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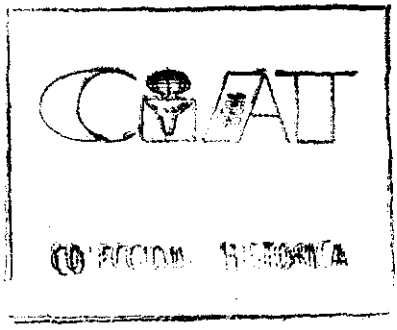
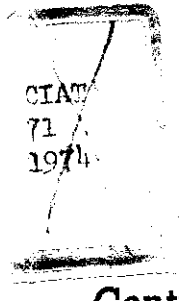


Some aspects of the cattle industry on the North Coast Plains of Colombia

LIBARDO RIVAS RIOS



Centro Internacional de Agricultura Tropical

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Some aspects of the cattle industry on the North Coast Plains of Colombia

LIBARDO RIVAS RIOS

Centro Internacional de Agricultura Tropical

Cali, Colombia

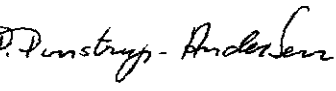
CONTENTS

FOREWORD

This study describes cattle production systems and their productivity the North Coast Region of Colombia.It is part of a multi-disciplinary effort to obtain a better understanding of the factors limiting production and productivity in the Latin American cattle industry.

The study is based on data obtained from a large number of cattle producers and provides a general description of the present situation. A supplementary study is being planned to gather more detailed information from a designated number of farms, in order to provide more knowledge of the factors influencing the economics of cattle production in the region.

It is hoped that the methodology and the results of this study will be useful to national and international organizations in the allocation of resources for research and extension and in the establishment of government policy relating to the cattle industry.



Per Pinstrup-Andersen
Leader, Agricultural Economics Program

Cali, Colombia, December 1973.

HIGHLIGHTS

1. This report provides the results of a study on the cattle industry in the North Coast Region of Colombia where basic data were obtained through a survey of 487 cattle ranches in the region.

2. An economic analysis of the ranches shows that net incomes and non-estimated costs per hectare maintain an inverse relationship to ranch size.

3. Even though the area studied is dedicated to beef production, milk production is economically important, particularly on small ranches. Here, milk production is important a) as a source of income; b) as a source of family nutrition; c) as a source of cash flow.

4. Cattle production and productivity in the area were limited mainly by inefficient husbandry practices and poor pasture management; by the inavailability of credit and technical assistance; and by shortages of animal feed during certain seasons.

5. Two key factors of inefficient management are the lack of basic records and poor training of laborers, including those in charge of administration and management.

6. It is recommended that milk production play an integral role in cattle production research, extension, and in the formulation of government cattle production policies for the region.

7. Efforts should be made to train administrators, foremen and, in some cases, the owners of the cattle ranches of the area.

8. It is recommended that economic and/or biological research be conducted in the following areas:

a) the milking of Zebu cows and its effect on the physiological development and growth of their offspring under current management practices;

b) the possibility of increasing the availability of food during the dry season;

c) the effect of alternative credit systems on cattle production;

d) the identification of animal health problems and the evaluation of their relative economic importance in the region;

e) the identification of principal diseases, pests and weeds affecting pastures and their estimated economic importance;

f) the description and analysis of the cattle marketing process in the region.

ACKNOWLEDGEMENTS

We wish to express our appreciation to Drs. Gerald I. Trant and Per Pinstrup-Andersen who directed this study. Their supervision, criticism and suggestions were invaluable to the development and completion of this work.

Further, we are indebted to the many people and institutions who assisted in the completion of this study. The list is extensive, but we would like to mention a few. The Caja de Crédito Agrario Industrial y Minero, the Banco Ganadero, the Instituto Colombiano de la Reforma Agraria, the Instituto Colombiano Agropecuario, and the regional Fondo Ganadero which assisted us in the development of the sample. We are indebted to Carlos Torres, Uriel Gutiérrez, César Valencia, Julio César Montes, José L. Ortiz, Camilo Jaramillo, Ernesto Orozco, Darío Martínez, Octavio Duque, Fabio N. Motta and Guillermo Reyes, for their assistance in the collection of the data; to Drs. Ned S. Raun, Eric Wells, C. Patrick Moore, Thomas Galvin, Charles Mullenax, H. Stonaker, Héctor Sarmiento, James Spain and Oswaldo Paladines, among others, who assisted in the review of thes report; to Miss María Eugenia Alvarez for her aid in the tabulation of the data; to Mrs. Yolanda I. de Lema and Mrs. Cielo de Rodríguez who typed the manuscript; to Miss Martha S. Daza who is responsible for the English translation and to Dr. Francis C. Byrnes, Mrs. Paulette Bermudez and Mr. Mark A. Gordon who edited this report and attended to its reproduction. To all these people we wish to express our gratitude.

INTRODUCTION

Background

We at the Centro Internacional de Agricultura Tropical, CIAT, through our Agricultural Economics Program, decided to perform a study on the productivity of the Colombian cattle industry because its potential is considered of great importance in the agrarian development of Colombia and other Latin American countries. Colombia has about 43 million hectares of pasture land which represents 38 per cent of the total area of the country, but only 16 million hectares are presently utilized, representing 40 per cent of the total pasture land available[1]. It is clear that the land not presently used for cattle ranching requires adequate preparation if a profitable operation is to be carried out in terms of pasture area. Colombia however seems to have an excellent potential for beef production.

Accurate data on the present cattle population are not available and various statistical sources show different figures. The latest National Statistics Office (DANE) information shows that the Colombian cattle population reached 19.432.000 head in 1970. This is relatively large population if compared with that of major beef producing and exporting countries, such as Australia, whose cattle population is similar to that of Colombia.[2] In South America, only Brazil and Argentina surpass Colombia's cattle population.

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1 Instituto Colombiano Agropecuario, ICA. Ganado de carne. Manual de Asistencia Técnica No. 2, p. 5.

2 United Nations Food and Agricultural Organization, FAO, Trade and Production Yearbooks, 1969.

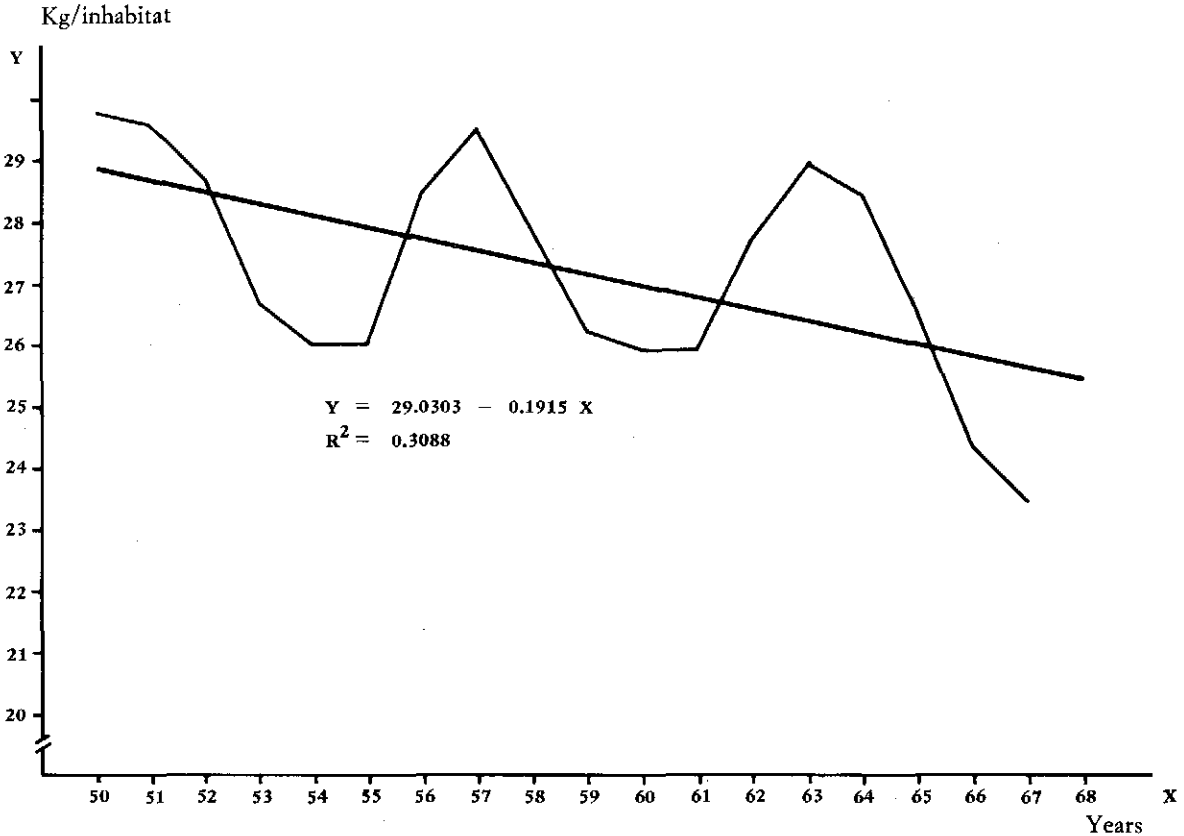
In spite of the fact that Colombia possesses the most important conditions for beef production —pastures and cattle, the annual *per capita* consumption of beef is continuously declining. This is because the growth rate in human population is greater than the annual growth rate in beef production (Table 0.1 and Figures 0.1 and 0.2).

Table 0.1. *Human population, cattle population, production, slaughter and* per capita *consumption of meat in Colombia, 1950-1970 (Figures-expressed in thousands).*

Years	*Human Population*[1]	*Cattle Population*[2]	*Production (head)*[3]	*Slaugter (head)*[4]	*Annual per capita consumption of meat Kg.*[5]
1950	11,615	15,513	1,849	1,397	29,8
1951	11,615	15,512	1,434	1,431	29,6
1952	11,986	12,200	1,415	1,414	28,7
1953	12,369	10,500	1,326	1,336	26,7
1954	12,764	10,994	1,309	1,315	26,0
1955	13,172	12,500	1,804	1,354	26,0
1956	13,593	13,390	2,054	1,550	26,0
1957	14,028	14,400	2,205	1,677	28,5
1958	14,476	14,840	2,336	1,652	29,5
1959	14,938	15,100	2,175	1,557	27,8
1960	15,415	15,400	2,412	1,581	26,2
1961	15,908	15,600	2,322	1,702	25,9
1962	16,417	15,600	2,487	1,879	25,9
1963	16,941	15,800	2,620	2,019	27,7
1964	17,482	16,000	2,684	2,068	28,9
1965	18,043	16,100	2,631	2,035	28,4
1966	18,620	17,605	2,614	1,925	26,5
1967	19,215	18,045	2,635	1,870	24,3
1968	19,829	18,496	2,357 *	1,942	23,4
1969	20,463	18,958	2,411 *	2,177	18,7 **
1970	21,117	19,432	—	2,293	—

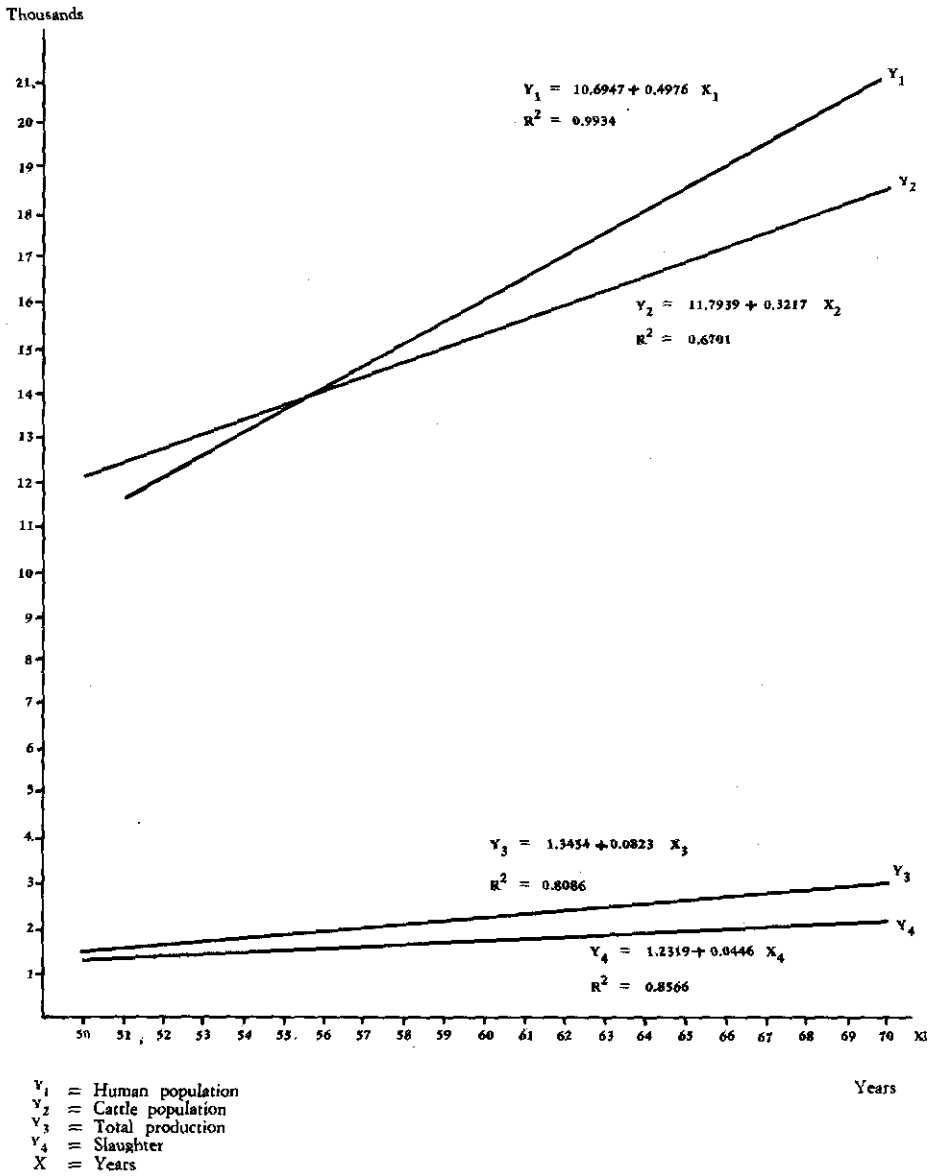
Sources: 1 Banco Ganadero. *Informes & Balances 1968-1969-1970.*
2 Silva, María Helena. *Colombia. Estadísticas Agropecuarias 1950-1966.* Universidad del Valle - ICA.
Tróchez, Carmen Helena. *Colombia. Estadísticas Agropecuarias 1966-1970.* Universidad del Valle. Social and Economic Sciences Division.
3 Atkinson, Jay L. *Changes in Agricultural Production and Technology in Colombia.* U. S. Department of Agriculture, Economic Research Services, p. 60.
4 Departamento Administrativo Nacional de Estadística. (National Statistics Office)
5 Riley, Harold M. *Beef Production in Colombia.* Universidad Nacional de Colombia. Palmira, 1962, p. 29.

* Estimated.
** Banco Ganadero.



Y = *Per capita* consumption
X = Years

Figure 0.1. Annual *per capita* consumption trend in Colombia - 1950-1968.



Y_1 = Human population
Y_2 = Cattle population
Y_3 = Total production
Y_4 = Slaughter
X = Years

Figure 0.2. Human population, cattle population, production and slaughter trends.

Table 0.2. *Available, recommended and deficient amounts of animal protein sources* per capita *in Colombia.*

Products	*Availability*			*Recommended amount*	*Deficit*
	Kg/Year	*Gr/day*	*%*	*Kg/Year*	*Kg/Year*
Beef	18.83	51.59	71.20	28.0	9.17
Pork	2.72	7.45	10.30	4.1	1.38
Mutton	0.09	0.25	0.30	0.1	0.01
Goat	0.01	0.03	3.03	0.01	0.00
Poultry	0.47	1.29	1.77	0.69	0.22
Fish and seafood	1.13	3.10	4.30	1.69	0.56
Eggs	3.17	8.68	12.10	4.76	1.59
Total	26.42	72.39	100.00	39.35	12.93

Source: Sáenz y J. A., Eusebio. 1970. *Recomendaciones de consumo de alimentos para Colombia.* Universidad Nacional. División Estudios Nutricionales. Bogotá. T.R.N. 40.

Furthermore, the *per capita* consumption of meat is below the 28 kg per year recommended by nutritionists (Table 0.2). At the present growth rate of 3.2 percent per year, the human population of Colombia will reach 24.7 million by 1975 and the estimated beef production deficit will be in the order of 227.2 million kg.

With this prospect in mind, a thorough study of the cattle industry is needed to obtain a clear understanding of the present situation and to strive to make it more productive through better utilization of available resources.

An increase in productivity which, in turn, increases production significantly, will only partially solve the present nutritional deficit. Even though potential demand may be high, the entire deficit cannot be overcome because nutritional requirements are higher than the effective demand.

The potential demand does not generate higher consumption because this effective demand depends essentially on consumer income and market prices. Consequently the greatest nutritional deficits are found primarily among low-income families. Even if beef production were substantially increased, it would be difficult or impossible to raise the nutritional level to a desirable standard without improving the incomes of the lower economic strata of the population.

The possible increases in production caused by increased cattle industry productivity may allow the country to improve its competitive position in the international beef market which, in turn, would increase the flow of foreign exchange needed to finance Colombia's economic development.

Objectives

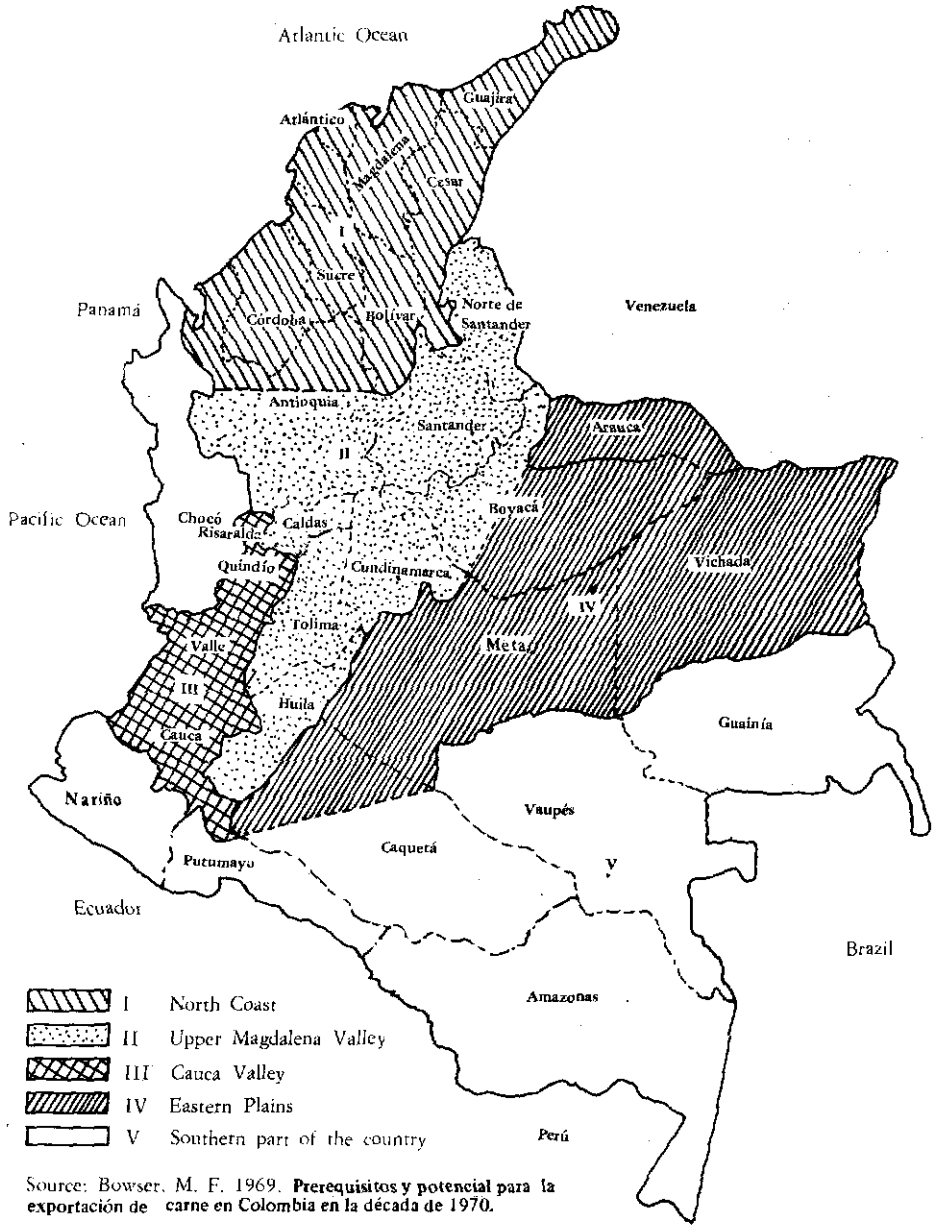
At present, Colombia is short on data for use in formulating policy to increase cattle productivity. For this reason, the present study attempts to attain the following goals: 1) to make an objective diagnosis of the cattle sector of the North Coast Region of Colombia by defining existing problems and estimating productivity rates. 2) within this framework, to formulate possible solutions to the problems and to recommend suitable policies concerning cattle raising. 3) to support the research staffs at CIAT and other institutions, in their efforts to determine existing problems in the area's cattle industry and cooperating with them in expanding and improving research and credit facilities. 4) to develop and test methods that can be used in similar studies in other Latin American countries, and to demonstrate their usefulness.

Cattle areas

There are five well-defined beef producing areas in Colombia:

I) the North Coast Plains, II) the Magdalena River Valley, III) the Cauca River Valley, IV) the Eastern Plains, V) the southern part of the country. Table 0.3 shows the extent of these areas and their respective cattle populations and Figure 0.3 shows their geographical location.

Ecologically, these areas vary greatly and production systems also differ. Because of soil quality, for instance, the cattle industry in the Eastern Plains is more extensive than in any other area of the country.



Source: Bowser, M. F. 1969. **Prerequisitos y potencial para la exportación de carne en Colombia en la década de 1970.**

Figure 0.3. Major cattle producing areas of Colombia.

Table 0.3. *Cattle regions, extension in hectares and cattle population of Colombia.*

Cattle regions	*Extension (ha.)*	*Cattle population (head)*
I) North Coast Plains[1]	9.707.396	7.567.000
II) Upper and Lower Magdalena[2]	5.607.214	4.330.000
III) Cauca River Valley[3]	1.166.408	1.250.000
IV) Eastern Plains[4]	23.908.780	1.340.000
V) Southern part of the country[5]	3.501.578	371.000

1 Includes Córdoba, Bolívar, Atlántico, Sucre, Cesar, Magdalena and Guajira.
2 Includes Huila, Cundinamarca, Caldas, Boyacá, Antioquia and the two departments of Santander.
3 Includes the Cauca, Valley and part of Caldas.
4 Includes Meta, part of Cundinamarca, Casanare, Arauca, Vichada and Guainía.
5 Includes Vaupés, Putumayo, Caquetá and Nariño.

Source: Caja de Crédito Agrario Industrial y Minero *El ganado vacuno en Colombia.* Pp. 9 - 13.

The North Coast Plains will be studied first because of its considerable volume of beef production (Table 0.4). The other areas may be considered in future studies.

Table 0.4. *Estimated beef production by geographical areas in Colombia (metric tons.).*

Year	*North Coast Plains*[1]	*Eastern Plains*	*Cauca River Valley*[2]	*Upper Magdalena and Meta*[3]	*Southern Colombia*	*Two Depts. of Santander*[4]
1966	195,457	6.818	46.306	119,236	631	70,165
1967	185,692	6,417	43,349	113,282	191	66,659
1968	186,402	6,408	43,339	113,151	n.a.	66,507
1969	198,082	6,417	47,336	115,763	n.a.	66,669
1970	213,669	6,502	52.074	124,015	n.a.	71,178
1971	240,325	6,722	57,559	134,240	n.a.	76,829
1972	260,080	6,808	63.195	144,545	n.a.	82,443

1 Includes Atlántico, Bolívar, Cesar, Córdoba, Guajira, Magdalena, Sucre.
2 Includes Valle, Cauca, Risaralda, Quindío and Nariño.
3 Includes Cundinamarca, Tolima, Huila, Antioquia, Caldas and Meta.
4 Includes Santander del Norte, Santander and Boyacá.
n.a. not available.

Source: Bowser, Max F. *1969 Prerrequisitos y potencial para la exportación de carne en Colombia en la década de 1970.* ICA. Pgs. 61 - 67.

CHAPTER I

COMPILATION OF DATA

Secondary information

As one of the main objectives of the study was to compile basic information and to improve the existing data, the first stage of the work was completely dedicated to obtaining and reviewing a great amount of bibliographical material related to information on cattle raising, with special emphasis on the North Coast Region.

Only general information was available on total cattle population, slaughter, pasture, hectarage, etc. There were no specific data on stocking capability, birth and mortality rates, production costs, profitability, etc. In some cases, the information was contradictory and inconsistent whether coming from different sources or from a single source.

Primary information

After a bibliographical review, in the second stage of the study, a survey was carried out in the North Coast Plains to obtain nonavailable information on beef production. A questionnaire was prepared and tested. It contained the following topics: a) availability of such production factors as land, labor, cattle, machinery and equipment; b) production: cattle, milk and cheese sales; c) administration and management practices: production records, economic activity, animal health, feeding, grass and soil management; d) credit and technical assistance situations; e) possible reactions of cattle ranchers to new situations.

The sample

The Caja de Crédito Agrario, Industrial y Minero (Caja Agraria), Banco Ganadero, Instituto Colombiano de la Reforma Agraria (INCORA), Instituto Colombiano Agropecuario (ICA), and Fondos Ganaderos of each region, made available the names and addresses of the cattle producers which directly or indirectly deal with these institutions. Names were also taken from the 1971 National Cattle Producers' Directory and an additional list of cattlemen was made with names provided by residents of the surveyed area.

Names for interviewing were drawn at random from a final list of approximately 4,000 producers.

The universe and the sample size

It is virtually impossible to establish a universe of the North Coast Plains cattlemen, giving the owner's names, addresses and ranch locations. According to the DANE 1960 Agriculture and Livestock Census, the Atlantic Coast area had 45,653 cattle operations, basically oriented towards milk and beef cattle production (Table 1.1).

From our directory, which was part of the universe, 487 interviews were conducted initially and 20 interviews were cancelled in the field because the information available contained erroneous data. In the tabulating stage of the survey, some of the data originally accepted were discarded because of inconsistency with other information obtained throughout the interview. In summary, our directory and the sample represented respectively, 10 percent and 1 percent of the universe.

Limitations of the study

The lack of records in most of the places visited was the main limiting factor in this study. For this reason, producers could not answer some of the items in the questionnaire. For example, on the topic of cattle population, some producers were unable to discriminate their herds according to age and sex. Because of the lack of records it was necessary to limit the calculation of birth rates to only those farms supplying

Table 1.1. *Cattle ranches by departments on the Atlantic Coast of Colombia.*

Departments	*Number of cattle ranches reported by census*	*Percentage*
Atlántico	3,302	7.2
Bolívar	14,776	32.3
Córdoba	12,127	26.7
Magdalena	15,448	33.8
Total	45,653	100.0

Source: DANE. *Censo Agropecuario Nacional 1960.*

all the necessary data. Another limiting factor was difficulty in locating cattle producers who lived far away from their farms.

Zoning of the work area

To obtain specific information, the area was divided into 10 zones, taking into account the degree of ecological homogeneity of each zone and overlooking departmental divisions. The cooperation of trainees from CIAT's Livestock Production Specialist Training Program, in Sincelejo (Sucre), with their deep insight of the North Coast Plains, was valuable in the zoning process.

The selected zones were: Zone 1, Middle Sinú; Zone 2, Savannas of Córdoba and Bolívar (south); Zone 3, Lower Sinú; Zone 4, Mompós-Magdalena River Depression; Zone 5, Savannas of Córdoba and Bolívar (north and central); Zone 6, Coast of Bolívar; Zone 7, coast of Atlántico; Zone 8, Lower Magdalena; Zone 9, Cesar River Valley; Zone 10, Gulf of Morrosquillo.

The selected zones appear in Figures 1.1 and 1.2 and are briefly described here:

Middle Sinú (Zone 1)

The Sinú River Valley is an extensive plain in the department of Córdoba, formed by the Sinú River and surrounded by branches of the Western Cordillera and the Sierras of Abibe,

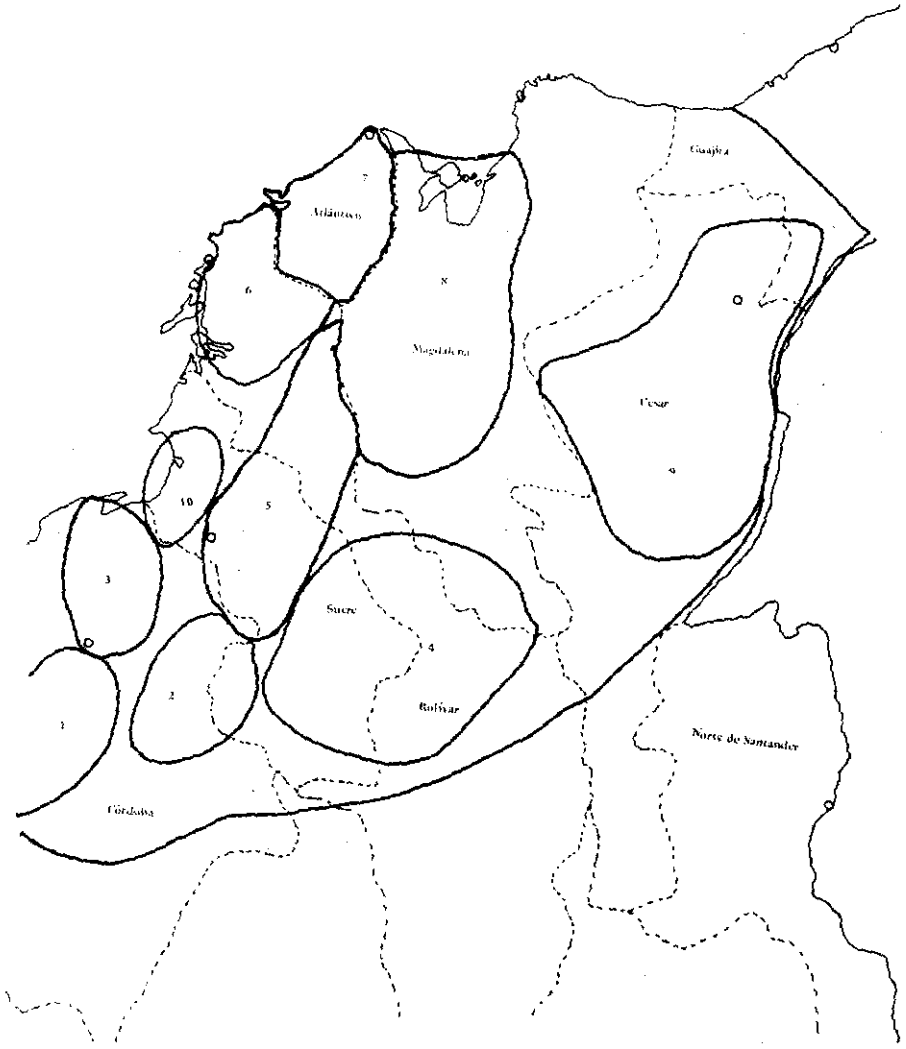


Figure 1.1. Geographical zones in the North Coast region.

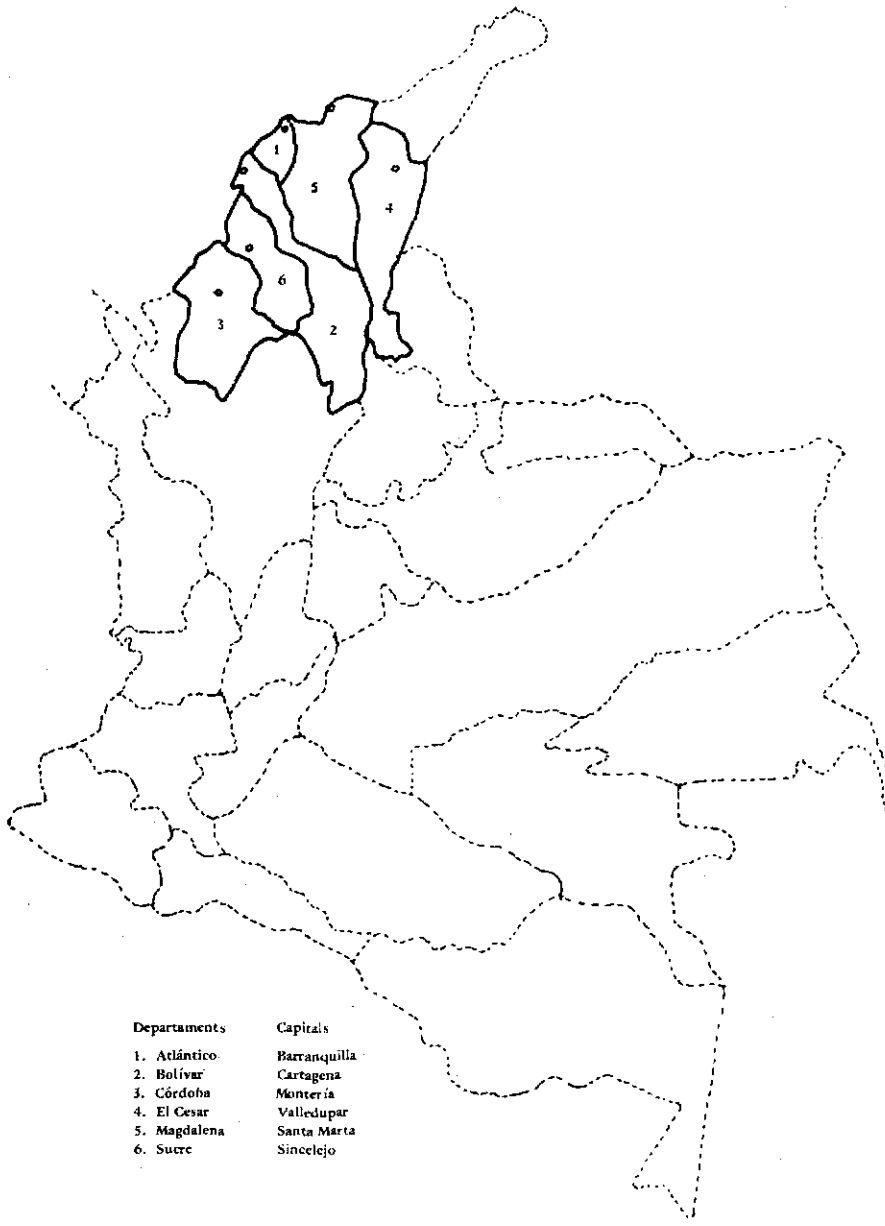


Figure 1.2. Main departments and cities of the North Coast Plains

Las Palomas and San Jerónimo. The eastern part of the valley is undulating with hills having a gradient of up to 80 percent. The central part of the Sinú River Valley is less subject to flooding than the lower part and has Montería as its main commercial center (average temperature 29°C and 20 meters above sea level).

The Savannas of Córdoba and Bolívar (Zones 2 and 5)

These zones are commonly called the Savannas of Bolívar and "are located in slightly undulating areas among the valleys of the Sinú, San Jorge and Magdalena rivers and the northern basins formed in the Western Cordillera and the Mounts of María. The extensive prairies adequate for cattle raising are located between the arid coast and the humid basins. Drought is characteristic of this area and is accentuated by strong trade winds".[3] During the dry season the cattle are taken temporarily to the marshes of the San Jorge and Cauca Rivers. Sincelejo is the main commercial center of the Savannas (200 meters above sea level). In this study, the southern part of the Savannas, located between Planeta Rica and Sahagún, is designated as zone 2; the central and northern parts, between Sahagún and Calamar, are called zone 5.

Lower Sinú (Zone 3)

This is a flat region located between Montería and the Bay of Cispatá where the Sinú River flows into the Atlantic Ocean and it is the area least susceptible to flooding in the valley. Its width varies and in Cereté reaches 18 kms. The sedimentation of the river has caused undulations in the eastern part of the valley. For this reason, the lower parts of the valley are flooded during the rainy season and marshes are formed which last throughout most of the year. This is a limiting factor in the development of the extensive livestock industry. In some areas there are temporary cotton and corn crops and permanent plantain crops.

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3 Source: Guhl, Ernesto. *Colombia. Bosquejo de su Geografía Tropical.* Universidad Nacional de Colombia, Department of Geography, p. 106.

Mompós-Magdalena River Depression (Zone 4)

The Mompós-Magdalena River Depression is the lowest region on the North Coast Plains. The depression begins at El Banco port, on the Magdalena River, where the river divides into the Loba and the Mompós branches. "All the water of the Magdalena river basin (260,000 km^2, without counting the Cauca river, 197,000 km^2) flows into the Mompós depression, located at the foot of the Andes and isolated from the coast by small hills, in the North Coast Savannas. This is the zone in the country most likely to flood and is 130 km wide and 75 km long."[4]

Magangué, a port of the Magdalena River, 27 meters above sea level, is the main commercial center of this area.

The Coasts (Coastal zones of Bolívar and Atlántico, Zones 6 and 7).

These two coastal zones have similar dry hot climates and arid soil conditions unfavorable to agriculture. These are small-farm regions where livestock operations are mainly dedicated to milk production and they supply Cartagena and Barranquilla, the two main milk consuming centers in the North Coast Plains.

Lower Magdalena (Zone 8)

This area is located between the right bank of the river and the mountain ranges of the municipalities of Ciénaga, Fundación and Aracataca that are part of the Sierra Nevada of Santa Marta. The northern part of the lower Magdalena area, where the great marsh of Santa Marta is located, is easily inundated. The flat areas of the Aracataca and Ciénaga form the banana zone. Today, however, the banana plantation is gradually disappearing, and the land that was formerly exploited by foreign companies is being incorporated in the projects of the Colombian Agrarian Reform Institute (INCORA).

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4 Source: Guhl, Ernesto. *Colombia. Bosquejo de su Geografía Tropical.* Universidad Nacional de Colombia, Department of Geography, p. 30.

Fundación is located south of the banana zone and is dedicated almost entirely to livestock. However, because of the regularity of rainfall during the second semester of the year, this area is used to plant corn, cotton and rice. Generally speaking, the main livestock centers in this area are Santa Marta, Ciénaga, Fundación, Plato and Pivijay.

Cesar River Valley (Zone 9)

Also known as the Savannas of Valledupar, this valley is formed by the Cesar River and all the plains extending between the Sierra Nevada of Santa Marta and the Eastern Cordillera (Sierra of Los Motilones).

This area has the best soils on the plains; its climate is dry and is strongly influenced by the surrounding mountains. Agriculture and livestock are the most important economic activities of the area. The main commercial center is Valledupar.

Zone of the Gulf of Morrosquillo (Zone 10)

This area extends from the Sierra of San Jacinto, an integral part of the Mounts of María, to the Gulf of Morrosquillo. The main municipalities are San Onofre, Tolú, Toluviejo and Palmitos. The geographic formations are varied including the low alluvial plains of Tolú and San Onofre and the rolling and mountainous areas of the Sierra of San Jacinto. Tolú and San Onofre have good grasses and, therefore, the cattle industry in this area is oriented mainly towards fattening. The area lacks water for large-scale crops; it does not have a defined river basin and the water is supplied by small streams flowing from the Sierra of San Jacinto to the Atlantic Ocean or the Magdalena River. During the dry season, however, these streams dry out and water must be stored in reservoirs or "jagueyes"[5] to meet the needs of the human and animal population. A more detailed description of this area is given in the appendix. The geographical distribution of the surveys appear in Table 1.2.

5 Jagueyes: typical name given to water reservoirs in some areas of Colombia.

Table 1.2. *Geographical distribution of the surveys conducted.*

Geographical areas	*Number of surveys*	*Percentage of the total*
Middle Sinú	31	6.3
Savannas of Bolívar (south)	43	9.0
Lower Sinú	35	7.1
Mompós-Magdalena River Depression	35	7.1
Savannas of Bolívar (north and central)	63	13.0
Coast of Bolívar	48	10.0
Coast of Atlántico	35	7.1
Lower Magdalena	85	17.4
Cesar River Valley	83	17.0
Gulf of Morrosquillo	29	6.0
Total	487	100.0

Processing of information

Classification

In order to obtain more specific information, cattle ranches in the 10 geographical zones were divided into three categories (Table 1.3). Category 1, includes ranches from 0 to 200 hectares; category 2, from 201 to 500 hectares; and category 3, those over 500 hectares. This classification was used to clarify the differences in productivity existing among the small, medium and large-size producers. It should be noted that the classification was made based on the author's subjective criteria.

Table 1.3. *Distribution of surveys by categories*

Categories	*Number of surveys*	*Percentage of the total*
Category 1	281	57.7
Category 2	138	28.3
Category 3	68	14.0
Total	487	100.0

Presentación de la información

Presentation of information

The information compiled is generally presented in terms of simple arithmetic averages, frequency distribution and weighted averages.

The factors used to obtain weighted averages were found by taking the distribution of farms by location and size (given by the 1960 DANE agricultural and livestock census) and grouping them into the three categories described earlier. The total farm percentage in each category was used as the weight factor for the respective category. Table 1.4 shows weight factors of 88, 8 and 4 for categories 1, 2 and 3, respectively, in the Middle Sinú. This means that 88 percent of the total number of cattle farms in this area have from 0 to 200 hectares, 8 percent have between 201 and 500 hectares and the remaining 4 percent have over 500 hectares.

Table 1.4. *Weight factors used*

Geographical areas	*Category 1*	*Category 2*	*Category 3*
Lower Sinú	88	8	4
Savannas of Bolívar (south)	88	8	4
Middle Sinú	88	8	4
Mompós-Magdalena River Depression	89	7	4
Savannas of Bolivar (north and central)	88	8	4
Coast of Bolivar	89	7	4
Coast of Atlántico	92	6	2
Lower Magdalena	81	12	7
Cesar River Valley	81	12	7
Gulf of Morrosquillo	88	8	4
Total weight factors for the area	86	9	5

Source: Calculations based on the Agricultural and Livestock Census, 1960.

CHAPTER II

ECONOMIC ORIENTATION AND PROFITABILITY

Economic orientation

The cattle industry on the North Coast Plains of Colombia is basically oriented towards beef production. There is a continuous flow of cattle from this area to other parts of the country lacking in beef. However, on 62 percent of the farms surveyed, cow-calf and milk production were the main economic activities while fattening was important in only 3 percent of the farms (Table 2.1).

Seventy-four percent of the cow-calf and milk producing farms have between 0 and 200 hectares while 54 percent of those engaged in fattening have more than 500 hectares (Table 2.2). These statistics show that in general, the small producer engages mainly in cow-calf and milk production. This

Table 2.1. *Distribution of cattle ranches on the North Coast plains, by main economic activity*

Main economic activity	*No. of ranches*	*Percentage*
Cow-calf and milk production	294	62
Cow-calf and growing	94	20
Cow-calf, growing and fattening	35	7
Growing	30	6
Fattening	13	3
Growing and fattening	10	2
Total	476	100

Table 2.2. *Distribution of cattle ranches by size and main economic activity on the North Coast Plains*

Main economic activity	*0-200 ha*		*201-500 ha*		*Over 500 ha*		*Total*	
	No. of ranches	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*
Cow-calf and milk production	217	74.0	67	23.0	10	3.0	294	100.0
Cow-calf and growing	38	40.5	35	37.2	21	22.3	94	100.0
Cow-calf, growing and fattening	8	23.0	6	17.0	21	60.0	35	100.0
Growing	18	60.0	9	30.0	3	10.0	30	100.0
Fattening	1	8.0	5	38.0	7	54.0	13	100.0
Growing and fattening	1	10.0	4	40.0	5	50.0	10	100.0
Total	283	59.0	126	27.0	67	14.0	476	100.0

is the most risky part of the cattle operation because a cattle farm must have high reproduction rates and low mortality rates if good results are expected.

The North Coast Plains and the Atlántico and Bolívar coasts are mainly dairy areas; 73.4 and 74 percent, respectively, of the farms are dedicated to cow-calf and milk activities (Table 2.3). The farms in the Lower and Middle Sinú regions are mainly cattle fattening operations. A high percentage of the farms in the Gulf of Morrosquillo have a complete livestock reproduction cycle, that is, cow-calf production, growing and fattening.

Land utilization

The farms of the North Coast Plains are almost exclusively used for cattle raising. On the average, 88 percent of the area is dedicated to pasture land, 6 percent to crops for home consumption, 5 percent is nonutilizable land or wooded areas and the remaining 1 percent is used for other purposes (Table 2.4).

Other types of livestock

On some farms, there exist small non-commercial livestock and poultry populations that are mainly used for farm labor and home consumption. Table 2.5 shows the statistics for these populations. Table 2.6 shows, by categories, the number of farms that have specific types of livestock or poultry.

Table 2.3. *Percentage distribution of cattle farms on the North Coast Plains by geographical area and by economic activity*

Geographical areas	*Cow-calf and milk production*	*Cow-calf and growing*	*Cow-calf, growing and fattening*	*Fattening*	*Growing*	*Growing and fattening*	*Other*[1]
Middle Sinú	37.0	28.0	16.0	16.0	3.0	—	—
Savannas of Bolívar (south)	50.0	33.4	2.4	7.1	7.1	—	—
Lower Sinú	48.5	18.2	12.1	9.1	9.1	3.0	—
Mompós-Magdalena River Depression	58.0	15.0	9.0	—	12.0	6.0	—
Savannas of Bolívar (north and central)	72.0	10.4	8.0	—	3.2	3.2	3.2
Coast of Atlántico	73.4	23.3	3.3	—	—	—	—
Coast of Bolívar	74.0	17.0	—	—	9.0	—	—
Lower Magdalena	66.0	20.0	6.0	—	7.0	1.0	—
Cesar Valley	58.0	24.1	8.0	2.4	5.1	2.4	—
Gulf of Morrosquillo	41.0	21.0	17.0	7.0	7.0	7.0	—

1 Selective livestock or any other type of cattle operation.

Table 2.4. *Land utilization on cattle ranches of the North Coast Plains*

Land utilization	*No. of hectares*	*Percentage*
Total area	153,635	100
Pasture area	134,939	88
Crop area	9,509	6
Woods and non-utilizable land	8,163	5
Other	1,025	1

Predominant cattle breeds

Ninety percent of the Plain's cattle population belongs to the cross-bred Zebu and/or "pringado" type which is the most commonly found breed in the region.

The use of European breeds in this area is insignificant with Brown-Swiss being the most predominant (Table 2.7).

Profitability

Profitability can be defined as the net profit obtained from money invested in the business. Often, the degree of profitability can be a good indicator of the efficiency of resource utilization and of the managerial ability of those operating the business. In general, profitability is directly related to the market conditions in which the enterprise operates, the tech-

Table 2.5. *Average population of other types of livestock and poultry per cattle ranch on the North Coast Plains*

Type of livestock or poultry	*Average No. of animals per ranch*			*Weighted average*
	0-200 ha	*201-500 ha*	*Over 500 ha*	
Donkeys	2	3	5	2
Oxen	3	4	7	3
Horses	5	9	21	6
Goats	11	19	13	12
Pigs	3	8	17	4
Hens	30	64	137	38
Mules	3	4	8	3
Sheep	13	31	32	15
Ducks	11	20	29	13
Turkeys	8	12	13	9

Table 2.6. *Number of ranches by ranch size, on the North Coast Plains having other types of livestock,*

Type of livestock and poultry	*0-200 ha*		*201-500 ha*		*Over 500 ha*		*Total*	
	No. of ranches	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*
Donkeys	132	47	72	53	32	47	236	48
Oxen	41	15	62	46	37	54	140	29
Horses	251	89	128	95	64	94	443	91
Goats	28	10	21	16	43	63	92	19
Pigs	82	29	52	38	30	43	177	36
Hens	125	44	71	53	42	62	238	49
Mules	171	61	110	81	51	75	332	68
Sheep	36	13	25	19	17	25	78	16
Ducks	35	12	36	27	17	25	88	18
Turkeys	40	14	39	29	22	32	101	21

Table 2.7. *Cattle population distribution by breeds, on the North Coast Plains*

Breeds	*Population to July/71 (head)*	*Percentage of the total*
Cross-bred Zebu and/or pringado	153,421	90.00
Pure Zebu	6,563	3.85
"Criollo" native breed (mixed)	4,946	2.90
Brown-Swiss	2,365	1.40
Brown-Swiss crossed with Zebu	911	0.60
Santa Gertrudis	750	0.44
Holstein	627	0.35
Holstein crossed with Brown-Swiss	323	0.20
Charbray	180	0.10
"Costeño con cuernos"	155	0.10
Gyr	97	0.05
Hereford	28	0.01
Ayreshire	3	0.00
Gucerat	2	0.00

nological level and the managerial criteria which prevail in the business. No data are available on the profitability of cattle operations in the Plains, and in Colombia in general, because most farms lack accurate records which would permit the determination of profitability.

For this study, statistics were obtained, for the first semester of 1971, of cattle and milk sales, initial cost of machinery and facilities, capital investment in land and cattle and cost of permanent labor on the cattle farms of the plains (Table 2.8). Based on these statistics, fixed costs of machinery and facilities were estimated on a semester basis. This estimate represents the depreciation costs of these two items assuming that the equipment would last 10 years and the facilities 20 years.

A zero salvage value and a straight line depreciation method were used.

Alternative costs of capital investments in cattle and land were determined. A cost of 10 percent per year was estimated for land and 12 percent per year for cattle. It was assumed that capital invested in cattle had a higher alternative cost than that invested in land because of the higher liquidity. To the previous costs, was added the cost per semester of perma-

Table 2.8. *Cattle and milk sales and average investments in land, facilities, equipment and cattle, by size, on the North Coast Plains First semester 1971*

Average value	*0-200 ha $ Col.* [1]	*201-500 ha $ Col.*	*Over 500 ha $ Col.*
Cattle sales	46,827	137,822	418,971
Milk sales	23,472	57,882	62,340
Total sales	70,299	195,704	481,311
Present value of the land	263,549	856,606	2,632,708
Initial cost of equipment	60,325	158,101	281,226
Initial cost of facilities	56,191	206,147	382,449
Number of permanent laborers	4	8	15
Average number of hectares in pasture land	94	291	738

1 Colombian pesos. Approximate rate of exchange at that time, 20 Col. pesos to US$1.00.

nent labor on the farm. The amount available to the producer to cover non-estimated or variable costs and profit was determined by subtracting all these costs from the total income received during the semester.

In relating the residual amount of money to the number of hectares of pasture land utilized, to cover variable costs and profits, producers obtain an average of $315 Colombian pesos per hectare in category 1; $290 in category 2, and $256 in category 3 (Table 2.9). From this information it can be observed that the larger the farm, the smaller the residual; this is because fixed costs increase at a faster rate than income when moving from a lower category to a higher one.

Using the same procedure to estimate costs in the different zones, the highest average residual contributions were found in the Mompós-Magdalena Depression, the Lower Magdalena and in the Cesar River Valley; the lowest were found on the Bolívar coast and on the two sections of the Savannas of Bolívar (Table 2.10). The residual per hectare of pasture land, by geographical zones, is shown in Table 2.11. This residual is highest for the small-farm region known as Coast of Atlántico where fixed costs are low because of small investments in facilities and equipment.

Table 2.9. *Estimated average costs by ranch size on the North Coast Plains, for the First semester, 1971*

	0-200 ha $ Col.	*201-500 ha* $ Col.	*Over 500 ha* $ Col.
Alternative cost of capital investment in cattle (12% per yr.)	12,264	33,842	96,592
Alternative cost of capital investment in land (10% per yr.)	13,177	42,830	131,635
Depreciation cost of equipment	3,016	7,905	14,061
Depreciation cost of facilities	1,404	5,154	9,561
Cost of permanent labor	10,800	21,600	40,500
Total estimated costs	40,661	111,331	292,349
Value of cattle and milk sales	70,299	195,704	481,311
Residual (includes profits and non-estimated costs)	29,738	84,373	188,962
Residual ha. of pasture	315	290	256

The northern and central parts of the Savannas and the coast of Bolívar have the lowest residual per hectare of pasture land utilized.

When we grouped the farms in our sample by main economic activity rather than by geographical area, four new groups emerged: cow-calf and milk production; cow-calf production, growing and fattening. Fixed costs were then estimated for these farms. The statistics in Table 2.12 on sales and average investment per farm were used to obtain the cost estimates in Table 2.13. Of the groups studied, growing and/or fattening yield the highest residual and cow-calf and milk production yield the lowest residual to cover profits and nonestimated costs per hectare. If the complete cattle production cycle is considered, it can be concluded from Table 2.13, that those producers that work only on the first stage of the cycle, that is, cow-calf and milk production, and those who work through the entire production cycle, that is, cow-calf production, growing and fattening, obtain the lowest residual per hectare of pasture land to cover variable costs and profits. Average-size farms —188 hectares— are mainly engaged in cow-calf and milk production while large-size farms —692 hectares— are engaged in cow-calf production, growing and fattening. This seems to indicate that medium-size operations, dedicated to growing and/or fattening, may be able to obtain the highest profitability.

Table 2.10. *Average costs and income from cattle and milk sales by geographical area on the North Coast Plains*

Geographical areas	*Estimated average values for first semester 1971 ($ Col.)*									
	Alternative cost of capital invested in cattle	*Alternative cost of capital invested in land*	*Depreciation cost of facilities*	*Depreciation cost of equipment*	*Permanent labor cost*	*Total estimated costs*	*Income from cattle sales*	*Income from milk sales*	*Total gross income*	*Residual (includes profits and non-estimated costs)*
Middle Sinú	17,964	29,206	1,871	4,982	17,550	71,573	92,998	13,685	106,683	35,110
Savannas of Bolívar (south)	18,070	17,055	1,980	2,412	16,200	55,717	67,985	15,923	83,908	28,191
Lower Sinú	18,965	21,533	2,112	3,651	10,800	57,061	67,709	20,777	88,486	31,425
Mompós-Magdalena River Depression	22,010	22,467	1,589	5,815	12,150	64,031	107,469	20,114	127,583	63,552
Savannas of Bolívar (north and central)	16,508	23,221	2,404	4,457	12,690	59,280	45,907	20,325	66,232	6,952
Coast of Bolívar	8,667	13,087	1,041	905	9,450	33,150	24,126	20,551	44,677	11,527
Coast of Atlántico	10,655	15,687	2,604	3,114	10,800	42,860	39,902	40,844	80,746	37,886
Lower Magdalena	20,779	20,053	2,502	4,777	10,800	58,911	56,546	65,766	122,312	63,401
Cesar River Valley	25,265	33,708	2,570	6,004	16,200	83,747	109,484	36,576	146,060	62,313
Gulf of Morrosquillo	17,965	20,641	2,123	3,966	10,800	55,495	76,579	20,994	97,573	42,078

Table 2.11. *Residual/ha of pasture to cover variable costs and profits by geographical area on cattle ranches of the North Coast Plains for the first semester 1971*

Geographical areas	*Average marginal contribution per farm $*	*Average ranch size (ha)*	*Residual ha*
Middle Sinú	35,110	204	172
Savannas of Bolívar (south)	28,191	141	200
Lower Sinú	31,425	125	251
Mompós-Magdalena River Depression	63,552	183	347
Savannas of Bolívar (north and central)	6,952	130	53
Coast of Bolívar	11,527	107	108
Coast of Atlántico	37,886	93	407
Lower Magdalena	63,401	162	391
Cesar River Valley	62,313	168	371
Gulf of Morrosquillo	42,078	148	284

Income and annual costs are the two factors involved in the calculation of profitability which is generally estimated for one-year periods. For our work, only total income figures for the first semester of 1971 were used. There was evidence, however, that income for the second semester was slightly higher than that of the first semester. Studying the cattle slaughter patterns of beef from the North Coast Plains in four of Colombia's major cities —Cali, Medellín, Barranquilla and Bucaramanga— it was found that from 1964 to 1972, the

Table 2.12. *Cattle and milk sales and average investment in land, facilities, equipment and cattle, by economic activity in cattle ranches of the North Coast Plains*

Average values per farm ($ Col.)	*Cow-calf and milk production*	*Cow-calf and growing*	*Growing and/or fattening*	*Cow-calf, growing and fattening*
Cattle and milk sales	86,639	248,404	382,616	306,112
Value of cattle inventory in July 1971	343,173	718,268	973,172	1.213,791
Present value of the land	546,998	1.349,480	1.771,533	2.150,805
Initial cost of equipment	99,809	110,727	205,154	207,606
Initial cost of facilities	106,797	233,268	197,837	312,354
Number of permanent laborers	5.6	9.3	9.0	14.0
Number of hectares in pasture land	188	382	520	692

Table 2.13. *Estimated average costs, by economic activity, of cattle ranches on the North Coast Plains for the first semester of 1971*

Average costs per ranch	*Cow-calf and milk production*	*Cow-calf and growing*	*Growing and/or fattening*	*Cow-calf, growing and fattening*
Alternative cost of capital invested in cattle (12% per yr.)	20,590	43,096	58,391	72,827
Alternative cost of capital invested in land (10% per yr.)	27,349	67,474	88,577	107,540
Depreciation cost of equipment	4,990	5,536	10,258	10,380
Depreciation cost of facilities	2,670	5,832	4,946	7,809
Cost of permanent labor	15,120	25,111	24,300	37,800
Total estimated costs	70,719	147,049	186,472	236,362
Value of cattle and milk sales	86,639	248,404	382,616	306,112
Residual (includes profits and non-estimated costs)	15,920	101,355	196,144	69,750
Residual/ha. of pasture	85	265	372	100

slaughter average during the second semester was 8 percent higher than during the first (Table 2.14). It could be expected, therefore, that cattle sales at the farm level in the region follow a similar pattern.

Economic importance of milk production

In spite of the fact that the Zebu breed is dedicated mainly to beef production it is also utilized for dairy production in the region.

Milk production is important in the area because it generates income which is, in turn, used by the small producers as working capital. Even though the dairy industry is important throughout the region, the lower Magdalena and the Atlántico and Bolívar coasts are considered the main dairy areas. During the first semester of 1971, for each peso of income generated by a typical farm, an average of 54 centavos in the Lower Magdalena zone, of 51 centavos in the Atlantic coast and of 46 centavos in the Bolívar coast, correspond to income from milk sales (Table 2.15). In the Bolívar coast, estimated fixed costs exceeded income from cattle sales but the income from milk sales produced enough to provide a resid-

Table 2.14. *Number of cattle from the North Coast Plains slaughterd in four main consuming centers of Colombia. (Head).*

Years	*Barranquilla*		*Bucaramanga*		*Cali*		*Medellin*		*Total*	
	First Semester	*Second Semester*	*First Semester*	*Second Semester*	*First Semester*	*Second Semester*	*First Semester*	*Second Semester*	*First Semester*	*Second Semester*
1964	19,953	36,027	18,796	20,199	57,792	52,709	55,980	58,379	152,521	167,314
1965	26,050	34,809	19,945	21,632	48,383	52,938	55,234	58,322	149,612	167,701
1966	27,428	28,354	20,427	20,335	46,300	46,517	51,836	53,910	145,991	149,116
1967	30,756	37,013	19,213	22,147	42,142	44,563	52,499	55,883	144,610	159,606
1968	35,545	40,842	20,666	23,145	43,354	46,623	62,234	60,376	161,799	170,986
1969	37,586	41,550	21,908	24,906	47,213	53,630	59,338	65,495	166,045	185,581
1970	41,658	44,064	25,437	28,939	50,406	46,759	67,311	73,070	184,812	192,830
1971	41,262	46,547	26,603	27,967	50,134	48,722	76,374	84,045	194,373	207,281
1972	38,569	—	26,066	—	—	—	77,502	—	—	—
Average	33.201	38.651	22.118	23.659	48.215	49.058	62.034	63.685	162.470	175.052
Rate	100	116	100	107	100	102	100	103	100	108

Source: Revista del Banco de la República. 1964 - 1972.

Table 2.15. *Ratio of milk sales to total sales and milk sales to cattle sales, by geographical areas on the North Coast Plains.*

(First semester 1971)

Geographical areas	*Average values per ranch ($ Col.)*				
	Cattle sales	*Milk sales*	*Total sales*	*Milk/Cattle sales/sales*	*Milk/Cattle sales/sales*
Middle Sinú	92,998	13,685	106,683	0.15	0.13
Savannas of Bolívar (south)	67,985	15,923	83,908	0.23	0.19
Lower Sinú	67,709	20,777	88,486	0.31	0.23
Mompós-Magdalena River Depression	107,469	20,114	127,583	0.19	0.16
Savannas of Bolívar (north and central)	45,907	20,325	66,232	0.44	0.31
Coast of Bolívar	24,126	20,551	44,677	0.85	0.46
Coast of Atlántico	39,902	40,844	80,746	1.02	0.51
Lower Magdalena	56,546	65,766	122,312	1.16	0.54
Cesar River Valley	109,484	36,576	146,060	0.33	0.25
Gulf of Morrosquillo	76,579	20,994	97,573	0.27	0.22

ual to variable costs and profits (Table 2.10). In the Lower Sinú and the Mompós-Magdalena Depression, the dairy industry has less economic importance than in the other areas. Per category, for each peso of income from milk sales, the average producer receives 33 centavos, 30 centavos, and 13 centavos, respectively (Table 2.16).

In summary, milk production has more economic importance on the small farms; its significance decreases as the size of the farm increases.

Few farms are engaged in commercial cheese production and cheese produced in the area is domestically consumed. No economic data are available on cheese production.

Table 2.16. *Ratio of milk sales to total sales and milk sales to cattle sales, by ranch size, on the North Coast Plains.*

(First semester 1971)

Farm size	*Average values per ranch ($ Col.)*				
	Cattle sales	*Milk sales*	*Total sales*	*Milk/Cattle sales/sales*	*Milk/Total sales/sales*
0 - 200 ha	46,827	23,472	70,299	0.50	0.33
201 - 500 ha	137,822	57,882	195,704	0.42	0.30
Over 500 ha	418,971	62,340	481,311	0.15	0.13

CHAPTER III

FACTORS OF PRODUCTION AND THEIR PRODUCTIVITY

The factors of production on the cattle ranches being studied were grouped in four categories: capital (including facilities and equipment), land, labor and cattle. The productivity of the factors is presented from a technical and an economic standpoint. The technical coefficients of the productivity of a factor are the physical relationships that can be established between a factor of production and other factors or between the factor and production itself. They help determine the intensity of utilization of the respective factor and, at the same time, establish comparisons among different countries or geographical areas. An example of a technical coefficient of productivity is the number of head of cattle per hectare. The economic coefficients of productivity are the relationships existing between the factors of production and certain monetary values such as invested capital or total income. Perhaps the main economic coefficient of productivity is the relationship existing between total income or the value of production, and the number of factor units used to produce that income.

Capital

On the average, per every 100 pesos of total investment on a ranch on the North Coast Plains, $10 are invested in facilities and $9 in equipment (Table 3.1). Investment in equipment, relative to other investment, decreases as the size of the farm increases; in other words, the larger the farm the

Table 3.1. *Investment distribution by ranch size, on the North Coast Plains*

Investments	*Ranch size*			
	0-200 ha	*201-500 ha*	*Over 500 ha*	*Weighted average*
	%	%	%	%
Equipment	10	9	6	9
Facilities	10	11	8	10
Land	45	48	56	46
Cattle	35	32	30	35
Total	100	100	100	100

larger the proportion of investment in assets other than equipment. According to Table 3.1, the investment in facilities when related to total investment, increases when moving from category 1 to category 2, and is smaller in category 3 than in the two previous categories.

Related to investment by hectare, if the investments in equipment and facilities are considered jointly, the Lower Sinú and the northern and central parts of the Savannas of Bolívar have the highest rates of investment per hectare while the lowest rates are found on the coast and the Savannas of Bolívar (south). Considering equipment and facilities separately, the Lower Sinú has the highest rate of investment in equipment, per hectare, while the Savannas (south) and the Coast of Bolívar have the lowest rates. The highest investment in facilities per hectare was found on the Coast of Atlántico and in the Lower Sinú. The Mompós-Magdalena River Depressions and the Middle Sinú show the lowest investment rates in facilities per hectare (Table 3.2).

There is an average investment per farm of $630 in facilities and $663 in equipment per hectare of pasture land on the North Coast Plains (Table 3.3). In monetary terms, the equipment and facility factors are used in the same proportion for every unit of utilized land.

The highest yields from equipment investments expressed as gross income or total sales in this period were found on the coast and the Savannas of Bolívar (south). The Bolívar coast, however, has the lowest average investment per hectare in equipment for the region. The highest yields from investments

Table 3.2. *Economic coefficients of capital productivity, by geographical area, in cattle ranches of the North Coast Plains*

Geographical areas	*Facilities (Col.$/ha)*	*Equipment (Col.$/ha)*	*Sales/ equipment*	*Sales/ facilities*
Middle Sinú	436	679	1.08	1.05
Savannas of Bolívar (south)	495	371	1.71	1.41
Lower Sinú	873	1,197	0.52	0.32
Mompós-Magdalena River Depression	396	880	0.62	1.79
Coast of Bolívar (north and central)	738	783	0.48	0.56
Coast of Bolívar	477	62	15.80	1.04
Coast of Atlántico	923	537	0.62	0.33
Lower Magdalena	767	677	0.57	0.43
Cesar River Valley	632	741	0.51	0.96
Gulf of Morrosquillo	497	716	0.41	0.42

in facilities expressed as gross income, were found in the Mompós-Magdalena River Depression which also shows the lowest average investment in facilities per hectare in the Plains.

In terms of gross income, the fact that the highest yields in equipment and facilities take place in areas with low average investments per hectare suggests other factors more important than those on the cattle producing ranches which determine to a great extent the degree of productivity.

The land factor

Land is perhaps the most important factor in cattle production on the Plains because grass constitutes the basis for cattle feeding in the area and other types of feedstuffs are virtually non-existent. Investment in land is the main component of the overall investment on these farms. On the average, on the farms being studied, per every $100 pesos of total investment, $49 pesos are invested in land (Table 3.1). The share of total investment of the land factor becomes larger as the size of the farm increases.

The average total investment in the different zones of this region shows that on the Bolívar coast and in the Middle Sinú, land investment accounts for 56 and 55 percent of the

Table 3.3. *Economic coefficients of capital productivity by farm size, on the North Coast Plains*

Farm size	*Facilities (Col.$/ha)*	*Equipment (Col. $/ha)*	*Sales/ equipment*	*Sales/ facilities*
0 — 200 ha	628	688	2.36	0.83
201 — 500 ha	755	518	0.92	0.68
Over 500 ha	463	370	1.98	1.21
Weighted average	609	576	2.00	0.90

total investment, respectively. This is because the Sinú Valley is one of the most fertile in the country and the average price of a hectare is $3,757 which is the highest priced farm land in the region (Table 3.4).

The Bolívar coast, a small-farm area, shows a high rate of investment in land. This reflects a limited use of equipment and low investments in facilities in the area. Consequently, land investment represents a high percentage of the total.

Price of land

A hectare of land attains the highest prices in the fertile Sinú and Cesar River Valleys. In these areas, cattle raising

Table 3.4. *Average land prices by zone and ranch size (Col. $/ha) for the First semester 1971*

Geographical areas	*0-200 ha*	*201-500 ha*	*Over 500 ha*	*Weighted average*
Middle Sinú	3,875	2,538	3,600	3,757
Savannas of Bolívar (south)	1,816	2,341	2,562	1,888
Lower Sinú	3,258	2,587	3,000	3,194
Mompós-Magdalena River Depression	2,167	1,861	2,361	2,153
Coast of Bolívar (north and central)	2,852	2,285	3,417	2,829
Coast of Bolívar	1,786	3,100	3,000	1,926
Coast of Atlántico	2,819	2,625	2,000	2,791
Lower Magdalena	2,599	2,210	2,800	2,566
Cesar River Valley	3,272	3,575	3,772	3,343
Gulf of Morrosquillo	2,114	3,409	3,428	2,270
Average	2,656	2,653	2,994	2,672

competes with agriculture for the land factor, especially in the Cesar Valley where cotton cultivation has great economic importance.

Technical coefficients of land productivity

The stocking rate is one of the main technical coefficients of land productivity. The estimated average rate for the area is 1.44 head per hectare. On the farms in category 1, the stocking rate is 1.45 per hectare; in category 2, 1.30 and in category 3, 1.53 (Table 3.5).

This shows that the farm size does not result in any marked differences in the stocking rate. When the farms are grouped by geographical area, however, larger stocking rate differences are noticed. The Middle Sinú has the highest stocking rate —1.7 head per hectare— while the Atlántico and Bolívar coasts which are traditional dairy areas characterized by dry soils, low rainfall and few rivers, have stocking rates as low as 0.9 and 1.2 head per hectare, respectively.

Milk production per hectare of pasture land for the different zones appears in Table 3.6. On the average, each hectare of pasture land on the Plains produces 0.77 liters of milk per

Table 3.5. *Average stocking rates by geographical area and ranch size on the North Coast Plains*

Geographical areas	*0 - 200 ha*	*201 - 500 ha*	*Over 500 ha*	*Weighted average*
Middle Sinú	1.8	1.1	1.3	1.7
Savannas of Bolívar (south)	1.7	1.2	1.5	1.6
Lower Sinú	1.4	1.7	2.4	1.4
Mompós-Magdalena River Depression	1.5	1.1	1.1	1.4
Savannas of Bolívar (north and central)	1.6	1.7	1.6	1.6
Coast of Bolívar	1.2	1.0	0.9	1.2
Coast of Atlántico	0.8	1.8	1.9	0.9
Lower Magdalena	1.6	0.8	1.5	1.4
Cesar River Valley	1.5	1.3	1.4	1.5
Gulf of Morrosquillo	1.5	1.6	1.8	1.5
Average	1.45	1.30	1.53	1.44

day. When the size of the farm increases, the efficiency of the land decreases in terms of daily milk production per hectare. In category 1, 0.99 liters are produced per hectare per day; in category 2, 0.77 liters and in category 3, 0.30 liters. This shows that the smaller operations are oriented toward milk production. The Lower Magdalena and the Atlántico Coast show the best daily milk production rate per hectare while the Middle Sinú and Savannas of Bolívar (south) show the lowest rates.

The above figures are closely related to the cow population per hectare. As a result, the Atlántico coast has the highest milk production rates and the highest cow population per hectare. On the other hand, the Middle Sinú has the lowest milk production and cow population per hectare (Table 3.7).

There is a similar relation between calf production and cow population per hectare, as the areas with large populations of cows show the highest calf production rates. Table 3.8 shows figures on calf production per hectare.

Table 3.6. *Daily milk production in liters/ha, by geographical area and ranch size, on the North Coast Plains*

First semester 1971

Geographical areas	*0 - 200 ha*	*201 - 500 ha*	*Over 500 ha*	*Weighted average*
Middle Sinú	0.30	0.34	0.14	0.30
Savannas of Bolívar (south)	0.62	0.39	0.07	0.58
Lower Sinú	0.93	0.73	0.56	0.89
Mompós-Magdalena River Depression	0.66	0.36	0.13	0.62
Savannas of Bolívar (north and central)	0.82	0.36	0.23	0.76
Coast of Bolívar	0.84	0.75	0.30	0.82
Coast of Atlántico	1.26	1.82	0.58	1.28
Lower Magdalena	2.75	1.29	0.37	2.41
Cesar River Valley	1.05	0 84	0.46	0.98
Gulf of Morrosquillo	0.74	0.89	0.18	0.73
Average	0.99	0.77	0.30	0.77

Economic coefficients of land productivity

An average total income of $659 (Col) was obtained per each hectare planted to grass in the area. Of that amount, $480 (Col) came from cattle sales and $179 (Col) from milk sales. During the first semester of 1971, the Lower Magdalena, the Cesar Valley and the Mompós-Magdalena River Depressions had the highest income per hectare while the Bolívar coast, the Lower Sinú and the Savannas of Bolívar had the lowest income (Table 3.9).

The labor factor

Labor is an important factor in agricultural production, especially in countries with a low level of industrialization where the agricultural sector provides many jobs. In the area studied, cattle raising is a main source of employment because industry is only slightly developed, with agriculture and ranching being the basis of the region's economy.

Three categories of labor are found on the cattle farms of the Plains:

Table 3.7. *Number of cows per hectare of pasture land, by geographical area and ranch size, on the North Coast Plains*

First semester 1971

Geographical areas	*0 - 200 ha*	*201 - 500 ha*	*Over 500 ha*	*Weighted average*
Middle Sinú	0.31	0.33	0.14	0.30
Savannas of Bolívar (south)	0.71	0.44	0.40	0.68
Lower Sinú	—	—	—	—
Mompós-Magdalena River Depression	0.54	0.37	0.34	0.52
Savannas of Bolívar (north and central)	0.57	0.40	0.46	0.55
Coast of Bolívar	0.51	0.36	0.25	0.49
Coast of Atlántico	0.73	0.78	0.37	0.72
Lower Magdalena	0.67	0.83	0.31	0.66
Cesar River Valley	0.66	0.47	0.30	0.61
Gulf of Morrosquillo	0.54	0.46	0.15	0.52
Average	0.58	0.49	0.30	0.49

Table 3.8. *Calf production per hectare of pasture land, by geographical area and ranch size, on the North Coast Plains First semester 1971*

Geographical areas	**0 - 200** *ha*	*201 - 500 ha*	*Over 500 ha*	*Weighted average*
Middle Sinú	0.10	0.13	0.04	0.10
Savannas of Bolívar (south)	0.15	0.09	0.14	0.13
Lower Sinú	—	—	—	—
Mompós-Magdalena River Depression	0.17	0.06	0.07	0.16
Savannas of Bolívar (north and central)	0.15	0.13	0.13	0.15
Coast of Bolívar	0.20	0.11	0.06	0.19
Coast of Atlántico	0.24	0.26	0.07	0.24
Lower Magdalena	0.23	0.32	0.11	0.23
Cesar River Valley	0.19	0.15	0.09	0.18
Gulf of Morrosquillo	0.19	0.16	0.03	0.18
Average	0.18	0.16	0.08	0.15

1. Managerial and administrative work.
2. Permanent labor.
3. Temporary labor.

The managerial and administrative work is performed by farm owners, administrators and foremen. The permanent labor is carried out by the cowboys, day laborers, milkers and house workers. These people are responsible for equipment, cattle, pasture management, etc.

Occasional work is performed by temporary day laborers. They are in charge of weeding, repairing fences, corrals, buildings and equipment, and harvesting on ranches where certain crops are important. The professional personnel providing technical assistance on some farms can be included in this last group.

Quality of labor

If the years of formal instruction received in public and private schools are used as basic criterion to measure the quality of labor on the ranches, it can be concluded that there is a lack of qualified personnel in the area. Table 3.10 shows the statistics related to ranch laborers who have received any

Table 3.9. *Average sales per farm per hectare of pasture land, by geographical area and ranch size, on the North Coast Plains*

	0 - 200 ha $ Col.			*201 - 500 ha $ Col.*			*Over 500 ha $ Col.*			*average Weighted $ Col.*		
Geographical areas	*Cattle*	*Milk*	*Total*	*Cattle*	*Milk*	*Total*	*Cattle*	*Milk*	*Total*	*Cattle*	*Milk*	*Total*
Middle Sinú	501	85	586	424	85	509	329	9	338	488	82	570
Savannas of Bolívar (south)	488	151	639	397	87	484	540	23	563	483	141	624
Lower Sinú	368	161	529	483	176	659	948	25	973	400	157	557
Mompós-Magdalena River Depression	632	149	781	858	96	954	393	15	408	638	140	778
Savannas of Bolívar (north and central)	370	210	580	363	80	443	308	24	332	367	192	559
Coast of Bolívar	278	252	530	114	138	252	177	37	214	262	253	515
Coast of Atlántico	337	105	442	422	717	1.139	1.023	73	1.096	356	141	497
Lower Magdalena	455	820	1.275	476	177	653	168	74	242	437	690	1.127
Cesar River Valley	952	280	1.232	339	224	563	383	50	433	839	257	1.096
Gulf of Morrosquillo	409	172	581	739	231	970	667	21	688	445	171	616
Average	479	238	717	461	201	662	494	35	529	480	179	659

Table 3.10. *Formal education received by laborers on cattle farms on the North Coast Plains*

Category	None		Primary		Secondary		Technical		College		Total of people
	No. of people	%	No. of people	%	No. of people	%	No. of people	%	No. of people	%	
Owners	39	9	143	35	151	37	17	4	60	15	410
Administrators	58	42	57	41	20	14.3	1	0.7	3	2	139
Foremen I	86	58	63	42	0	0.0	0	0.0	0	0	149
Foremen II	61	66	31	34	0	0.0	0	0.0	0	0	92
Cowboys	177	86	28	14	0	0.0	0	0.0	0	0	205
Day laborers	63	94	4	6	0	0.0	0	0.0	0	0	67
Temporary day laborers	73	96	3	4	0	0.0	0	0.0	0	0	76
Milkers	87	82	19	18	0	0.0	0	0.0	0	0	106
House workers	22	71	8	26	1	3	0	0.0	0	0	31
Professionals	0	0	0	0	0	0.0	0	0.0	13	100	13
Mechanics	8	42	8	42	0	0.0	3	16	0	0	19
Chauffeurs	17	43	24	55	0	0.0	1	2	0	0	42
Carpenters	0	0	2	100	0	0.0	0	0.0	0	0	2
Accountants	0	0	0	0	10	48	1	4	10	48	21
Domestic help	75	88	10	12	0	0.0	0	0.0	0	0	85

type of formal instruction. It should be noted that each classification includes personnel that have either partially or totally completed primary or secondary school or other kinds of formal education.

After classifying the laborers and grouping them by the different tasks performed, it is clear that the group that has received the highest degree of formal education is the one doing management and administrative work. Only 9 percent of the total number of owners have not received any type of formal education. Thirty-five percent have attended primary school; 37 percent, high school; 4 percent technical school and 15 percent college.

There is a sharp decrease in the amount of instructions received by people under the owner's direction. 42 percent of the total number of administrators, 58 percent of the foremen and 66 percent of the foremen II have not received any type of formal instruction.

This is a serious problem because the main occupations of many of the owners are outside cattle raising (Table 3.11). Some owners live in the capital cities of the region, or in the interior of the country, and visit their ranches only occasionally. For this reason, those who actually administer and manage the farm are usually the administrators or foremen who often have little formal education.

Table 3.11. *Percentage distribution of owners by occupation in the departments of the North Coast Plains of Colombia*

Departments	*Agriculture and livestock* %	*Non-agriculture-livestock* %
Atlántico	88.5	11.5
Bolívar	75.6	24.4
Córdoba	60.4	39.6
Magdalena	65.6	34.4

Source: DANE. National Agriculture and Livestock Survey. 1968.

In the group working directly with cattle or pasture management, 86 percent of the cowboys, 87 percent of the milkers and 96 percent of the day laborers had not received any formal education. This limited amount of education is also characteristic of the temporary laborers.

Implications of the low level of education

Lewis [1] has designed a model of economic development which intensively utilizes unlimited labor supplies. He argues that within the traditional production framework a high level of education is unnecessary for labor. In the case of the North Coast Plains, however, low education levels are a barrier to increased productivity. Modification of the traditional production framework by the introduction new technologies necessitates labor sufficiently qualified to effectively utilize these new technologies for increased productivity. On the North Coast Plains the low educational level of the labor prohibits the effective utilization of new cattle production technologies. Here, education of the labor force will have to precede technologically generated increases in productivity.

Remuneration of the labor factor

Generally speaking, the work day in the area starts at 6 a.m. and ends at 2 p.m. This may vary slightly from one farm to another. Cattle producers' and laborers' opinions differ widely as to the length of the work day. Some producers are willing to pay laborers extra if they are willing to work overtime, but the laborers do not want to extend the length of their normal work day. Cattlemen interpret this attitude on the laborers' part as laziness. This attitude may be the result of the laborers' value system. It is perhaps more meaningful to them to have free time rather than extra money for overtime worked.

On the other hand, the wages and salaries paid on the ranches of the area (Table 3.12) are relatively low, compared to the average salaries paid by national manufacturing indus-

1 Lewis, W. Arthur. *Economic Development with unlimited supplies of labor.* Manchester School of Economic and Social Studies. pp. 139-192.

Table 3.12. *Average salaries and wages on cattle ranches on the North Coast Plains (First semester of 1971)*

Occupation	*Average with or without food ($ Col.)*
Administrators[1]	837.50
Foremen I [1]	537.00
Foremen II [1]	410.00
Cowboys [2]	14.00
Day laborers [2]	10.50
Temporary day laborers [2]	14.75
Milkers [2]	10.75
House workers [2]	6.90
Domestic help [1]	161.00

1 Monthly salary
2 Daily wage

tries (Table 3.13) which, in addition, pay higher fringe benefits. Because of limited knowledge of the labor law, some workers do not claim the fringe benefits they are entitled to by law.

Technical coefficients of labor productivity

The technical coefficients of labor productivity help determine the degree of efficiency in the utilization of the production factor.

Table 3.13. *Average annual basic salaries of workers and employees in the national manufacturing industry. 1969-1970*

Years	*Employees*	*Workers*
1969	2,750	1,327 [2]
1970 [1]	2,870	1,390 [3]

1 January, 1970.
2 Based on salary of Ps. 5.53/hr.
3 Based on a salary of Ps. 5.79/hr.

Source: DANE. Monthly Statistical Bulletin. July-August, 1971.

Table 3.14 shows some coefficients of permanent labor productivity on cattle farms of the plains, such as hectares per laborer, daily number of liters of milk per man, number of cows per man and number of men per farm. If the labor efficiency is measured in terms of the number of men employed per hectare of pasture land, it can be stated that the efficiency is higher in the Lower Magdalena and the Savannas of Bolívar (north and central) where there are 36 and 34 hectares, respectively, per permanent laborer. Using the same criteria, the lowest productivity rate is found on the Atlántico Coast, where 20 hectares per laborer are found. If daily milk production per laborer is taken as a productivity index, the Lower Magdalena has the highest rate, 62.7 liters per day per man. This figure exceeds the regional average of 23.1 liters per man (Table 3.14). The Atlántico and Bolívar coasts also have a high rate.

The highest ratio of number of cows per man was found in the Lower Sinú and on the Savannas of Bolívar where there is one laborer for every 19 cows. In the Middle Sinú, there is one laborer for every 11 cows.

Table 3.14. *Technical coefficients of permanent labor productivity by geographical areas on cattle ranches of the North Coast Plains*

Geographical areas	*Ha/ man*	*Daily liters of milk/ man*	*Cows/ man*	*Men/ farm*
Middle Sinú	28	8.6	11	6
Savannas of Bolívar (south)	24	12.9	15	6
Lower Sinú	28	17.6	19	4
Savannaslof Bolívar (north and central)	34	16.7	19	4
Mompós-Magdalena River Depression	24	15.7	15	5
Coast of Bolívar	29	21.9	14	3
Coast of Atlántico	20	29.0	14	4
Lower Magdalena	36	62.7	18	4
Cesar River Valley	24	23.0	14	6
Gulf of Morrosquillo	31	23.1	18	4
Average	28	23.1	16	4

At the farm level, the Bolívar coast has the lowest permanent labor utilization. This area is characterized by small cattle operations that employ, on the average, three men per farm.

In the ratios of hectares per man and the number of cows per man, a decrease of the labor factor is found when moving to a higher category. This implies that as the farm size increases, cattle population and number of hectares utilized increase relatively more than the number of laborers.

When productivity is expressed as a ratio of daily milk production to the number of workers employed, labor is more productive in categories 1 and 2 (Table 3.15).

Economic coefficients of labor productivity

According to the information in Table 3.16, during the first semester of 1971, labor showed the highest productivity, in terms of sales per man, in the Lower Magdalena and in the Mompós-Magdalena River Depression. In the former there is a high ratio of milk sales per man and, in the latter, high sales can be explained by the fact that cattlemen sell the majority of their herds during the rainy season because the low altitude of the zone permits easy flooding at this time. During the first semester of 1971, there was little rainfall; when the survey took place, the rainy season was just beginning and the cattle producers had already started to take precautionary measures. The two sections of the Savannas of Bolívar had the lowest *per capita* income during the first semester of 1971.

Table 3.15. *Economic coefficients of labor productivity by ranch size on the North Coast Plains*

Farm size	*Ha/ man*	*Daily liters of milk/ man*	*Cows/ man*	*Men/ farm*
0 — 200 ha	24.4	23.4	25	4
201 — 500 ha	38.1	24.6	19	8
Over 500 ha	62.5	15.4	20	15
Weighted average	27.5	23.1	16	4

Table 3.16. *Economic coefficients of labor productivity by geographical area on the North Coast Plains*

Geographical area	*Sales ($ Col.) per man*			*Equipment ($ Col.) per man*	*Facilities ($ Col.) per man*
	Cattle	*Milk*	*Total*		
Middle Sinú	14,307	2,105	16,412	15,329	11,512
Savannas of Bolívar (south)	11,331	2,654	13,985	8,040	13,203
Lower Sinú	16,927	5,194	22,121	18,253	21,115
Mompós-Magdalena River Depression	23,882	4,470	28,352	25,846	14,126
Savannas of Bolívar (north and central)	9,767	4,324	14,091	18,967	20,457
Coast of Bolívar	6,933	5,905	12,838	5,200	11,970
Coast of Atlántico	9,975	10,211	20,186	15,571	26,037
Lower Magdalena	14,136	16,441	30,577	23,886	25,025
Cesar River Valley	18,247	6,096	24,343	20,015	17,136
Gulf of Morrosquillo	19,144	5,248	24,392	19,830	21,226

Average income amounted to $(Col) 18,919 per man hired; of that amount, $(Col) 13,014 came from cattle sales and $(Col) 5,905 from milk sales. Cattle sales per man increased when moving from category 1 to 3. Milk sales per man were highest in category 2 (Table 3.17).

Analyzing the investment in fixed assets per man and the investment in facilities and equipment, the Mompós-Magdalena Depression shows the highest amount of investment in equipment per man. Labor is mechanized in the area and this explains the high labor productivity rate in terms of income per man. The lowest investment in equipment per man took place on the Bolívar coast which is the poorest area of the region. The regional average investment in equipment per man is $(Col) 16,088 (Table 3.17).

Investment in facilities per man is high on the Atlántico coast and in the Lower Magdalena ($(Col) 26,037 and $(Col) 25,025, respectively). These two areas have the highest coefficients of labor productivity in terms of milk sales per man. In the areas where milk production is important, there is a larger investment in facilities per man than in those, such

Table 3.17. *Economic coefficients of labor productivity by ranch size on the North Coast Plains*

Farm size	Sales ($ Col.) per man			Equipment ($ Col.) per man	Facilities ($ Col.) per man
	Cattle	Milk	Total		
0 — 200 ha	11,706	5,868	17,574	15,468	14,408
201 — 500 ha	17,228	7,235	24,463	20,533	26,772
Over 500 ha	27,931	4,156	32,087	18,748	25,497
Weighted average	13.014	5.905	18.919	16.088	16.075

as the Middle Sinú, where milk production has little importance. The investment in facilities per man in the Middle Sinú is low $ (Col) 11,512. The regional average investment in facilities per man is $ (Col) 16,075 which is similar to the regional average investment in equipment per man.

It can be stated that in the cattle production process of the North Coast Plains, equal investments in facilities and equipment were applied to one unit of the labor factor as were similarly applied to one unit of the land factor.

The cattle factor

Cattle are a factor of production and a final product. The breeding stock is the factor of production. The animals produced on the ranch which are then sold, or the animals used as breeding stock and then sold or substituted by others are considered the final product.

Developing a highly productive cattle herd requires appropiate management [1] as well as breeds that have a desirable degree of adaptability, fertility, precocity and good carcass yields.

[1] "Good management is the correct application of genetics, physiology, nutrition and health oriented towards production increases according to environmental conditions". Instituto Colombiano Agropecuario, ICA. *Manual de Asistencia Técnica*, No. 2, p. 8.

Table 3.18 *Bovine rates by geographical area and ranch size on the North Coast Plains (First semester of 1971)*

Geographical area	*0 - 200 ha* %	*201 - 500 ha* %	*Over 500 ha* %	*Weighted average* %
Middle Sinú	34.0	40.0	29.0	34.0
Savannas of Bolívar (south)	21.0	20.0	35.0	21.0
Mompós-Magdalena River Depression	31.0	18.0	21.0	29.0
Savannas of Bolívar (north and central)	26.0	32.0	27.0	26.0
Coast of Bolívar	37.0	31.0	23.0	36.0
Coast of Atlántico	33.0	33.0	19.0	32.0
Lower Magdalena	34.0	38.0	36.0	35.0
Cesar River Valley	29.0	31.0	31.0	29.0
Gulf of Morrosquillo	36.0	35.0	22.0	35.0
Average	31.2	30.8	27.0	30.9

Technical coefficients of productivity of the cattle factor

Birth rate. This is one of the most important coefficients of productivity in a herd and it indicates the number of births per 100 cows. The average birth rate on the plains, for the first semester of 1971, was 30.9 (Table 3.18). On ranches ranging from 0 to 200 hectares, the birth rate ranged from 21 to 37 percent with an average of 31.2 percent.[2] On farms between 201 and 500 hectares, it ranged from 18 to 40 percent with an average of 30.8 percent; on farms over 500 hectares, it varied from 19 to 35 percent with an average of 27.4 percent.

The highest average birth rate by geographical area took place on the Bolívar coast —36 percent— while the lowest was found on the Savannas of Bolívar —21 percent. The Middle Sinú had the highest birth rate in the area during the first semester of 1971, even though it had the lowest ratio of cows per hectare.

An annual average birth rate was estimated to verify the birth coefficients based on the weaned and unweaned calf and cow populations as of December 31, 1970. It was assumed that the calf population as of December 31, 1970, was born

2 The range refers to the value in which the birth rate oscillates in the different categories of the various geographical areas.

Table 3.19. *Annual bovine rates by geographical area and by ranch size on the North Coast Plains*

Geographical area	*0 - 200 ha %*	*201 - 500 ha %*	*Over 500 ha %*	*Weighted average %*
Middle Sinú	67	45	65	65
Savannas of Bolívar (south)	63	50	50	61
Lower Sinú	74	43	—	58 [1]
Mompós-Magdalena River Depression	79	49	7	74
Savannas of Bolívar (north and central)	65	64	35	63
Coast of Bolívar	66	65	—	65 [1]
Coast of Atlántico	62	—	31	58 [1]
Lower Magdalena	54	61	—	57 [1]
Cesar River Valley	56	68	49	57
Gulf of Morrosquillo	62	78	36	62
Average	65	58	39	63

1 Arithmetic average.

between December 31, 1969 and December 31, 1970 and that the cow population remained constant during this period. Based on these data and assumptions, an annual average birth rate of 63 percent was estimated for the area (Table 3.19). This birth coefficient indicates that, considering the area as a unit, average birth rates are proportionally the same during the two semesters of the year. This, however, does not hold true when the different geographical areas are considered separately. The statistics in Table 3.19 confirm those of Table 3.18 in that they show a higher birth coefficient for category 1 than for categories 2 and 3.

According to the information in Table 3.19, the Mompós-Magdalena River Depression has the highest birth coefficient in the area, even though it had the lowest in the region during the first semester of 1971. The Bolívar coast, in turn, has high coefficients both for the 1969-1970 period as well as for the first semester of 1971.

Comparing the figures in Tables 3.18 and 3.19, it can be concluded that births occur more frequently during the first semester of the year in the Middle Sinú, the Atlántico and Bolívar coasts, the Lower Magdalena, the Cesar River Valley and the Gulf of Morrosquillo.

It should be noted that the statistics in Table 3.19 show the actual birth rates minus the mortality rates while those of Table 3.18 show only the actual birth rates.

Mortality rate. The mortality rate depends on management practices, especially on precautionary measures taken to maintain the herds' health. The mortality rate in the area reached an average of 2.3 percent during the semester. The six-month average mortality rate was 2.3 percent for ranches in category 1, 2.2 percent for those in category 2, and 1.7 percent for those in category 3 (Table 3.20).

The above statistics show that the mortality rate decreases when moving from a lower to a higher category, with the smaller ranches having the highest rate. The highest mortality rates were found in the Atlántico and Bolívar coasts, 3.7 and 3.4 percent, respectively. The Bolívar coast has the highest birth and mortality rates. The above areas are characterized by small operations oriented towards cow-calf and milk production. The Middle Sinú and the Cesar River Valley have the lowest mortality rates with the Middle Sinú being an area where cow-calf and milk production has less importance.

These mortality coefficients include animals of all ages. They were not classified by age because of a lack of records on the ranches surveyed.

Table 3.20. *Bovine mortality rates by geographical area and by ranch size on the North Coast Plains*
First semester 1971

Geographical area	*0 - 200 ha* %	*201 - 500 ha* %	*Over 500 ha* %	*Weighted average* %
Middle Sinú	1.1	2.7	0.9	1.2
Savannas of Bolívar (south)	2.5	1.1	1.1	2.3
Lower Sinú	1.9	3.5	5.0	2.1
Mompós-Magdalena River Depression	1.7	1.0	7.0	1.6
Savannas of Bolívar (north and central)	2.9	5.0	0.8	3.0
Coast of Bolívar	4.0	2.1	1.1	3.7
Coast of Atlántico	3.6	2.2	0.2	3.4
Lower Magdalena	1.9	2.4	0.6	1.7
Cesar River Valley	1.4	0.7	0.4	1.2
Gulf of Morrosquillo	1.7	1.6	0.3	1.6
Average	2.3	2.2	1.7	2.3

Sales-cattle population ratio.[1] The ratio of cattle sales to total cattle population averages 18.3 percent during the first semester of 1971. In category 1, this percentage reached 18.4; in category 2, 17.3; and, in category 3, 18.4 (Table 3.21).

Purchase-sale operations are numerous among cattle raisers; therefore, the volume of sales cannot be considered as a total extraction rate. If calculations were made in this fashion there would be multiple accounting of animals sold and purchased.

The marketing age is a productivity coefficient closely related to the sales-cattle population ratio. Because of the lack of adequate birth and sales records, it was not possible to obtain this information. The lack of records is a limiting factor in obtaining more specific data and productivity coefficients.

Table 3.21. *Sales-cattle population ratio by geographical area and by ranch size on the North Coast Plains*
First semester 1971

Geographical areas	*0 - 200 ha* %	*201 - 500 ha* %	*Over 500 ha* %	*Weighted average* %
Middle Sinú	15.6	24.6	21.0	16.4
Savannas of Bolívar (south)	15.6	21.3	16.5	16.1
Lower Sinú	23.8	16.8	22.0	23.1
Mompós-Magdalena River Depression	31.7	17.9	23.4	30.4
Savannas of Bolívar (north and central)	14.3	16.7	16.6	14.5
Coast of Bolívar	15.1	8.0	17.8	14.7
Coast of Atlántico	18.6	7.9	—	13.0 [1]
Lower Magdalena	15.6	24.6	11.4	16.3
Cesar River Valley	19.9	18.3	19.0	19.6
Gulf of Morrosquillo	14.0	17.5	21.9	14.5
Average	18.4	17.3	18.8	18.3

1 Arithmetic average.

1 Estimate based on the ratio of total number of animals of all ages sold during the semester to the total number of animals in the herd, at the beginning, plus cattle purchases, if any.

Milk production per cow

Because of the economic importance of milk production in the area, estimates were made to determine milk production per cow. Table 3.22 shows that the highest milk production rates per cow are found on the coasts of Atlántico and Bolívar, and in the Lower Magdalena, while the lowest rates are found in the Middle Sinú and on the Savannas of Bolívar (south). The statistics in Table 3.22 are in agreement with the economic orientation of the ranches in the different areas of the Plains in that the dairy areas show high milk production rates per cow while the non-dairy areas, such as the Middle Sinú, have the lowest milk production coefficients of the area.

Daily milk production per cow is higher on the farms in category 1 than in categories 2 and 3. This is because small operations depend on milk production and the producers try to maximize the amount of milk extracted from each cow. The average daily milk production throughout the year is 2.85 liters in category 1, 2.58 liters in category 2 and 2.35 liters in category 3.

Milk production per cow is 20 percent higher during the rainy season than in the dry season and the regional weighted average of milk production per cow is 3.06 liters in the rainy season and 2.54 liters in the dry season (Table 3.23).

Table 3.22. *Average daily milk production per cow, by geographical area on the North Coast Plains*

Geographical areas	*Milk production per cow (liters)*	
	Dry season	*Rainy season*
Middle Sinú	2.01	1.90
Savannas of Bolívar (south)	1.92	1.97
Lower Sinú	2.55	2.87
Mompós-Magdalena River Depression	2.01	2.06
Savannas of Bolívar (north and central)	2.07	2.28
Coast of Bolivar	2.45	2.88
Coast of Atlántico	3.43	3.74
Lower Magdalena	2.71	3.19
Cesar River Valley	2.74	3.12
Gulf of Morrosquillo	2.31	2.74

Table 3.23. *Average daily milk production per cow, by ranch size on the North Coast Plains*

Farm size	*Milk production per cow (liters)*	
	Dry season	*Rainy season*
0 200 ha	2.57	3.14
201 - 500 ha	2.50	2.66
Over 500 ha	2.29	2.42
Weighted average	2.54	3.06

Other productivity coefficients

It was impossible to estimate the parameters of productivity based on kilograms of meat produced because transactions are made without scales, or as the cattle raisers say "by eye." This is a system in which the buyer and the seller agree on a certain price without knowing exactly the animal's weight. As a result, the producer is more concerned about the appearance than the actual weight of the cattle he sells.

Von Oven shows several parameters of productivity in some cattle operations in South America. He recognizes that these figures are only generally accurate. Even so, they give an idea of the relationship between herds productivity on the Plains and the productivity of cattle in other areas of South America. These data are contained in Table 3.24 and they lead to the conclusion that the production level of the herds of the Plains is below the productivity rate of the Argentinian and Uruguay an herds.

A low level of productivity results in high production costs. Table 3.25 shows several production costs per kg on the hoof in several South American countries. These statistics show that it is more expensive to produce a kg of meat on the hoof on the Plains than it is in Argentina, Uruguay, Paraguay, Bolivia, Venezuela and even on the Eastern Plains of Colombia.

Table 3.24. *Annual productivity coefficients in some South American countries*[1]

Productivity Coefficients	*Argentina*		*Uruguay*	*Colombia*	
	Prov. of Buenos Aires	*Chaco*	*Non-agri cultural area*	*North Coast*	*Eastern Plains*
Extraction percentage	31.00	25.00	24.00	22.00	17.00
Utilizable number of hectares per animal	1.1	4.0	1.4	1.0	3.4
Number of animals per man	160	185	178	44	225
Number of men per 100 ha.	0.55	0.15	0.42	2.5	0.13
Production per kg. on the hoof per animal	133	119	151	90	73
Production per kg. on the hoof per ha.	120	30	112	104	23
Production per kg. on the hoof per man	22,000	22,800	27,000	4,050	15,750

1 Average coefficients for operations with good and fair management (Arithmetic average).

Source: Von Oven, Roderich. *Return on Capital and Development Possibilities in the Beef Cattle Industry of South America*. Institut fur Agrarokonomic, Universitat Gottingen. 1971.

Von Oven argues that the Colombian situation is advantageous because the country is located in an area that has beef production deficits. It can send its surpluses to countries such as Venezuela, Perú and the Antilles, without worrying about high production costs. However, once these markets reach a saturation point, it will be difficult to sell the surplus to other countries.

If the main goal is to substantially increase production, the increases should be caused by higher productivity of the present resources and not by an increase in the resources themselves. Basically, production should not increase because of an increase in the herd or the number of hectares utilized but because of higher birth rates, lower mortality rates, better administrative and management practices, higher stock rates, better feed conversion, etc. This implies a reduction in production costs that would allow favorable competition in the international beef markets.

Table 3.25. *Production costs per kg on the hoof in some South American countries*

Countries and areas	*With good management U.S.$*	*With fair management U.S.$*
Argentina		
Province of Buenos Aires	0.12	0.14
Eastern Chaco	0.08	0.10
Uruguay	0.07	0.08
Paraguay		
Eastern Chaco	0.05	0.05
Brazil		
Rio Grande do Sul	0.12	—
Pantanal	—	0.10
Bolivia		
Beni	0.10	0.15
Venezuela		
Apure	0.13	0.13
Eastern Plains	0.19	0.16
Colombia		
Eastern Plains	0.08	0.08
Coast	0.15	0.24

Source: Idem. Table 3.24.

CHAPTER IV

ADMINISTRATION AND MANAGEMENT

Administration

For maximum and efficient utilization of available resources a productive activity requires good administration and management of production practices. It is important to consider some deficiencies in the administration of cattle farms on the Plains because they directly influence production. It is important to study the attitude of the typical cattle producer in the region. He seldom departs from the established patterns of production. This behavior as well as the workers low level of education is likely to interfere with the acceptability of production and administration techniques.

Most of the cattle operations in the area are poorly managed. The cattle producer often lacks knowledge as to the exact amount of his assets and, consequently, he is unaware of the total investment in his farm. For example, he may ignore the value of the fences that divide the different lots of the ranch, which may represent as much as a million pesos in large ranches, or when estimating costs he may not know how many head of cattle he has or the age distribution of his herd; sometimes feeding costs are considered zero because many ranchers consider that no cost is involved in producing pasture. The feeding costs for a certain period could, However, be the profit derived from the rental of the land planted to grass or the alternative cost of the capital invested in acquiring the land. In this situation it is difficult to obtain higher returns on investment because of problems in allocating and

utilizing available resources. To correct this situation it is necessary to have an adequate organization for the control of production factors at the farm level.

Use of records

Good administration cannot be achieved without a continuous knowledge of farm performance and the different variables of the production process. This knowledge can only be obtained through a careful compilation of data on production and economic activities. These records are the tools for developing the different areas of administration such as control, organization, direction, planning and forecasting.

One of the principal weaknesses in farm administration on the Plains is the lack of a sound record system which includes data on production costs, cattle inventories, equipment and facilities, production volumes, rotation and movement of animals in pasture grounds, weight gains and weight at different ages. These data are essential for making a through economic analysis which may be the key to expanding production.

Production records. Sixty-four percent of the cattle producers surveyed stated they did not have production records. These include records of birth, milk production, weight at different ages and all information related to different aspects of production.

The problem of lack of records is more serious with the small producers. Seventy-two percent of the cattle producers interviewed in category 1, 61 percent in category 2 and 43 percent in category 3, do not keep any production records (Table 4.1). The Cesar River Valley has the highest number of production records in operation in the North Plains; 47 percent of the cattlemen in this area maintain these records. In the Lower Sinú and the Bolívar Coast only 14 and 17 percent of the cattle raisers, respectively, keep records.

The quality of these records is also important. Even though some cattle producers claim that they keep records, these are rudimentary, only including overall production figures. They

Table 4.1. *Production records by geographical areas in cattle ranches in the North Coast Plains*

Geographical areas	*Category 1*		*Category 2*		*Category 3*		*Total*	
	No. of ranches	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*
Middle Sinú	5	63	1	9	5	42	11	35
Savannas of Bolívar (south)	7	35	3	20	4	50	14	33
Lower Sinú	3	15	2	15	0	0	5	14
Mompós-Magdalena River Depression	4	31	1	7	6	75	11	31
Savannas of Bolívar (north and central)	16	44	8	38	5	83	29	46
Coast of Bolívar	3	13	1	20	1	50	5	17
Coast of Atlántico	11	37	3	75	1	100	15	43
Lower Magdalena	11	21	17	68	3	75	31	36
Cesar River Valley	14	29	14	87	11	61	39	47
Gulf of Morrosquillo	0	0	4	36	3	43	7	24
Total	74	28	54	39	39	57	167	36

do not show production per animal, different weights, movement of animals, rotation of pastures or information on individual performance.

Records of economic activity. These are more widely used than production records. They register income purchases, cattle inventories, equipment, facilities, supplies, production costs and any other aspect related to the economic activity of the ranch. Fifty-four percent of the cattle producers of the Plains interviewed keep records on economic activity. This includes 43 percent in category 1, 63 percent in category 2 and 78 percent in category 3 (Table 4.2).

The Savannas of Bolívar (north and central) have the highest rate of records kept, while the Bolívar Coast has the lowest rate. These records, however, are incomplete and in some cases show only overall sales and cattle inventories without specifying the type of cattle or showing production

Table 4.2. *Record of economic activity by geographical area in cattle ranches on the North Coast Plains*

	Category 1		*Category 2*		*Category 3*		*Total*	
Geographical areas	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*
Middle Sinú	7	88	1	9	9	75	17	55
Savannas of Bolívar (south)	6	30	5	33	4	50	15	35
Lower Sinú	8	40	9	69	2	100	19	54
Mompós-Magdalena River Depression	6	46	7	50	7	88	20	57
Savannas of Bolívar (north and central)	20	56	15	71	6	100	41	65
Coast of Bolívar	6	26	1	20	2	100	9	30
Coast of Atlántico	14	47	3	75	1	100	18	51
Lower Magdalena	21	40	25	89	3	75	49	58
Cesar River Valley	22	45	14	87	12	67	48	58
Gulf of Morrosquillo	1	9	7	64	7	100	15	52
Total	111	42	87	63	53	78	251	54

costs. It is imperative to know all the costs in detail in order to analyze their structure and determine the causes for the high costs mentioned previously.

The cattle producers give three specific reasons wich limit their use of records:

1. Lack of qualified personnel.
2. The expense of hiring people specifically for this work.
3. Record keeping is complicated.

Cattle producers do not usually realize the benefits they can derive from good records but instead they are mainly concerned with the costs involved in record keeping operations. The

complexity of record keeping should be analyzed because it appears to be the cause of the first two problems mentioned by the cattlemen. If the cattle producer keeps complex records, he needs qualified personnel for this work and the complexity of the records may demand considerable time to keep them updated. Some producers kept records for a short time but, because of lack of time, did not continue to do so. A simple record keeping system should be designed and distributed so that any person would be able to enter basic information without having to devote much time to it.

Management

Currently, few new cattle and pasture management practices are evident in the region. Some management practices which could improve productivity are being used only by a few producers. They are as follows:

Feeding

Grazing is the basis of cattle feeding on the area. Eighty percent of the pasture lands consist of native grasses and, 20 percent cultivated grasses (Table 4.3).

The use of grass has economic justification on the Plains because land is the most abundant resource. Any other type of feeding would probably not be economical because the domestic beef market has no meat grading system.

The Colombian Agricultural Institute (ICA) [1], has conducted fattening experiments on cows in confinement using corn, grain sorghum and molasses silages as energy sources, and cotton seed meal, soybean meal and urea as protein sources. Gains of 700 to 1,400 grams, per animal per day, were obtained but it was concluded that the high costs of feed, machinery and facilities in this type of experiment do not make it profitable unless the present structure of the domestic market is changed and different prices are set for different types of meat. On the other hand, ICA has conducted regional trials in different parts of Colombia using rotation systems for pastures, fertil-

1 ICA. Ganado de Carne. Asistencia Técnica. Manual No. 2, 1969. p. 8.

2 Idem.

Table 4.3. *Pasture land in the departments of the North Coast Plains*

Departments	Natural		Artificial	
	Ha	%	Ha	%
Atlántico	96,268	84	18,964	16
Bolívar	1,022,626	76	309,226	24
Córdoba	143,020	90	163,877	10
Magdalena	1,316,563	73	488,335	27
Total	3,828,477	80	980,402	20

Source: DANE. National Agriculture and Livestock Survey. 1968.

ization, irrigation, grass mixtures and studies of stocking rates per unit of surface, obtaining daily weight gains from 400 to 800 grams per heifer.[2] This indicates that good results can only be obtained with grazing by slightly changing the traditional practices of pasture management.

Use of other feedstuffs The use of feedstuffs other than grass, is limited on the cattle ranches of the area. Concentrates and feed supplements are rarely used. In Colombia, cattle compete for the "concentrate input" with the swine and poultry industries and with the cattle industry of other countries. The problem is aggrevated because a good portion of the domestic production of raw materials for producing concentrates, such as soybean meal, is exported. Prices are higher on the international market. For this reason, the National Government has set export quotas for these products so that a reasonable percentage can be used domestically. The high price of concentrates in Colombia is caused by a market of high demand and low supply. Fifty-seven percent of the cattle producers interviewed consider concentrates too expensive. Transportation of concentrates is difficult. Moreover, they do not necessarily have to use them when good pastures are available (Table 4.4).

Table 4.4. *Percentage distribution of cattle ranches of the North Coast Plains according to utilized concentrate and the reasons given for a low percentage of utilization*

Concentrate utilization	*No. of ranches*	%
Concentrate used	55	11.0
Concentrate not used	432	89.0
Reasons given for a low percentage of utilization	*No. of cattle men*	%
1. Very expensive	246	57.0
2. Not necessary	58	13.4
3. Enough available pasture land	48	11.1
4. Not customary in the area	32	7.4
5. Difficult to obtain	9	2.0
6. Very expensive and difficult to transport	4	1.4
7. Difficult to transport	4	0.9
8. Other reasons	29	6.8

The Atlántico Coast, where the dairy industry is important, is the region which uses the highest amount of concentrates in the entire area. Thirty-one percent of the ranches use concentrates. The lowest percentages were found in the Lower Sinú (no usage) and on the Bolívar coast (2 percent)(Table 4.5).

On the Plains, concentrates are mainly used for dairy operations and for reproducing stock but not for fattening.

A low percentage of other feed supplements, such as cut sugar cane, cotton hull and plantain stalks, is also used. The Cesar River Valley has the highest rate of utilization —35 percent— of these supplements. Cotton hull is the most widely utilized feedstuff —76 percent— on the ranches that use them (Tables 4.6 and 4.7).

Cotton hull is followed in order of importance by cut sugar cane, "guineo" plantain and banana stalks.

Feeding problems

Cattle producers of the North Coast Plains have feeding problems because of the severe dry and rainy seasons. These seasons are not well defined and there are marked variations in their length and dates.

Table 4.5. *Concentrate utilization by geographical area on cattle ranches of the North Coast Plains*

Geographical areas	*Concentrate utilization*	
	No. of ranches	*Percentage of total ranches*
Middle Sinú	3	10
Savannas of Bolívar (south)	5	12
Lower Sinú	0	0
Mompós-Magdalena River Depression	7	20
Savannas of Bolívar (north and central)	9	14
Coast of Bolivar	1	2
Coast of Atlántico	11	31
Lower Magdalena	10	12
Cesar River Valley	6	7
Gulf of Morrosquillo	3	10
Total	55	11

During the dry season 33.5 percent of the farmers on our partial list, reported shortages of grass while 13 percent experienced lack of water. The Cesar River Valley and the Atlántico Coast are the most seriously affected areas because they lack grass during the dry season (Table 4.8). This may explain why the Cesar River Valley uses the highest rate of feed supplements and the Atlántico Coast shows the largest index of concentrate utilization.

Table 4.6. *Utilization of other feedstuffs on cattle ranches on the North Coast Plains*

Geographical areas	*No. of ranches*	*Percentage of total ranches*
Middle Sinú	5	16
Savannas of Bolívar (south)	7	16
Lower Sinú	1	3
Mompós-Magdalena River Depression	0	0
Savannas of Bolívar (north and central)	17	27
Coast of Bolivar	3	6
Coast of Atlántico	8	23
Lower Magdalena	11	13
Cesar River Valley	29	35
Gulf of Morrosquillo	2	7
Total	83	17

Table 4.7. *Percentage distribution of cattle ranches on the North Coast Plains according to feed supplement utilization, by geographical area and type of supplements used*

Geographical areas	*Cotton hull*		*Cut sugar cane*		*Green feeding crops*		*Green feeding crops and cut sugar cane*		*"Guineo" plantain and banana stalks*		*Cotton-seed*		*Sorghum*		*Other*	
	No. of ranches	%	*No. of ranches*	%	*No. of ranches*	%	*No. of ranches*	%	*No. of ranches*	%	*No. of ranches*	%	*No. of ranches*	%	*No. of ranches*	%
Middle Sinú	0	0	3	60	0	0	1	20	0	0	0	0	0	0	1	20
Savannas of Bolívar (south)	0	0	3	42	2	29	0	0	2	29	0	0	0	0	0	0
Lower Sinú	0	0	1	100	0	0	0	0	0	0	0	0	0	0	0	0
Mompós-Magdalena River Depression	0	0	0)	0	0	0	0	0	0	0	0	0	0	0	0	0
Savannas of Bolívar (north and central)	0	0	6	34	3	18	1	6	3	18	1	6	1	6	2	12
Coast of Bolívar	0	0	3	100	0	0	0	0	0	0	0	0	0	0	0	0
Coast of Atlántico	4	50	1	12.5	1	12.5	0	0	1	12.5	0	0	0	0	1	12.5
Lower Magdalena	0	0	0	0	3	27	0	0	5	46	0	0	1	9	2	18
Cesar River Valley	22	77.	0	0	1	3	1	3	1	3	2	7	0	0	2	7
Gulf of Morrosquillo	0	0	1	50	0	0	1	50	0	0	0	0	0	0	0	0
Total	26	31	18	22	10	12	4	5	12	14	3	4	2	2	8	10

Table 4.8. *Cattle feeding problems during the dry season on ranches of the North Coast Plains*

Geographical areas	*Grass shortage*		*Lack of water*		*Other*	
	No. of ranches	*% of the total of ranches*	*No. of ranches*	*% of the total of ranches*	*No. of ranches*	*% of the total of ranches*
Middle Sinú	8	25.0	5	15.0	1	3.0
Savannas of Bolívar (south)	11	26.0	6	14.0	2	4.0
Lower Sinú	9	26.0	1	3.0	0	0.0
Mompós-Magdalena River Depression	10	29.0	5	14.0	0	0.0
Savannas of Bolívar (north and central)	12	32.0	0	0.0	0	0.0
Coast of Bolívar	11	34.0	3	9.0	1	3.0
Coast of Atlántico	14	40.0	3	8.0	2	6.0
Lower Magdalena	29	34.0	19	22.0	1	1.0
Cesar River Valley	45	53.0	16	19.0	2	1.0
Gulf of Morrosquillo	9	31.0	3	10.0	1	3.0
Total	158	33.5	61	13.0	10	2.1

During the rainy season, flooding results in feeding problems by preventing rotation of pasture grounds and making them partially or totally unusable (Table 4.9).

Flooding problems were found on 13.6 percent of the farms surveyed on the Plains. This situation is more severe in the Mompós-Magdalena River Depression where 70 percent of the farms are exposed to flooding. This is the lowest part of the Plains and all the waters of the region converge in this area. There exists, therefore, a proliferation of marshes and swamps, during the rainy season and some areas remain flooded most of the year. In spite of the feeding problems during the dry and rainy seasons, the utilization of feed supplements and concentrates is limited, and forage and grass storage practices are virtually unknown.

Feeding problems are directly reflected in the time required by each animal to reach market age because, with a deficient diet, development is delayed, and fattening must take place after adulthood is reached. This has two implica-

Table 4.9. *Cattle feeding problems during the rainy season on the ranches of the North Coast Plains*

Geographical areas	Difficult access of the animals to grass		Difficult rotation of pasture grounds		Pasture grounds not used because of rains		Other	
	No. of ranches	% of the total of ranches	No. of ranches	% of the total of ranches	No. of ranches	% of the total of ranches	No. of ranches	% of the total of ranches
Middle Sinú	3	9	0	0	3	9	0	0
Savannas of Bolívar (south)	5	12	0	0	2	4	0	0
Lower Sinú	4	11	1	2	1	2	1	2
Mompós-Magdalena River Depression	11	32	1	2	9	26	1	2
Savannas of Bolívar (north and central)	8	21	2	5	6	16	1	2
Coast of Bolívar	0	0	0	0	2	6	1	3
Coast of Atlántico	2	6	0	0	2	6	0	0
Lower Magdalena	6	7	2	2	4	5	0	0
Cesar River Valley	3	3	0	0	1	1	1	1
Gulf of Morrosquillo	4	14	0	0	2	6	1	3
Total	46	9.7	6	1.3	32	6.8	6	1.3

tions: first, it delays reproduction and extends the time required by the cattle producer's investment to reach maturity and, second, when fattening takes place during adulthood the meat is of poorer quality than if this process had taken place at a younger age. This must be taken into account when considering an increase of beef exports because the international market demands meat of high quality.

The area has important maize, rice, cotton, sesame and cassava production. These products and some by-products can be used for animal feed. Therefore, efforts should be made to find an economical way to utilize these feedstuffs, especially during the dry season.

It is also important to introduce forage and grass storage practices for silage and hay. These practices are unknown throughout the area, but their wide implementation could lead to improved cattle feeding systems.

Mineral supply

The main mineral nutrients required by cattle are phosphorus, calcium and salt (sodium chloride) and lesser amounts of potassium, zinc, iron, manganese, cobalt, iodine and copper. On the Plains, these minerals are supplied in the form of mineralized salts, which are mixtures containing a high percentage of salt, bone meal —as a source of calcium and phosphorus— and trace elements.

Sixty-six percent of the farms surveyed add mineralized salts to cattle feed, 30 percent add only common salt and the remaining 4 percent do not add any type of mineral supplement (Table 4.10).

Table 4.10. *Mineral supplement supply by geographical area on cattle ranches of the North Coast*

	Common salt		*Mineralized salt*		*No supplement*		*Total*	
Geographical areas	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*
Middle Sinú	13	42	18	58	0	0	31	100
Savannas of Bolívar (south)	18	43	25	57	0	0	43	100
Lower Sinú	13	37	20	57	2	6	35	100
Mompós-Magdalena River Depression	13	37	22	60	0	0	35	100
Savannas of Bolívar (north and central)	13	21	49	78	1	1	63	100
Coast of Bolívar	5	11	39	81	4	8	48	100
Coast of Atlántico	6	17	21	60	8	23	35	100
Lower Magdalena	26	31	56	66	3	3	85	100
Cesar River Valley	35	42	48	57	0	0	83	100
Gulf of Morrosquillo	5	17	23	79	1	4	29	100
Total	147	30	321	66	19	4	487	100

Table 4.10 shows that 73 percent of the farms in the Gulf of Morrosquillo area use mineralized salt for cattle feeding while the Savannas of Bolívar (south), the Lower Sinú and the Cesar River Valley have the lowest percentages in the region. Common salt is widely used as a mineral supplement in these areas.

Mineral supplements are supplied to the cattle *ad libitum*. The daily mineral supplement supply per animal could not be determined because of the lack of accurate information.

Such information is important because the mineral requirements are determined by the age of the animal, the type of grass and the type of soil on the farm. The cattle in the area may not be receiving the required amounts of mineral nutrients. Thirty percent of the cattle producers use common salt as a mineral supplement; four percent use no supplement. Mineralized salts contain a high percentage of salt and even though consumption may be high, they do not give the animal the required amount of mineral nutrients.

Calcium and phosphorus deficiencies influence production because calcium deficiencies result in rickets and malformation of the bone structure and, this in turn, produces low carcass yields. The phosphorus deficiency influences fertility and other metabolic functions such as the utilization efficiency of energy intakes. Significantly the preceding chapter indicates that the average birth rate of the area is low.

Soil management

The quality and quantity of grass in cattle operations are determined by the type of grass, by the soil fertility and by the management of both. Soil management practices in the area are almost non-existent and only a small number of producers consider this aspect. Land fertilization is practiced only on those lots where crops are planted.

Ninety percent of the ranches surveyed have not made any soil analyses for pasture production. Having the highest rate is the Middle Sinú: 31 percent of the ranches have carried out soil analysis. In the remaining areas, the analysis

percentage is low, ranging from 5 to 12 percent of the total number of farms (Table 4.11).

Fifty-five percent of the total number of producers surveyed considered soil analysis unnecessary. Eighteen percent did not have any facilities to carry out analysis, twelve percent lacked information and three percent stated is was not customary in the area (Table 4.11). Analyses were conducted on a small number of farms but only a few accepted the recommendations. The owners considered recommendations such as fertilization and irrigation too expensive.

Grass and pasture ground management

Grass production and quality are determined by the management of grass and pasture grounds. The Plains have a typical tropical environment and rotation of pastures is difficult because of severeness of the seasons, especially the rainy season. Often, pasture utilization is subject to prevailing weather conditions at a specific time. Information on pasture land management of the area, including pasture size, number of days of use during the dry and rainy seasons, number and type of animals per ground and type of grass, could not be obtained because these data were not clear to the cattle producer, usually because no records were kept.

There are several problems regarding pasture management. These include pastures which are too extensive, animals of different sex and age mixed in the same pasture and excessive grazing. Pasture management is affected not only by excessive grazing and the severity of the seasons, but also by the poor care given to them by the ranchers. The use of fertilization is limited and irrigation and drainage are not used mainly for economic reasons. Weed control in tropical climates is one of the main problems of pasture management. Manual weed control is used on 39 percent of the farms in the area.

A combination of manual and chemical control is used in 31 percent of the farms and about 1 percent of them use no weed control whatsoever (Table 4.12). It is not enough to have weed control methods they must also be carried out effi-

Table 4.11. *Soil analyses made and reasons for the lack of analyses made on cattle ranches of the North Coast Plains*

Geographical area	*Soil analyses made*		*Not considered necessary*		*Lack of means*		*Lack of information*		*Rancher's lack of interest*		*Not customary in the area*	
	No. of ranches	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*
Middle Sinú	10	31	17	53	2	6	3	10	0	0	0	0
Savannas of Bolívar (south)	2	5	27	64	7	17	3	7	2	5	1	2
Lower Sinú	3	9	21	60	5	14	4	11	0	0	2	6
Mompós-Magdalena River Depression	4	12	22	65	5	15	2	6	1	2	0	0
Savannas of Bolivar (north and central)	6	9	22	35	21	33	12	19	1	2	1	2
Coast of Bolivar	3	6	20	42	10	21	12	25	1	2	2	4
Coast *of* Atlántico	2	6	18	52	3	8	9	26	3	8	0	0
Lower Magdalena	9	11	45	53	16	19	11	13	0	0	4	4
Cesar River Valley	5	6	61	73	10	12	3	4	0	0	4	5
Gulf *of* Morrosquillo	2	7	15	52	10	35	1	3	0	0	1	3
Total	46	10	268	55	89	18	60	12	8	2	15	3

Table 4.12. *Type of weed control used on cattle ranches, by geographical area, on the North Coast Plains*

Geographical areas	*Manual*		*Chemical*		*Manual and chemical*		*Mechanical*		*Manual and mechanical*		*Chemical and mechanical*		*Manual mechanical and chemical*		*No control*	
	No. of ranches	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No of ranches*	*%*
Middle Sinú	5	16	7	22	17	53	2	6	0	0	0	0	0	0	1	3
Savannas of Bolívar (south)	14	34	6	16	18	44	0	0	1	2	0	0	1	2	1	2
Lower Sinú	15	44	3	9	14	41	0	0	1	3	0	0	0	0	1	3
Mompós-Magdalena River Depression	9	21	7	27	12	37	0	0	0	0	1	3	4	12	0	0
Savannas of Bolívar (north and central)	20	32	7	11	25	40	2	3	1	2	2	3	4	6	2	3
Coast of Bolívar	34	73	1	2	9	19	2	4	0	0	1	2	0	0	0	0
Coast of Atlántico	17	49	9	25	7	20	0	0	0	0	1	3	1	3	0	0
Lower Magdalena	43	51	11	13	10	12	4	5	7	8	2	3	6	7	1	1
Cesar River Valley	24	29	7	8	29	35	2	5	0	0	9	11	11	14	0	0
Gulf of Morrosquillo	8	28	5	17	7	24	2	7	4	14	2	7	1	3	0	0
	189	39	63	13	148	31	14	3	14	3	18	4	28	6	6	1

ciently. García Samper[1] attributes the low labor productivity of the area (whether measured in terms of live-weight kilograms of beef produced per man-hour or in terms of the number of man hours per hectare-Table 3.21) to the manual weed control system. This system of control consists of cutting the external parts of the plant, leaving the weed roots in the ground allowing the weeds to start growing again after a short time. This makes the system expensive and ineffective. Chemical control is more restricted because of the high prices of herbicides and weed killers on the national markets.

Excessive grazing, especially during the dry season, greatly contributes to weed expansion. Since weeds are more resistant than grass to trampling and cattle usually do not eat them, they grow rapidly and outgrow whatever amount of grass remains.

Because of weeds, toxic plants, pests and grass diseases, pasture management is difficult and productivity low. It was not possible to determine the most common weed species in the different geographical zones. Similarly, it was not possible to establish the number of toxic plants, pests and diseases attacking grass because of the great diversity of common names under which they are identified. These names vary even within the same geographical area. Weeds are often mistaken for legumes and grasses. For example, *Paspalum virgatum* sb, sp. is a weed which is consumed by cattle when young and which is considered a grass by some producers. A study of weeds, pests and grass diseases should be undertaken for the area and samples collected for classification and the determination of distribution-density patterns.

Toxic plant names are more uniform throughout the area. Problems caused by toxic plants were found on only 9.4 percent of the farms in our sample. *Mascagnia concinna* is the most common in the area and it causes problems on 4.7 percent of the farms (Table 4.12). The Lower Magdalena and the Mompós-Magdalena River Depression are

Table 4.13 *Toxic plants by geographical areas on the North Coast Plains*

Geographical area	*Petiveria alliacea*		*Mascagnia concinna*		*Pachyptora kererе*		*Other plants*		*No problem*	
	No. of ranches	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*
Middle Sinú	2	6	0	0	2	6	2	6	25	82
Savannas of Bolívar (south)	0	0	0	0	1	2	1	1	41	96
Lower Sinú	0	0	0	0	1	3	1	3	33	94
Mompós-Magdalena River Depression	0	0	5	14	3	9	0	0	27	77
Savannas of Bolívar (north and central)	0	0	3	5	2	3	1	2	57	90
Coast of Bolivar	0	0	2	4	0	0	0	0	46	96
Coast of Atlántico	1	3	0	0	0	0	0	0	34	97
Lower Magdalena	0	0	10	12	5	6	0	0	70	82
Cesar River Valley	0	0	3	4	1	1	0	0	79	95
Gulf of Morrosquillo	0	0	0	0	0	0	0	0	29	100
Total	3	0.6	23	4.7	15	3.1	5	1	441	90.6

the areas most affected by this weed. *Pachyptora kererе* is the second most toxic plant in the Plains and it is found on 3.1 percent of the farms. *Petiveria alliacea* is a less important weed and low percentages are found in the Middle Sinú and on the Coast of Atlántico.

Artificial insemination

Artificial insemination is not practiced to a significant degree in the area under study. It was not used in 99.6 percent of the farms visited. The reasons that stock owners gave for this situation are listed in Table 4.14.

A certain amount of organization is necessary in order to practice artificial insemination. Adequate records on service dates, bulls used, cows inseminated and heat period are needed. The fact that these records are not available could be the main reason for not using this practice more freguently on the North Coast Plains.

Table 4.14. *Artificial insemination and reasons for the low utilization of this technique on the North Coast Plains*

Degree of utilization	*No. of cattle raisers*	*%*
Artificial insemination used	2	0.4
Not used	485	99.6
*Reasons for the low level of utilization**	*No. of cattle raisers*	*%*
1. Lack of qualified personnel	127	26.0
2. Lack of knowledge of method	98	20.0
3. Lack of essential equipment	70	14.3
4. Not necessary to substitute the bulls	70	14.3
5. High cost	69	14.0
6. Lack of confidence in method	36	7.3
7. Not customary in the area	30	6.1
8. Lack of technical assistance	24	4.9
9. Small herds	15	3.0
10. Other reasons	17	3.4

* Some cattle raisers gave more than one reason.

CHAPTER V

TECHNICAL ASSISTANCE AND ANIMAL HEALTH

Technical assistance

To increase productivity in the agricultural sector, an efficient technical assistance program for producers is needed. Many of the problems the producers presently face could be solved with adequate assistance. Technical assistance could be a catalyst in moving from traditional to modern agriculture. However, if technical assistance is to be efficient and solutions to production problems found, a thorough knowledge of the problems faced by the producer is necessary. We hope that this study will supply basic information on the limiting factors of the cattle industry and will contribute positively to the formulation of technical assistance policies for the area under study.

Forty-three percent of the total number of farms in the sample received technical assistance. Many of the small producers have not received any assistance. 67 percent of the farms in category 1, 52 percent in category 2 and 28 percent in category 3, have not received any kind of technical assistance (Table 5.1).

Table 5.1 shows that the Middle Sinú, the Gulf of Morrosquillo and the Bolívar Coast have the highest percentages of technical assistance while the Atlantico Coast, the Lower Magdalena and the Lower Sinú have the lowest.

Table 5.1. *Technical assistance by geographical area and ranch size on the North Coast Plains*

Geographical areas	*Percentage of ranches receiving technical assistance*			
	Category 1	*Category 2*	*Category 3*	*Total*
Middle Sinú	63	55	83	68
Savannas of Bolívar (south)	25	33	63	35
Lower Sinú	29	50	—	34
Mompós-Magdalena River Depression	33	46	56	44
Savannas of Bolívar (north and central)	36	43	83	43
Coast of Bolívar	48	20	100	47
Coast of Atlántico	17	50	100	23
Lower Magdalena	21	57	50	34
Cesar River Valley	29	56	72	43
Gulf of Morrosquillo	18	45	100	48
Total	33	48	72	43

Technical assistance is mainly oriented towards the solution of management and animal health problems. On the farms in categories 1 and 2, technical assistance was given in these two areas, and in category 3, it was diversified to include pasture and soil management and equipment (Table 5.2 and Figure 5.1).

Few farms have received assistance with soil and pasture management in spite of the fact that the lack of grass during the dry season is a major factor limiting production. No assistance has been given with regard to organization and management of farms. This deserves special attention because many of the productivity problems originate in administrative and organizational deficiencies at the farm level. Because one problem is a lack of qualified personnel capable of carrying out administrative and organizational activities, a permanent service would have to be established to assist producers in these areas. In the industrial sector, SENA [1] trains personnel and gives technical assistance. SENA as well as other national institutions, could perform similar activities in the agricultural and live stock sectors of Colombia. It is worth noting that SENA has already started training workers for the agricultural sector.

1 Servicio Nacional de Aprendizaje (National Service of Apprenticeship).

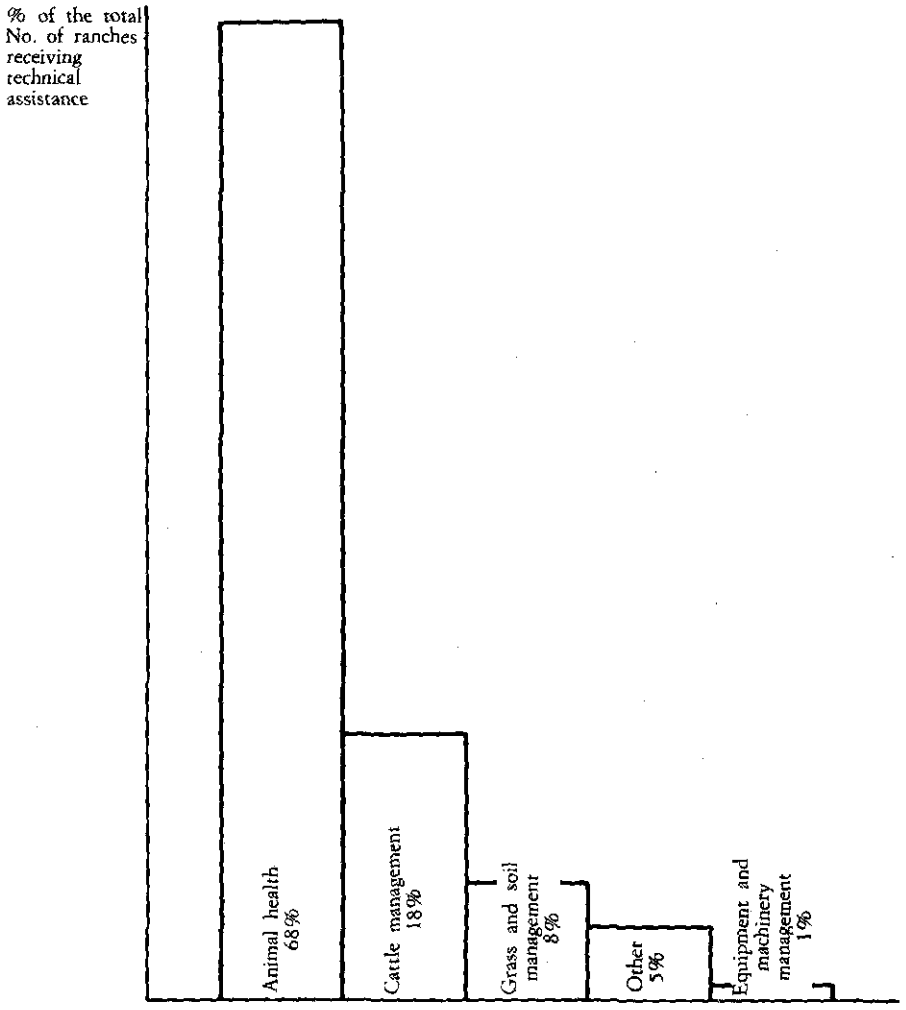


Figure 5.1. Type of technical assistance services rendered to cattle ranches on the North Coast Plains of Colombia

Table 5.2. *Type of technical assistance received by cattle ranches of the North Coast Plains, by geographical area and ranch size*

Geographical areas	Animal health			Cattle management			Grass and soil management			Machinery and equipment management			Other		
	Percentage of farms receiving services														
	Cat. 1	Cat. 2	Cat. 3	Cat. 1	Cat. 2	Cat 3	Cat. 1	Cat. 2	Cat. 3	Cat. 1	Cat. 2	Cat. 3	Cat. 1	Cat. 2	Cat. 3
Middle Sinú	71	86	53	29	14	26	0	0	16	0	0	0	0	0	5
Savannas of Bolívar (south)	80	72	63	0	14	12	20	0	25	0	0	0	0	14	0
Lower Sinú	63	75	0	25	25	0	12	0	0	0	0	0	0	0	0
Mompós Magdalena River Depression	100	63	56	0	25	22	0	0	11	0	0	11	0	12	0
Savannas of Bolívar (north and central)	72	69	83	17	8	17	11	15	0	0	0	0	0	8	0
Coast of Bolívar	66	100	50	20	0	25	7	0	25	0	0	0	7	0	0
Coast of Atlántico	67	50	50	11	50	50	22	0	0	0	0	0	0	0	0
Lower Magdalena	72	86	100	14	7	0	14	7	0	0	0	0	0	0	0
Cesar River Valley	83	89	71	17	0	23	0	0	0	0	0	0	0	11	6
Gulf of Morrosquillo	100	83	42	0	0	17	0	17	25	0	0	8	0	0	8

According to the producers, technical assistance is not given when needed (Table 5.3). The technical assistance in the area is mainly with animal health problems. When the ranchers have this type of problem, they call the technician . The latter however may not be available immediately because of distances or previous commitments to other farmers. As a result, when he finally visits the farm, the disease may be advanced and may have already resulted in great losses.

It appears that two main problems are lack of technicians and lack of technical assistance centers. In order to minimize the problems of long distances between farms and technical assistance centers, it will be necessary to disperse these centers throughout the region.

Technical assistance is automatically received when the producers work in association with cattle producers' funds or when they have received credit. In this last case, the value of technical assistance services is initially deducted from the gross amount of the loan. Some producers, however, believe that with their experience in cattle production, they do not need any kind of technical assistance. It appears that the demand for this service is not high at the present time. In the majority of cases, technical assistance is accepted because it is a prerequisite for credit purposes. Often the service is requested as a last alternative when a problem is already fully developed. Most problems could probably be avoided if assistance were requested on time.

Table 5.3. *Main failures in technical assistance noted by cattlemen of the North Coast Plains*

Type of failure	*No. of cattle growers*	*Total percentage*
Service not rendered on time	46	55
Expensive	13	16
Wrong recommendations given	7	8
Only given to a small number of farms	6	7
Lack of necessary technical and economic resources	3	4
Technical assistance paid for but service not rendered	3	4
Lack of interest from those providing assistance	2	2.5
Only given to large cattle operations	2	2.5
Lack of knowledge of the problems of the area	1	1

A second problem is the cost of technical assistance. It is possible that technical assistance could be considered too expensive in relation to the benefits received. Cattle producers have the tendency to judge any investment that is not directly involved with cattle purchases as being too costly.

Another failure of technical assistance is the frequency in which wrong recommendations are given. In addition, the technical assistant and the producer often have differences of opinion. The producer may have formerly followed a different procedure and he may be reluctant to accept the recommen dations offered by the technician.

Technical assistance is mainly given by the Colombian Agricultural Institute (ICA) and by private companies (Table 5.4). Limited assistance is received from cattle producers', associations.

Animal health

Figure 5.2 and Tables 5.5 and 5.6 show animal health problems based on information supplied by the producers.

Producers in the area consider hoof and mouth desease and foot rot to be the two main animal health problems (Figure 5.2). Cattle on 11 percent of the farms visited had hoof and mouth disease and problems related to foot rot.

Differential diagnosis may be difficult for the farmer. "Huequera" is a problem. The name most often refers to bovine anaplasmosis, primarily a tick borne infection. Similar symptoms may, however, be seen in bovine babesiosis and in trypanosomiasis and confusion in diagnosing these may also exist. A general practice of the Plains is dehorning when the animals present symptoms of anaplasmosis such as weakness and loss of appetite. It is believed that dehorning will cure the disease.

Table 5.5. shows differences in distribution of diseases. The Middle Sinú, for example, has the highest number of hoof and mouth disease problems.

Table 5.4. *Institutions giving technical assistance to cattle ranches on the North Coast Plains*

Name	*No. of ranches receiving technical assistance*	*% of total*
Colombian Agricultural and Livestock Institute (ICA)	49	23.5
Private companies	48	23.0
Cattle producers' funds	16	8.0
National Federation of Cattle Raisers (FEDEGAN)	15	7.3
Cattle Raisers' Bank	13	6.0
INCORA	13	6.0
SENA	7	3.5
Other institutions or combinations of those listed above	47	22.7
Total	208	100.0

Table 5.6 indicates that there is no clear relationship between the incidence of disease and the farm size. Fifty-two percent of the farmers state that they had no animal health problems but some may not be able to recognize them.

Vaccination practices

Vaccination programs are necessary to prevent diseases that have important economic implications. Table 5.7 lists the diseases for which vaccines are used and the percentage of farms employing them.

Vaccines must be given to the animal at the correct age and at proper intervals. Figures 5.3 and 5.4 show the frequency of vaccination for hoof and mouth disease and brucellosis. The current recommendations from the Colombian Agricultural Institute (ICA) are as follows: hoof and mouth disease should be controlled at all ages, every four months and brucellosis vaccination should be given between the ages of 4 and 8 months. Manufacturers of blackleg vaccines normally recommend an annual vaccination for calves. Figure 5.5 shows the frequency with which anthrax vaccination is used on ranches On 72 percent of the farms, vaccination was carried out against neumoenteritis of calves.

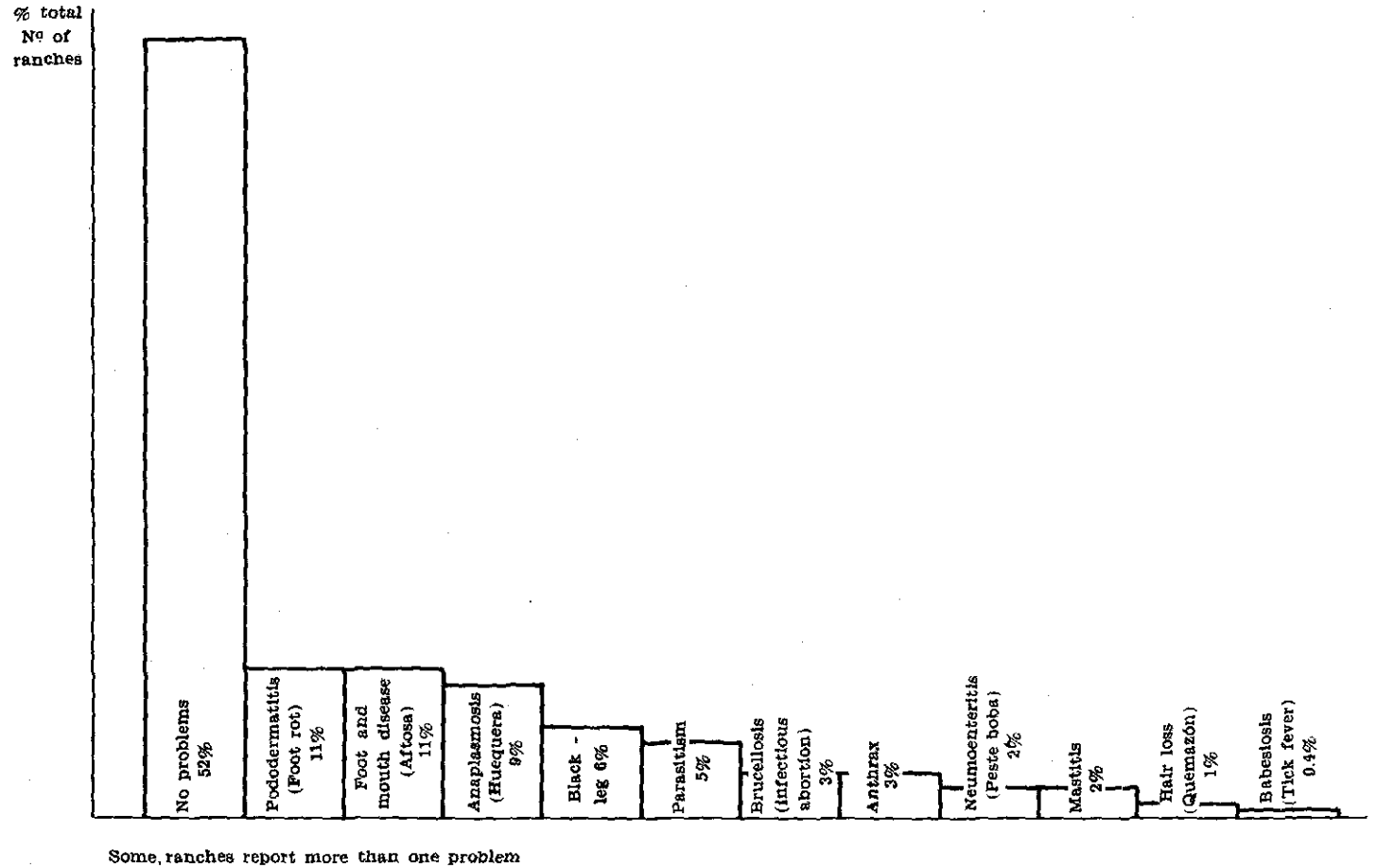


Figure 5.2. Major animal health problems on cattle ranches of the North Coast plains of Colombia.

Table 5.5. *Main animal health problems on cattle ranches, by geographical area, on the North Coast Plains**

Geographical areas	*Hoof and mouth disease (Aftosa)*	*Pododermatitis (Foot rot)*	*Anaplasmosis*	*Blackleg*	*Parasitism*	*Brucellosis*	*Anthrax*	*Babesiosis (Tick fever)*	*Septicemia*	*Neumoenteritis*	*Mastitis*	*Hair loss*	*Rabies*	*Other problems*	*No problems*
	Percentage of affected farms														
Middle Sinú	42	0	0	0	21	13	0	6	0	0	0	0	0	23	29
Savannas of Bolívar (south)	16	5	11	5	5	2	5	0	0	5	2	0	0	16	58
Lower Sinú	3	3	3	0	16	0	0	0	0	0	0	0	0	19	71
Mompós-Magdalena River Depression	9	20	18	6	3	0	0	0	6	0	6	9	0	12	38
Savannas of Bolívar (north and central	9	8	9	6	13	0	6	0	5	3	2	2	0	12	60
Coast of Bolívar	4	10	6	2	0	4	2	0	0	4	0	2	0	24	41
Coast of Atlántico	3	34	8	3	6	0	0	0	0	0	0	3	0	21	40
Lower Magdalena	8	14	3	11	7	2	7	0	6	3	2	0	0	1	56
Cesar River Valley	14	6	15	6	6	9	4	0	1	0	2	0	6	3	47
Gulf of Morrosquillo	3	3	7	3	28	0	0	0	3	0	0	0	0	21	48
Total No. of ranches	54	55	44	28	26	17	16	2	15	10	8	6	5	78	256

* Some farms have more than one problem.

Table 5.6. *Main animal health problems by ranche size, on the North Coast Plains*

Type of problem	*0—200 ha*	*201—500 ha*	*Over 500 ha*
	Percentage of affected ranches		
Aftosa (Hoof and mouth disease)	10	12	12
Pododermatitis (foot rot)	11	14	7
Anaplasmosis	10	6	9
Blackleg	6	8	0
Parasitism	5	4	6
Brucellosis	3	4	4
Diarrhea	5	2	0
Anthrax	3	4	0
Septicemia	2	4	6
Neumoenteritis	3	1	0
Mastitis	1	1	3
No problems	54	47	56

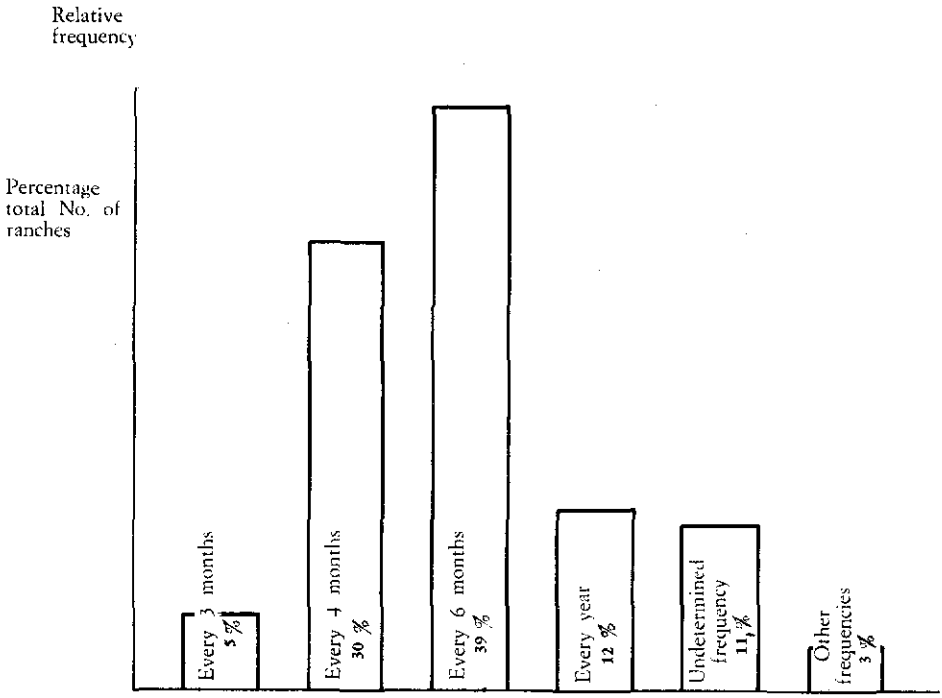


Figure 5.3. Relative frequency of aftosa (hoof and mouth disease) vaccination on cattle farms of the North Coast Plains

Table 5.7. *Vaccination practices on cattle ranches, by geographical area, on the North Coast Plains*

	Diseases to be controlled															
	Aftosa (Hoof and mouth disease)		*Brucellosis*		*Anthrax bacteri.*		*Anthrax Blackleg*		*Mastitis*		*Neumoen-teritis*		*Septi-cemia*		*Other*	
Geographical areas	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*
Middle Sinú	32	100	10	31	20	62	25	78	6	18	22	68	24	75	2	6
Savannas of Bolívar (south)	41	97	11	26	26	61	32	76	4	9	28	66	17	40	3	7
Lower Sinú	33	94	16	45	23	65	24	68	13	37	21	60	19	54	8	22
Mompós-Magdalena River Depression	34	100	8	23	28	82	31	91	5	14	25	74	15	44	1	2
Savannas of Bolívar (north and central)	61	96	18	28	47	74	51	80	5	7	45	71	37	58	1	1
Coast of Bolívar	45	93	24	50	34	70	40	83	3	6	41	85	18	37	0	0
Coast of Atlántico	33	94	15	42	26	74	27	77	5	14	27	77	15	42	1	2
Lower Magdalena	80	94	22	25	71	83	69	81	11	12	52	61	40	47	4	4
Cesar River Valley	83	100	37	44	65	78	73	87	0	0	73	87	35	42	0	0
Gulf of Morrosquillo	27	93	7	24	26	89	22	75	1	3	18	62	24	82	1	3
Total	469	96	168	34	366	75	394	80	53	10	352	72	244	50	21	4

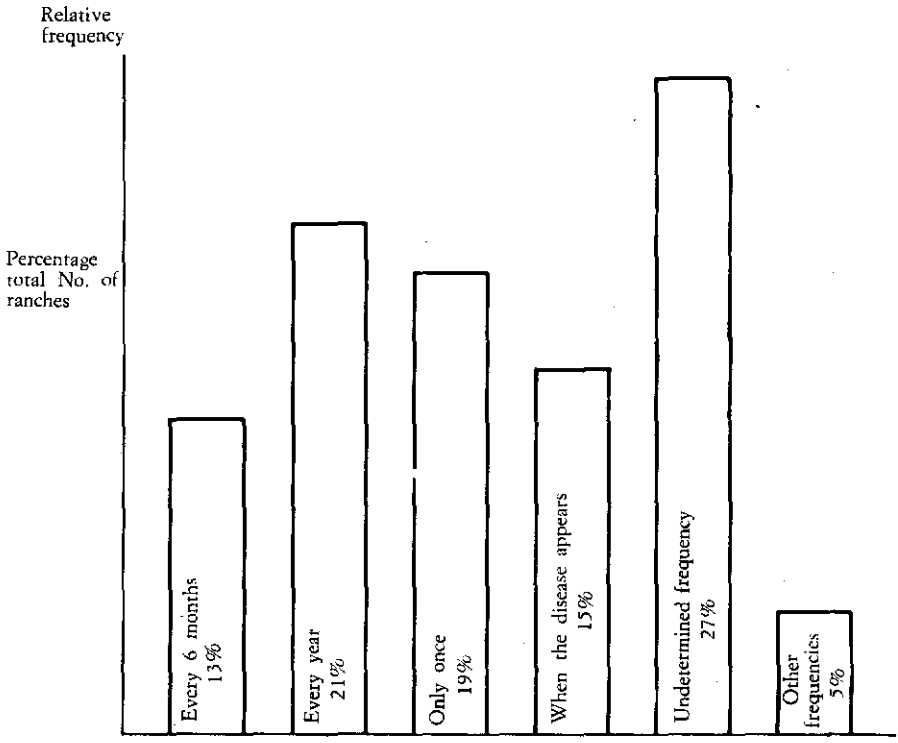


Figure 5.4. Relative frequency of brucellosis vaccination on cattle ranches of the North Coast Plains

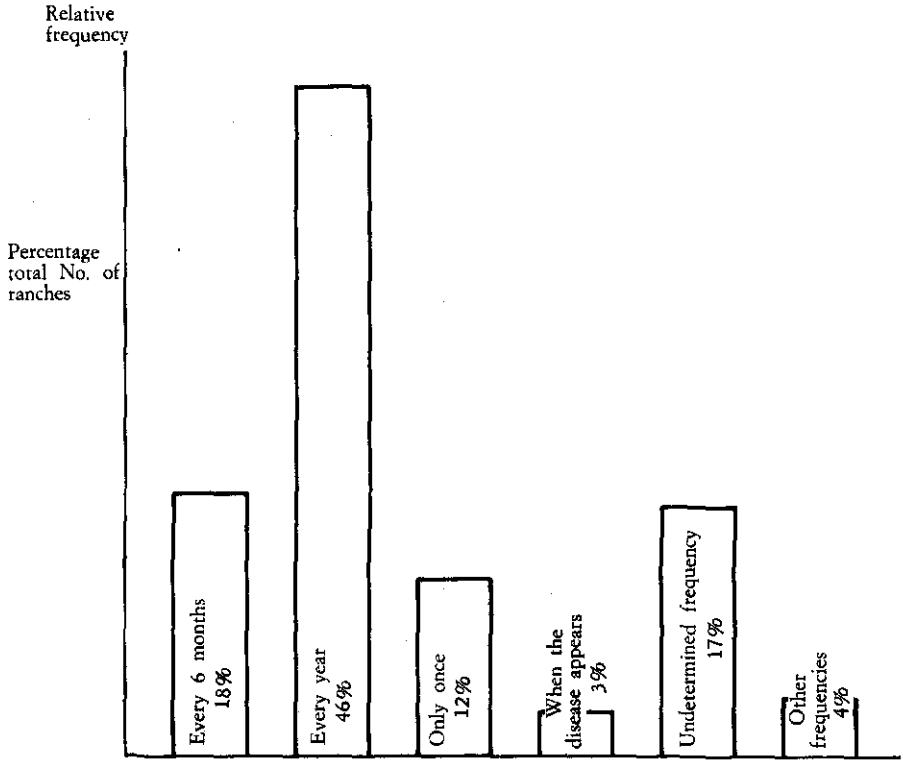


Figure 5.5. Relative frequency of anthrax vaccination on cattle ranches of the North Coast Plains

An important factor in the use of vaccines in the region is that storage requirements are often not available. Without the recommended temperature requirements, vaccines may be rendered useless.

Control of ectoparasites

Most ranches (82 percent) attempt to control ectoparasites (Table 5.8). These insects include ticks and biting flies. The highest percentage were found in the Cesar River Valley and the lowest in the coast of Bolívar zone. Cattle were most commonly sprayed by a pump carried on the operator's back. On large and medium size farms, cattle are immersed in a "dip." This is efficient but relatively expensive.

Table 5.8. *Methods employed in antiparasitic baths on cattle ranches of the North Coast Plains*

	Cattle bathed		*Methods used*							
			Spray		*Immersion*		*Immersion and spray*		*Other*	
Geographical area	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*
Middle Sinú	28	90	12	43	8	28	4	14	4	14
Savannas of Bolívar (south)	37	86	30	81	4	11	0	0	3	8
Lower Sinú	26	74	13	50	4	15	2	8	7	27
Mompós Magdalena River Depression	27	77	4	15	22	81	0	0	1	4
Savannas of Bolívar (north and central)	53	84	41	77	7	13	0	0	5	10
Coast of Bolívar	25	52	22	88	0	0	0	0	3	12
Coast of Atlántico	33	94	27	82	0	0	1	3	5	15
Lower Magdalena	68	80	63	93	1	1	0	0	4	6
Cesar River Valley	81	97	73	90	6	7	0	0	2	3
Gulf of Morrosquillo	23	79	16	70	3	13	0	0	4	17
Total	401	82	301	75	55	14	7	2	38	9

Internal parasites

Internal parasites control is less important in the area. Internal parasites are spread by the practice of constructing water "jagueyes" which, in turn, provide a good environment for the proliferation of larvae and eggs. This results in parasitic problems for the cattle. Another factor influencing parasitism in the area is the relocation of cattle during the dry season to marshes in the lower parts of the Cauca, San Jorge and Magdalena Rivers. The length of time the cattle remain in these areas nullifies any previous health programs because here they may contract parasites and other diseases.

CHAPTER VI

CREDIT

General information

Credit is important for the expansion of cattle production. Cattle investments generally take a long time to pay off and, for this reason, the producers may lack working capital and liquidity.

The problems caused by lack of credit are reflected in practices such as excessive milk extraction, premature cattle sales and growing and/or fattening in producer associations, or with other producers. Milk sales provide income that is used as working capital by small and medium-size producers. Forty-eight percent of the farms had to sell cattle prematurely. Broken down by category the percentage are: category 1, 50 percent; category 2, 48 percent; category 3, 41 percent (Table 6.1). The small dairy farms of the Bolívar coast have the highest rate of premature cattle sales; the Lower Sinú has the lowest.

Table 6.2 shows the main reasons for premature cattle sales. According to the producers, the main reason for these sales are their financial commitments. The pay periods do not coincide with the income-receiving periods, and the producer

Table 6.1. *Premature cattle sales on ranches of the North Coast Plains*

Geographical areas	*Category 1*		*Category 2*		*Category 3*		*Total*	
	No. of ranches	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*
Middle Sinú	3	43	8	62	6	50	17	53
Savannas of Bolívar (south)	10	48	5	38	3	38	18	43
Lower Sinú	7	33	4	33	1	50	12	34
Mompós-Magdalena River Depression	8	62	8	62	4	50	20	59
Savannas of Bolívar (north and central)	20	56	6	28	4	67	30	48
Coast of Bolivar	23	56	3	60	1	50	27	56
Coast of Atlántico	13	43	3	75	—	—	16	46
Lower Magdalena	26	48	14	52	1	25	41	48
Cesar River Valley	26	52	7	47	6	33	39	47
Gulf of Morrosquillo	6	55	6	55	2	29	14	48
Total	142	50	64	48	28	41	234	48

is forced to sell his cattle to meet financial commitments. This situation may be because of the inavailability of credit, poor credit planning by the lending institutions and poor use of credit by the producer.

Table 6.2. *Reasons for premature cattle sales on ranches of the North Coast Plains*

Reasons for selling	*No. of ranches*	*Percentage of the total*
To meet financial commitments	150	64
Severe dry and/or rainy seasons	35	15
Lack of liquidity	18	8
Disease outbreaks	7	3
Business uncertainties	5	2
Other reasons	19	8
Total	234	100

Joint cattle operations are caused in part by lack of credit. When a farmer does not have financial means to purchase cattle he collaborates with another producer or the cattle producers' funds where he obtains money and/or cattle thus commiting himself to sharing, by mutual agreement, his profits. Thirty-three percent of the total number of producers use the shared ownership system. Eighty-nine percent of the in the Mompós-Magdalena River Depression practice this system (Table 6.3).

Table 6.4 shows the partnerships entered into with other producers. Fifty-four percent of the producers participating in some partnership collaborate with other producers and 28 percent are members of a producer fund association. El fondo Ganadero provides the cattle, the producer cares for and feeds them. When the cattle are sold, the parties share profits according to previously established percentages.

Use of credit

Fifty-six percent of the total number of ranchers have used credit including 67 percent in category 3, 58 percent in category 2 and 52 percent in category 1 (Table 6.5).

Table 6.3. *Joint cattle operations*[1], *by geographical area, on the North Coast Plains*

Geographical areas	*No. of ranches*	*Percentage of the total No. of ranches in the area*
Middle Sinú	19	59
Savannas of Bolívar (south)	20	47
Lower Sinú	10	29
Mompós-Magdalena River Depression	31	89
Savannas of Bolívar (north and central)	15	24
Coast of Bolivar	21	44
Coast of Atlántico	2	6
Lower Magdalena	25	29
Cesar River Valley	7	8
Gulf of Morrosquillo	10	34
Regional Total	160	33

1 Association Between a cattleman and other persons or institutions.

Table 6.4. *Classiffication of partners in joint cattle operations on the North Coast Plains*

Type of partners	*No. of ranches*	*Percentage*
Other cattle producers	87	54
Cattle producers' funds	28	17
Colombian Institute of Agrarian Reform (INCORA)	6	4
Banco Ganadero	5	3
Ingral	3	2
Fondo y Banco Ganadero	2	1
Other	29	18
Total	160	100

The Mompós-Magdalena River Depression and the Atlántico and Bolívar coasts are the areas where credit is most widely used.

Table 6.5. *Use of credit, by geographical area and farm size, on the North Coast Plains*

	Category 1		*Category 2*		*Category 3*		*Total*	
Geographical areas	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*	*No. of ranches*	*%*
Middle Sinú	4	50	7	64	7	58	18	58
Savannas of Bolívar (south)	9	45	8	53	4	50	21	49
Lower Sinú	13	62	4	33	2	100	19	54
Mompós-Magdalena River Depression	9	75	8	62	5	56	22	65
Savannas of Bolívar (north and central)	14	39	9	43	3	50	26	41
Coast of Bolívar	26	63	3	60	2	100	31	63
Coast of Atlántico	19	63	2	50	1	100	22	63
Lower Magdalena	27	51	20	71	2	50	49	58
Cesar River Valley	19	39	12	75	15	83	46	55
Gulf of Morrosquillo	6	55	6	55	5	71	17	59
Total	146	52	79	58	46	67	271	56

In spite of the fact that the Mompós-Magdalena River Depression has the highest index of credit utilization, it also has the most joint cattle operations and the highest number of premature sales. These premature sales may be the result of the fact that the area is periodically flooded.

The Bolívar coast has a high credit use index as well as a large number of premature sales.

Weaknesses of the present credit system

The ranchers in the region studied indicated that the primary weakness of the present credit system is the number of conditions that they must accept in order to obtain the credit. In mentioning this problem they were primarily referring to the supervised credit system in which before granting credit the lending institution carries out a study of the ranch and later, when the loan is granted, specifies the way in which the loan should be used. Some of the ranchers severely dislike this credit policy because they feel that the total loan should be used to purchase animals and they do not consider other investments in the ranch to be necessary.

The supervised credit system of course is not necessarily a bad credit policy when one considers that the ranch should be

Table 6.6. *Weaknesses of the present credit system noted by cattle producers on the North Coast Plains*

Type of weakness	*Frequency*	*Percentage*
Many prerequisites for credit purposes	122	25
Credit does not arrive on time	98	20
Too much red-tape	69	14
Loans of limited amounts	65	13
High monthly payments	61	12
Short payment terms	41	8
High interest rates	19	4
Credit given by personal influence	10	2
Other	12	2
Total [1]	497	100

1 Some cattle raisers noted more than one weakness.

adequately equipped with installations, equipment, pasture management, etc. in order to be highly productive.

The supervised credit system assures that the loans are not used outside the ranch, that is, it assures that the credit is used to increase production and helps avoid it being converted to an inflationary factor.

In order to help assure the correct use of the loans the supervised credit is accompanied by technical assistance. The value of such technical assistance is discounted from the loan before the loan is actually made. This procedure constitutes another complaint among the ranchers. Some of them maintain that it should not be compulsory to receive technical assistance when receiving credit.

The second major area of complaint among the ranchers with respect to credit is that the credit is not provided at times needed. Frequently when the rancher needs the credit it is not available. These complaints point out a situation of insufficient supply of credit in relation to the demand at the current interest rate. It is not possible at any given time to provide sufficient credit to the ranchers who request it. As a result of this situation certain ranchers do not receive the loans when needed. Other weaknesses in the credit policies indicated by the ranchers are: too small amounts of credit provided, high amortization payments, short repayment periods and high interests. Most of these factors are associated with the problem of insufficient supply of credit. As a consequence, small loans are given in order to attempt to satisfy as large a number of the requests as possible. The credit institutions must recuperate the money as fast as possible hence the repayment periods are short and the amortization payments high. The interest rates are high because of the large demand and the limited supply. However it should be noted that the interest rates for the development of the beef cattle industry are lower than those of the free market.

Figure 6.1 illustrates the supply and demand situation with respect to cattle credit. The credit supply is inelastic with respect to interest rates. In other words, the amount of

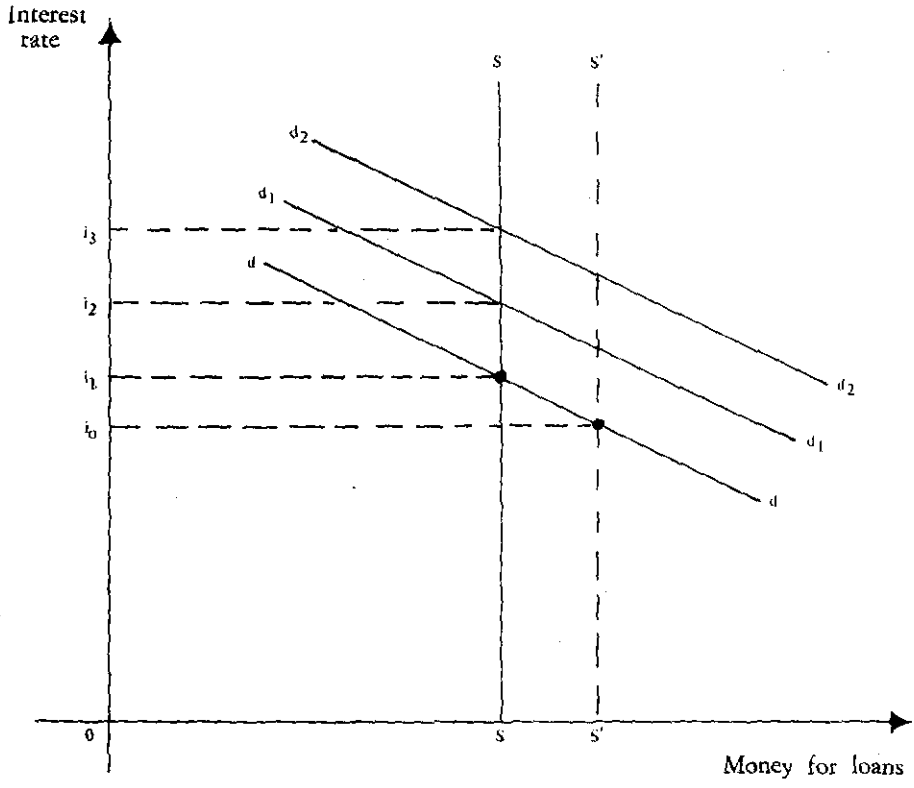


Figure 6.1. Supply and demand of livestock credit

money lent does not depend on the interest rate charges. This is a valid assumption considering that beef production credit is a development credit and the total amount available is determined by public development institutions with little regard for the existing interest rates on the market. In Figure 6.1, supply is represented by line SS. Demand for credit can be considered as a function of existing interest rates because cattle producers, when requesting loans, take into account not only the market interest rates but also those given by credit development funds. The credit demand is represented by line dd in the Figure.

If the existing interest rate for development credit is i_0, the amount of credit demanded is O S' and the amount supplied is OS. Therefore, there is a credit demand that is not met, equivalent to segment SS'. To meet demand at an i_0 interest rate, the supply line should be displaced from SS to S'S', but since this is not feasible, a market equilibrium for development credit is reached when interest rises from i_0 to i_1. At this point, supply equals demand. If the credit supply is constant and demand moves upward to d_1 and then to d_2, the interest rate could increase first to i_2 and subsequently to i_3.

Table 6.7A. *Possible uses of the credit granted to cattle producers of the North Coast Plains (Ranches between 0 and 200 ha)*

Use	*Loans up to Col. $20,000 Percentage*	*Loans up to Col. $50,000 Percentage*	*Loans up to Col. $100,000 Percentage*
Cattle purchases	43.0	51.0	52.0
Soil and grass improvement	20.2	12.0	8.0
Constructions, buildings, corrals, etc.	17.0	8.0	7.0
Improvement of foundation stock	12.4	12.0	8.1
Equipment and machinery purchases	2.0	4.0	6.0
Land purchases	1.7	10.0	16.1
Irrigation, drainage, reservoirs	1.5	1.2	1.2
Health control improvement	1.0	1.0	0.6
Feeding systems improvement	0.2	0.6	0.3
Crop investment	1.0	0.2	0.3
Employment of more workers	—	—	0.1
To keep as cash	—	—	0.2
Poultry investment	—	—	0.1
Total	100.0	100.0	100.0

Possible use of new loans

Considering the importance, to the credit institutions and the entities that establish credit policies for livestock production, of knowing the likely behavior of the rancher with respect to additional credit, an attempt was made to obtain this type of information. Producers were asked how they would spend an additional amount of credit. Three levels of additional credit were considered: $20,000, $50,000 and $100,000.

Tables 6.7A, 6.7B and 6.7C summarize the indicated uses of credit, by farm size, for the three loan alternatives. These tables show the percentages of ranchers mentioning each alternative for credit used.

The information shows that in all three categories, producers want to allocate between 31 and 64.5 percent to cattle purchases. Also, as the loan increases, the proportion for cattle purchase increases. The situation is different for those loans used for improvement of pastures, construction, foundation stock and health control because these percentages de-

Table 6.7B. *Possible uses of the credit granted to cattle producers of the North Coast Plains (Ranches between 201 and 500 ha)*

Use	*Loans up to Col. $20,000* %	*Loans up to Col. $50,000* %	*Loans up to Col. $100,000* %
Cattle purchases	31.0	39.0	53.0
Soil and grass improvement	18.1	17.0	8.0
Constructions, buildings, corrals, etc.	23.5	26.0	19.0
Improvement of foundation stock	14.2	8.0	6.0
Equipment and machinery purchases	4.0	4.3	7.2
Land purchases	0.2	1.2	3.0
Irrigation, drainage, reservoirs	1.2	2.0	0.5
Health control improvement	5.0	0.7	0.6
Feeding systems improvement	1.3	1.3	1.5
Crop investment	0.1	—	—
Employment of more workers	1.3	1.3	1.5
To keep as cash	0.1	—	—
Poultry investment	—	—	1.0
Total	100.0	100.0	100.0

Table 6.7C. *Possible uses of the credit granted to cattle producers of the North Coast Plains (Ranches over 500 ha)*

Use	*Loans up to Col. $20,000* %	*Loans up to Col. $50,000* %	*Loans up to Col. $100,000* %
Cattle purchases	40.0	62.3	64.5
Soil and grass improvement	20.5	11.4	7.5
Constructions, buildings, corrals, etc.	14.0	7.2	6.0
Improvement of foundation stock	3.0	2.0	3.0
Equipment and machinery purchases	—	1.4	0.8
Land purchases	4.2	2.5	1.3
Irrigation, drainage, reservoirs	16.0	13.0	12.0
Health control improvement	0.5	—	4.0
Feeding systems improvement	—	—	0.3
Crop investment	1.4	—	—
To keep as cash	0.4	0.2	0.6
Total	100.0	100.0	100.0

crease when the amount of the loan increases. The percentage of money used to buy machinery and equipment shows an upward trend in categories 1 and 2 when the amount of credit increases. Producers in category 1 tend to use a higher portion of the credit for land purchases than those in categories 2 and 3. Purchases of land increase as the loan becomes larger.

Investments for other purposes are considered less important by the producers and they do not show a regular pattern as loan size increases.

In the long run, if the cattlemen's tendency to spend a large percentage of their loans for buying cattle results only in increased cattle population of the area, it would probably be more efficient to improve productivity of the present herd instead of acquiring more cattle. Comparing the cattle industry of Australia with that of Colombia, it can be observed that productivity rates differ greatly, but the cattle populations are similar. During 1969-70. Australian and Colombian cattle populations were almost equal (Table 6.8). Australian beef production, however, doubled the Colombian production, and its exports were five times larger than those of Colombia. In spite of climatic and managerial differences between

Table 6.8. *Cattle population and exports from Colombia and Australia*

Country	*Production (metric tons)*	*Cattle population (head)*	*Amount of beef exported (metric tons)*	*Value of exports (dollars)*
Colombia	438,914	19,576,000	6,152	3,556,000
Australia	1,028,000	20,700,000	256.074	236,333,000

Source: FAO. Trade and Production Yearbooks. 1969.

the two countries, the previous comparison shows that Colombian productivity can be increased with its present cattle population.

At this point we can see the supervised credit system. It determines what areas, if properly developed with investment, will maximize or increase productivity. It forces the producers to concentrate on improving such aspects of production as feeding conditions, animal health and general management, and on acquiring facilities and equipment for the accomplishment of these ends. Supervised credit also discourages increases in herds size until the producer has seriously addressed himself to improving these other aspect of production.

Table 6.9 shows the incentives which would motivate producers to increase the number of cattle on their farms. The most important are increased loans and less strict credit prerequisites. Sixty-eight percent of the producers visited would increase the number of cattle on their farms if they were able to obtain larger loans. This confirms the previous information on the possible uses of credit. Another factor which would motivate cattlemen to increase the size of their herds would be the assurance of permanent land ownership, that is, that the farms would not be expropriated by the Colombian Institute for Agrarian Reform (INCORA).

Forty percent of the producers would increase the size of their herds if the local authorities would enforce stricter controls on cattle rustling. Several producers gave multiple incentives.

Table 6.9. *Favorable conditions under which producers would increase cattle population**

Geographical areas	*Increase in or approval of credit*		*Assurance of land owner ship*		*Strict control of cattle rustling*		*Price increase of cattle on the hoof*		*Facilities to buy machinery and equipment*		*Demand increase*		*No reason to do it*		*Other*	
	No. of cattle	*%*	*No. of cattle*	*%*	*No. of cattle*	*%*	*No. of cattle*	*%*	*No. of cattle*	*%*	*No. of cattle*	*%*	*No. of cattle*	*%*	*No. of cattle*	*%*
Middle Sinú	21	66	14	44	12	37	16	50	5	16	18	56	1	3	—	—
Savannas of Bolívar (south)	29	69	27	64	18	43	13	31	5	12	6	14	—	—	3	7
Lower Sinú	19	54	21	60	13	37	12	34	2	6	10	28	1	3	3	8
Mompós-Magdalena River Depression	21	62	25	73	15	44	10	29	5	15	8	23	—	—	—	—
Savannas of Bolivar (north and central)	33	52	45	71	26	41	5	8	12	19	14	22	—	—	5	8
Coast of Bolívar	40	83	30	62	27	56	2	4	12	25	3	6	—	—	2	4
Coast of Atlántico	21	60	17	49	13	37	7	20	14	40	4	11	1	3	2	6
Lower Magdalena	57	69	49	59	41	49	—	—	31	37	9	11	1	1	2	2
Cesar River Valley	60	71	57	68	29	34	20	24	33	39	11	13	3	4	1	1
Gulf of Morrosquillo	18	62	21	72	—	—	—	—	1	3	8	28	5	17	—	—
Total	319	66	306	63	194	40	85	17	120	25	91	19	12	1	18	4

* Most of the cattle producers mentioned more than one favorable condition for increasing their herds

CHAPTER VII

MARKETING

Marketing is a series of operations that allows the transition of the goods from the producer to the consumer in a manner determined by the consumer. Marketing systems coordinate production, distribution and consumption of goods. To measure the efficiency of a marketing system, two concepts must be taken into consideration: efficiency of operation and efficiency in price setting. From an operational standpoint, a marketing system is more efficient when the cost of operations involved to satisfy the needs of the consumer become lower. From the standpoint of price setting, the efficiency is measured when the mechanism assures good communication between producer and consumer so that the price of articles indicates to the producer what goods are needed by the consumer. When the goods are subject to price control by state institutions, it is difficult to determine the efficiency of the price setting system.

Cattle marketing in the Plains

The Plains supply cattle to the areas in the interior of the country. Table 7.1 shows beef production and consumption on the Plains. Consumption in the area is less than one-third of the production and the remainder is sent to other areas mainly as cattle on the hoof.

Table 7.1. *Beef production and availability on the North Coast Plains*[1] *(Metric ton)*

Year	*Production*	*Consumption*	*Surplus production over consumption*
1966	195,457	55,331	140,126
1967	185,692	57,541	128,151
1968	186,402	59,838	126,564
1969	198,082	62,231	135,851
1970	213,669	64,720	148,949
1971	240,325	67,309	173,016

1 Includes Departments of Atlántico, Bolívar, Cesar, Córdoba, Guajira, Magdalena, Sucre. Figures are estimated from 1969 to 1971.

Source: Bowser Max F. 1969. *Prerrequisitos y potencial para la exportación de carne en la década de 1970.* Departamento de Economía Agrícola. ICA.

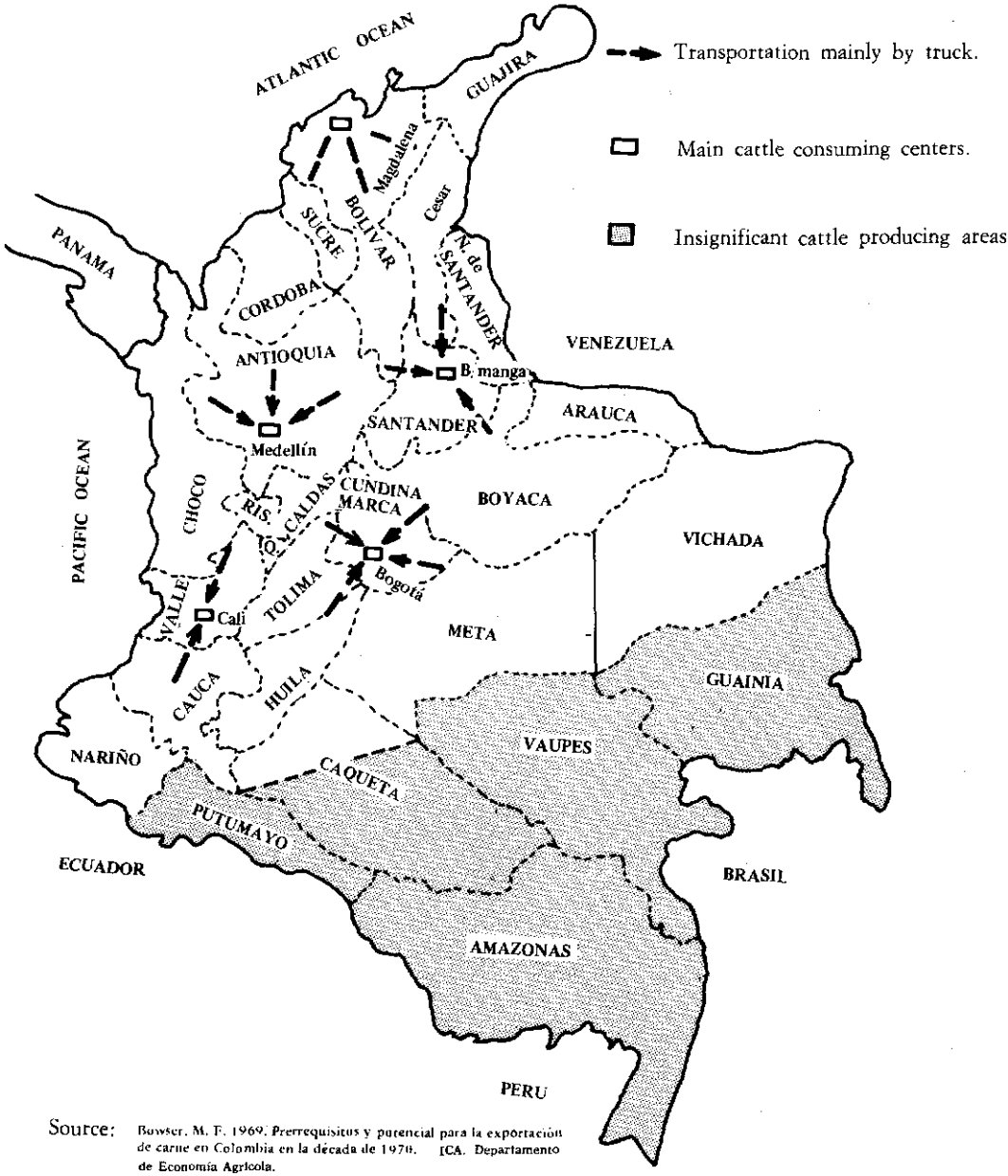
Cattle are shipped from the Plains, mainly to Medellín and Bucaramanga. Some of the cattle which go to Medellín are then sent to Cali, a city located in the southern part of the country. Some cattle go to Barranquilla which is a port city and a main beef consuming center on the Northern Plains. Some of the cattle produced in the area go to Venezuela, illegally, via La Guajira. Figure 7.1 shows the cattle flow patterns mentioned above.

The producer in the marketing process

The producer of the area is mainly concerned with production and has almost no participation in the marketing process. Eighty-three percent of the producers sell the cattle produced, right on the farm. (Table 7.2).

PIMUR [1] describes the marketing process for cattle produced on the north coast and consumed in Cali. The process involves a purchasing commissioner who goes to the farm and/or local cattle markets to buy cattle on the hoof at the re-

1 PIMUR González Corredor, Hugo. *Beneficio y distribución de carnes de res y cerdo en la ciudad de Cali.* Informe técnico No. 13, 1969, pp. 82-83.



Source: Bowser, M. F. 1969. Prerrequisitos y potencial para la exportación de carne en Colombia en la década de 1970. ICA. Departamento de Economía Agrícola.

Figure 7.1. Cattle flow to the main consuming centers, 1969.

Table 7.2. *Sale locations for cattle produced on ranches of the North Coast Plains*

Place of sale	*No. of ranches*	*Percentage of the total*
At the farm	399	82.8
In neighboring villages	21	4.4
In market places of regional fairs	11	2.3
At the farm and in Medellín	8	1.6
Other	43	8.9
Total	482	100.0

quest of wholesale merchants and/or meat suppliers. Another possibility is a selling commissioner who depends on the producer and, at his request, takes cattle from the farms to the cattle markets, in most cases the market at Medellín. A purchasing commissioner is more frequently found than a selling commissioner. The shipping commissioner works at markets such as the one held in Medellín; he receives, brands and counts the cattle bought by the purchasing commissioner. He has the responsibility of sending cattle on the hoof by truck to Cali to a predetermined wholesale merchant or meat supplier. If the cattle have been purchased by a wholesale merchant, they are sent to the slaughterhouse after a stop at the Cali market.

Figure 7.2 is a general layout of the routes followed by cattle from the farms on the North Coast Plains to the slaughterhouse in Cali. After slaughter in Cali meat products may follow several alternative marketing routes.

Price setting for the producer

Most of the farms in the area do not have scales for weighing cattle. For this reason, the producer does not know the exact weight of different animals at different ages or their weight gains during a specific period. At time of sale he does not know the exact weight of the cattle and he sells them "by eye." The selling price is established through a bargaining process between the buyer and the seller. In some cases the two parties are so skilled in this type of transaction that if the animals were weighed and their price per kg on the hoof determined, the final amount agreed upon would differ only slightly from the "by eye" selling system.

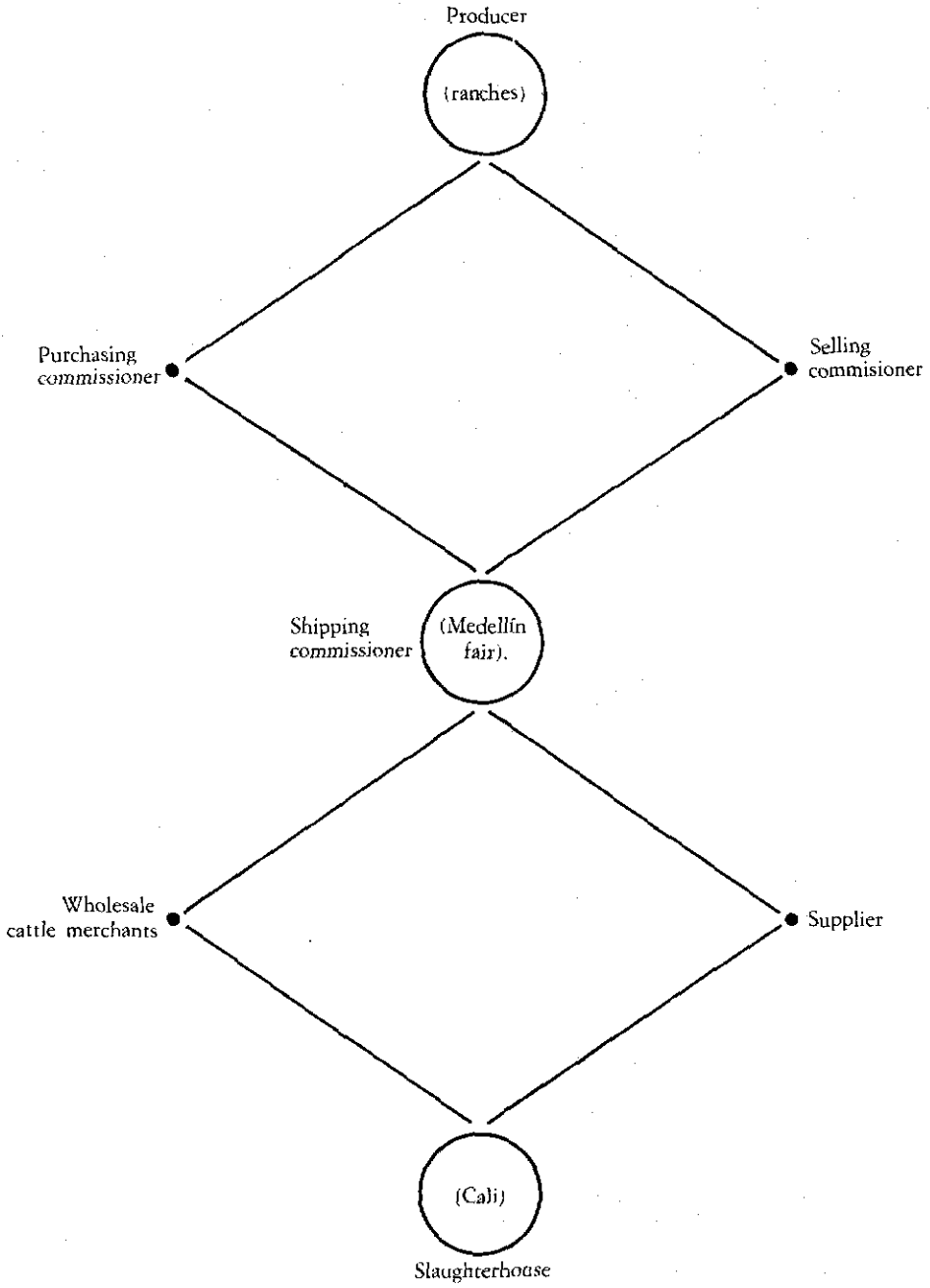


Figure 7.2. Marketing of cattle on the hoof from the North Coast Plains to Cali.

Eighty-six percent of the total number of farms surveyed use the "by eye" selling method; 10 percent employ the weighing system and 4 percent combine the two methods (Table 7.3). The system of selling without weighing "by eye" is more frequent on small farms on the Atlántico and Bolívar coasts where 90 and 91 percent, respectively, of the total number of farms use that system. Weighing is more frequent in areas where fattening is important such as in the Gulf of Morrosquillo and Middle Sinú zones.

Weighing is useful for sales and for selection of the herd because the producer will know the weight of the animals at different ages and will be able to make a selection based on those cattle showing better feed conversion rates.

Transport of cattle

Transport of cattle is important to marketing because most of the cattle produced on the Plains are slaughtered in the urban centers, in the interior of the country.

Cattle are transported by truck or are driven by cowboys. Trucks are used for long distances and whip driving for short distances. There is a combination of the two systems when trucks cannot reach the farm because of poor roads or lack of them. Railroads are used only limitedly in the area for cattle transportation; the Lower Magdalena uses railroad to some extent. Santa Marta and Bucaramanga are joined by railroad, and this route is used to send cattle to eastern Colombia. Transportation by river is insignificant. During the rainy season, however, when the roads in the Mompós-Magdalena River Depression are flooded the cattle are transported by ship (Table 7.4).

Transportation fares by truck are determined by the length of the trip, by compensatory loads, by the time of the year and by the condition of the roads. During harvesting, fares are high because of the great demand for trucks and prices also increase when the trucks have no compensatory loads for their return trip.

Table 7.3. *Price setting methods used by the producer for cattle sold on the North Coast Plains*

Geographical areas	Agreement between buyer and seller "by eye"		According to weigh., kg. (weighing)		Combination of both methods		Total	
	No. of Cattle	%	No. of Cattle	%	No. of Cattle	%	No. of Cattle	%
Middle Sinú	23	72	7	22	2	6	32	100
Savannas of Bolívar (south)	36	88	3	7	2	5	41	100
Lower Sinú	30	86	2	6	3	8	35	100
Mompós-Magdalena River Depression	29	85	4	12	1	3	34	100
Savannas of Bolivar (north and central)	56	89	6	10	1	1	63	100
Coast of Bolívar	45	94	3	6	—	—	48	100
Coast of Atlántico	32	91	2	6	1	3	35	100
Lower Magdalena	76	90	7	8	2	2	85	100
Cesar River Valley	69	84	11	14	2	2	82	100
Gulf of Morrosquillo	18	64	6	22	4	14	28	100
Total	414	86	51	10	18	4	483	100

The trucks used for cattle transportation do not have any partitions to isolate the cattle to prevent injuries. As a result, during transport weight losses or losses from injuries are high.

PIMUR [1] interviewed several meat suppliers that transport their cattle from the Plains to Cali. It was found that normal weight losses per head are as follows:

1 PIMUR González Corredor, Hugo. Op. cit. p. 89.

Table 7.4. *Systems and means used for cattle transportation on the North Coast Plains*

Geographical areas	*Truck*	*Whip driving (cowboys)*	*Truck and whip driving*	*Cattle not transported*	*Truck and river*	*River*	*Whip driving and river*	*Truck and railroad*	*Other*
Middle Sinú	47	19	28	6	0	0	0	0	0
Savannas of Bolívar (south)	30	46	21	0	0	3	0	0	0
Lower Sinú	37	37	12	14	0	0	0	0	0
Mompós-Magdalena River Depression	6	22	19	0	9	19	22	0	6
Savannas of Bolívar (north and central)	32	28	22	13	5	0	0	0	0
Coast of Bolívar	19	56	10	15	0	0	0	0	0
Coast of Atlántico	23	43	31	0	3	0	0	0	0
Lower Magdalena	31	27	37	0	0	1	2	1	1
Cesar River Valley	31	16	53	0	0	0	0	0	0
Gulf of Morrosquillo	28	41	24	7	0	0	0	0	0
Total	29	31	29	5	1	2	2	0.2	0.8

i) During the first 5 hours of travel	18 kg
ii) From 5 to 10 hours of travel	10 kg
iii) More than 10 hours of travel	12 kg
Total	40 kg

It should be noted that the proportion of the total loss that actually refers to a loss in carcass weight is not known.

Marketing problems in the region

Only 14 percent of the producers surveyed indicated marketing problems. Many producers are unaware of problems because of their limited participation in the marketing process. Poor or flooded roads are a serious problem because they increase transportation costs and cattle losses, depreciate the value of the cattle and prevent the producer from obtaining better prices. However, the problem is mentioned only by one percent of the cattle producers (Table 7.5).

The main problems of cattle marketing appear to be a) low prices for the producers, b) poor quality of transport, c) excessive number of intermediaries between producer and consumer, d) seasonally poor farm access. e)"by eye" cattle sales. Many of these problems appear to be interrelated. For example, too many intermediaries hinder price increases for the producer. But the producers' distance from their markets and their ignorance of market conditions make these intermediaries necessary.

Low prices are relative because in a hypothetical situation of present market prices and lower production costs, the producer would not consider market prices for cattle as being low. This situation suggests that efforts should be made to determine the reasons for high production costs, with the view of lowering them as significantly as possible. If this can be accomplished, the producers' income can be raised without an adjustment of current market values.

Strong participation by the producer in the marketing process may provide him with better prices. A well-managed cattle cooperative could be useful, eliminating private intermediaries and the larger volume of cattle handled could considerably influence prices.

Efficiency of the marketing system

A study should be undertaken to determine the efficiency of the present marketing system. There are indications that this system presents some weaknesses. From the standpoint of operational efficiency, the inadequate transportation of cattle results in losses and excessive transportation costs. It is difficult to radically change the present system. If the cattle are slaughtered in the region and then transported to the interior of the country in refrigerated trucks, this would require a large investment in trucks which must be imported. This specialized transportation system would face difficulties in obtaining compensatory loads. In addition, the consumer prefers fresh meat that has not undergone refrigeration.

If the trucks are better equipped and cattle management is improved during transportation, losses could be reduced. It is evident that with deficient management of the cattle during transportation, a high percentage of animals are damaged. The poor condition of the roads is another limiting factor because it delays the trips, ruins the vehicles and injures the cattle.

A specific study of the cattle marketing system and its efficiency is necessary.

Input availability

According to the survey, the cattle producers do not have difficulty obtaining medicines, drugs, salts and other production inputs.

Only three percent of the producers reported problems of this type (Table 7.6). The location of the ranch causes these

Table 7.5. *Cattle marketing problems noted by producers in the North Coast Plains*

Geographical areas	*No problem*		*Low price*		*High transport ation costs*		*Lack of trans- port means*		*Too many inter- medi aries*		*Lack of demand*		*Inacces- sible roads in the Rainy season*		*Lack of scales*		*Other*	
	No. of ranchers	*%*	*No. of ranchers*	*%*	*No. of ranchers*	*%*	*No. of ranchers*	*%*	*No. of ranchers*	*%*	*No. of ranchers*	*%*	*No. of ranchers*	*%*	*No. of ranchers*	*%*	*No. of ranchers*	*%*
Middle Sinú	25	81	0	0	1	3	1	3	2	7	0	0	0	0	0	0	2	4
Savannas of Bolívar (south)	34	79	1	2	0	0	2	5	1	2	3	7	0	0	0	0	2	5
Lower Sinú	31	88	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0
Mompós-Magdalena River Depression	33	94	0	0	0	0	0	0	0	0	1	3	0	0	0	0	1	3
Savannas of Bolívar (north and central)	48	75	3	5	0	0	3	5	3	5	4	6	0	0	1	2	1	2
Coast of Bolívar	41	86	1	2	0	0	0	0	2	4	0	0	0	0	0	0	4	8
Coast of Atlántico	33	94	1	3	0	0	0	0	0	0	1	3	0	0	0	0	0	0
Lower Magdalena	73	86	5	6	0	0	2	2	0	0	0	0	2	2	3	4	0	0
Cesar River Valley	81	98	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0
Gulf of Morrosquillo	26	90	2	7	0	0	0	0	0	0	0	0	1	3	0	0	0	0
	425	86	13	3	1	0	8	2	8	2	9	2	7	1	6	1	10	3

Table 7.6. *Distribution of cattle producers that have difficulty acquiring inputs and cattle, by geographical area*

Geographical areas	*Face difficulties in acquiring cattle*		*Face difficulties in acquiring inputs*	
	No. of Cattle producers	*%*	*No. of Cattle producers*	*%*
Middle Sinú	10	4	0	0
Savannas of Bolívar (south)	4	10	0	0
Lower Sinú	1	3	1	3
Mompós-Magdalena River Depression	2	6	0	0
Savannas of Bolívar (north and central)	5	8	1	2
Coast of Bolívar	3	7	6	13
Coast of Atlántico	1	3	2	6
Lower Magdalena	12	14	2	2
Cesar River Valley	6	7	2	2
Gulf of Morrosquillo	2	7	2	7
	39	8	16	3

problems. If located far from the commercial area, there are difficulties in transportation because of road flooding or lack of roads. Many producers reported difficulties in obtaining inputs because of high prices and lack of funds. Few cattlemen have reported difficulties in acquiring cattle.

It can be concluded that the ranchers do not see any problems in obtaining the type of inputs presently used in the beef cattle production systems.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

Even though the region studied is considered an area of beef production, milk production is of great economic importance at the farm level. Cow-calf and milk production are the main economic activities of the small farms while fattening is most important on the larger farms. The Atlántico and Bolívar coasts and the Lower Magdalena are dairy areas while the Sinú Valley and the Gulf of Morrosquillo are cattle fattening areas. The farms of the area do not have mixed operations and agriculture and any other type of animal production is primarily for farm consumption.

The performance of variable costs could not be obtained in this study. However, the estimates of fixed costs indicate that the producer has a sizable residual to cover variable costs and profits. Farm size and production orientation seem to influence the size of this residual.

In the cattle production process of the area, equal amounts of money are invested in equipment and facilities per unit of land and labor factors. In areas where the dairy industry is more important, larger investment in facilities per man were found.

Areas with low investment in installation and equipment show a higher productivity of capital than those areas where investment in these factors is high although the volume of sales is higher in the latter. This indicates a decreasing productivity to capital.

Six months is a relatively short time for proving the previous statement and therefore it is necessary to study this situation for a longer period. A semester is not sufficient for a thorough study of the existing relations between production and the factors of production. Since it was difficult to obtain information for a longer period because of the lack of records on the farms surveyed, it was necessary to use only a semester in spite of the fact that a cattle production period could require two, three or four years.

Another study is being carried out by the Agricultural Economics Program with the purpose of collecting information from a limited number of selected ranches in the area. The size of the sample will be smaller but the information will extend for a longer period. This study will survey the performance of the total costs of production.

Land constitutes the major component of total producer investment. Moving from a smaller to a larger ranch category, investment in land occupies a larger proportion of total investment.

The use of the labor factor is relatively higher in smaller than in larger operations because as farm size increases, the number of hectares and cows increase more rapidly than the number of laborers hired.

Labor in the region is not adequately trained. Illiteracy is a common factor among farm laborers. This is a drawback to the introduction of changes in the production process. When productivity needs to be increased, many factors of production are taken into consideration while the human element is often neglected. Because of their role in the organization of the production process, the human element must be physically and intellectually prepared to face the new situation.

Average calving rates observed in the area are not as low as might be expected. Small ranches show the highest rates. Areas with high birth rates also have high mortality rates. Mortality decreases as ranch size increases because producing and fattening are more important on larger ranches. Improved administration at the ranch level is in its initial stages. The

rancher does not have the adequate tools to control the resources available. The lack of good records prevents accurate planning. In most cases, operations are carried out without managerial criteria; sometimes the rancher does not know the cost of his assets and, therefore, cannot determine whether his business is profitable or if he should change it to make it more profitable.

Management practices are dedicated to cattle and few are oriented towards soil and grass management, even though grass, the main feedstuff in the area, is scarce during the dry season and the use of concentrates and feed supplements is restricted. Fertilization and irrigation are infrequently used on the cattle ranches of the area and only those soils that will be used for crops are analyzed.

The lack of grass during the dry season could be solved through better management and/or planting of grasses and forage legumes to provide an improved diet. Another possibility would be to feed the animals grains, meals, by-products and/or non-protein nitrogen sources readily available at reasonable prices. The introduction of silages and haying practices might also be beneficial.

The lack of credit is a serious problem for the cattle producers of the area. About half of those in the survey do not have access to credit. The existence of joint cattle operations and the premature sales of cattle in order to meet financial commitments reflect the scarcity of credit. In order to increase production, credit must be directed to prevent its utilization for other purposes, or for additional purchases of cattle, thus neglecting other production factors.

Less than half of the producers visited have received technical assistance. Technical assistance is mainly aimed at the solution of animal health problems and is little concerned with administration, equipment, soil and pasture management. Technical assistance is not granted quickly enough. Most animal health problems in the area have their origin in lack of technical assistance. The main animal health problems of the area are hoof and mouth disease (aftosa), anaplasmosis and pododermatitis (foot rot).

Even though the producer needs technical assistance, it is not frequently requested. Many producers receive technical assistance as a condition for credit approval.

Participation of the producer in the marketing process is limited. Most of the sales take place at the farm and prices are set without weighing ("by eye").

Trucking is the main means of transportation but it causes economic losses because of decreases in weight and injury to the animals during transportation. The poor road system is another limiting factor.

In summary, the cattle production of the North Coast Plains is carried out in a traditional manner with low parameters of productivity. However, it is abundant in two basic resources, land and cattle, which provide the area with good potential.

The most important question is how to increase production at the farm level, without using larger amounts of land or cattle.

This study covers only some of the important aspects of cattle production. Because this is only a general study, more detailed and specific research should be undertaken. Areas for furter study include:

1. Production costs.
2. Design and distribution of simplified record-keeping systems.
3. Determination of production factors and their interrelationship over extended periods of time.
4. Study of the marketing system to determine its efficiency.
5. Study of pests, diseases and weeds in pastures.
6. Economic feasibility of using products available in the region for cattle feeding.

Other recommendations are listed under "Highlights."

APPENDIX

DESCRIPTION OF THE AREA UNDER STUDY

Extension and borders [1]

"The North Coast Plains are surrounded by the high Andean system and the Caribbean sea on the south and north, respectively; on the east by the Sierra Nevada of Santa Marta and the Eastern Cordillera and on the west by the final branches of the Western Cordillera —the Sierra of Las Palomas, which is a zone of transition to the humid plains of the Pacific. The major SW-NE extension is 320 km and NW-SW is 240 km, excluding the Península of La Guajira. With the exception of the Sierra Nevada, the land structure is gently rolling forming low hills of about 300 meters above sea level."

The hills in the North Coast Plains range from 0 to 500 meters above sea level.

Climate

Temperature

The annual average temperature in the area is more than 27°C. The climate varies, however, in the different areas of the Plains (Table A.1).

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1 Guhl, Ernesto. *Colombia: Bosquejo de su geografía tropical.* Universidad Nacional de Colombia, Dept. of Geography, p. 108.

Table A.1. *Annual average temperature in some areas of the North Coast Plains*

Geographical area	*Annual average temperature (°C)*
Riohacha	36.6
Ciénaga	32.2
Tolú	30.1
Santa Marta	30.0
Fundación	29.0
Monteria	29.0
Puerto Colombia	29.0
Cáceres	29.0
Cartagena	28.0
Barranquilla	28.0
Galerazamba	27.4
María La Baja	27.1
Pozos Colorados	23.0

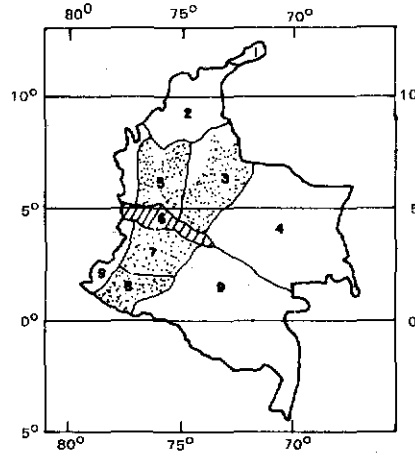
Source: Pérez Arbeláez, Enrique. 1966 *Recursos Naturales de Colombia.* Instituto Agustín Codazzi. P. 8.

Instituto Agustín Codazzi. 1961. *Estudio semidetallado de suelos del sector plano del Municipio de Ciénaga para fines agrícolas.* Bogotá P. 41.

Rainfall

The rainy season extends from May to October with the highest levels of rainfall in May and October. The dry season stretches from January to April and from November to December (Figure A.1). The amount of rainfall increases when moving from the coast to the interior of the area in the north-south direction. Northern trade winds influence the amount of rainfall. From December to April, these winds cause critical drought periods especially in January and March. The annual rainfall varies considerably in the different geographical areas of the Plains. (Table A.2). Rainfall is important to area; it determines differences in soil conditions because altitude does not differ considerably in this zone. Moving from the coast to the interior in a north-south direction, a dry area is found near the desert of La Guajira, characterized by xerophytic native vegetation. As the area nears the Andes the rainfall increases and the vegetation is more abundant. This area is suitable for agricultural livestock.

Annual rainfall cycle in Colombia (By E. Guhl)



Key

Rainfall (periods)

Rainfall with dry periods

Dry periods

Areas

1. Guajira .....
2. North Coast Plains .....
3. Eastern Cordillera (4°-8°N) ..
4. Eastern Plains .....
5. Mountains of Antioquia and Caldas
6. Central Andean Zone .....
7. Cauca and Magdalena Valleys / Plateau of Popayán .....
8. Southern Mountains .....
9. Pacific Coast, Amazon Jungle

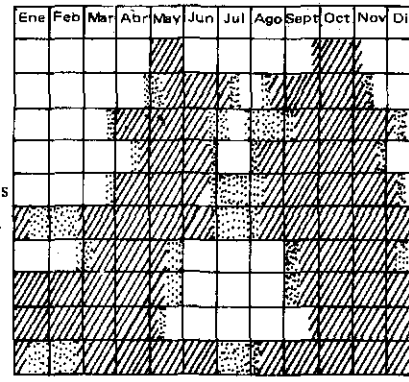


Figure A.1.

Table A2. *Average annual rainfall in some geographical areas of the North Coast Plains*

Geographical areas	*Average annual rainfall (mm)*
Cáceres	386.5
El Cenizo	2.092.5
Aracataca	1.660.1
Sincelejo	1.607.0
Fundación	1.269.5
Cartagena	1.208.0
Montería	1.201.1
Cereté	1.075.7
Barranquilla	867.0
Toluviejo	858.0
Pozos Colorados	457.0
Santa Marta	460.0

Sources: Instituto Geográfico Agustín Codazzi. 1968. Estudio general de suelos, y aptitud agropecuaria de los Municipios de San Onofre, Tolú, Toluviejo y Sincelejo. Vol. IV, Nº 10. Bogotá. P. 5.

1969. Estudio semidetallado de suelos para fines agrícolas, del sector plano del Municipio de Fundación. Vol. V, Nº 6. Bogotá, P. 4.

1969. Estudio general de suelos, para fines agrícolas, del sector quebrado de los Municipios de Santa Marta y Ciénaga. Vol V, Nº 8, Bogotá. P. 9.

1969. Estudio semidetallado de suelos del sector plano del Municipio de Ciénaga para fines agrícolas. Vol. V, Nº 1. Bogotá. P. 16.

Guhl, Ernesto. n. d., Colombia: Bosquejo de su geografía tropical. Universidad Nacional de Colombia. Facultad de Ciencias Humanas. Departamento Geografía.

The seasonal variation in rainfall influences the production systems. It results in seminomadic cattle operations. During the dry season cattle must be transferred to the marshes of the Magdalena, Cesar and San Jorge rivers, in search of water and grass.

Humidity

Humidity also varies in the different areas of the Plains. The weather bureaus located in the area register relative humidity between 70 and 80 percent; this is a semi-humid environment. There are other environments in the area that could be classified as arid, dry, dry mountain shade, semi humid, humid and marshy (Table A.3).

Table A.3. *Absolute and relative humidity in some geographical areas of the North Coast Plains*

Geographical areas	*Absolute humidity (mm)*	*Relative humidity %*
Sincelejo	24.0	90
Salinas "El Torno"	23.2	82
Barranquilla	23.0	83
Puerto Colombia	22.9	81
Cartagena	22.5	78
Mompós	22.4	73
Montería	22.3	76
Santa Marta	21.8	83
Uribia	19.0	59

Source: Pérez Arbeláez, Enrique. 1969. *Recursos Naturales de Colombia*. Instituto Agustín Codazzi, P. 182.

could be classified as arid, dry, dry mountain shade, semi-humid, humid and marshy (Table A.3).

Soils

The geomorphology of the area's soils is varied. The soils may be light or heavy, moderately or very acid. The following are some descriptions of different soil characteristics within the area. [1]

The Cesar River Valley has well drained soils of medium texture, low phosphorus content, fair to low ability to exchange cations, a pH ranging from moderately acid to acid and fair to poor base saturation.

The soils of the Gulf of Morrosquillo are mostly acid but some alkaline soils are found . They are clayey, rich in potassium and nitrogen, have a good saturation base and an excellent ability to exchange cations.

1 Data from studies conducted by the Agustín Codazzi Geographical Institute.

The Sincelejo soils, on the Savannas of Bolívar, have a clayey texture, a pH range from neutral to slightly acid, good ability to exchange cations, a low sodium and potassium content, normal nitrogen content and slow permeability. In the Arache-Cereté-Montería areas, the soils are clayey and poorly drained and have a pH ranging from alkaline to moderately acid.

The area of Baranoa, Department of Atlántico, has heavy soils which are difficult to drain. Their pH fluctuates between 4.4 and 9.8 and they are rich in potassium, magnesium and phosphorus.

Vegetation

The vegetal formations of the North Coast Plains are varied and include mainly xerophytic and cardonal species, subxerophytic forests, rainy and dry forests and tropical savannas. This vegetation is conditioned to humidity and temperature but it is mainly the varied rainfall which determines the type of vegetation in each of the areas.

The human element

In pre-Columbian times, the territory known today as the North Coast Plains was inhabited by aborigines belonging to the Karib and Arawak tribes: warrior families that were enemies. They fought the Spanish invader when he attempted to settle in their dominions and destroyed the first cities founded by the Spaniards —San Sebastián de Urabá, 1509 and Santa María la Antigua del Darién, 1510. In 1525, Rodrigo de Bastidas founded Santa Marta and protected it from the attacks of the natives. The Spaniards founded several ports on the Caribbean coast, taking advantage of coastal conditions. However, they did not settle there permanently but used these ports mainly as entrance gates to the interior of the country and as embarkation ports where the wealth taken away from natives was shipped to Spain. The Spaniards chose the temperate and cold climates of the mountains to live.

Once they had taken all the gold used by the Indians, in their homes and ceremonial temples, they began exploiting

natural resources, such as minerals. The Indians died from the inhuman and cruel treatment afforded them by the Spaniards in the mines. It was then that the third ethnic element appeared. The Negro was brought from Africa to America as a slave, to work in the mines.

The present inhabitant of the Plains is a mixture of Indian, Spanish and Negro, with a high Indian percentage. He has an extroverted personality and a natural gaiety. The rural population, especially, closely follows tradition.

Social and economic organization

Only few nuclei of pre-Columbian descendants remain and they live relatively isolated maintaining their traditional culture. These include the Cogi in the department of Magdalena, Taganga and some villages of the Sierra Nevada of Santa Marta; the Guajiros in the Peninsula of La Guajira and the Catios in the Upper Sinú. These groups live at the subsistence level and their participation in the economic life of the region is insignificant; they have a tribal organization where the "cacique" is the chief.

Compared to other areas of the country, the North Coast Plains show little industrial development. Their main economic centers and their populations'[1] are Barranquilla, 498,301; Cartagena, 242,085; Santa Marta, 104,471; Montería, 126,329; Valledupar, 78,437 and Sincelejo, 55,707. All of them are department capitals but the only important industrial center is Barranquilla.

The level of industrialization is low. Since the middle class consists mainly of office workers, laborers, second-line managers, etc., there is not a proper environment for its growth in this area. The middle class is almost non-existent in the rural areas where there are only two groups-the owners and the laborers. In some cases, the laborers still refer to the owner as "the white man".

1 DANE, 1964 Census.

Table A.4. *Percentage distribution of legitimate and illegitimate human birth rates in the departments of the North Coast Plains. 1967.*

Departments	*Birth percentages*	
	Legitimate	*Illegitimate*
Atlántico	69.9	30.1
Bolívar	51.5	48.5
Córdoba	44.5	55.5
Sucre	42.9	57.1
Magdalena	42.8	57.2
Guajira	32.5	67.5

Source: Departamento Administrativo Nacional de Estadística. DANE.

The most common family organization in the area is the "free union" and the coastal departments have the highest illegitimate birth rates in the country (Table A.4).

Population

The 1964 census reported a population of 3,098,877 inhabitants in the departments on the Caribbean coast. The highest density was found in Bolívar with 219.4 inhabitants per km^2. Magdalena had the lowest density with 16.9 inhabitants per km^2 (Table A.5).

Twenty-seven percent of the coast's population participates actively in the region's economy, 50 percent of whom work in agriculture, silviculture, hunting and fishing (Table A.6).

Table A.5. *Population density in the departments of the North Coast Plains*

Departments	*Number of inhabitants per km^2*
Atlántico	39.4
Bolívar	219.4
Córdoba	23.3
Magdalena	16.9

Source: Departamento Administrativo Nacional de Estadística. DANE. Population census 1964.

Table A.6. *Total population, economically active population, and economically active population engaged in agricultural and livestock operations in the North Coast Plains*

Department	*Total population*	*Economically active population*	*Economically active population engaged in agr. and livestock operations*	*Economically active population engaged in agr. and livestock operations as a percentage of the total economically active population*
Atlántico	717,406	193,287	31,134	16
Bolívar	1.066,347	267,334	145,217	54
Córdoba	585,714	159.141	107,902	68
Magdalena	789,410	216,197	131,397	51
Total	3,098,877	835,959	415,650	—

Source: Departamento Administrativo Nacional de Estadística. DANE. Population census. 1964.

Sixty-eight percent of the economically active population in the department of Córdoba work in agriculture, silviculture, hunting and fishing while the population of the Department of Atlántico involved in these activities is only 16 percent.

Table A.7. *Literacy and illiteracy rates in the departments of the North Coast Plains. 1964.*

Departaments	*Literacy* %	*Illiteracy* %
Atlántico	80	20
Bolívar	56	44
Córdoba	45	55
Magdalena	58	42
Total rate	60	40

Table A.8. *Cattle population and production of some crops in Colombia and in the departments of the North Coast Plains. 1969.*

	Cattle population[1] *(head)*	*Cotton m. t.*	*Sesame m.t.*	*Bananas m.t.*	*Cassava m.t.*
Atlántico	223,000	3,337	2,786	2,702	44,225
Bolívar	2,180,000	3,861	1,690	20,530	162,680
Cesar	———	155,371	2,967	11,208	95,568
Córdoba	1,995,000	23,923	1,820	7,505	155,730
Guajira	207,000	18,496	399	1,875	21,250
Magdalena	2,272,000	22,348	7,604	80,408	104,130
Sucre	———	11,097	1,610	525	109,968
National total	16.232.000	356.353	31.147	562.716	1.712.998

Sources: Tróchez, Carmen Helena. n.d. *Estadísticas Agropecuarias de Colombia*, 1966-1970, Universidad del Valle.

1 DANE. The cattle population of Sucre and Cesar is included in the population of Córdoba and Magdalena. 1968 data.

Education

In the Caribbean area, illiteracy is high, especially in Córdoba (55 percent). Atlántico has a 20 percent illiteracy rate. These are percentages determined for population over seven years of age. In general, the illiteracy rate in the North Coast departments reaches 40 percent. We can, therefore, conclude that the educational level is extremely low.

The agricultural and livestock sector

Livestock

The North Coast Plains are mainly a cattle producing and agricultural area. Fifty percent of the active population is involved in agriculture, silviculture, hunting and fishing. Cattle production is the main activity of the Plains and it has become an important beef supplier to other areas of the country. Between 40 and 50 percent of the country's cattle population is found on the North Coast Plains where 9.7 million hectares of land are dedicated to this industry.

Cotton

Cotton growing is important to the economy of the Plains. In 1969 the Plains contributed 67 percent to the total cotton production of Colombia. The Department of Cesar is the main producer. In 1969, it contributed 43.5 percent to the total Colombian production. The area planted to cotton was 151,740 hectares (Table A.8).

Sesame

Sesame production in 1969 reached 27,190 tons, equivalent to 57 percent of Colombia's total production. The area planted was 18,876 hectares (Table A.8).

Cassava

Cassava is cultivated throughout the country but the North Coast Plains produced 40 percent of the total cassava production in Colombia. The area planted to cassava amounted to 83,300 hectares (Table A.8).

Other crops

Rice is also important in the area. It is grown in the flooded lowlands. The Department of Cesar is the major producer. It produced 48,802 [1] tons in 1969 in an area of 13,050 hectares. The total production of rice in the Plains in 1969 reached 163,452 tons, which is 24 percent of the total national production. The area planted was 77,110 hectares.

Plantain is also important, 307,310 tons were produced in 1969, equivalent to 13 percent of the total national production. The area planted was 39,400 hectares.

1 Caja Agraria (Agricultural Credit Bank)

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