasing production costs is becoming more and more important. Increasing prices of land in the Central Valley may stimulate milk production in lower regions, unless the high temperatures and rains would be less suitable. In the lowlands however farmers can produce milk without fertilizers and concentrates, just on well growing forages. (A. Amador, C.Jiménez, W. Rojas pers. com.)

Production data per region are difficult to obtain but table 7.3.2. gives a comparison of relative values of dairy activities in 1973 and 1982, to have an idea of growth of importance of the dairy sector in the Atlantic Zone. Production data of a new census done in 1983 are not available.

Since the arrival of Borden in Costa Rica, the milk production for the market in the Guápiles Zone increased strongly. According to Mr. M. Gomez from the C.A.R in Siquirres the cattle farmers are poorly organized and do not present their problems to the

governmental extension services. Therefore Borden set up its own extension service because the cattle-farmers think the extension isn't doing anything (R. Pereira pers. com.) Their Federación de Cámeras de Ganaderos brought Borden (Lactaria Costarricense) into Costa Rica, in search for competition against the almost monopoly of Dos Pinos(the biggest milkcollection cooperation), small cooperations couldn't manage. Dos Pinos and Borden together got a probable collection of 800.000 bottles/day. (C.Jiménez pers. com.) Dos Pinos cannot receive more now, so small farmers try to sell to Borden. In addition much milk sold to small middleman or directly to the consumer. (M. Leiva, pers. com.) Therefore total production figures of milk are hard to obtain.

It would be important to lower the consumption price of milk so that more people are able to buy and the market can be expanded. For a poor family, even a small amount of milk represents high spending. The family budget for alimentation has got a high expenditure on milk but in terms of volume the Costa Rican milk consumption/head is low. Costs of transport can become lower when the new road Guàpiles-San José will be finished and that may stimulate dairy farming near Guápiles. Remaining limiting factors for (dairy) cattle farming are high costs of labour,-fertilizers,-medicines, and especially concentrates. High priced maize sets the price of other important cereals, and concentrates are of irregular quality. (C.Jiménez, W.Rojas and R. Pereira pers. com.) In general terms, according to Mr. M. Gomez, the most important problems are title on land, credit, marketing, deseases and parasites, and land-use under high rainfall conditions. The farmers need better advice based on local research data.

TABLE 7.1.1. Land-use in Costa Rica and Huetar Atlántica.

	Region 'Huetar Atlántica'		Country	
	(km^2)	(%)	(km^2)	(%)
Annual crops	190.0	1.9	2.713.9	5.3
Perennial crops	782.8	7.7	3.522.6	6.9
Pastures	2.329.3	23.2	21.669.1	42.4
Moorland	-	-	1.330.0	2.6
Bushes	1.154.1	11.5	4.006.1	7.8
Forest	5.311.9	52.9	16.384.7	32.0
Others	278.6	2.8	1.518.6	3.0
Total	10.046.7	100.0	51.145.0	100.0

Source: SEPSA '82 in table 6.105 Annex 6 p.22 IDA-RUTA 1984.

TABLE 7.1.2. Export values of agricultural products 1950-1980 of Costa Rica in millions of current dollars.

	1950	1960	1980	Annual incremental rate (%)
Coffee	17.8	45.4	246.4	8.9%
Banana	31.5	20.3	201.2	6.1%
Cocoa	2.0	5.9	4.2	2.4%
Sugar	-	1.8	2.1	16.0%
Beef	-	4.7	70.4	13.9%
Wood	0.2	0.1	(?)	(?)
Others	2.3	7.8	80.4	12.2%
Total	53.8	85.8	643.2	10.1%

Source: 1950/1960 OFIPLAN,1980 Dirección General de Estadistica y Censos in Salas,U et al. 1983 p.74.

TABLE 7.1.3. Crude values of agricultural production in millions of colones of 1966 in Costa Rica.

	1950		1960		1980		1950-1980
	abs.	%	abs.	%	abs.	%	Annual incr.rate
Coffee	123	17.6	293	18.5	535	23.0	4.8
Banana	215	30.7	125	12.5	468	20.1	2.8
Cocoa	16	2.3	36	3.6	24	1.0	1.3
Sugarcane	33	4.7	43	4.3	107	4.6	3.9
Rice	27	3.8	59	5.9	96	4.1	4.2
Maize	32	4.6	20	2.0	31	1.3	0.9
Beans	13	1.8	19	1.9	16	0.7	0.7
Other crops	129	18.4	152	15.3	404	17.4	3.8
Beef	31	4.5	101	10.1	246	10.6	6.9
Milk	68	9.7	101	10.1	231	9.9	4.0
Pork	13	1.8	18	1.8	67	2.9	5.4
Wood	0	-	40	4.0	97	4.2	-
Total	699	100	996	100	2.322	100	4.0 (%)

Source: 1950 AID, Programma de Desarrollo Agropecuario 1971-1974, p.12 cifras deflatas, 1960BCCR, Cifras sobre Producción Agropecuaria 1950-1978, 1980, cifras preliminares del BCCR in Salas, U.et al. 1983 p.74.

TABLE 7.1.4. Comparision of data from the agricultural census in 1973 and the livestock-farmers inquiry of 1982 about pasture area and heads of cattle.

REGION	PASTURE (ha)			HEAD of cattle		
	Census'73	Inquiry'82	Change%	Census'73	Inquiry'82	Change%
Chorotega	693.830	731.420	5.4	748.457	792.100	5.8
%	44,46	33,75		44,19	34,80	
Central	406.770	563.011	38.4	459.156	525.600	14.5
%	26,06	25,98		27,11	23,10	
Brunca	184.300	279.948	51.9	164.630	278.700	69.3
%	11,81	12,92		9,71	12,20	
H.Norte	203.950	359.605	76.3	241.560	414.600	71.6
%	13,02	16,60		14,26	18,20	
H.Atlant.	71.290	232.928	226.7	80.109	265.300	231,2
%	4,60	10,75		4,73	11,70	
Total	1.560.640	2.166.910	38.8	1.693.912	2.276.300	

Source of Table 7.1.4.: Censo Agropecuario 1973. Ministerio de Economía, Indústria y Comercio, Dirección General de Estadística y Censos. SEPSA Depto. de Estudios Económicos y Estadistica, Cuadro 30 SEPSA 1982-Solera 1983 p.53 and MIDEPLAN 1984 p.56.

TABLE 7.1.5. Annual incremental rates of pasture area and head of cattle in the period of 1973-1982 in Costa Rica.

REGION	Pasture area	Head of cattle
Chorotega	0,6	0,6
Central	3,7	1,5
Brunca	4,8	6,0
H.Norte	6,5	6,2
H.Atlántica	14,0	14,2
Total	3,7	3,3

Source: Solera 1983 p.54 SEPSA 1982.

TABLE 7.1.6. Relative amounts of animals divided by sexe and production purpose in the different regions. (%)

REGION	Dairy cows	Dairy farms	Dual p.cows	Dual p. farms
Chorotega	5,6	0,7	32,6	15,7
Central	59,2	65,1	16,6	10,9
Brunca	7,7	12,5	6,1	11,9
H.Norte	21,2	11,7	26,2	36,2
H.Atlántica	6,3	10,0	18,5	25,3
Total	100	100	100	100

(in the country:)	% ♀	% ♂	ratio ♀/♂	(in regions)	% ♀	% ♂	ratio
Chorotega	30,9	42,9	0,72	(100%)	59,6	40,4	1,48
Central	25,4	18,3	1,38	(100%)	73,9	26,1	2,83
Brunca	11,9	13,0	0.92	(100%)	65,2	34,8	1,87
H.Norte	18,5	17,6	1,05	(100%)	68,4	31,6	2,16
H.Atlántica	13,3	8,2	1,62	(100%)	76,9	23,1	3,33
Total	100	100					

Source: After data from Solera 1983 p. 32 table 11 and MIDEPLAN 1984, table 9 all data from SEPSA 1982 .

TABLE 7.1.8. Total poultry population in 1979 in provinces.

Guanacaste	1.006.547	7 %
Alajuela	3.594.814	25 %
Heredia	4.313.777	30 %
San José	3.594.814	25 %
Carthago	467.325	3 %
Puntarenas	754.910	5 %
Limón	647.066	5 %

Source: Murillo, M.R. 1981 p.7 table 5

TABLE 7.1.9. Existence of livestock on different sized farms in the Atlantic Zone planning regions according to an inquiry done by IDA on 523 farms. (%)

Sector I is poultry , II is pigs, III is cattle.

REGION	Astua Pirie			Cariari			Central Area			South Coast		
(Total of farms in the inquiry)	75			89			251			108		
sector	I	II	III	I	II	III	I	II	III	I	II	III
Farm size (ha)												
SMALL (0-11,9)	85	44	52	89	78	67	74	35	29	54	32	16
MEDIUM (12-39,9)	83	59	79	93	57	90	87	55	70	71	33	36
BIG (40-199,9)	95	68	90	-	-	-	83	41	66	69	63	63

Source: IDA 1982, p. 17 and 19 table 3.1 and 3.5.

TABLE 7.1.7. Participation of poultry and egg production in Costa Rican livestock production (In millions of 1966 valued colones)

PRODUCT	1978	%	1979	%	1980	%	1981	%	1982	%
Beef	239,0	53	224,8	51	194,0	46	241,7	52	202,6	48
Pork	20,1	4	27,2	6	26,1	6	27,9	6	25,4	6
Poultry	10,1	2	10,1	2	8,8	2	7,7	2	6,9	2
Milk	139,1	31	140,7	32	141,7	34	142,7	31	146,3	35
Eggs	41,1	9	47,1	9	47,1	11	47,1	10	37,2	9
Total	448,4		443,4		417,7		467,3		418,5	

Source: Banco Central de Costa Rica, Cifras sobre producción agropecuaria 1973-1982 in Morales Matamoros, E et al. 1985 p. 174 table 31.

TABLE 7.2.1 Agricultural land (in thousands of ha.) for census years 1950, 1955, 1963 and 1973 in Costa Rica.

Census YEARS		Total	Annual crops	Perennial crops	Pasture land	Forest land	Other land
1950	ha	1.812.7	217.7	132.4	630.8	790.5	41.3
	%	100	12.0	7.3	34.8	43.6	2.3
1955	ha	1.852.0	281.6	155.4	722.7	676.8	15.5
	%	100	15.2	8.4	39.0	36.5	0.8
1963	ha	2.668.1	387.5	200.5	957.7	1.097.1	25.3
	%	100	14.5	7.5	35.9	41.1	1.0
1973	ha	3.122.5	283.3	207.2	1.558.1	1.000.1	73.8
	%	100	9.1	6.6	49.9	32.0	2.4

Source: G.Hartshorn et al. 1982 table IV-5 p.69.

TABLE 7.2.2. Distribution of pasture area on different farm sizes with most important species of grasses present in the Atlantic Zone in comparison with the Chorotega region by example.(1982)

	0-100 ha	(%)	101-500 ha	(%)	+500 ha	(%)	Total	(%)
Chorotega	143.169	19.57	339.222	46.38	249.029	34.05	731.420	100
	primary species		sec. spec.		third species			
	Jaragua 67.2		Natural 12.7		Estrella A.12.0			
Huetar Atl.	152.268	65.37	60.974	21.88	29.685	12.74	232.927	100
	primary species		sec. spec.		third species			
	Natural 47.6		Estrella 14.6		Ratana 14.5			
Costa Rica	692.243	31.95	928.842	42.87	545.584	25.18	2.166.669	100
	primary species		sec. spec.		third species			
	Jaragua 37.4		Natural 21.9		Estrella A. 13.7			

Source: Solera, A.1983 table 8 and 9 p. 28,29.

N.B. The most important grass species are summarized in annex nr.16.9

TABLE 7.3.1. Costa Rican beef production (thousands of kgs.)in current prices (colon/kg.)

YEAR	total production	internal -- consumption +	%	internal market price liveweight	internal m.price slaughtered ++	export ++	%
1974	62.058.6	28.549.0	46	4.37	8.49	54	
1975	71.662.2	34.727.0	48	3.78	8.22	52	
1976	74.465.9	32.646.0	44	3.84	8.15	56	
1977	82.623.9	43.286.7	52	4.44	9.34	48	
1978	91.533.7	45.825.5	50	5.26	10.31	50	
1979	91.035.8	48.244.6	53	7.14	13.81	47	
1980	78.751.8	45.858.0	58	8.53	-	42	
1981	97.145.7	51.477.0	53	11.18		47	
1982	72.562.4	43.299.0	60	26.14		40	
1983	66.547.5	48.201.0	72	35.31		28	

+ Intestines of all slaughtered animals included.
++ Carcase

Source: Morales Matamoros, 1985 table 84 and 86 p.332 and p.341. With data from SEPSA, CNP, IDA and Banco Central.

TABLE 7.3.2 Comparison of relative values of dairy activities in 1973 and 1982.

	1973 milk production (1000 kgs.)		1982 Nr. dairy + dual purp. farms		1982 Nr. dairy + dual p. heads of cattle (1000)	
Atlantic Z.	4.834.1	(2,2%)	2612	(17%)	57.2	(11.9%)
Costa Rica	215.940.6	(100%)	15799	(100%)	477.6	(100%)

Source: Censo Agropecuario 1973 in Morales Matamoros, 1985 table 27 p. 156 , Encuesta Ganadera Nacional 1982 SEPSA in Morales Matamoros, 1985, table 25 p.153., and SEPSA 1982 in MIDEPLAN, 1984, table 9 p.55.

CHAPTER 8. SOME IMPORTANT INSTITUTIONAL SERVICES IN THE ATLANTIC ZONE.

8.1 Government and research.

In the Atlantic Zone the government is represented at agricultural service by the Centro Agrícola Regional (CAR) in Siquirres and regional extension offices, the research station 'Los Diamantes' and various special programs, all services coming from the Ministry of Agriculture and Animal Production (MAG: Ministerio de Agricultura y Ganadería).

The CAR in Siquirres is divided into different sectors: fytosanity (sanidad vegetal), animal health (salud animal), extension (extensión), forestry (forestal) and fishery (pesqueria). So animal production is represented by veterinary services. Of the six regional extension offices Guápiles, Siquirres (with a veterinary lab.) and Cahuita have veterinarians on the staff. All offices have an agronomist plus specialist on the added disciplines and helpers. The extension workers very often stand with empty hands. They have to work with data from elsewhere, or from Costa Rica in general. What farmers want is not always available. (M. Gomez, pers. com.)

The MAG works with special programs on control of Brucellosis, and Tuberculosis, against the Panamafly, extension about ticks and mastitis. (M. Leiva pers. com.) Mastitis costs the country every year 5×10^9 ₡ (colones) according to Mr Leiva. On Artificial Insemination a program with German aid has been started. This program isn't functioning in the Atlantic Zone yet, because dairy-cattle nucleus herds used,and all the insemination services are very expensive. The project doesn't grow that fast.

Another special program is the Program of the 'Fomento Lechero', a dairy promotion program. Director is Luis Villegas. In Costa Rica there was an increase of 8% in the production last year. (M.

Leiva pers. com.) Now they stopped in some regions the production promotion, like in the Atlantic Zone and continue to work on marketing and consumption. (M. Carillo pers. com.)
In the Río Frío establishments of IDA (Instituto de Desarrollo Agrícola) with small farms of 10-12 ha., commercial dairy production is practised. The farms got more than 10 animals. (UCR, 1984) This was stimulated by the IDA-CATIE program,'Programa de Módulos Lecheros',and the Fomento Lechero program. The Fomento Lechero program established a collection and extension centre 'La Rambla' in collaboration with IDA.(O. Echandi, pers. com.) The milk-collection point started in 1983 with 425 kg, received 11.355 liters/day in july 1984 and now about 20.000 liters per day. This part of the Fomento Lechero Program has strong connections with Borden in Guápiles. (Valverde, M. 1984) (M. Carillo pers. com.) It proves that small farmers with dairy cattle need some help on the scale of their milk.
The University of Costa Rica is working in Río Frío on small farmers research in collaboration with the Canadian IDRC (International Development and Research Centre, O. Echandi pers. com.)
Other important activities of CATIE are those in the Silvopastoríl project, with the director Roland Borel. The work of Silvopastoríl has two phases: (1) basical experiments to choose strategies and (2) farm studies.
Ad 1. On CATIE in Turrialba the team worked out some experiments on leguminosae, in the first place with trees. Goats and sheep were grazed on Poró (Eritrina poeppigiana) and Soya (Glycine max.) and now they will start with calves too. The aim is to add proteïn and other nitrogen compounds to the ration in order to raise animal production levels and increase N-percentages in soils. Poró and Madera Negra (Glyricidia sepium) can be used as live-fences and as proteïn banks. Present research is on planting methods for trees

and herbaceous leguminosae. (from CIAT, Colombia) CATIE also searched for native leguminosae like Desmodium and Centrosema species. To check the adaptation of the plants there will be some trials in'Los Diamantes',Guápiles, perhaps also in Neguev, El Indio (Tica Ban),and Maryland is a possibility too.

On 'La Rosalía' (see short discription in chapter 9) Silvopastoril started an investigation with Brangus calves, fed on three levels of Poró, one zero group and one Poró ad lib. plus banana, after determining maximum rations. The project wants to interprete these data for dairy cattle.

In the next stage Silvopastoril intends to develop a recipy for practical circumstances. The basic forrage is Estrella Africana pasture which is used on many farms in the Atlantic Zone.

In the second phase, Silvopastoril intends to work on farms to analyse their original way of farming, during almost a year. After that some new technics will be introduced after which the farms remain under periodical analysis for production figures, pasture- and soil-changes,etc. The statistical set up is still a problem. Five zones will be choosen with five farms per zone. Shadow trees, soil compaction, reproduction and animal health are probable objects for study. Dutch students may cooperate in the grassland- or animal husbandry aspects. At 'Los Diamantes' the recovery of deteriorated Brachiaria pasture could be followed after introduction of better management. The experiments with farms will take place in Neguev, Cariari, El Indio and for several farm types in Guácimo. (A.Vargas pers. com.)(CATIE CIID, 1986)

8.2 Some institutions and organisations of the marketing field in the Atlantic Zone.

To offer cattle for sale, it is possible to go to the rural market places. But most merchants, and sometimes farmers too, go to 'Montecillos' near Alajuela, the most important market place for cattle. Normally the trade of beef-cattle happens to take place here with the supervision of the Consejo Nacional de Producción (CNP). The cooperative slaughterhouse 'Montecillos' is situated there too. (Morales Matamoros 1985) The government is controlling exports with quotas by activities of the CNP-'Comisión Asesora del Mercado de Carne'. The package of meat and quality control of the meat is done by the governmental 'Comisión Reguladora de la Carne' and MAG. Both commissions have got representatives of several marketing and production organisations like the Cameras Ganaderos and the Ministry of Economics.

Recently rural slaughter-houses are being established in all regions of Costa Rica for the internal market. (SEPSA 1980)

The marketing of milk depends largely on cooperations and small private -enterprises. The biggest milk-processing cooperation is Dos Pinos. This cooperation also delivers inputs like concentrates to its members. In the Atlantic Zone Borden (Lactaria Costarricense) is more active. A lot of farmers sell their milk to little middlemen, or cooperate with own transports to be able to deliver collectively to Borden or Dos Pinos. The list of prices in annex nr.16.11 explains what prices the farmers do receive for their raw milk. They are cut for quality, transport and cooling-costs.

Some farmers use crop-residues from other farms or enterprises like second quality maize, molasse('miel') and skimmed sugarcane-sweets with a lot of minerals in it from the'trapiches' (sugar-sweet factories) Near Cariari exists a banana destruction plant that mixes

chalk with the banana powder, to sell this product to concentrate-industries. The livestock farmers organisation of Costa Rica, the 'Federación de Cámeras de Ganaderos' has got a representant in the Atlantic Zone. (Camera de Ganaderos de la Zona Atlántica) The Cameras represent and support their members on technological and marketing field. (SEPSA 1980)

CHAPTER 9. FARM TYPES OF ANIMAL HUSBANDRY IN THE ATLANTIC ZONE.

9.1. Introduction.

With the ley system (fencing, grazing day and night, possible rotation schemes and separation of cattle groups) you can speak of advanced husbandry practices. In the Costa Rican lower areas aswell the upland more intensive dairy-farming systems, even arable forage production is practised. The highlands with sufficient rainfall offer especially favourable conditions for those ley-systems. (Ruthenberg, H.1983 p.110-120) A dairy farmer has to decide what calves he will rear.

On the other hand, a more extensive way of farming with grazing systems exists in the Atlantic Zone. Near the smallholdings and estates with tree-crops like cocoa and perennials like banana and platano ranching occurs.

The term ranching is generally used to refer to legally owned properties with well defined boundaries. In ranching the number of animals and workers, and the capital investment per ha. are low. The ranching systems are based on a regular herbage supply by maintaining the pastures in its most productive conditions. (Ruthenberg, H.1983 p. 345, 355) In between the systems mentioned above, in Costa Rica from cow-calf operations which supply young animals to fattening ranches, a dual purpose system is developed. Because of economical circumstances it became an important system. When the milk, besides the one that drinks the calf, is being sold outside the farm, but with farm management directed to rearing cattle for fattening you can speak of dual purpose farming. (Olman Díaz Sanchez, pers. com. SEPSA) The farmer can keep all his surplus bull calves and raise and sell them as bulls or steers. (Williamson G. et al. 1978 p.268 p.325) The following seven paragraphs interprete the survey information into farm types with the animal

husbandry component.

9.2. Dual purpose-cattle farming with on-farm consumption of milk.

In the Atlantic Zone the typical small dual purpose cattle farm is prevalent with consumption on farm, and normally some off-farm labour for extra income. Annual crops like maize or beans or perennial crops like cocoa or platano occupy two or three hectares per farm. The remainder is generally native or Ischaenum ciliare pasture. Because of poor soils, and low milk and meat production per farm, the farm isn't producing enough for selling products. As a result these farms cannot easily obtain credit. The cows produce 3-4 liters of milk/head/day. Some pigs or chicken, being hold near the house, supply for extra protein for the family.
(See farm-interview 2.3-9.2-10.0-13.0-16.2-19.0)

9.3. Dual purpose-cattle farming with sale of milk (derivates).

Small farms can find a way to sell by making cheese of their extra obtained milk besides the sale of young animals. Others find clients for fresh milk or cheese locally. The family has in this way a regular income that ables to increase the input level.
In case of making cheese there often also pigs are kept, fed on whey. Another reason for making cheese in dyal purpose systems, is the distance to a consumption market. Relatively big farms in remote areas can specialize more and invest more in improved pastures, minerals, salt and medicines when their scale is large enough. Breeds used are Brahman, Indo-Brasil, some Holstein-Fresian and Yearsy and criollo-mixtures.
(See farminterview 2.3-9.2-10.0-13.0-16.2-19.0)

9.4. Specialized dairy farming.

Especially in the region near Guápiles by influence of Borden, the Central Valley market, and the Fomento Lechero program, by example near Río Frío, specialized dairy farming occurs. A bit higher up the Turrialba or Talamanca slopes the colder climate favours dairy farming. With supplementation, use of fertilizers and high yielding forrages CATIE suggests production of milk with even four animals per hectare with annual production untill 10.000 kg/ha. in the Atlantic Zone. (CATIE 1974) Problems with heavy rainfall decreasing milk production of typical dairy-cattle are significant according to Aldo,T. et al.(1974). Nevertheless the typical dairy-farming with poorer rearing or sale of the calves is present in the Atlantic Zone. The breeds used are graded or even purebred Holstein-Fresian, Yersey and Brown Swiss. Regular income on these farms allow investments like improved pastures (by example Estrella Africana), growing of King grass (Pennisetum sp.), feeding molasses, the use of medicines and, typically, a milking stable with cement floors. In those cases milk production becomes 4-6 liters per animal, in the higher areas even more. Some farmers milk twice a day. The biggest farms are about 70 hectares.
(See farm-interview 3.0-4.0-5.1-11.0-14.2)

To give some examples of activities of dairy farmers delivering to Borden the following remarks:
The farm of Oscar Bonilla has a system of feeding native pasture and supplementing the forage ration with King grass (Pennisetum sp.) and Erythrina poeppigiana. His herd is almost purebred Yersey.
On the farm of Carlos Arroyo Garrita (phone 716164), behind the little airport, Brachiaria mutica and Pueraria phaseoloides (Kudzu) mixtures are used. After one and a half year the mixture still

seemed to be quite stable.
The biggest farm delivering to Borden is that of Juan Diego Ferraro. He has 140 head of cattle on 70 hectares. At milking, the cows are supplemented with bananas. A problem is how to keep stables clean and how to store the bananas.
Borden plans to establish another milk collection plant on the Colegio Agropecuario de Siquirres. Now they are testing an interesting yute (banana variety) Erythrina poeppigiana mixed ration for dairy cattle.
On the farm of Alberto Amador there is a tunnel milking parlour. Some other farms too are planning to install milking machines.
On the farm of Mr. Amador they had big problems with sub-infectious mastitis. Very proud was a negro farmer who was mentioned to be a very hygienic milker. He used sawmill dust on the stable floors.
All these farms are situated near Guápiles.

9.5. Fattening of cattle.

After rearing 'till 150 kg. lifeweight at eight months on cow-calf operation farms (see paragraph 9.6) or on farms where the fattening also takes place, the animals are fattened, untill they reach the weight of 500 kilograms at age of 1½ or 2 years old. This fattening is a more intensive system and seems to be more rare in the Atlantic Zone as compared to cow-calf operations. For fattening, the farm needs improved pastures on fertile, well drained soils. Because of costs/ha. you especially can find these farms in recently 'developing' regions, where the prices per hectare are still low enough. Cleaning the pastures from weeds by herbicides or long-knife is an important practice. The fattening farms can produce for beef-export. Normally they obtain young calves from neighbouring cow-calf operation farms.(After León,S.J.

et al. 1982)

(See farm-interviews 2.4-18.0)

A special example of breeding and fattening of cattle is the earlier mentioned farm of Dionicio Mora, 'La Rosalía'. The farm is about 1000 hectares, with 600 hectares forest and 400 hectares pasture. Improved pastures like Guinea (Panicum maximum) and Estrella Africana are irrigated by the Río Jiménez and Río Cristína. The breeding stock (Brangus (3/8 Brahman 5/8 Aberdeen Angus)) came from the USA. Some practises like spraying against 'mosca de tórsalo' (Dermatobia hominis) and ticks (Boophilus amblyomma), feeding bananas and the problems with 'Pierna negra' (carbuco sintomático), anaplasmosis and brucellosis, and ascaridae, fasciola and dictocaulus worms are representative for a lot of cattle-farms. (pers.com. on the farm)(Monge Navarro J.E.1976)

9.6. Rearing of cattle in cow-calf operations.

Cows to grow calves for beef production in so-called cow-calf operations are extensively kept, normally on medium size up to very large scale. With about 2 LU/ha. on farms of 20-350 ha or more, farmers rear their cattle living on the farm or in small towns outside the farm. Traditionally they don't like arable crops or they don't choose to cultivate because of bad status of soils. Care for animals is generally lower on the larger farms. Transport is less a limiting factor for fattening systems because of the smaller animal-size and weight. These farms can be far from good roads. (See farm-interviews 2.2-5.2-6.0-7.1-9.1-17.2)

9.7. Extremely extensive rearing of cattle.

Actually, this is not an animal production farm-type but an extremely extensive form of cow-calf operation with primary aim to demonstrate land occupation. After clearing forests and oftenly growing about three times maize without fertilizers on the better soils, big land-owners put some cattle on the land with or without fencing. The aim is to sell the best timberwood, prepare some land for seeding maize or for grazing cattle and wait for the increase of the price/ha for speculation. Forced by law and the danger of 'precarismo' the land-owners look for the cheapest way of land-use keeping soil surface free from forest. As a solution some cattle are put on the land with a laborer to look after them.
(See farm interview 8.0)

9.8. Pig-holdings.

Specialized pig-holding farms, taking advantage of the free obtainable bananas were mentioned as rare. (CNP Guápiles and M. Carillo pers.com.) However, near banana-estates many farmers use bananas for cattle and pigs. Large holdings exist in Río Frío, Colonia St. Raphaël, Colegios Agropecuarios of Guápiles and Guácimo,'Los Diamantes',Mercedes, Finca Rojas, La Unión and Asbana (with Tilápia). In small-farm holdings around Cariari pigs are normally fed on maize, whey, banana and tiquisque tubercule. (Gutiérrez, W. 1983)

9.9. Farm sizes and degrees of intensification.

IDA-settlement farms of 10 ha. and other small farms with less than about 12-15 ha. are not big enough as economically sound animal production units for commercial purposes, without strong intensification. This is especially mentioned for dairy-farming by Spielmann 1972 (Thrupp L.A. 1980) Farms of this size need off-farm labour or strong programmatic aid to develop intensive dairy farming like in Río Frío. See the calculations of table 9.9.1. Many ex-laborers from banana-estates or immigrants from other provinces own this size of farms. Normally the smaller the farm, the more intensive the system. (More output per unit of input). (See table 9.9.2.) But on the contrary, more improved pastures (Ischaenum ciliare included) can be found on bigger farms, with investments of high costs/ha. (Table 9.9.3.)
Table 9.9.4. indicates that from beef-cattle farming to dairy-farming there is a gradual decrease in size of the farm, with an increase of stocking rate. Data of stocking rates found by CATIE in 1973 (0,47-1,67 LU/ha.) are low. (CATIE 1977)
The difference in growth of pasture area and number of cattle in the period '73-'82 (see paragraph 7.1) also suggests an increase in stocking rate. The tendency of a decrease in farmsize and increased interest in dairy or dual purpose farming with higher stocking rates on smaller plots, doesn't mean a decrease in area of improved pastures. On the contrary, more and more (small)farmers start to sow improved pastures. (R.Pereira and others pers.com.)
Some of the big cattle farms near Guápiles are mentioned by Mr. Carillo (pers. com.). According to him and Mr. Molina there is a slight decline in the number of very big ranches in the Atlantic Zone. Some examples of the last big ranches are: 'San Elías' of Miguel Gazel; 'Los Molinos' of Carlos Gonzalez; 'La Rosalía'; the farm of Alberto Amador and the already sold 'La Cabaña'.

TABLE 9.9.1. Proportion of farms with at least one member of the family working off-farm. (%)

Farm-size	(ha)	Astua Pirie	Cariari	Central area	South Coast
SMALL	(0-11,9)	40.7	33.3	49.3	54.0
MEDIUM	(12-39,9)	17.2	26.2	44.2	47.6
BIG	(40-199,9)	21.1		24.1	12.5

Source: IDA 1982 table 6.7 p.57. (for numbers of farms see table 7.1.9.)

TABLE 9.9.2. Indicators of farm management on different farm sizes.

Farm size (ha.)	Stocking rate	Cow-calf relation	native pasture area / total pasture area
0-20	1.8	68.8%	71.7%
20-500	1.1	68.4%	52.7%
500-	0.9	59.9%	50.3%

Source: SEPSA 1980 (Grupo de trabajo) data from census 1973. table 17 p.53

TABLE 9.9.3. Comparision of improved pasture area to natural pasture area within different farm sizes. (% improved pasture)

Farm-size	(ha)	Astua Pirie	Cariari	Central Area	South Coast
SMALL	(0-11,9)	37,1	32,1	14,3	28,9
MEDIUM	(12-39,9)	67,5	43,2	28,1	1,5
BIG	(40-199,9)	77,2		43,7	30,3

Source: IDA 1982 tables 2.4 p.11 and A-4 p.62 (for numbers of farms see table 7.1.9.)

TABLE 9.9.4. Stocking rates and animal husbandry activities compared with other purposes in order to farm size.

Size of farm (ha)	STOCKING RATES (LU/ha) Astua Pirie	Cariari	Central Area	South Coast
SMALL (0-11,9)	0,78	4,04	1,86	4,62
MEDIUM (12-39,9)	1,39	2,05	1,30	1,73
BIG (40-199,9)	1,20		1,29	0,58

Principal activity (%) for whole Costa Rica :

Size of farm (ha)	CROPS	MEAT	DUAL P.	MILK	OTHER	TOTAL	OWN CATTLE
'SMALL' (0-100)	45,0	33,1	3,0	13,6	5,3	100	60,3
MEDIUM (100-500)	8,5	69,6	16,1	5,0	0,8	100	92,8
BIG (500-)	17,6	73,8	8,6	-	-	100	93,8

Average proportions of crop-land to pasture and stocking rates.

	POCOCI Guápiles	Cariari	GUACIMO Guácimo	Pocora
crop land / pasture	0,41	1,38	0,46	0,02
head of cattle / hectare	1,00	1,31	1,67	0,47
average farm size (in hectares)	56,56	33,16	22,51	100,27

Source in order of sequence: IDA 1982 table 3.3 p. 19 , Valverde M, 1983 table 10 p.31 , CATIE 1977 table 4 p.17.

9.10. Farm management factors.

Some data on management factors and results given is table 9.10.1 suggest well functioning production systems in comparison with the whole country, especially taking biological data into account. Data of Gutiérrez about dairy cattle in Cariari indicate a mean length of lactation of 212 days, a calving interval of 412 days, first calving at 43,8 months and 6,8% calf-mortality in the year '81-'82. But in general terms the production is low.
Some nutritional deficiencies like P are of possible influence.
The same data for small farms (less than 50 ha. and less than 25 animals) are presented in table 9.10.2. These data are divided by combinations of farm activities. (GDP = dual purpose cattle, CA = annual crops, CP = perennial crops) Interesting is the high birth rate in comparison with the data in table 9.10.1. In the same study a very low percentage of participation in cooperative organisation for regions in the Atlantic Zone was found, and also a low percentage farmers benefiting from extension.
The next table from the same study shows some economical data for small farms. (table 9.10.3) These data suggest a smaller return on capital and man-hours in the dual purpose farm-type without crops. In the report, the author mentions a higher return/ha. with crops than with animals. This explains the popularity of mixed farming on smaller farms.
A special remark must be made about animal deseases. Farmers complain about low-prices and deseases plus their costs. They are not concerned about low productivity, except for bad soils.
Tick-born deseases like anaplasmosis, pyroplasmosis, are mentioned, also in literature. Brucellosis, tubercolosis, mastitis, 'Pierna Negra' (a clostridium infection), torsalosis(Dermatobia hominis), Septicemia and'Carbón' (anthrax) are well-known problems for farmers. (Prado V.M. 1976)

TABLE 9.10.1 Indicators of farm management and production.

	REGION	
	Huetar Atlántica	Costa Rica
rate of birth	47,90%	48,63%
mortality rate of calves	7,1%	7,1%
cow/gift of semen (Nr.)	28,2	22,8%
cow/bull ratio	3,55%	4,38%
adult mortality rate		3,4%
age at first cover		24-35 months
intercalving period		18-20 months
weight at weaning		160 kgs.
age at slaughter of young bulls		36 months
liveweight at slaughter:		
-males		422,6 kgs.
-females		366,0 kgs.
-young bulls		100,0 kgs.
carcase dressing percentage:		
-males		55,4%
-females		51,0%
young bulls		49,0%

Source : SEPSA 1980 and SEPSA 1982 in IDA-RUTA 1984 Annex 6. p.23 table 6.109 and table 6.110.

TABLE 9.10.2. Indicators of farm management and production in Pococí and Guácimo, averages and standard deviations.

	PREDOMINANT SYSTEMS		
	GDP	GDP + CA	GDP + CA + CP
Stocking rate (LU/ha)	2.4 ± 1.7	2.1 ± 1.0	2.2 ± 0.7
Improved pastures (%)	18	31	2
Milk production			
(L/day/cow)	2.1 ± 1.5	2.8 ± 2.6	2.6 ± 1.5
(L/ha/day)	2.0 ± 2.6	1.3 ± 0.9	1.8 ± 0.7
Age at first calving			
(months)	33 ± 3	30 ± 5	31 ± 4
Birth rate (%)	69 ± 37	65 ± 33	79 ± 45
Rate of survival (%)	92 ± 24	90 ± 26	82 ± 33
Farmers that use crop-derivates (Nr.) (for animal feeding)	16	17	17

Source : Guillén Bustos, C.R. 1983 table 26 p.67

TABLE 9.10.3. Disposability of inputs and total production values of the predominant systems in Pococí, Guácimo. (average and coëfficient of variation.)

	PREDOMINANT SYSTEMS					
	GDP		GDP + CA		GDP + CA + CP	
Size of farm (ha)	13.6	93	20.2	73	12.9	79
labor time (months)	19.1	50	21.9	57	19.8	47
Capital ($US)	7350.6		6198.1		3810.0	
Instalations	1539.9	261	1637.5	256	575.0	53
Machines	749.7	243	52.4	94	208.6	290
Cattle	4992.7	103	4344.3	102	2905.9	75
Other animals	68.3	168	163.9	167	120.5	104
Total production value ($US)	787.3	74	1516.7	69	2105.4	44

Source : Guillén Bustos, C.R. 1983 table 23 p.62

CHAPTER 10. FARM TYPES WITHIN THE REGIONAL CONTEXT.

10.1 Description of physiographic systems in the Atlantic Zone.

(See also maps in annex 16.1-3)

To define the most important physiographic systems, geomorphical-, geological-,topographical-, and soil differences must be considered. The most important systems are the Talamanca terciary system (T), the Central Valley mainly quaternairy system (C), and the mixed volcanic terciary and quaternairy system (R) of tectonic depressions.

The most important problems of those soil types described above are as follows:

1) On the TH soils, soil-compaction and landslides can be expected. This is an important issue for grassland management. These problems can also be found on CFo.
2) Leaching of soil nutrients, especially under annual crops, and as a result a lack of micronutrients (CFo, RAo, RH, LH, CLo).
3) Retention of P. (CFo,OFy, CLi, CLo, CM, TH, and RH.)
4) Drainage problems (RAp, RAu, RB).

After deforestation and cropcultivation with a lot of pesticides, there will be a notable influence on soil flora and fauna, drainage and soil structure.

(For further details see Wielemaker, department of soil-science WAU)

In the descriptions of the cantons Siquirres, Guácimo and Pococí a lack of K, Cu and Zn in the forages is noticed. Iron could be excessive. (Guzman, M.J. 1979) Even so a lack of P is mentioned for Cariari by Gutiérrez (1983).

10.2 Animal Husbandry farm types within regional agricultural context.
(See also maps in annex 16.1-3)

Between Siquirres and Rio Amarillo (near Guápiles) mountainslopes and lowlands can be distinguished. On the mountainslopes with volcanic soils small farms with crops and dairy practises are found. The climate is favourable for dairy farming in comparison with lower areas untill the slopes become too steep, where more coffee is found. In the lowlands maize, cocoa, some 'caña india' are grown, but most land is in pasture with dairy-farming and even use of Yersey-breeds or Holstein Fresian, or the dual purpose cattle. The influence of Borden is recognizable. Nearer Cariari in the North bananas are found. This area is surrounded by secondary forest on past abandoned banana'fincas' and other plantations. Inbetween, the more extensive cow-calf operations express the value of land: low valued soils as a result of bad drainage, or past exploitation or just of poor value because of soil-type, all with the result of diminished possibility of crop cultivation. The better parts are used for maize, beans, coco, cocoa, taro and other crops. Especially the recently cleared forestland (by land-invadors, IDA-projects and others) is used for growing maize without fertilizer.

In the Río Frío banana (and bambu) district, a special small farm dairy production is developed.

Passing Horquetas to Puerto Viejo the influence of San Carlos can be recognized. Landownership by people from San Carlos and immigrants from San Carlos is clearly present. In the North, passing the Northern settlements of Cuatro Esquinas in the direction of the Río Colorado area, more cow-calf operations and cultivations of maize without many inputs, are more recently developed. New roads to the Río Sardina and Cero Negro hills, and the Río Colorado area, (also more eastwards Lomas de Sierpe) carry the log-

ger transports of huge trees. In this direction one may find poor invadors inbetween big landowners with their cow-calf operations. A lot of them do not actually aim at livestock production but use cattle just for speculation and the occupation of land, after the best trees are cut by loggers. On the borders of this deforestation area fattening and rearing of cattle is the main livestock farming-type.

Following the railroad after Siquirres to Puerto Limón one meets the growing influence of the negro-farmer from the Carribean. There are huge banana 'fincas' near Santa Marta, Matina, Carmen and Golden Grove. In the middle of this zone the farmers in the Bataan area grow a lot of rice. In this area platano, yam and cocoa plots,with cow-calf operations inbetween (mixed with some fattening) and with dry-rice fields,are found. Towards the coast and near the rivers of this area the bigger cattle farms, sometimes dual purpose, normally fattening and rearing of cattle are present.

Passing Limón to the South, the narrow land-strip along the coast carries coco-palms on the sea-side, a lot of cocoa (especially grown by negro-farmers) and some cow-calf operations or even dual-purpose cattle farming. Further South of Limón the importance of livestock gradually diminishes. In the Valle the Estrella (banana), Valle de Talamanca (platano, tubercules) and in Sixaola (banana, platano cocoa and oil-palm) there is still some livestock production, especially pigs fed on bananas, but it is of less importance than in the North. Interestingly,a lot of mules are used in this area. In the mountains again deforestation is progressing with cattle on the recently cleared soils.

Very distinct is the Talamanca zone of Turrialba, Tuíz, La Suissa. Coffee, sugarcane, with use of steers for traction and intensive

dairy-farming (especially with Yersey, Brown Swiss fed on by example extra King grass (Pennisetum sp.) and molasse) distinguish this more climate from other Atlantic regions.

(Reference: reports of the sondeo field survey and description of the zone by Manuel Gomez, pers. com. CAR Siquirres.)

CHAPTER 11. SPECIAL PROBLEMS IN ANIMAL HUSBANDRY OF THE ATLANTIC ZONE.

a) High production costs because of high priced land, labour, concentrates and veterinary drugs in comparison with off-farm prices of livestock products, like in other parts of Costa Rica.
b) Dependency on forage production of grasslands quantitatively, and qualitatively with all kind of management problems.
c) Low integration with cropping systems.
d) Animal deseases and climatic factors.
e) Shortage of extension and veterinary service and lack of special recommendations for animal husbandry in the Atlantic Zone.
f) Low levels of influence and collaboration of all farmers with governmental and marketing institutions.

CHAPTER 12. CRITERIA AND SELECTION OF REGIONS.

12.1 Criteria for Tropical Animal Production.

Criteria for Tropical Animal Production for the election of sample areas. The area should

a) be representative for larger area or in itself of sufficient importance.
b) be diverse in terms of variation in soil, climate, history and agricultural practices, also as expected for the future.
c) offer possibilities for multidisciplinary work.
d) be representative for all important livestock farming types to be distinguished.
e) be influenced by changes like new roads, starting enterprises such as Borden, deforestation and shift of bananaplantations that have high significance for the development of animal husbandry in the Atlantic Zone.

12.2 Proposed areas by Tropical Animal Production.

An area described by districts within the maximum sizes to be mapped proposed by Tropical Animal Production is:
Guápiles, Jiménez, Cariari, Roxana or Rita, Guácimo, Mercedes, Pocóra, Río Jiménez, Duacaría, Germánia, Caíro and if possible the Río Frío area. This area could largely be integraded within the CATIE-Silvopastoríl project.

12.3 General results.

The area known as map units Guápiles, Guácimo, Agua Fría, Bonilla and Río Sucio with the Sixaola district is now proposed as sample area. In the future smaller areas will be choosen for further research. This interdisciplinary decision has been taken because of representativeness, climatic and demographical difference with sufficient issues to be studied.

CHAPTER 13. RECOMMENDATION OF TOPICS FOR FURTHER RESEARCH.

Because of problems mentioned in chapter eleven the following recommendations and topics for further research, especially for small-farm units are recommended:

1) The level of investment and productivity of livestock operations and composition of the costprice of livestock products, with the importance of livestock in farm economy and family budget.
2) The influence of Lactaria Costarricense (Borden) on the marketing of dairy products. The collection capacity of Borden, Dos Pinos and small private enterprises.
3) Organisation of marketing in relationship with farmers organisations and governmental services.
4) Positive and negative effects of livestock and grass on soil fertility; stocking rates in relation to the farm type and problems of deforestation.
5) Productivity of pastures and feeding in terms of energy, protein and mineral supply. The role of improved pasture and pasture-management problems; choice of pasture species.
6) Adaptation of livestock under low-land conditions and related problems of animal deseases and availability of veterinairy services.
7) The possible integration of cropping systems with animal husbandry. (consequences of feeding bananas, cultivation of special fodder-crops and leguminosae within the cropping system.)

An evaluation made by SEPSA-CONIAGRO (1982) mentions some special problems in the Atlantic Zone and research being done. Weed control, mineral deficiencies, reproduction control and selection of high productive animals are mentioned as the most important problems. Also forage production and energy-protein supply is mentioned as an important area of research.

CHAPTER 14. TIMETABLE.

16/5 Arrival at San José, Costa Rica.
17/5 Bibliography studies, listing institutions.
18/5 Bibliography studies. San José-Turrialba.
19/5 Research on literature on IICA-CATIE library. Meeting with Franco Romero and Arthuro Vargas, zootechnical engineers of CATIE, working on the 'Silvopastoríl' project.
20/5 Research on literature, second meeting with Franco Romero.
21/5 Research on literature, Turrialba-San José.
22/5 Meeting with Carlos Jiménez and William Rojas, zootechnical engineers working on 'El Alto', research station of the UCR. Visits at bookshops.
23/5 Reporting, a meeting with engineer Minor Leiva Canales, sub-director of Dirreción General de Salud y Producción Pecuaria (MAG).
24/5 Reporting.
26/5 Visit at SEPSA, meeting with Olman Díaz Sanchez, zootechnical engineer, working at SEPSA. Research on literature in the SEPSA library. Meeting on the 'Facultad de Agronomía, escuela zootécnia', with Oscar Echandi, working with IDRC on the Río Frío project.
27/5 San José-Turrialba, Turrialba-Guápiles. First impressions of the Zone. Short meetings with Arthuro Vargas and Ricardo Pereira Cerdas, representant of Borden, the Lactaria Costarricense milk collection plant.
28/5 Field survey, visiting dairy-farms with Ricardo Pereira. Short visit on the IDA settlement-project 'El Indio' near Ticaban. Meeting with Yurién Rojas Vargas, director of the 'El Indio' program.
29/5 Visit on 'La Rosalía', a subject of the 'Silvopastoril' project, meeting with Roland Borel, Franco Romero, Arthuro Vargas and others. A small talk with the farmer himself. Meeting with Miguel Carillo, zootechnical engineer. He worked at the 'Programa de Fomento Lechero' and is still working at MAG.
30/5 Meeting with Rafael Molina, ex-administrator of 'La Cabaña', now working on the Río Frío CIID-IDA project.
31/5 Meeting with Miguel Carillo and Alberto Amador on the milk-collection plant in Guápiles. Alberto José Amador Zamora is the president of the 'Federación de Cámeras de Ganaderos de Costa Rica.'
1/6 Research on literature, first interdisciplinary meeting.

2/6 Short meetings at 'Los Diamantes', regional extention office and Consejo Nacional de Producción in Guápiles. Meeting with Manuel Gomez, sub-director of the CAR (Centro Agrícola Regional) in Siquirres.
3/6 Start of multidisciplinary (sondeo)field trips with small talks with farmers:Guápiles, Cariari.
4/6 Río Frío
5/6 Puerto Viejo
6/6 Palmita,Río Colorado
7/6 Guácimo, Siquirres
8/6 Reporting
9/6 Siquirres, Turrialba
10/6 Monodisciplinary research on grassland status. Meeting with Arthuro Vargas about Silvopastoríl.
11/6 Siquirres, Limón
12/6 Sixaola (Talamanca) Dr.Ir.G.Zemmelink joins the survey-team.
13/6 Limón, Cahuita
14/6-19/6 Reports, decisions, discussions in the workshop.
20/6 Meeting at CATIE Turrialba-Guápiles
21/6 Report-writing and literature studies.
23/6 Guápiles-San José-Guápiles
24/6 Report-writing and literature studies. (Visits of Dr.Ir.G, Zemmelink at Río Frío and Talamanca valley)
28/6 Rapid visits to Río Colorado, Millas, Bataán, and Neguev.
29/6 San José -report writing and literature studies in cooperation with Dr.Ir.G.Zemmelink.
8/7 Visit on UCR-WAU Tropical Animal Production research.
11/7 Visit to Centro Nacional de Acción Pastoral (CENAP)
12/7 18.35h Schiphol Amsterdam airport Holland.
Writing of report untill 31-7-86

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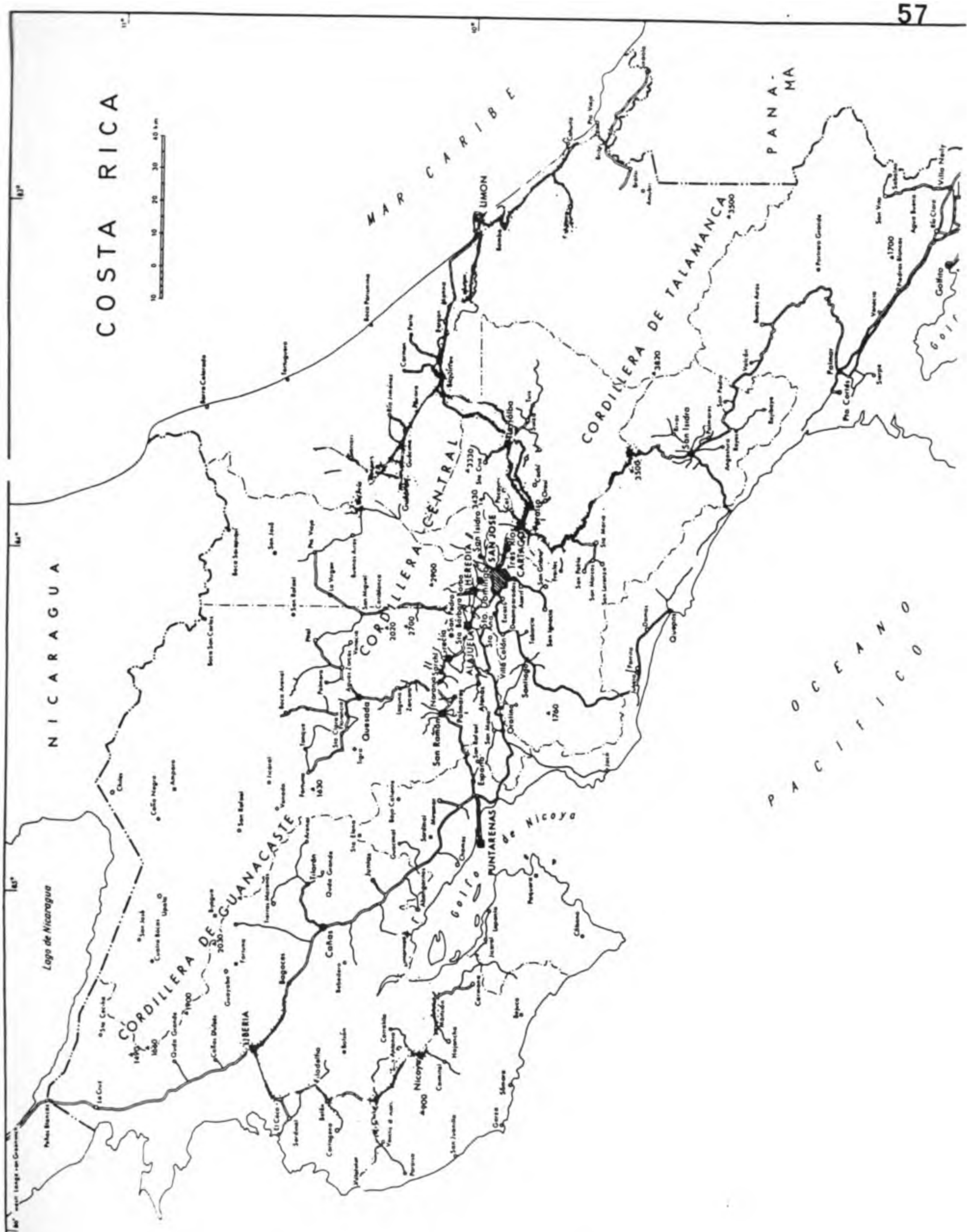
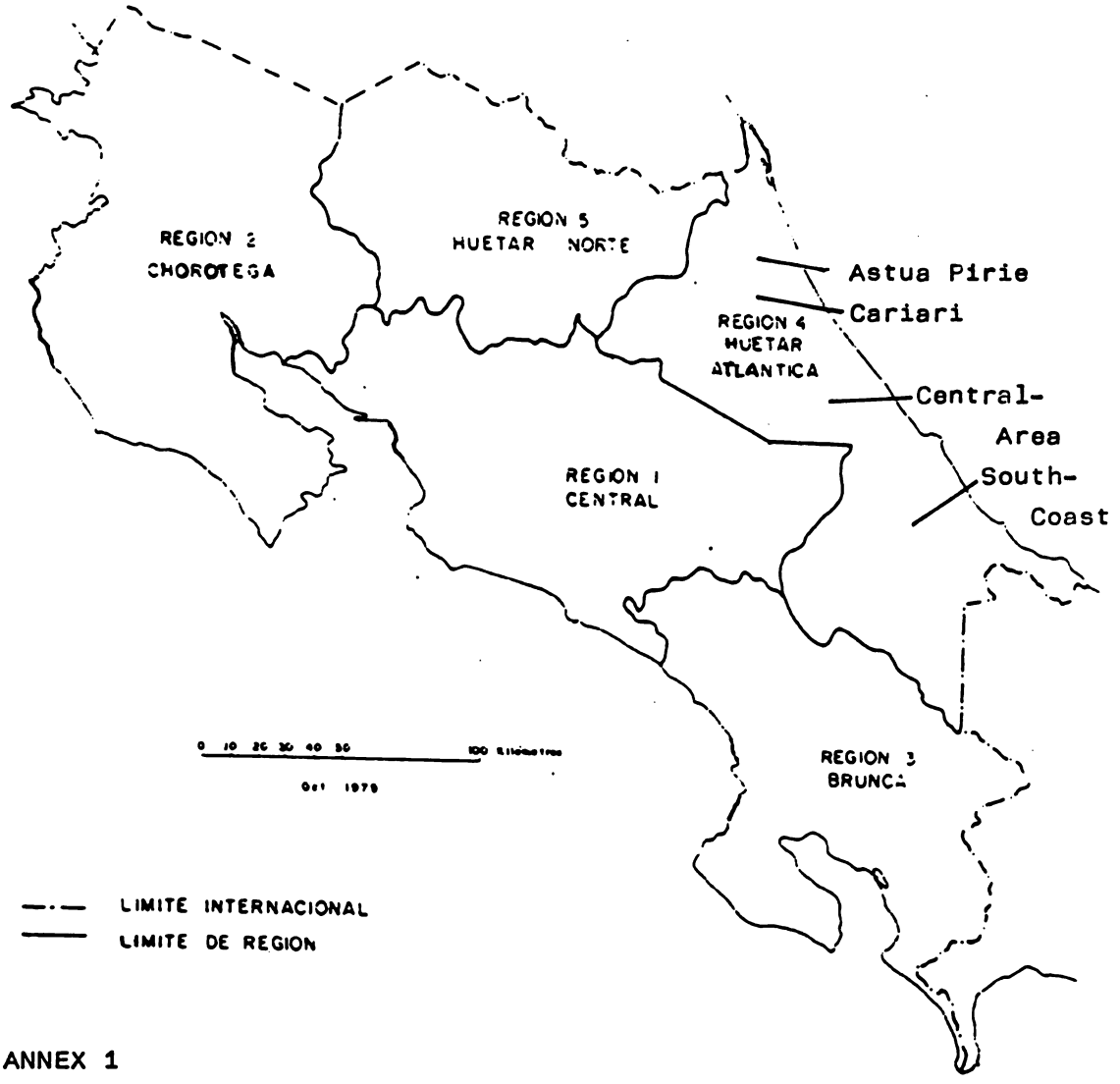
CHAPTER 16. ANNEXES.

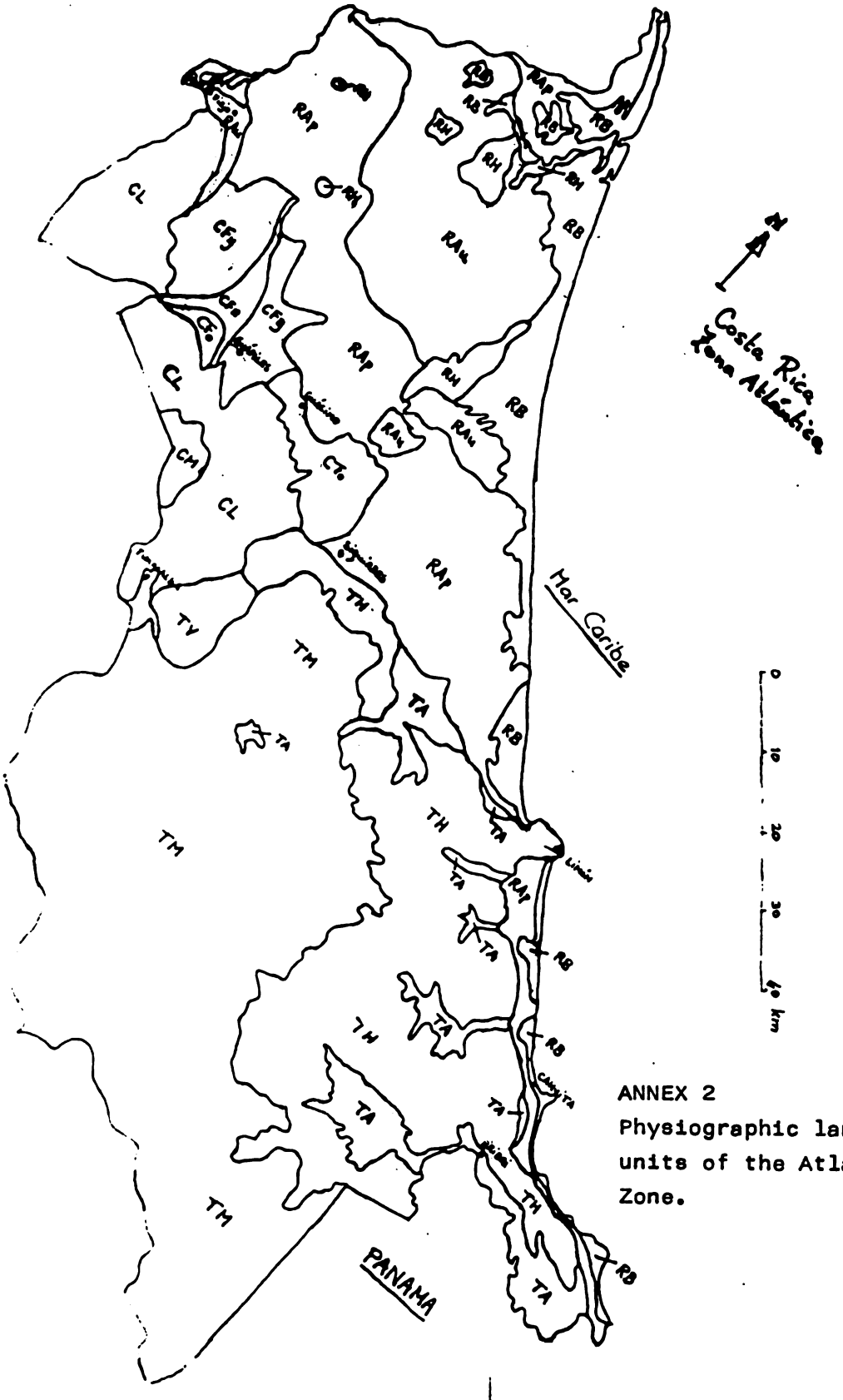

COSTA RICA
MAR CARIBE
NICARAGUA
PANAMA
OCEANO PACIFICO
CORDILLERA CENTRAL
CORDILLERA DE TALAMANCA
CORDILLERA DE GUANACASTE
Lago de Nicaragua
Golfo de Nicoya
LIMON
SAN JOSE
CARTAGO
HEREDIA
ALAJUELA
PUNTARENAS
LIBERIA
Quesada
San Ramón
Nicoya
Cañas
Bagaces
Golfito



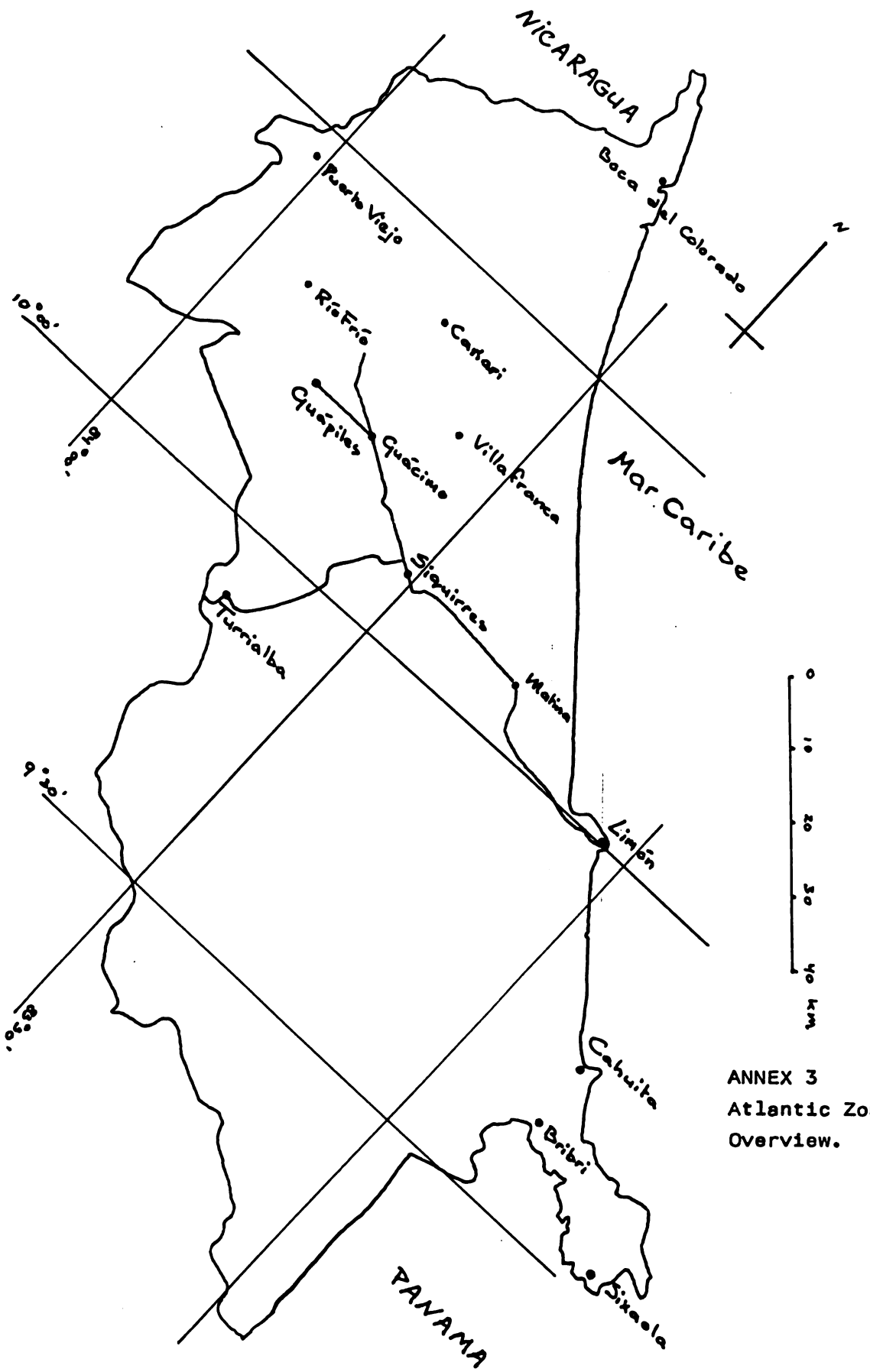
ANNEX 1

NAMES OF PLANNING REGIONS OF COSTA RICA AND THE ATLANTIC ZONE.

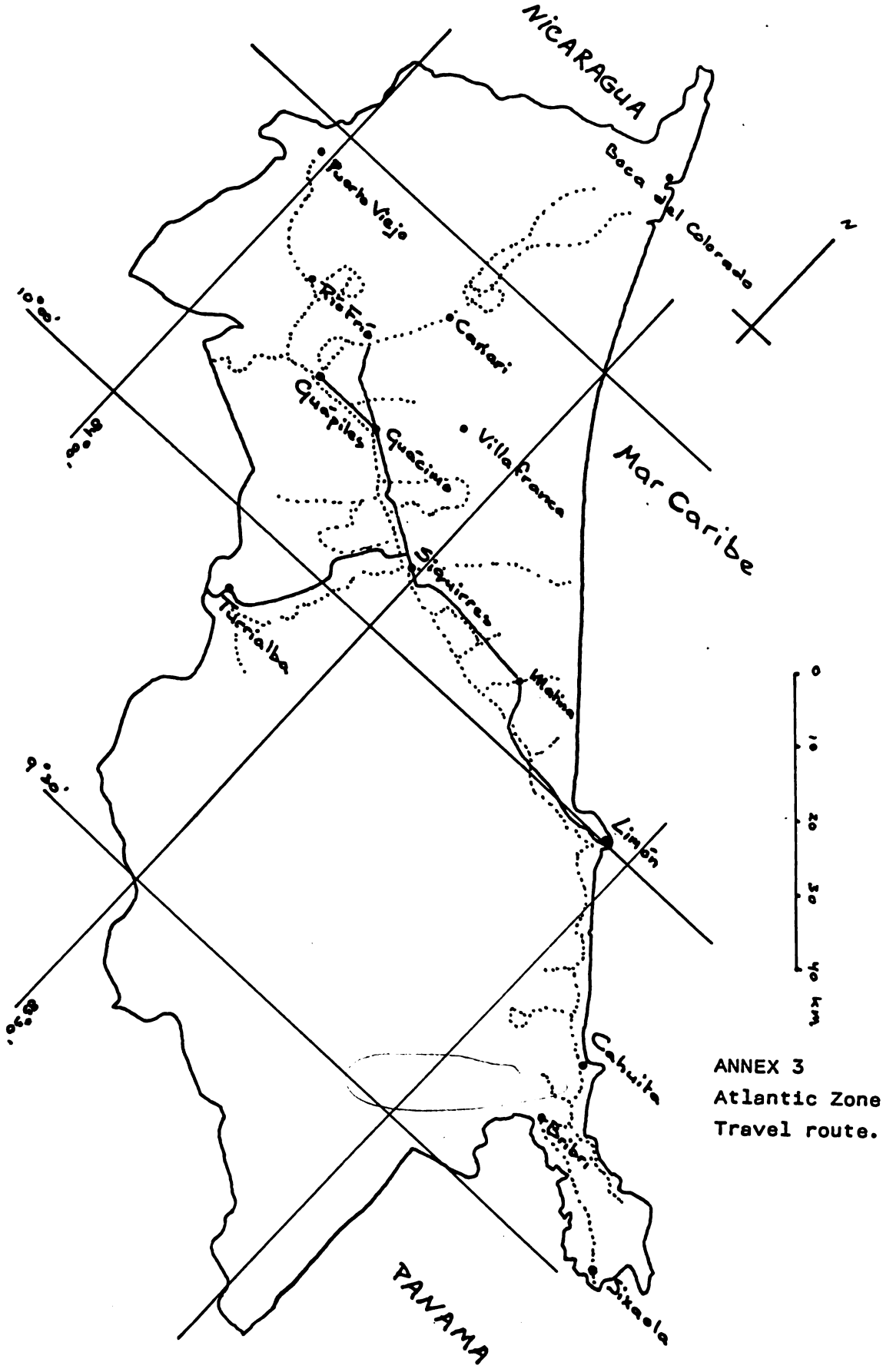
REGIONES PARA LA PLANIFICACION SOCIOECONOMICA DE COSTA RICA



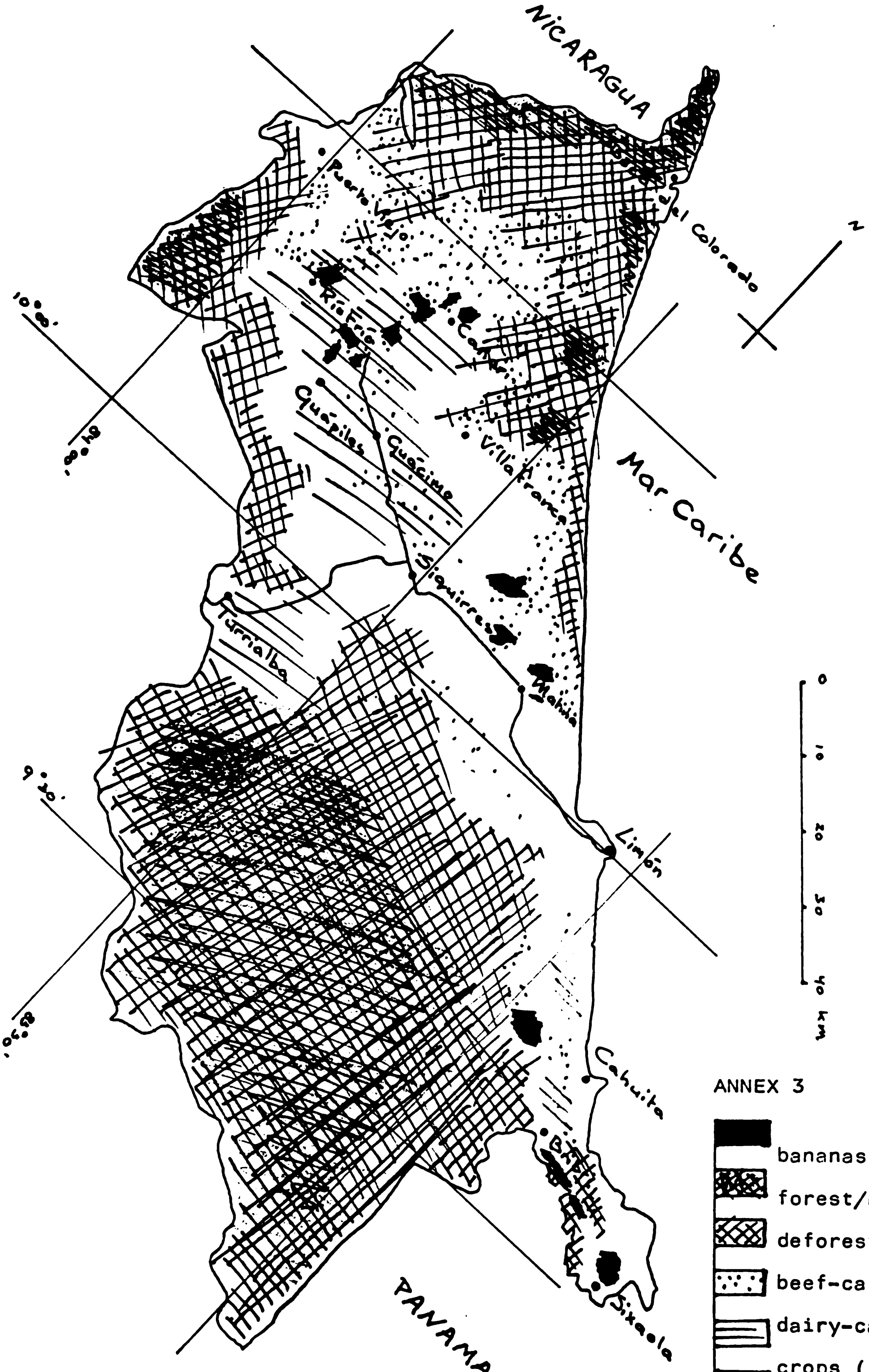
ANNEX 2
Physiographic land-units of the Atlantic Zone.



ANNEX 3
Atlantic Zone
Overview.



ANNEX 3
Atlantic Zone
Travel route.



ANNEX 3

- bananas
- forest/mountains
- deforestation
- beef-cattle
- dairy-cattle
- crops (/cattle)

ANNEX 4 LIST OF KEY INFORMANTS.

Mr. R. Pereira : Borden(Lactaria Costarricense)
Mr. M. Carillo : Fomento Lechero program, MAG.
Mr. R. Molina : Río Frío IDRC project, ex-administrator 'La Cabaña'.
Mr. A. Amador : President of the Federación de Cámeras Ganaderos.
Mr. O. Echandi : UCR-IDRC Río Frío project.
Mr. F. Romero : CATIE Producción Animal- Silvopastoríl.
Mr. A. Vargas : CATIE Producción Animal- Silvopastoríl.
Mr. O. Díaz : SEPSA
Mr. C. Jiménez : Escuela Zootécnia UCR.
Mr. W. Rojas : Escuela Zootécnia UCR.
Mr. M. Gomez : Centro Agrícola Regional, Siquirres.
Mr. M. Leiva : Dirección General de Salud y Producción pecuaria.(MAG)
Mr. R, Arguello: ,, ,, ,, ,, y ,, ,, . ,, .

ANNEX 5

CHECKLIST voor TROPISCHE VEETEELT gegevens in COSTA RICA.

Regio/situering:
Bedrijfsnaam c.q. naam contactpersoon:
Datum:

A) BODEMGEBRUIK:

Bos:	:	ha.
Akkerbouwgewas	:	ha.
		ha.
Grasland	:	ha.

B) BEDRIJFSINKOMEN:

Bos:
Akkerbouw:(belang van gewassen)

Veehouderij	rund	vlees	:
		melk	:
		overig	:
	varkens		:
	kip	vlees	:
		ei	:
	overig		:

C) AANWEZIGHEIDSVERKLARING GRASLAND:

1) Grond niet, of niet meer geschikt voor akkerbouw.
2) Beschikbaarheid van arbeid dwingt extensief grondgebruik af.
3) Veehouderij levert regelmatig inkomen.
4) Afzet van veehouderijprodukten beter verzekerd.
5) Voorliefde van boer voor veehouderij.

D) BEDRIJFSVOERING:

1) Veestapel omvang: runderen, varkens, kippen.
2) Akkerbouw-veeteelt integratie:
   a) gebruik van bijprodukten (welke voor welk dier)
   b) mestgebruik en bodemvruchtbaarheid
   c) rotatie schema met weide/groenvoergebruik
   d) tractie/transport.
3) Investeringsniveau grasland/veeteelt:
   a) aandeel natuurlijk/verbeterd grasland.
   b) verbouw van ruwvoedergewassen.
   c) bemesting van grasland
   d) perceel-indeling van grasland
   e) grasland en veemanagement (beweidingssysteem)
   f) status van het grasland.

g) vee bijvoeding (op grasland) d.m.v. mineralen, zout, andere produkten.
h) watervoorziening.

4) Produktie beperkingen en mogelijkheden:
a) rund -vleesvee- vruchtbaarheid
sterfte
leeftijd eerste kalf
leeftijd + gewicht bij verkoop
extraction rate
-melkvee - ras
leeftijd eerste kalf
tussenkalftijd
melkgift
b) andere diersoorten idem.
c) veterinaire zorg, K I , voorlichting.

ANNEX 6 INTERVIEWS OF LIVESTOCK KEEPING FARMERS.
IDENTIFICATION OF FARMING SYSTEMS BY CONVERSATIONS.

2.2. Hoja 3447 II E^{5}70.8, N^{2}66.7(See maps of the 'Instituto Geográfico Nacional' 1:50.000) Past Cariari, 2 km. after Campo Dos. Date: 3-6-'86. Son of farmer, working on his brothers maize field.
Use of land: Forest 30 ha, cleared forest 20 ha. (recent), Pasture 20 ha
Farm income: Especially by selling young steers. Price of young steers sold to merchants is 3000-4000 ℄. (Dfl.150-200,-) Last year was better: 6000 ℄. At age of seven months, weight 200-300 kg. they are sold.
Reason for land-use type: Because of bad drainage.
Farm management: (1) 60 head of cattle, one bull.(2)-- (3) improved pastures: Estrella Africana, Ischaenum ciliare, no use of fertilizers. Two times a year the pastures are cleared of weeds by longknife and herbicides. The cattle is supplemented by salt. (4) Age at first calving 3 years, after that each year a calf. Cattle is vaccinated and washed by hand against ticks. Sometimes there are problems with partitions. No veterinary assistance.

2.3. Hoja 3447 II E^{5}71.2 N^{2}68.8 Past Cariari, La Esperanza.
Date: 3-6-'86. Farmer came recently from Puriscal.
Use of land: Cultivates: 4 ha. of cocoa (3 recently planted), 6 ha of maize and some pasture.
Farm income: From maize and one ha. of cocoa. He kept some dairycattle, chicken and a pig, for autoconsumption. Sometimes his family made cheese.
Reason for land-use type: Lack of financiation for other cultivates forces to extensive land-use.
Farm management: (1) 4- head of cattle : Brown Swiss- Indo Brasiltype dairy cattle and some calves. (2) For his cultivates he used chemical fertilizers. (3) He told he had Brachiaria spp. and Ischaenum ciliare. (4) He complained about lack of extension.

2.4. Hoja 3447 II $E^{5}72.9$ $N^{2}72.8$ Past Cariari, near Cuatro Esquinas. Date 3-6-'86. Cowboy of the farm.

Use of Land: 200 ha pasture with some forest.

Farm income: Fattening of male calves, brought from neighbours. Sold at two years old at 500-600 kg weight.

Reasons for land-use type: Further off the road in recently defores-ted region.

Farm management: (1) 350 head of cattle: Brahman steers. (3) Improved Estrella Africana pastures, without fertilizers in very good state. No special parcellation. The cattle is supplemented with minerals and salt. No other products. (4) Extraction rate would be 50 animals sold per year. Remark: before starting with cattle they grew some maize, for several years.

2.5. Hoja 3446 IV $E^{5}57.5$ $N^{2}46.5$ Near Guápiles, San Raphael. Date 3-6-'86. Wife of banana-company laborer.

Use of land: Pastures 10 ha. Homegarden : 1 ha.

Farm income: Off farm labor and some cheese sold. 1 kg. (15-20 liters or bottles (0,67 l.) of milk needed) gives 80 ¢. She pro-duced too little to sell fresh milk.

Reason for land-use type:-(regional tradition?)

Farm management: (1) She milked 6-8 cows normally, had one dairy-type, one beef-type bull and some young cattle. (2) The farm was situated near the banana-fields but she didn't mention she used bananas for the cattle. (3) 2 ha is of Estrella Africana, the rest is native pasture. No use of fertilizers. The cattle is supplemented with molassee. (4) Maximum production was 6 liters. The cows main-tained giving milk during 7 months. Some health problems with ticks, internal parasites, brucellosis and 'pierna negra' existed. They controlled those deseases by 'own' treatments.

3.0. Hoja 3447 III $E^{5}48.9$ $N^{2}59.0$ On the South of finca 2, Río Frío. Date: 4-6-'86. Small IDA farmer.

Use of land: 1 ha of cocoa, 9 ha. of pastureland.

Farm income: He gained 75.000 ¢ /year /ha from cocoa, he told. He had an other 10 ha plot titled on his wifes name, all pasture. General income is obtained by delivering milk to Dos Pinos and (this farm) to Borden.

Reasons for land-use type: This part is under influence of the IDA-MAG 'Fomento Lechero' project in Río Frío. (He had grown more cultivates.)

Farm management: (1) 16 milk delivering cows (18 in total) of Guernsey-Yersey type, one cross- bull. (3) His improved pastures didn't produce because he choose Ischaenum ciliare about which he complained. He didn't use fertilizers (too expensive), but supplemented his cattle with minerals and salt. (4) The milk production /cow/day is 6 bottles (4 liters). Some cows reach 9 months of giving milk. First calving at 2-3 years old, calving each 1-1½ year. Brucellosis, 'pierna negra' were some problems.

Remark: He wanted to start with an A.I. program of the Cameras Ganaderos.

5.1. Hoja 3447 III $E^{5}40.3$ $N^{2}60.0$ Near Tigre, Puerto Viejo.
Date: 5-6-'86. Three laborers.

Use of land: Pastures 70 ha. N.B. No forest.

Farm income: Milk delivering to Horquetas with 8-9 milk-churns. (50-60 liters of volume) The milk is collected by Borden from San Carlos. They have had milking machinery equipment but 've sold it because of udder size problems. The three men milk from 2.00 A.M. untill 6.00 A.M. now. Some chicken for autoconsumption. Some wood and firewood saving as future income possibility.

Reason for land use type: --

Farm management: (1) 58 dairy cows (heifers), 150 head of cattle in total. One HF bull. (2) Use of bought molasse. (3) All pasture of Estrella Africana, some small plots of King grass. (Pennisetum sp.) Disweed by long knife and herbicides. Some concentrates are sometimes used, bought in San José. Rotation system applied. Animals get minerals and salt and pasture during milking. (4) Average production of 10-12 bottles/ day (7-8 liters) Carbon (anthrax) is a problem, ticks are not.

4.0. Hoja 3446 IV $N^{2}44.2$ $E^{5}46.9$ Before Río Frío.

Date: 4-6-'86 Dairy cattle farmer.

Use of land: Forest 20 ha. Pasture 80 ha.

Farm income: Recently his wife had to make cheese of the milk because of not being able to deliver fresh milk to Borden anymore.

Reason for land-use type: No cultivates produced (he tried) because of bad drainage. From the beginning he had cattle.

Farm management: (1) A well looking stable , 35 milking cows, and young stock. (3) division of pastures with 30 ha. improved Brachiaria spp. pasture. For weed management he contracts laborers. No use of fertilizers. Some supplements like molasse are used. (4) Production 6-9 bottles on the average (4-6 liters) Had some problems with mastitis. (because of heavy control seems to be a serious problem.

5.2. Hoja 3447 III $E^{5}37.0$ $N^{2}77.5$ El Tigre, Finca Santiago.

Date: 5-6-'86 The owner and a laborer.

Use of land: Forest 350 ha. (reserva natural, contracted by DGF), pastures 350 ha.

Farm income: Cattle breeding without fattening.(Because that is not economical, it is too hot for fattening) Animals are sold in the

region. They are thinking about dual purpose farming. Young animals value 11.000 ℓ .

Reasons for land use type: The owners, six brothers, don't come regular enough to farm to intensify the way of farming.

Farm management; (1) 450 head of cattle in cow calf operation, and two HF dairy cows for autoconsumption. (3) Native pastures are maintained free from excessive quantities of weeds by three labourers. a fourth- one is the cow-boy. (4) No problems of ticks; use of vitamins and mineral salts. No technical assistence. Put vaccinations by themselves.

Remark: Those six brothers own other terraines in San Carlos.

6.0. Hoja 3347 II $E^{5}35.2$ $N^{2}72.3$ Near Puerto Viejo.Date: 5-6-'86.

Use of land: 5 ha cultivates (trees like coconut, fruit a.s.o.) 29 ha of pastureland and some forest.

Farm income: Negociation with cattle and rearing cattle with almost dual purpose.

Reason for landuse type:The land isn't suitable for cultivates because of low fertility.

Farm management: (1) 60 head of cattle in cow-calf operation of which he milks five for autoconsumption. Male calves he sells at one year of age. (2).-- (3) Native pastures with live-fences. (Glyricidium sepium) (4) The milked cows give 4 liter/day. First partition at age of 2½ - 3 years old. Few problems with animal health.

7.1. Hoja 3347 II $E^{5}29.4$ $N^{2}70.7$ 6 km. West of Puerto Viejo. Date: 5-6-'86.

Use of land: Pastures 26 ha. (for sale 15.000/manzana)

Farm income: Sale of young steers at 150 kgs. for 7000 ℓ each, to merchants.

Reason for land-use type: The land has got slopes and therefore isn't suitable for crops.

Farm management: (1) 69 head of Brahman cattle, of which 25 cows. (2) Some fruit trees stand on pasture land. (3) Most grass is natural and some of the area is improved pasture. ('Sacala sabana' and Guinea gigante) (Could be Ixophorus unisetus and Panicum maximum) (First-one ??) (4) At eight months the steers are sold for fattening.

Remark: One laborer on the farm seems to run all things.

7.2. Hoja 3347 II $E^{5}29.4$ $N^{2}70.7$ Parcela Las Brisas, Puerto Viejo. Date: 5-6-'86 IDA settler.

Use of land: 2 ha of forest, ½ ha of annual crops and platano, 9½ ha pasture land.

Farm income: Milk is sold locally but a lot of off-farm work is done.

Reason for land-use type: Cultivates are doing poorly.

Farm management: (1) Some young turkeys, four adult cows (1HF), one heifer, one calf. Two cows are milked. (2) -- (unless a lot of different crops are on the farm.) (3) He tried to improve his pasture by sowing native pasture-seeds. (4) Maximum milk yield is 8 bottles per day (5,4 liter) or 15 bottles.

8.0. Hoja 3447 I $E^{5}65.0$ $N^{2}91.0$ West of the Río Colorado area, Finca Sardina. Date: 6-6-'86. Labormans-wife.

Use of land: 480 ha pasture and (mainly) forest.

Farm income: speculation (first aim) and selling reared cattle, selling wood.

Reason for land-use type: (see above) Need to demonstrate the occupation of the land. Maize dries out.

Farm management: (1) 250 head of cattle in cow-calf operation. (Brahman, cross.) (2) Hired laborers are cutting the best trees in the forest. (3) No pasture management except for cutting weeds by long-

knife. (4) After 2½ years first partition. No special care for the animals.

9.1. Hoja 3447 III $N^{2}70.0$ $E^{5}61.5$ Finca Senegal. Cocotales de Costa Rica S.A.. Benorth of Cariari to Río Colorado area.
Date : 6-6-'86. Laborers.
Land Use: 400 ha forest, 600 ha coconuts.
Farm income: Coconuts.
Reason for land-use type: Foreign investment. The administrator has 400 head of cattle on the area for rearing and fattening.
Farm management: (3) Ischaenum ciliare, Estrella Africana and Brachiaria mutica are amoung the grasses. No concentrates except some molasses are used. They spray against ticks.

9.2. Hoja 3447 I $E^{5}65.0$ $N^{2}87.0$ Cero Negro hills. (Río Colorado.)
Date : 6-6-'86. Very poor squatter.
Use of land: Some maize, coconut tried out, forest and ± half of the area pasture. Very compact clay soils.
Farm income: Off farm. (Forest clearing or weed-) Production is for autoconsumption.
Reason for land-use type: Trying to get his own title on the (poor) land. No credit available.
Farm management: (1) Two dairy-cows plus three young stock. (4) total production eight bottles milk per day.

10.0. Hoja 3447 I $E^{5}70.0$ $N^{2}82.0$ On the road to Río Colorado, Penitencia. Date : 6-6-'86.
Use of land: 3 ha maize, 0,5 ha rice, 1 ha cocoa, fruit-trees and beans. 15 ha pasture.
Farm income: Crops.Milk for autoconsumption and young male calves, old cows for sale.

Reason for land-use type: Came recently from Guanacaste and are starting.

Farm management: (1) 10 heads of cattle adults. (3) native pastures.

11.0. Hoja 3446 II $E^{5}83.0$ $N^{2}32.5$ The mountain slopes off the road Guápiles-Siquirres. 7-6-'86.

Use of the land: 1 ha all kind of crops and trees. 15 ha pasture.

Farm income: Besides strong use of credit and saved money the only income was milk sold to local merchants of Limón. The crops were for autoconsumption.

Reason for land-use type: The farmer started with an associate that proposed the cattle farming, but this man took off, leaving debts. Too low for coffee but with slopes.

Farm management: (1) 15 maize-fed chicken, a sow with three young pigs fed on banana, maize and King grass. Twenty-five head of Guernsey x Yersey, Brahmanx Brown Swiss and HF -cattle. Nineteen of them in production; 2 bulls, 8 calves. (2) Bought second-quality maize for feeding the cows, pigs and chicken. Bought bananas and molasse for the cows, that become during milking these products. (2^{nd}-quality maize costs 150 ¢ / 35 kg.) (3) Pastures are mainly native but with some area of Brachiaria, Setaria sphacelata and Ischaenum ciliare, and a plot of King grass (Pennisetum sp.). Sometimes he used to give bone meal because of wrong Ca/P supply. (4) Milk production of the nineteen animals was about 150 liters of milk/ day. (60 bottles of milk per churn of 40 liters) The market value of one cow he estimated at 20.000-35.000 ¢ (Dfl. 1000-1750) He had to spray against ticks and treat them with anti-parasites. Carbon was a real danger.

Remark: 1) The man himself didn't have much experience with cattle. 2) His smart stables, just for milking, had a muddy entrance. 3) Calves were in a bad state.

12.0. Hoja 3446 I $E^{5}81.8$ $N^{2}40.0$ Pocóra, Milano.
Date 7-6-'86. IDA farmer.
Use of land: 3 ha crops. (1½ ha cocoa) 7 ha. pasture.
Farm income: Cocoa values 85 ℓ /kg., milk sold to neighbours or cheese of 80 ℓ/ kg in the villages. Cattle values 9000 ℓ . Beef cattle is sold for 30 ℓ/ kg. (In the shop 120 ℓ/ kg.)
Reason for land-use type: Difficulty on market-aspects but seems to have confidence in growing crops.
Farm management: (1) One whey-fed pig of 80 kg. , 9 head of cattle and some calves. (3) Live fences on moderately/poorly drained valley-bottom. Cows get minerals. (4) Average production of 8 bottles per cow/day. (5,4 liters) At maximum 15 bottles.
Remark: Credit was hard to obtain, but the farmer received some to buy a cow.

13.0. Hoja 3446 II ± $N^{2}36$ $E^{5}88.5$ Cairo Tres Millas (Neguev)
Date: 8-6-'86.
Use of land: 10 ha cocoa, 2 ha maize. 3 ha pasture.
Farm income: Cocoa and maize. Cows are for autoconsumption of milk.
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Farm management: (1) 4 cows, two pigs with use of bananas for feeding.

14.1. Hoja 3445 II $N^{2}20.0$ $E^{5}86.0$ Tucurrique, Pejibaye, 5 km. after Tuíz. Date 9-6-'86.
Use of 24 steers on a huge sugarcane farm of criollo breed. They were fed with grass and sugarcane.

14.2. Hoja 3445 II $E^{5}82.0$ $N^{2}12.0$ Valley of the Reventazón.
Date: 9-6-'86. Nephew of the owner.
Use of land: 4.2 ha coffee, 1.4 ha sugarcane, 2.8 ha pasture.
Farm income: Cash crops and some milk.
Reason for land-use type: Climate favours it; tradition in the region.
Farm management: (1) 10 cows, of which nine in production, of (not pure-) criollo-Yersey bred. One Yersey-criollo bull and some young calves of which two in the stable. Some of them he had bought were Holstein-Fresian. (2) He supplemented with 'miel' molasse and grew King grass that he cuts with a chaff-cutter. (3)He had mainly Estrella Africana pasture and used to give concentrates. (4) His cattle gave about 11-to 6 liters of milk in the morning and evening respectively, which he measured individually. (third month of production) His calves were poorly fed. He had some problems with udder skin-infections and didn't use veterinarian service. In general terms the cows were in a very good shape.

16.1. Hoja 3546 II $E^{6}25.8$ $N^{2}26.0$ Above Matina.
Date : 11-6-'86. (Some decennia ago United Fruit left this area.)
Use of land: 27 ha of pasture with live-fences, 11 compartments. Some ha cocoa and some (20 ha?) recently invaded forest, now grass.
Farm income: The sale of male calves, cocoa (900 kg/ha) and milk (cheese).
Reason for land-use type: No credit available. Bad infrastructure, bad drainage, no possibility to invest, bad soil quality.
Farm management: (1) 30-40 chicken for occasional sale (300 ₡ each) that ate concentrates and maize. The concentrates cost 800 ₡ / bag of 46 kg. Five pigs for autoconsumption fed on bananas, whey and some concentrates. Some geese introduced by Taiwanese development-workers. 94 head of Brahman/Gyr cattle. (30 adults, 2 bulls)
(2) He bought crop rests and fed his animals with Erythrina Poepigiana and Glyricidium sepium from his live-fences.

(3) His pastures are native and some Ischaenum ciliare. (4) A part of his cattle he sends to his neighbours to prevent overgrazing. His bull is used by neighbours too. He milkes his cow one time/day. Production some 6-8 bottles/day. Total production about 70 bottles per day. Normally first partition is at age of three years. He gives the animals salt, minerals, vitamins and veterinary drugs.

16.2. Hoja 3546 III $N^{2}32.0$ $E^{6}17.5$ Near Cuatro Millas.
Date 11-6-'86. Ex-laborer.
Use of land: 1 ha of cocoa, 0,5 ha fruit trees, 0,9 ha platano, 4,5 ha pasture.
Farm income: Off-farm income from the banana-companies. All his crops and animals are for 'autoconsumption' more or less.
Reason for land-use type: Tenure of own plot for autoconsumption. He prefers more crops.
Farm management: (1) 16 cows with 7 in production of milk. No special inputs. Some chicken. (2) The animals also were grazed under the cocoa. (4) Production of milk is 4-6 bottles/day.

17.1. Hoja 3645 III $E^{6}62.8$ $N^{1}91.7$. Near Cahuita, the Carbon Valley.
Date : 13-6-'86. A black farmer.
Use of land: 10 ha of forest, 1 ha of cocoa, 110 ha of pasture (ex-cocoa!)
Farm income: The sale of cheese and young cattle.
Reason for land-use type: His cocoa was affected by the Monilia-fungus so he cut all. Before that he used to have some dairy cows for his children.
Farm management: (1) His herd counts 120 head of which he milked 30 cows at the moment of interview. They were of Gyr, criollo, Brahman, Yersey mixture,and a bull of HF he had once. (2) -- (3) His pastures were native- and Estrella Africana pasture and Pennisetum sp. The na-

tive pastures he had mainly in the upper parts. The pastures got steep slopes on the hill-sides and show some erosion. Sometimes he got 5-7 laborers for cleaning the secondary forest and pastures from weeds. Two others milk the cows. He supplements the animals with salt and minerals, but thought he could improve the mineral status of pasture spreading some salt on it too. He knew nitrogen did better. (4) His milk he processes into cheese. (8-10 kgs. per day.) He sells the cheese to Cahuita. He vaccinates against internal parasites, and sprays against ticks.

17.2. Hoja 3645 III $E^{6}62.8$ $N^{1}91.8$

Date 13-6-'86 Rich farmer near Cahuita.

Use of land: Some small plots with fruit trees, 10 ha of coconut palm and 90 and 30 ha pasture. (Divided system.)

Farm income: Sale of reared young cattle.

Reason for land-use type: Because of the Monilia desease he converted 90 ha of cocoa into pasture. Cow-calf operations are more economical than fattening , because of cheaper transports.

Farm management: (1) 300 head of cattle. (2) --(3) Rotation scheme of three weeks per plot grazing and one month rest. Supplementation with salt. Species are Estrella Africana and on more humid soils Echinochloa polytachya. (4) Deseases like Carbon (Anthrax) and tick-born deseases are a problem sometimes. He used to spray with Negubon each three months against ticks.

18.0. Hoja 3446 II $\pm$ $E^{5}85.5$ $N^{2}36.5$

Date 10-6-'86 Finca 'Los Laureles'.

Use of land: 14 ha cocoa (wants to plant 9 ha more) 70 ha.pasture.

Farm income: Cocoa and mainly the sale of beef-cattle.(This wasn't his only farm.)

Reason for land-use type: Cocoa does economically well, but having cattle is 'easy work!'

Farm management: (1) Mixed system of rearing and fattening the 80 head of cattle, on separated plots. (2).-- (3) The farmer used to clear the native pastures from weeds. They looked good. He said that dairy-farming seemed too intensive to him. Sometimes he used 'miel' (molasse). adds salt and minerals. For him 2 LU/ ha was maximum. (4) He sprayed against ticks and vaccinated the animals by himself.

Remark: He was trying to buy more land on the other bank of the river.

19.0. Hoja 3446 I E^{5}90.0 N^{2}45.5 In the Northern Neguev area.
Date 10-6-'86. IDA settler from Turrialba his wife.

Use of land: 1 ha of several crops. 2 ha of forest, 7 ha pasture.

Farm income: Off-farm. The crops and cattle were almostly just for autoconsumption.

Reason for land-use type: The disappearing San Juan pasture of the former ranch, didn't produce anymore, and the soils were bad. The farmers wife said the soil was too compact because of the mechanically improving of pastures by the former owners of the ranch. (according to this and other families)

Farm management: (1) Nine head of cattle (dual purpose). Young stock and a pig and some chicken. (2) She thought not to be able to invest in crops. (3) They use a strong rotation scheme. On the upper parts of the hills the pastures are poorer. (more weeds) They clean the pastures with a long-knife and don't use fertilizers. They put some Ischaenum ciliare at some parts.

ANNEX 7 A-4 papers. (revised)

Animal Production.

1.IMPORTANCE OF GRASLAND AND ANIMAL PRODUCTION
Data from SEPSA (1983):

	1973	1982
Area in grassland (ha)	71.000	233.000
% of total area in grassland	7	24
No. of cattle	80.000	265.000

Number of cattle increased with average of 14 % per year, that is a stronger increase than in any other major part of the country.

2.FACTORS OF IMPORTANCE FOR NEAR FUTURE.

a)Land in Central Valley is getting more and more expensive due to alternative use. (arable crops, horticulture, construction)

b)Concentrates as needed for intensive dairying in the Central Valley are scarce and expensive.
Both factors stimulate movement of cattle production to lower areas in less intensive systems, in attempt to reduce cost price.

c)The new road San José-Guápiles shortens transport to consumption-centres which is of special importance for bulky and perishable products like milk and beef. In line with this Borden has opened a milk collection centre in Guápiles.

3.SYSTEMS OF CATTLE PRODUCTION IN THE ATLANTIC ZONE:

a)After clearing forest land is stocked with cattle to lay claim of ownership on the land. Animal production as such is not important. This leads to very extensive husbandry, without inputs, potentially destructive.

b)Cow-calf operations for beef production (crianza), usually in more remote, wet areas (1) but also closer-by, better areas (2).

c)Fattening of young stock produced in systems number b. : usually more improved pastures, less remote areas (part of fattening of calves produced in the Atlantic is done outside this area). Systems b and c may be combined on one farm.

d)Dual purpose cow-calf operations: the farmer milks his best cows while these are rearing a calf. The number of cows milked may vary as well as the methods of milk marketing.

d.1)Number of cows milked is small and provide milk for on-farm consumption only.
d.2)Surplus of milk is sold as fluid milk.
d.3)Surplus milk is converted into cheese and whey fed to pigs, either on farm or on neighbours' farms.
In all these systems there is a combination of beef and milk production. The relative importance may vary from almost entirely beef-type operation to systems where the major emphasis is on milk.

System a occurs only in areas where deforestation is in progress such as Llanura de Tortuguero.

Systems b (crianza) and c (engorde) occur in the whole Atlantic Zone. On larger farms especially in the more recently 'developed' areas. The two systems exist often next to each other in the same area where the better pastures are used for engorde and the poorer areas for crianza. The same type of animal production but in smaller units occurs in the IDA settlement areas (e.g. Neguev, El Indio, Cuatro Esquinas), on former banana plantation areas and near present plantation areas. These farms (± 10 ha.) include often 1-2 ha of arable crops and some 8 ha of pasture.

Milk production on a commercial scale (development from system b to d.2 or d.3 occurs throughout the region (even East of Cahuita) but seems to be more important in the Llanura de Santa Clara (along de road from Siquirres to West of Guápiles). Marketing of milk is more difficult for smaller farms and requirements with regard to minimum amount accepted by companies like Borden. In Horquetas (Río Frío) however, the development of milk production has progressed further than in other area, probably as a result of the program 'Fomento Lechero'.

5.CRITERIA FOR CHOICE OF SAMPLE AREA.
-Representative of larger area or in itself of sufficient importance.
-Occurence of diverse agricultural systems related to soil, climate, and past history.
-Possibilities for multidisciplinary work.
-Subject to changes with time.
Specific for animal production:
-Occurence of diverse animal production systems related to:

-time since invasion of area
-soil type
-occurence of other forms of agriculture e.g. banana plantations
-expectation that changes may occur in near future due to factors like the new road and enterprises like Borden.

6.PROPOSED AREAS

Canton	District	Caracterization
Pococí	Guápiles	banana milkproduction
	Jiménez	,,
	Cariari	,, extensive
	Roxana or Rita	,,
Guácimo	Guácimo	crianza/engorde/dairy
	Mercedes	,, / ,, / ,,
	Pocóra	,, / ,, / ,,
	Río Jiménez	ex-banana ,, / ,, / ,,
	Duacaría	,, / ,, / ,,
Siquirres	Germania	much variation-Neguev area.
	Cairo	,, ,, - ,, ,, .
Horquetas	part of Río Frío between Río Sucio & Río Chirripó.	more development dairying on small units.

Surface area : 1700 km^2 +, Río Frío.

7.RESEARCH TOPICS
Level of investment and productivity of livestock operations.
Importance of livestock for farm economy and family budget.
Cost price livestock products.
Marketing of livestock products.
Positive and negative effects of livestock/grass on soil fertility.
Productivity of pastures: energy and proteïn supply, minerals.
Cooperation of farmers and farmers organisations and their role in purchase of inputs and marketing of products.
Role of Dos Pinos and Borden with regard to milk collection and marketing.
Extension with regard to livestock and pastures.
Availability of veterinary services.

ANNEX 8 ABBREVIATIONS, UNITS.

CAR	Centro Agrícola Regional
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza
CENAP	Centro Nacional de Acción Pastoral
CNP	Consejo Nacional de Producción
DGF	Dirección General Forestal
EEC	European Economic Community
IDA	Instituto de Desarrollo Agrícola
MAG	Ministerio de Agricultura y Ganaderia
SEPSA	Secretaria Ejecutiva de Planificación Sectoral Agropecuario y de recursos naturales
UCR	Universidad de Costa Rica
WAU	Wageningen Agricultural University
LU	Livestock Unit

1 ₡ (colon, colones) = ± 1/55 US $ = ± 4,5 cents of Dfl.

1 manzana = 0,706 ha = 0,286 acre.

1 botella (bottle) = 0,67 liter.

(FOR ANNEX 9 SEE NEXT PAGE)

ANNEX 10 ANIMAL HUSBANDRY FARM TYPES IN THE INTERVIEWS.
(Annex 6)
Dual purpose cattle with on-farm consumption of milk:
2.3-9.2-10.0-13.0-16.2-19.0
Dual purpose cattle with sale of milk (derivates):
2.5-7.2-12.0-16.1-17.1
Specialized dairy farming:
3.0-4.0-5.1-11.0-14.2
Fattening:
2.4-18.0
Cow-calf operations:
2.2-5.2-6.0-7.1-9.1-17.2
Extensive cow-calf operations:
8.0

ANNEX 9 GRASSES, WEEDS AND LEGUMINOSAE TO BE FOUND IN THE ATLANTIC ZONE.

Improved pastures:	
Alemán	Echinochloa polystachya
Estrella Africana	Cynodon nlemfluensis
Gigante	Pennisetum purpureum
Guinea	Panicum maximum
Guinea rastrera	Panicum maximum (var. embu)
Honduras	Ixophorus unisetus
Imperial	Axonopus scoparius
Janeiro	Eriochloa polystachya
Jaragua	Hyparrhenia rufa
Ruzi	Brachiaria ruziziensis
San Juan	Setaria sphacelata
Native pastures:	
Jenibrillo	Paspalum notatum
	Paspalum conjugatum
	Paspalum fasciculatum
Ratana (improving?)	Ischaenum ciliare
	Ischaenum spp.
Zacate Amargo	Axonopus compresus
	Homolepsis
	Calepogonium
Weeds:	
	Hyptis capitata
	Sida acuta
	Mimosa pudica
	Sonchus oleraceus
	Paspalum urbillei
	Solanum nigrescens
Leguminosae:	
Kudzu Tropical	Pueraria phaseoloides
Poró	Erythrina poeppigiana
Madero Negro	Glyricidia sepium

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.

MINISTERIO DE AGRICULTURA Y GANADERIA
SAN JOSE, COSTA RICA

San José, 27 de mayo de 1986
Nº 263 - VM

A QUIEN INTERESE :

El suscrito, Ing. Osvaldo Pandolfo, VICEMINISTRO del Ministerio de Agricultura y Ganadería, tiene el gusto de presentar al señor AERNOUT VAN DER WEIDE (Zootecnista, funcionario de la Univesidad de Wageningen (Holanda, con la cual este Ministerio desarrolla un Programa de Cooperación Técnica sobre estudios exploratorios de recursos agropecuarios de la Región Atlántica.

Así mismo, solicito para este funcionario toda la colaboración posible, tanto de empresas públicas como privadas, que permitan la más apropiada ejecución de sus labores.

Muy atentamente,

ING. AGR. OSVALDO PANDOLFO RIMOLO
VICEMINISTRO DE AGRICULTURA Y GANADERIA

OPR/bdea

CC: Archivo