

The Beef Cattle Industry in the Roraima Savannas:
A Potential Supply for Brazil's North

By

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The experience of conducting field research and writing a doctoral dissertation has no equal. The opportunity and privilege of living on the frontier of northern Brazil has been one that I shall never forget. To the warm, friendly people of Brazil I express my heartfelt thanks.

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PREFACE

This study was undertaken primarily to determine the present and future possibilities of improving the quality and increasing the quantity of beef cattle in Roraima for the supply of urban consumers in Manaus. Roraima is truly one of the "last frontiers" and precious little information has been researched and written about this remote part of the world. Therefore, a secondary purpose of the study was to make basic information more available to those whose interests lie in the study of frontier areas.

Those who reside on the savannas of the Alto Rio Branco and in the cities of Boa Vista and Manaus certainly are more aware of their economic situations than this study may imply. As a foreigner, and especially as a North American, the author found it extremely difficult to instill confidence in the people, to convince them that he had no personal ambition to purchase land and exploit the existing cattle interests in Roraima. Just prior to the author's field investigation, two North Americans had been ordered to leave the Territory following a series of charges pertaining to business abuses. As a result, people were very hesitant to volunteer

information on almost any topic. At the other extreme, there were those individuals who wanted to impress upon their inquisitive visitor that their ranches were among the most modern and efficient in Brazil. Information and data given by these people bore absolutely no resemblance to that which the author observed.

All translations from Portuguese to English have been made by the author and he maintains sole responsibility for them. Since the terms which appear in the Glossary will be used so often in this dissertation, they will not be italicized after their initial use.

Most of mankind now lives in a single world system, and because most of the world's people, including Brazil's, have found the Metric System more practicable than alternative measurement systems, the author has purposely been inconsistent in stating units of measurement. As a gesture of respect for the Brazilians, most of the units of measurement are stated in the Metric System with the United States System stated in parentheses where immediate comparison is deemed meaningful.

May this effort stimulate others to devote their skills, time, and effort to the problems and possibilities of producing beef in a savanna environment and to this little known part of the world.

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Abstract of Dissertation Presented to the Graduate Council
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THE BEEF CATTLE INDUSTRY IN THE RORAIMA SAVANNAS:
A POTENTIAL SUPPLY FOR BRAZIL'S NORTH

By

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Brazil is a nation currently undergoing rapid change. While population growth continues, more and more people are moving from rural areas to urban centers. Almost unique among the developing nations is the fact that Brazil's economy is moving even faster than the rapid population changes and the urban consumers are gaining real purchasing power on a grand scale.

There are, however, certain regions of Brazil which have some very real supply problems in the face of promising economic growth. Manaus, the booming urban center of Western Amazônia, experiences annual critical shortages of beef, the most desirable source of animal protein in the diets of its people. As a greater share of Manaus' population achieves a suitable income, the demand for beef, a more expensive item than the traditional high-caloric food staples, increases to true crisis proportions.

Lying some 400 miles to the north, the savannas of Roraima have produced beef on an extensive grazing basis for nearly two centuries, yet little material progress in productivity has been shown since the inception of ranching there. The ranches of Roraima are completely isolated from major markets, save for two months out of the year, when cattle can be sent by river barge to Manaus. An all-weather road will soon bring this savanna area out of isolation and offer an opportunity for the ranchers to supply Manaus during its critical periods of shortage.

It is the purpose of this dissertation to investigate the supply pattern of beef to Manaus and to determine the probable impacts of the road on the beef cattle industry of the savannas of Roraima. An attempt will be made to demonstrate the present degree of inaccessibility to and from Roraima, to trace the historical evolution of ranching in that area, determine the nature and extent of production and marketing problems, and assess the importance of the new road as a possible key to alleviating the beef shortage in Manaus.

The ranchers in Roraima welcome the road as an avenue of improved access to material inputs required to improve the quality of their cattle and the performance of their productivity, but fear that the road will lead to the creation of a cattle complex closer to Manaus, thus pre-empting their

present position with respect to that market. They view the negative turn of events which have occurred on Marajó Island as a result of the completion of the Belém-Brasília road as an omen of their future and look to distant foreign markets as their salvation. Given the magnitude of the problem of overcoming foot-and-mouth disease and the growing demand for beef in Manaus, and viewing the situation in light of the economic principles of opportunity cost and the law of comparative disadvantage, it appears that ranching in the savannas of Roraima will benefit greatly by the new land surface connection to Manaus. The ranchers will have greater access to material supplies at less cost and will be able to reach the Manaus market with their cattle on a 12-month basis.

CHAPTER I

INTRODUCTION

Typical of some of the other larger nations of Latin America, Brazil is characterized by a relative abundance of land, and when viewed in the long-run, still enjoys a situation of underpopulation rather than overpopulation. In production, area and population, Brazil is the largest country in Latin America. The nation has over 93 million people, occupying a mainly tropical area larger than the 48 contiguous United States. Differing from most of the underdeveloped world, Brazil does not yet face the Malthusian dilemma of serious population pressure on the food supply.

This is not to say that Brazil does not have a population problem of enormous proportions. Perhaps the greatest temptation to lapse into a state of complacency, surely a dangerous attitude in this world of many problems, is in maintaining the general belief that, given so much empty space, the nation need not be concerned with a high rate of population growth. In this belief, Brazilians too easily forget that much of this space is not yet physically productive (given present available technical knowledge) or, even if it is, it is

geographically too remote for years to come. More important, however, many Brazilians have completely ignored the fact that, in its economic effect, population growth places pressure on the quality of the human resource as well as its distribution. Thus, even if one accepts the view that Brazil's long-run optimum population might be 200 or even 300 million, the alacrity with which they reach this size, i.e., the annual rate of growth, is a matter of urgent importance.

If the annual rate of natural increase continues at the present level of 2.7 per cent, Brazil certainly will find it almost impossible to ameliorate the population problem. At such a rate of growth, it would appear that Brazil cannot possibly allocate the massive resources required to expand and improve its infrastructure--schools, public utilities, public agricultural services, highways and communications, and the like--and industrialize at the rate needed if it is to absorb into economically worthwhile non-agricultural employment a rapidly growing surplus of underemployed rural people or unemployed urban dwellers. The agricultural sector will suffer greatly as well. With rural labor being kept cheap and ignorant by high rates of population growth, the modernization of agricultural techniques will seldom be economically sound and will increase social problems by displacing labor by mechanization. Even at a much lower rate of

net population growth (for example 1.5 per cent), all of these problems would still have to be confronted, but at least gradual progress toward their solution would be feasible.¹

A few statements are necessary to relate the previous statements to the empirical situation. By 1960, after more than 400 years of development, 90 per cent of Brazil's 70.2 million people and 93 per cent of the cropland were located in less than half the country's area and within 300 miles of the coast. In terms of cultivated land, Brazil at about one acre per capita did not rank far above some of the more densely populated countries such as India and Pakistan.² Despite considerable progress since 1945, Brazil remains a dual economy in two respects. On a geographical basis the nation is viewed as the developed South and the underdeveloped Northeast and Amazon regions. On a temporal basis, while a substantial number of the people have shared at least moderately in the fruits of industrial and agricultural progress, the majority remain poor. A large number of the latter earn meager incomes in agriculture, many are underemployed in either agriculture or in urban areas, and the remainder are unemployed. Alongside this condition, the 1960 national census revealed an illiteracy rate of 39 per cent and an average level of schooling of 2.4 years, emphasizing the existence of a skilled labor shortage. Overall, annual per capita income is somewhat above

\$300 U.S., but the regional distribution is very uneven. In the Northeast per capita income stands at \$170,³ while in the state of Guanabara (the Rio de Janeiro urban area) it is almost three times the national average. This poses a serious social and political problem and limits the effective size of the consumer market.

Nonetheless, in the past two decades Brazil has made tremendous strides. While population increased at an average rate of slightly over 3 per cent in the 1950's and somewhat under 3 per cent in the 1960's, real GNP grew at an annual average of 5.8 per cent in the 1949-1962 period. During the 1963-1966 period, GNP averaged only 3.25 per cent owing to the inflation crisis during the 1962-1964 period.⁴ Nineteen seventy was the third consecutive year in which Brazil achieved close to a 9 per cent rise in real GNP. With the population growth rate down to 2.7 per cent per annum, the three year average GNP growth rate of 8.8 per cent translates into an impressive annual rise of more than 6 per cent in real per capita output.⁵

The rapid rise of industry has greatly changed the structure of the economy. Between 1949 and 1966 the combined output of mining, manufacturing, construction and power facilities rose about 256 per cent while agricultural production rose by only 102 per cent.⁶ This has given rise to

an immense rural-urban migration and interregional migration. About two-thirds of the population was rural in 1949, but the 1970 census showed that this had declined to 44 per cent.

Brazil's livestock sector as a whole lags behind other sectors of the economy. During the last decade the prices of livestock products have increased faster than the general price level. The same has not been true for food crops. On the demand side this reflects the strong desire of urban consumers to substitute the more expensive livestock products for the cheaper cereals as their incomes rise. It also reflects on the supply side the relatively inelastic response of livestock production to rising prices, a consequence of the technological backwardness and inefficiency of the livestock sector. Most assuredly, wherever urban market opportunities exist and are not undermined by counterproductive price ceilings, the producers of livestock products, even beef cattle, are not only growing in number, but are also beginning to follow many of the improved practices in use in more advanced countries.

In general, however, livestock practices can still be described in primitive or semi-colonial, chiefly characterized by land monopoly, extensive land and livestock exploitation, low technical standards and unsatisfactory labor relations. Even those producers who do strive for increased productive

efficiency find it difficult to achieve because they face complex managerial problems (more so than crop producers) and proceed on a purely empirical basis without reliable and adequate technical direction. With an acute lack of technical and market information, improved practices are not financially feasible, particularly since the prices of modern agricultural inputs are rising more rapidly than farm-product prices.

Within the category of livestock, beef is the major source of animal protein in Brazil, accounting for nearly three-fourths of all red meat and poultry consumed each year. The overwhelming majority of beef is produced in the states of Rio Grande do Sul, São Paulo, Mato Grosso, Goiás, and Minas Gerais. The major markets lie in Brazil's South, in the built up urban areas of São Paulo, Rio de Janeiro, Belo Horizonte and Pôrto Alegre. Any producing areas in the thinly settled North are for all practical purposes excluded from this market area by sheer distance if nothing else.

One area characterized by primitive ranching conditions is the remotely situated Território Federal de Roraima, Brazil's northernmost political unit of state or territorial size. Roraima contains natural grasslands to the extent of some 16,000 square miles, which is approximately the total combined area of Delaware and Maryland. It is possible that

this grassland could become the scene of modern ranching, supplying the rapidly growing urban center of Manaus, Amazonas. Human population pressures pose no difficulties for this extensive activity as the population density for the entire territory is less than 0.04 persons per square mile. Scrawny range cattle have been grazed on these unimproved savannas for nearly two centuries with the beef being sent to two markets: Manaus (1970 population, 305,000); and Boa Vista, the territorial capital (population estimates range between 14,000 and 30,000 with the former more likely to be representative). Brazil's improving infrastructure, by bringing Roraima out of isolation, is now making it feasible to supply beef and cattle products to areas of greater distance which were formerly out of the market area owing to physical barriers or prohibitive transport costs.

The objective of this study, therefore, is to examine in detail, and in a geographical context, the present situation of cattle-raising in Roraima and the prospects for further development of this particular economic activity in that area.

Two major themes which the author believes are fundamental themes in geography will be pursued in this study. One major theme is that of spatial arrangement and movement. It is here that geographical elements may be characterized as points, lines, or areas.⁷ Furthermore, common geographical

problems may be thought of as a group of tensions created by these geographical elements. Dimensional tension is created between point- and area-occupying activities. For example, on a national scale urban industrial centers may be thought of as points, whereas agricultural activities are area-occupying. A dimensional tension is created by the fact that man requires association with, and the products of, both farm and factory.

Another tension is that which exists between present activities and past facilities and institutions, that is, historical tension. In many studies past legacy may be the single most important fact. Existing institutions and facilities will always be lacking in suitability for the present because man is always creating new activities which, for greatest efficiency, necessitate new arrangements. This tension is a fundamental geographical problem which arises time after time, and, in fact, is a factor influencing the beef cattle situation in Roraima Territory.

Scale, which can classify problems as local, regional, national or world, is of primary importance. In the case of Roraima, the spatial distribution on the surface of the savannas cannot be ignored. This unit area dimension is a basic concept. Many terms used by geographers, such as density, rent, land value, crop yield, are compounds of the

term "unit area" with counts of other elements.

The second major theme is the relationship between man and the environment.⁸ In earlier times much attention of the geographer was focused on how the environment controls man's behavior. Counter theories developed to this, but no example of man's control of his environment was demonstrated by acceptable method and, consequently, the concept is no longer considered useful as a guide to geographic understanding.

Today the general concept accepted by geographers is based on the notion that the physical character of the earth means different things for different people. The significance to man of the physical environment is a function of the objectives, attitudes, and technical abilities of man himself. The resource base provided by the earth takes a new meaning with each change in any of the element of the human culture. Thus, the geographer is interested in the process of interaction between man and the environment.

The choice of the specific type of agricultural activity at any location depends upon three prime factors. First are site characteristics, i.e., characteristics of a particular place such as soil, slope, micro-climate, and size and shape of farm and field. Second are the situation characteristics, which are defined as the elements of relative position, such as location with respect to market. The third and most

complex factor is that of technology and the socio-political organization of the people.

Included in the socio-political organization of the people is the polarization to subsistence societies and exchange (or commercial) societies. On the one hand, the subsistence society can generally be characterized as having no contact between groups, or at best only short range contacts. Self-support is the rule and there is little exchange of goods and ideas. Inherited culture prevails. Production is labor intensive although productivity per worker is low. Change comes about slowly owing to an attitude of long-run fatalism and the lack of an abstract image.

On the other hand, an exchange society can be described as having long range contacts with a great exchange of material goods and human thoughts. There is a high level of adapted techniques. As opposed to the subsistence society's labor intensiveness, the exchange society is capital intensive. Labor productivity is high and rapid change is a characteristic feature.

Within this framework of thinking, then, the beef cattle industry of the Roraima savannas will be discussed in the following chapters. But, of course, to make a valid contribution to the learned world, and geography in particular,

suitable methods would be selected to investigate the problem in an orderly and scientific manner.

NOTES

¹These comments are based on those by William H. Nicholls, "The Brazilian Food Supply: Problems and Prospects," Economic Development and Cultural Change, XIX (April 1971), p. 379.

²U. S. Department of Agriculture, Economic Research Service, Brazil's Position in World Agricultural Trade, ERS-Foreign 190 (Washington, D. C.: Government Printing Office, 1967), p. 1.

³"News Review: Brazil, Northeast, Income," Bank of London and South America Review, v, No. 57 (September 1971), p. 540.

⁴Another indicator of progress revealed itself in the 1970 census as the rate of illiteracy had fallen from 39.5 per cent in 1960 to 33.1 per cent in 1970.

⁵Brazil: International Economic Survey (New York: Chemical Bank, September 1969), p. 4.

⁶Brazil: Economic Review and Outlook, International Notes No. 173 (New York: Chemical Bank, July 1971), p. 1.

⁷The ideas expressed here are drawn from lectures by, conversations with, and readings from Professor John D. Nystuen, "Identification of Some Fundamental Spatial Concepts," Papers of the Michigan Academy of Science, Arts, and Letters, XLVIII (1963), 373-84.

⁸The order of discussion does not imply that one theme is more important than the other. On the contrary, they are of equal importance and inseparable in reality.

CHAPTER II

METHODOLOGY

Outstanding researches and able formulation of hypotheses, like outstanding inventions and skillful manufacturing, fail to achieve notable results unless effectively presented to a large public. It is often and truly said that research is not complete until it is published. However, as Boring has pointed out, a badly written report may find no public because it is too forbidding to be read. "What is in the writer's mind becomes public opinion only when many other persons read and understand him."¹ Thus, while effective presentation can never take the place of able investigation, it is the indispensable means of assuring full success to any investigation. The following paragraphs will discuss the selection of a method of inquiry and presentation.

Various levels of methodological sophistication warrants the selection of the most appropriate method to investigate the stated problem.² As it is so aptly stated by Gould and Sparks,³

In these days of complex interregional, nonlinear, and dynamic models one hesitates to utilize simple means to approach

the problem under investigation. However, frequently these beautiful programming models have been constructed in a developed environment where profuse and dependable data, both for the formulation of the model and its empirical test, are close at hand.⁴

In underdeveloped countries reliable data are almost nonexistent and the categories of available recorded material leave much to be desired.

The inappropriateness of using a dynamic quantitative model to aid in the study of the cattle situation in Roraima can be seen in the following example. Halter and Dean have used simulation to find some improved management policies to deal with uncertain environments in which decisions were made about buying feeders for the range, transferring feeders to the feedlot, and selling fat stock. To construct a model to simulate monthly range conditions over a period of several years, the authors needed a data source which would reveal actual range conditions at the beginning of each month. Fortunately, the United States Crop Reporting Service represents the desired source of information. In Brazil no such organization and service exist. Furthermore, the data needed to formulate decisions on direct buying for the feedlot included expected slaughter price, final weight, days on feed, feed cost per head per day, initial weight and an uncertainty

factor margin. Ranching and beef production in Roraima Territory have yet to reach the level of advancement whereby such statistics as just mentioned are recorded or can be computed. Wisely, the authors of the article on simulation conclude that:

In farm management research at the firm level...some degree of caution should be raised in recommending simulation as a general means of analysis. It would be tempting to use simulation for almost any size of problem; but, it should be made clear that unless simulation provides answers to questions which cannot be answered by simpler techniques, it is doubtful that it should be used at the firm level.⁵

What Halter and Dean actually showed was that ranch management decisions did not, in fact, require the use of simulation as an expectation model to improve the efficiency of the decision to buy and sell stock.

Also, it can be safely said that the ranch managers in the United States most likely have some degree of education and are fully literate. In the example previously cited the managers made almost all critical decisions of buying and selling. To the contrary in Roraima, very often the manager is illiterate or can barely read and write and does not make important decisions. Instead, the absentee owner, very much out of touch with the production aspects but more informed about the market situation, makes the decisions. What is

missing in Roraima is the almost instantaneous flow of information via mass media which indeed exists in the U. S. example.

Gould and Sparks cry their tale of woe upon discovering that in underdeveloped areas the quantitative models have far outrun the available data.⁶ Because of this, simple models may suffice to carry the investigator past areas of unreliable or incomplete data and smooth over the pitfall of component error. The authors concluded that the safest route of approach to the problem was to utilize a simple linear model. One critical assumption they made was that the high prices from large city markets reflect supply and demand in the nearby rural areas. In the case of Roraima this assumption would not be valid, as all prices are set by SUNAB (Superintendência Nacional de Abastecimento), an autonomous government agency, which, in fact, wreaks havoc on the free-wheeling system of supply and demand. In addition, the model would have to take into account the effect of political boundaries and varying national economies. Thus, even a "primitive" linear model would still not operate if applied to the Roraima situation.

Quoting the gentlemen mentioned above, "In all charity, perhaps we should remember that the Model T frequently got through and provided useful service when badly potholed roads

tore sleeker models apart."⁷ Similarly, one does not send a regiment to capture a thief when a few policemen can accomplish the task. This author, for the purposes of this dissertation, feels that a qualitative approach is more apropos than a quantitative approach. Owing to a lack of historically continuous records and unreliable existing data,⁸ the investigator turns to the process of deductive-inductive analysis based on field evidence, observation, and interview.

In the field, the investigator sought and acquired published material, written in Portuguese and unavailable in the United States, from official government offices and agencies in Manaus, Amazonas and Boa Vista, Roraima. In Manaus, the library of INPA (Instituto Nacional de Pesquisas da Amazônia), which is the National Institute for Amazonian Research, proved to be a suitable beginning point for further library research. Other pertinent information was collected from the Public Relations Sector, Secretary of Production, State of Amazonas (Estado do Amazonas, Secretaria de Produção, Setor de Relações Públicas). The official government sources utilized in Boa Vista were the Ministry of Agriculture of the Territory of Roraima (Ministério da Agricultura), the office of the Division of Production, Lands, and Colonization, D.P.T.C. (Divisão de Produção, Terras, e Colonização), the statistical section of Fundação IBGE (Instituto Brasileiro

de Estatística, Inspetoria Regional de Estatística, Boa Vista, Roraima), and the office of the secretary of the mayor's administration of Boa Vista (Prefeitura Municipal de Boa Vista, Secretaria de Administração).

Personal contacts in the two capitals led to both the acquisition of undistributed published material and fruitful personal interviews. Of course, before embarking on the actual field work in Roraima, the author paid a visit to His Honor Francisco Zangerolame, Mayor of Boa Vista, and His Excellency Governor Hélio Campos, Governor of the Federal Territory of Roraima, outlining his investigatory intentions.

One of the writer's original aims in gathering desired unpublished material from ranch owners and managers was to use a questionnaire which had been both simplified and modified from its previous use in Costa Rica. This questionnaire is shown in Appendix A of this study. It was immediately discovered that a gross difference in the level of advancement of beef production existed between Roraima and Costa Rica, the latter being far more advanced, and that even the modified questionnaire was too sophisticated. Two principal reasons for this were, first, a majority of the ranch owners were not available for interviewing and second, most of the ranch managers had only a minimum ability to read and write. Furthermore, as the study will reveal, labor is so inexpensive

that machinery and fencing are still rarities in Roraima, thus making several of the questions null and void. To compensate for the loss of this useful tool the author relied on conducting lengthy conversations with ranch owners, managers, government officials, local businessmen, and personal friends. In each conversation a prepared set of questions was woven into the exchange and hence, a verbal questionnaire was, in fact, administered.

NOTES

¹Edwin G. Boring, "Another Note on Scientific Writing," Science, LXXXIV (1936), 457-469.

²The word complexity may be substituted for the word sophistication for those violently opposed to the so-called "new geography."

³Peter R. Gould and Jack P. Sparks, "The Geographical Context of Human Diets in Southern Guatemala," Geographical Review, LIX (January 1969), 66. Hereafter cited as Gould and Sparks.

⁴For the explanation of data needed to construct a simulation model, see, for example, A. N. Halter and G. W. Dean, "Use of Simulation in Evaluating Management Policies under Uncertainty: Application to a Large Scale Ranch," Journal of Farm Economics, XLVII (1965), 557-573.

⁵Ibid., p. 573.

⁶Gould and Sparks, p. 66.

⁷Ibid.

⁸The following is an example illustrating the fallacies of published data pertaining to the Roraima study. The 1968 volume of Anuário Estatístico published by the Instituto Brasileiro de Geografia e Estatística (IBGE) indicates that Roraima Territory exported 9,000 head of cattle during July and August of 1967. This figure is official and comes from the office of the mayor of Boa Vista. In reality, all of the cattle in 1967 were sent down the Rio Branco to Manaus. The suppliers (marchantes) who come from Manaus must pay a fee (imposto de barreira) to the mayor's office for each head of cattle he has purchased and intends to ship to Manaus. In 1967 the fee was NCr\$23.00 per head. Officially the suppliers paid fees for 9,000 head of cattle which was entered in the

official records. Unofficially, 12,000 cattle were purchased and rather than pay the full fee, the suppliers bribed a minor official with the sum of NCr\$5.00 for each head of cattle he did not record, which amounted to 3,000 head! Thus, the export figure is understated by 25 per cent.

CHAPTER III

THE PHYSICAL SETTING

Roraima, a federal territory of Brazil, with an area of 141,009 square miles, approximately the same size as the state of São Paulo or the combined areas of the Federal Republic of Germany and the German Democratic Republic, lies between $5^{\circ} 16' 19''$ N and $1^{\circ} 27' 00''$ S Latitude and straddles the northern and southern hemisphere tropics.¹ Longitudinally, the territory extends from a western extreme of $64^{\circ} 39' 30''$ W, eastward to an extreme of $58^{\circ} 58' 30''$ W. In terms of angular distance extremes, the linear distance from north to south is 461 miles and from east to west it measures 392 miles. The entire region lies within the time zone four hours less than Greenwich.

Roraima Territory is bounded internationally by Venezuela to the north and west for a distance of some 594 miles and shares a common border with the Republic of Guyana to the east for 430 miles. To the southwest, south, and southeast, Roraima is bounded by the Brazilian states of Amazonas and Pará.

That portion of the territory containing the savannas

upon which this study will focus is known as Rio Branco or the Alto Rio Branco, and forms an area some 16,000 square miles in extent.² (Figure 1) The Rio Branco savannas form a part of the Rio Branco-Rupununi region; an area covering some 21,000 square miles. The eastern portion, covering approximately 5,000 square miles, lies within Guyana and is commonly known as the Rupununi.

The Alto Rio Branco-Rupununi savanna landscape lies at elevations ranging from approximately 300 to 1,000 feet, rising somewhat towards the margins of the watersheds. These savannas form a gently rolling plain of rather monotonous appearance within which isolated peaks and low ridges occasionally rise to view above the galleria forests which follow the streams as they meander across the landscape.³ The savanna region as a whole is enclosed by a series of mountain ranges and elevated surfaces which rise 1,000 to 4,000 feet with a few isolated peaks of even higher elevation, and are aligned in such a way as to produce a basin-like relief, with the southern boundary of the basin lower and less continuous. (Figure 1) The physiographic unit is broken by two large drainage outlets. To the northeast, the Rupununi River, draining the Rupununi portion of the savannas, flows through the Essequibo system to the Atlantic Coast. To the south, the broad alluvial plain of the Rio Branco

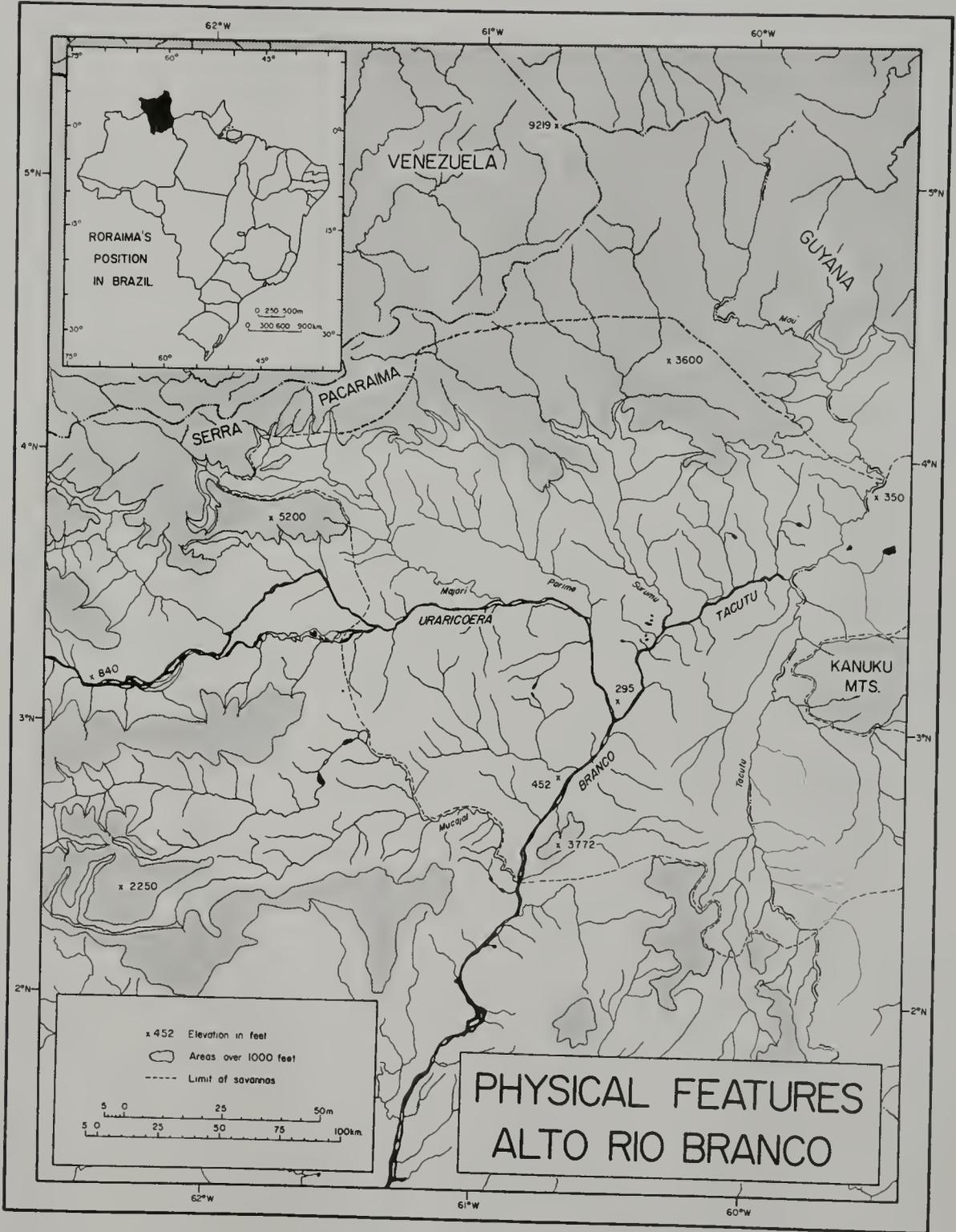


Figure 1

drains waters from the remainder of the region and passes it on through the Rio Negro, the Rio Amazonas and ultimately into the Atlantic Ocean. The savanna landscape occupies the northern part of the floor of this basin-like formation.

In terms of geologic structure, the Rio Branco-Rupununi savannas belong to the Guiana Shield, an ancient pre-Cambrian mass that forms the nucleus of the northeastern part of South America. Between the granitic rocks and gneissic rocks of the basin rim lie the alluvial lowlands of recent fluvial-lacustrine deposits which occupy approximately half the basin floor. Scattered areas of more elevated terrain, between 350 and 500 feet, follow along the edge of the mountain rim, thus forming a discontinuous pattern. These areas are composed of undulating gravel ridges largely of lateritic origin, laterite plateau remnants, and long gentle sheetwash slopes. The lowland is considered to represent part of a planation surface provisionally dated Late Tertiary and upon this bevelled surface the contemporary landscape has been fashioned by Quaternary deposition and erosion.⁴

In modern times the main tributaries of the Amazon and Essequibo river systems are incised into the savanna surface. For example, at St. Ignatius Mission, Guyana (Lat. $3^{\circ} 20'N$, Long. $59^{\circ} 50'W$), the Takutu river is 10 to 15 meters (33 to 50 feet) below the general level of the surrounding savanna

surface and similar conditions prevail elsewhere. Yet, in spite of this apparent, though slight, landscape rejuvenation, the regional drainage system is unable to carry the high volume of surface runoff during the height of the rainy season. As a result the river levels rise at the onset of the rains and in many places overflow their banks. Consequently, ground water drainage in the savanna is restricted and flooding and waterlogging occur over extensive low-lying regions. In more elevated areas, conditions are less extreme, but even here ground water levels frequently rise close to the surface. As the rainy season wanes, much of the surface flood water rapidly disperses (by runoff and evaporation) and is accompanied by regional lowering of river levels. An increased ground water gradient is thus established and ground water drainage accelerates. This process is greatly facilitated by the existence of porous sand and gravel substrata, both in the low-lying alluvial plain and in more elevated areas to the south and east. In a few places ground water drainage is impeded by heavy textured horizons, and many shallow ponds and lakes may appear for several months but during this occurrence there is no general profile impedance and ground water levels fall fairly rapidly with the lowering of the rivers. It is evident that the hydrological imbalance across the watershed region contributes

to the seasonal contrast of the savanna landscape.

Before discussing the climatic characteristics of the Alto Rio Branco, the author wishes to express a word of caution. The Federal Territory of Roraima contains only one official climatic data collecting station, located at the airport in Boa Vista, the territorial capital. Observations are made by the Meteorological Station of the Air Route Service, Q. G. 1st Aereal Zone, Ministry of Aeronautics (Estação Meterológica do Serviço Retas Aéreas, Q. G. 1^a Zona Aerea, do Ministério da Aeronáutica). The data collected at Boa Vista apply only to the region of the Alto Rio Branco, that is, the region of savannas upon which the cattle-raising takes place, and cannot be generalized to include the region to the north and to the south. In the extreme north lies the mountainous region with elevations reaching a maximum of 2,875 meters (i.e., Mt. Roraima, elevation 9,219 feet), while the station at Boa Vista is situated approximately 120 meters (400 feet) above sea level. Also, the data cannot be generalized to include the lower reaches of the Rio Branco because there climatic conditions are different. In the lower Rio Branco the vegetation is that of a dense rain forest while the Alto Rio Branco is dominated by savannas. However, the data obtained from the weather station at Boa Vista are indeed pertinent to this study.

The outstanding characteristic of the Alto Rio Branco climate is the marked seasonality of the rainfall. Tables 1 and 2 and Figure 2 reveal that at Boa Vista 78 per cent of the mean annual total of 1,740 milimeters (69.5 inches) fell during the four months of May, June, July and August, 1958-1963. By comparison, the rainy season in the central Amazon Basin to the south extends over a much longer period. At Manaus (Figure 3), an annual average total of 2,128 milimeters (85 inches), over 100 milimeters per month, fell during nine months of the year over the same period of time.

Mean monthly temperatures at Boa Vista are fairly typical of the Amazon-Guiana region, with an average maximum of 29.1°C (84.4°F) in June, during the height of the rainy season, and an average maximum of 33.3°C (91.9°F) for October, in the heart of the dry season. The mean monthly lows for the same two months were 23.3°C (73.9°F) and 23.6°C (74.5°F), respectively. The mean diurnal range, 6.5°C (11.7°F) to 9.7°C (17.5°F), which is one of the most attractive features of the savanna climate, is high for a lowland location so close to the equator. High wind speeds in the months following the rainy season help to dry out the inundated savannas but at the same time greatly reduce the effectiveness of the precipitation.

Vegetation in the Alto Rio Branco can be placed into one

Table 1

Air Temperature Regime--Boa Vista, Roraima

Years	J	F	M	A	M	J	J	A	S	O	N	D
1958-1963												
Average high	32.0	31.8	33.3	31.4	31.3	29.1	29.6	30.8	32.4	33.3	32.5	32.6
Average low	23.2	23.1	23.5	23.8	24.7	23.3	23.1	21.9	23.2	23.6	23.6	23.6
Mean	27.6	27.5	28.4	27.6	28.0	26.2	26.4	26.4	27.8	28.5	28.1	28.1

Temperature in degrees Centigrade.

Air Temperature Regime--Manaus, Amazonas

Years	J	F	M	A	M	J	J	A	S	O	N	D
1958-1963												
Average high	30.6	30.2	30.3	30.3	31.0	31.1	32.2	33.4	34.1	33.1	31.8	31.2
Average low	22.3	22.8	23.0	23.1	23.3	22.7	22.9	23.0	23.6	23.8	23.3	23.5
Mean	26.5	26.5	26.7	26.7	27.2	26.9	27.6	28.2	28.9	28.5	27.6	27.4

Temperature in degrees Centigrade

Table 2

Rainfall Regime--Boa Vista, Roraima

Years	J	F	M	A	M	J	J	A	S	O	N	D	Total
1958-1963	13.1	30.9	10.6	114.3	195.8	343.4	377.8	446.8	36.9	54.6	53.8	41.7	1,740.7
Rainfall in millimeters													

Rainfall Regime--Manaus, Amazonas

Years	J	F	M	A	M	J	J	A	S	O	N	D	Total
1958-1963	317.5	272.4	250.3	327.6	192.7	114.1	46.5	37.4	44.1	109.6	182.4	233.0	2,127.6
Rainfall in millimeters													

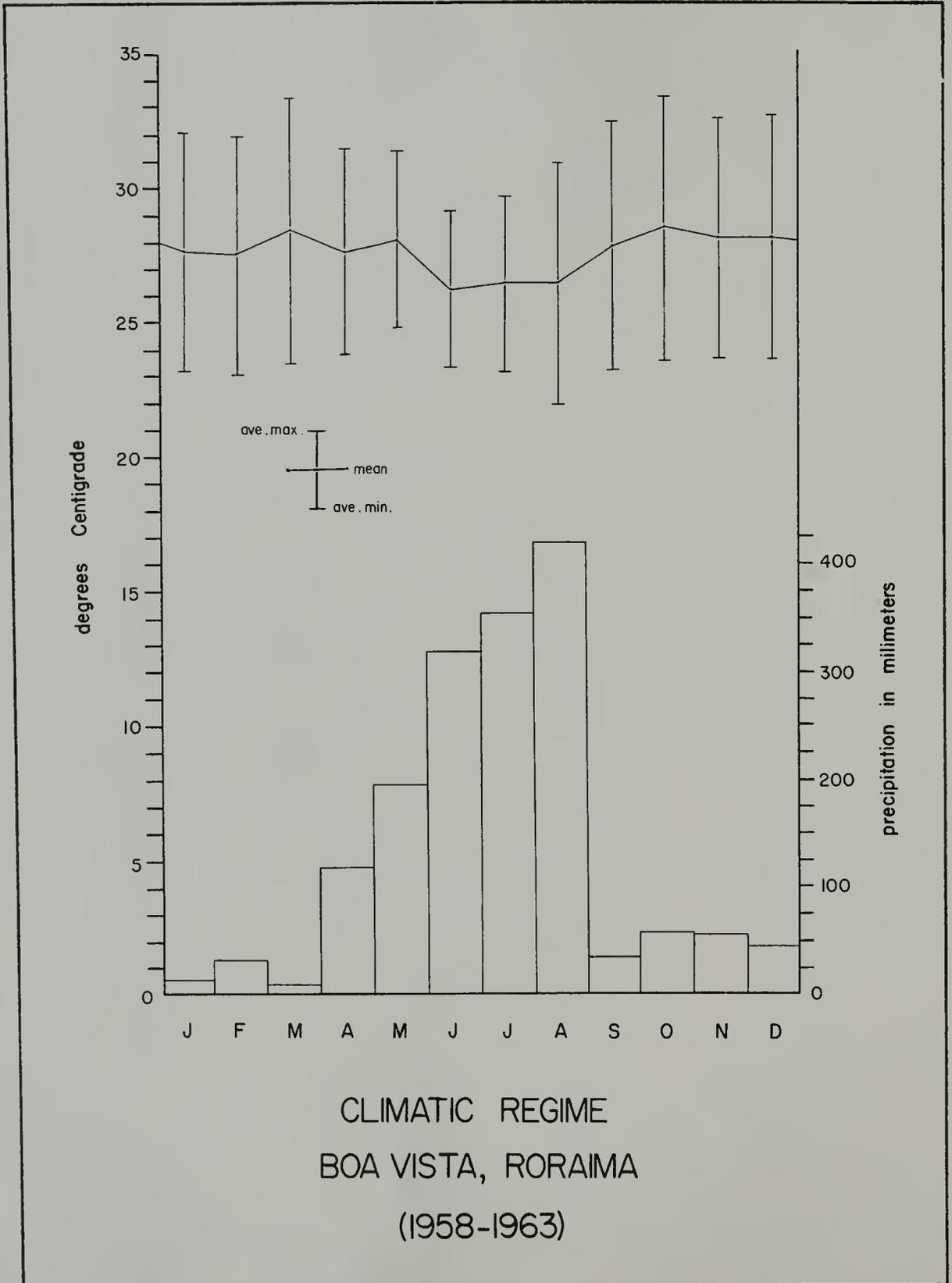


Figure 2

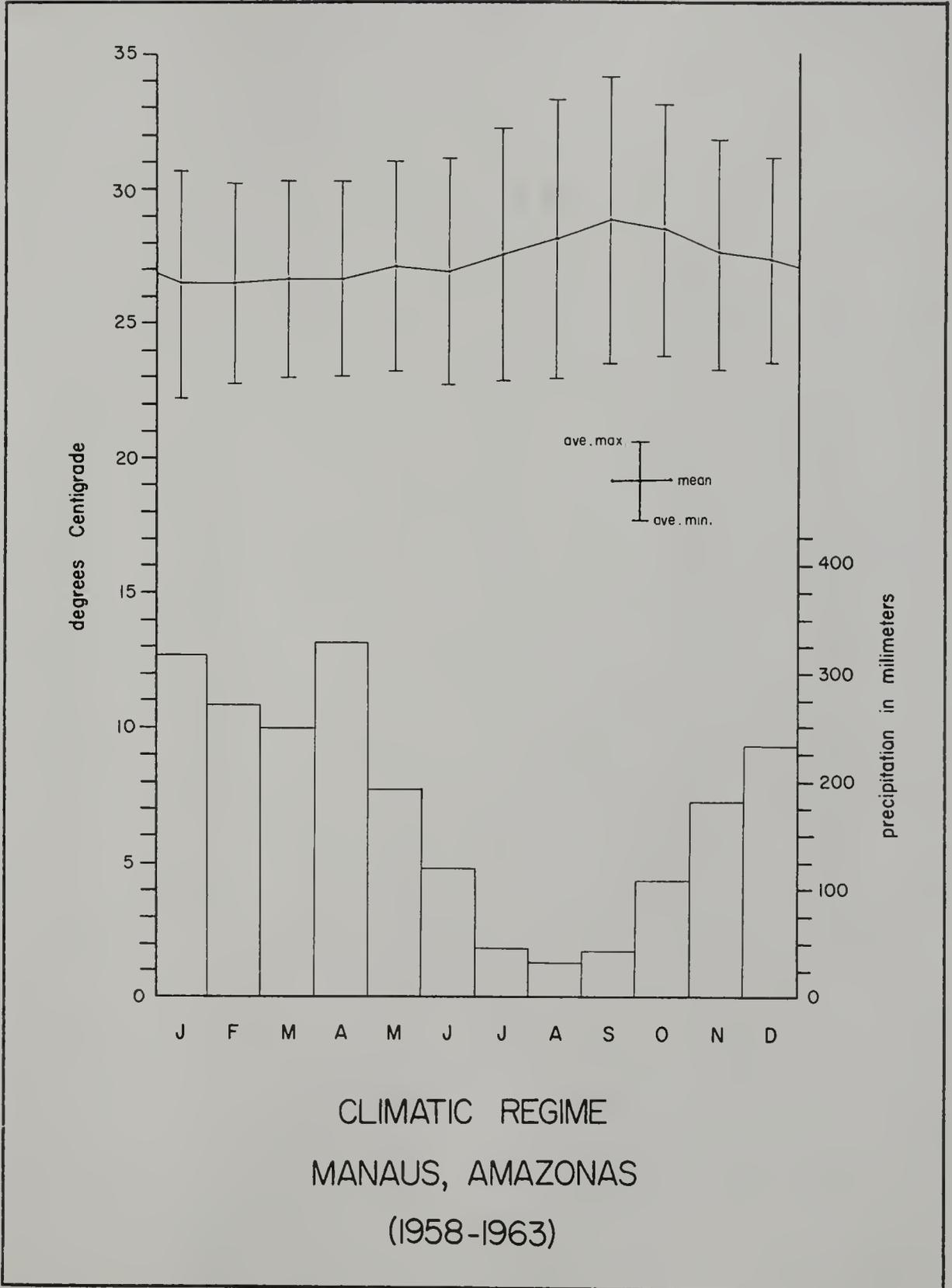


Figure 3

of four main categories.⁵ Most of the mountainous areas, at least on their lower slopes, contain a dense cover of rain forest. Occasionally there are almost pure stands of pau-roxo (purple-heart, Peltogyne densiflora), a valuable timber tree representing a potential resource for Roraima. The rain forest merges into a fringing semi-deciduous forest, where certain species lose their leaves during the dry season. A similar type of forest occupies most of the "bush islands" in the savanna.⁶ Second-growth associations tend to predominate over what are considered to be climax forms because of the extensive practice of range grazing and repeated burning.

The savanna association is primarily of the open scrub or woodland type. The density of the scrub varies from open woodland formation to almost pure grassland. The dense scrub, known as campo cerrado in the extensive savannas of Central Brazil, is a rarity in the Alto Rio Branco. The dominant scrub form is the fire-resistant pau-lixá, the sandpaper tree (Curatella americana), and Trachypogon plumosus is the dominant grass. On iron-stone ridges and white sand the grass grows alone, while on brown sand uplands it is joined by other grasses such as Andropogon angustatus, Aristida setifolia, Axonopus chrysites and Mesosetum loliiforme. The grasses may reach over three feet in height and are found in

bunches six inches to one foot apart. On lower grounds where there is likely to be flooding during the rainy season, Trachypogon is supplanted by a mixed cover which includes sedges and some low shrub forms.⁷ In the baixas (extensive depressions) the ground is occupied almost entirely by sedges. Flood water may stand in these areas to a depth of several feet for up to five months.

Although the above description and classification of the regional vegetation is based on the excellent work done by Hills and others at McGill,⁸ other systems have been applied on the basis of regional terms for vegetation. The work of the Brazilian geographer, Antônio Teixeira Guerra, exemplifies the use of such terms.⁹ He states that the vegetation cover of that region is characterized by savannas that are more or less "wooded."¹⁰ The savannas of the Rio Branco represent a series of different appearances which have regional names such as campos agrestes, campos de baixada and campos cobertos.

The campos agrestes is a type of vegetation having an herbaceous cover, without shrubs and rarely with low shrubs. The grasses are isolated or are dispersed in tufts, leaving the soil, for the most part, uncovered. This term is also applied to an area having a dense and continuous cover of grass or herbaceous plants, which is not the case found in Roraima. The campos agrestes, also called lavrados, correspond

to the true plains, being almost devoid of trees or even shrubs.

On the campos agrestes the existing grass is not palatable to the grazing cattle who look, instead, for the campos de baixada, which corresponds to humid pastures. Physiognomically the only feature which differentiates these areas from the lavrado is that in the campos de baixada (or simply baixas) the grass forms a continuous cover, is tenderer, and contains some buriti plam, by virtue of the greater humidity.

Campos cobertos is the name given by the local inhabitants to the savannas upon which trees and shrubs begin to appear. This grades into what is known as the cerradões, which is defined as waterless scrub wastelands.

Although the classification and description of the vegetation given Guerra falls far short of that given by Hills and others of the McGill University Savanna Research Project, it is included here to show that regional vegetational terms do exist in the Alto Rio Branco and that the local people do have an awareness of the variety of their physical environment. The author found that among the ranch hands and rural dwellers the term most frequently used in a blanket fashion when asked to identify grasses, trees, soils, etc., was simply agreste.¹²

The soils of the Alto Rio Branco can be characterized

as being highly acidic and very low in all nutrients and bases. Chemical weathering of tropical soils occurs at approximately three times the rate of weathering in middle latitudes. This leads to very deep senile soils. The deep weathering occurrence is particularly the case where the soil surface is easily penetrable, such as on the lateritic ridges where drainage is rapid. The excessive eluviation of clay and organic matter reduces the water retaining capacity of the surface soil. The resulting deep desiccation in the dry season further increases the loss of soil constituents and thus intensifies the detrimental cycle. If the soil surface becomes compacted by heavy rainfall, high insolation, and the removal of vegetation by fire, then sheet wash, gullyng and severe erosion generally occur. Humus is rapidly decomposed in the tropics owing to the increased activity of the soil bacteria in higher temperatures.

Referring to the studies of the McGill University Savanna Research Project, there are perhaps three main intergrading groups of soils in the Roraima savannas:¹³

- a. Soils of the Flats: These are the lowland soils. They are pale colored silts and clays and occasionally have a thin organic cover. In some places they become yellow in lower horizons, and occasionally contain red iron or black manganese nodules. These soils are flooded regularly, then desiccated, and the result of the fluctuating water table appears to be the promotion of laterization.

- b. Gravelly Soils: These occur on upland sites and are composed of secondary laterite or "peridigon." These contain pebbles ranging from three inches in diameter to large pisoliths, set in a matrix of red earth which becomes paler in the lower horizons.
- c. Gray Soils: These occur also on upland sites, but are composed of a mixture of gray sand, and silt or silty clay. Massive or primary laterite occasionally outcrop in both these groups of soils.¹⁴

From this brief introduction to the landscape of the Alto Rio Branco in Roraima it is evident that a far from ideal natural environment for human land settlement and occupation exists. The soils are lacking in nutrients and the soil structures leave much to be desired. Most of the natural vegetation is not palatable to grazing animals and the distribution of rainfall throughout the year is extremely unfavorable both to the formation of a habitable environment and to man's activities. In order to overcome such physical disadvantages any form of economic activity would require technical knowledge, skills, material supplies, and large capital inputs. In the chapters which follow the author has viewed in the field the consequences of this relationship between man and the physical milieu.

NOTES

¹The Federal Territory of Roraima was officially created by Law 5,812 of September 13, 1943. Prior to this time the area was part of the state of Amazonas. Although the territory was legally authorized in 1943, it was not until June 20, 1944 that the territory actually came into existence. At that time it was known as the Federal Territory of Rio Branco, taking its name from the river. In mid-1963 the official name of the territory was changed from Território Federal do Rio Branco to Território Federal de Roraima.

²South American Savannas, Comparative Studies, Llanos and Guyana, McGill University Savanna Research Project, Savanna Research Series, No. 5 (Montreal: Department of Geography, McGill University, December 1966), p. 10. (Hereafter cited as Llanos and Guyana); Antônio Teixeira Guerra, Estudo Geográfico do Território do Rio Branco, Biblioteca Geográfica Brasileira, Serie A "Livros," No. 13 (Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística, Conselho Nacional de Geografia, 1957), p. 2.

³These isolated peaks are inselburg-type landforms which primarily take the form of small, usually rounded and forested hills.

⁴Llanos and Guyana, p. 10.

⁵The classification of vegetation is extremely complicated and confusing. For the sake of clarity and understanding, the author will state what he feels are the most concise, but accurate, statements pertaining to vegetation. For those extremely interested in more detailed information about the vegetation of this region, consult the McGill University Savanna Research Project, Department of Geography, McGill University, P.Q., Canada.

⁶The "bush island" phenomenon is very common in the Rio Branco-Rupununi savannas. As the term implies, the formation of forest or dense scrub appears on the savanna landscape as an island, often circular in shape. Most likely the bush

islands are remnants of earlier forest formations which have been greatly reduced by burning and grazing activities. In some bush islands forest regeneration begins, but, because of a regional lowering of the water table, it is unlikely to progress very far. The bush islands probably will fall prey to savanna fires in the future.

⁷Most likely, among the sedges would be found Rynchospora spp., Dichromena spp., Scleria spp., and Stenophyllus spp. The sedges are less strongly tufted and grow more closely together than in the grass-dominant areas. Some shrub and woody herb forms, small and neither bushy nor dense, would include Psidium spp., Palicourea spp., Casearea spp., Randia spp., and Erythroxyllum spp.

⁸Llanos and Guyana.

⁹Guerra, pp. 114-123.

¹⁰Guerra, writing in Portuguese, uses the term cerrado in the phrase mais ou menos cerrados. The term cerrado has several meanings, but when used in reference to vegetation it means a savanna with scattered thickets of deciduous scrub forest.

¹¹Jacques Ourique (O Vale do Rio Branco), describing such a landscape, expressed himself in the following manner: "The sufficiently elevated lands, the higher and more rugged the more they advanced in the direction of our frontiers with British Guiana and Venezuela, die out along the banks of the Rio Branco almost always in steep river banks, in the majority of the cases elevated several meters. In that region, so similar to the Argentine pampas and more beautiful because of the distant chains of mountains that interrupt the horizon, the entirety of nature amasses itself so that it may become, one day, the principal and most abundant and most diverse granary of this great state.

"There, beautiful green plains which extend, beyond sight, in gentle undulations, in serene and sad continuity, predominate, interrupted only by one or another isolated stand of trees or by the rare groups of elegant miritizeiro [fiber mauritia palm]. The landscape is distinguished almost always by clear sand-bottomed lakes, devoid of vegetation, where the thirsty steer quenches his thirst in the hours of sultriness." (Manaus, 1906), p. 8.

¹²The appearance of the term agreste in Roraima is most interesting. The overwhelming majority of people presently in Roraima, although no precise data are available, have either recently immigrated from or are first generation immigrants from the sertão of the Northeast states of Ceará, Piauí, Pernambuco, Paraíba, Alagoas and Maranhão. It is in this region of the Northeast that the true agreste exists. Even though some savanna areas in Roraima vaguely resemble the agreste of the Northeast, the species of vegetation, soils, and climatic conditions of the former differ from the latter. What has happened then is that the uneducated people coming from the rural Northeast have spread the term agreste, but the true meaning of the term, at least in the case of Roraima, has been abandoned.

¹³Here the author is making an assumption, backed by field observation and the findings of the Instituto de Pesquisas e Experimentação Agropecuário do Norte, Belém, Pará. Hills states in his article "The Interior of British Guiana and the Myth of El Dorado" (Canadian Geographer, II, 1961, 34) that the Rupununi savannas are merely an appendage of larger Roraima or Alto Rio Branco savannas. Those working with the McGill University Savanna Research Project have drawn from their own findings and the findings of extensive investigations by the Regional Research Centre of the British Caribbean (an organization based in Trinidad which carried out extensive soil sampling in Rupununi in the late 1950's) a number of generalizations, and have arrived at three main groups of intergrading soils. The author is assuming that these generalizations hold for the Alto Rio Branco as well. The possibility of this being an erroneous assumption is acknowledged.

¹⁴Llanos and Guyana, pp. 11-12.

CHAPTER IV

ACCESSIBILITY

One of the key factors of modern exchange societies is the rapid and efficient distribution of goods and information. This is largely determined by the quality of highway and waterway networks, dependable mail and telegraph systems and by the existence of an informed populace instructed by mass media such as radio, television, and newspapers. For those in Roraima, access to markets, goods, and information is most difficult. The converse is also true for those merely wishing to travel to Roraima, or more significantly, to establish business relations, or ship bulk items to or from the area.

The Territory of Roraima is within a region where, until a relatively short time ago, the only mode of transportation outside its boundaries was that of river navigation. As if this were not enough of a limitation, travel was, and still is, further impeded by the fact that during the "summer" (i.e., the dry season which occurs from September to May) the waters of the Rio Branco fall so low that they eliminate, for all practical purposes, commercial transportation.

The possibility of constructing a road or a railroad

connecting Manaus and Boa Vista has long been under consideration. In a public address, the governor of the State of Amazonas in 1905, referring to the construction of a railroad connecting Manaus and Boa Vista, remarked inter alia:

In addition to the rail line I mentioned to you previously, the contract was signed, by virtue of Law 493 of October 23, 1905, with the engineers Humberto Saboia de Alburquerque and Hermano de Vasconcelos Bittencourt, for the construction of a railroad which, starting from Campos Sales, ends at the Jauaperi River. Upon reaching there, by decree number 775-A of April 30 of the same year, a decree which will opportunely be submitted to the consideration of this Congress, the line would be extended to Boa Vista.²

This particular endeavor never saw the light of day.

Auguste Plane (1903), when discussing the functions of the Rio Branco in its connections with Guyana (then British Guiana) together with the difficulties caused by the dry season and the numerous river rapids, stated: "If the project of the construction of a railroad from Manaus to the Rio Branco were executed, this river would experience an extremely rapid colonization."³ Once again, no railroad and no rapid colonization along the Rio Branco came into being.

More recently, interest in reducing the isolation of the Alto Rio Branco has intensified. In 1938, however, a civil engineer, Raimundo Pereira da Silva, issued a

cautionary statement concerning the current desire to improve travel and communications between the city of Manaus and Boa Vista and the region of the Alto Rio Branco. After thorough studies and the organization of a project (complete with a budget) for perennial stream navigation on the entire course of the Rio Branco, from its delta into the Rio Negro to the confluence of the rivers Mau' and Tacutu above Boa Vista, he felt able to state that the clearing and channeling of the Rio Branco's course was physically quite feasible and might have far-reaching economic consequences. It would, however, be too great an expense, in his opinion, for the realities of this backward region which, although it did have numerous and vast potential rich resources, did not yet have a population large enough to represent economic production capable of justifying the huge capital investment necessary to undertake such a project.⁴

Even though the pessimistic view expressed by Pereira da Silva and others⁵ has continued to the present day, the Brazilians have begun to carve a road through the rainforest in an effort to bring Roraima out of its isolation. This undertaking will be discussed later in this chapter.

The time necessary for human travel to Roraima has been drastically reduced by the advent of commercial and military air transportation. Boa Vista is now directly accessible

via the Brazilian airline Cruzeiro do Sul from Manaus three times weekly, and Georgetown (Guyana) twice weekly. While this has facilitated human access and the carriage of mail and high-value/low-bulk goods, shipments of building materials, most consumer goods, and cattle remain prohibitively expensive owing to relative isolation or inaccessibility which remains as Roraima's major impediment to joining the modern world.

Travel and communication difficulties present a serious hindrance to economic and administrative activities. Those living in the savannas of the territory become completely ilhadas, that is, isolated, during the rainy season because all roads and many of the air strips become inundated. Similarly, during the dry season, Boa Vista faces grave shortages of supplies owing to the extremely low level of the Rio Branco which becomes unnavigable.⁶

Even in terms of air miles from Boa Vista to populated areas representing markets and centers of industrial production the region's extremely isolated situation is easily discerned. (Figure 4)

To emphasize the absolute lack of access by land and discontinuous modes of ingress and egress by other routes, each category of transportation and communication may now be considered separately.

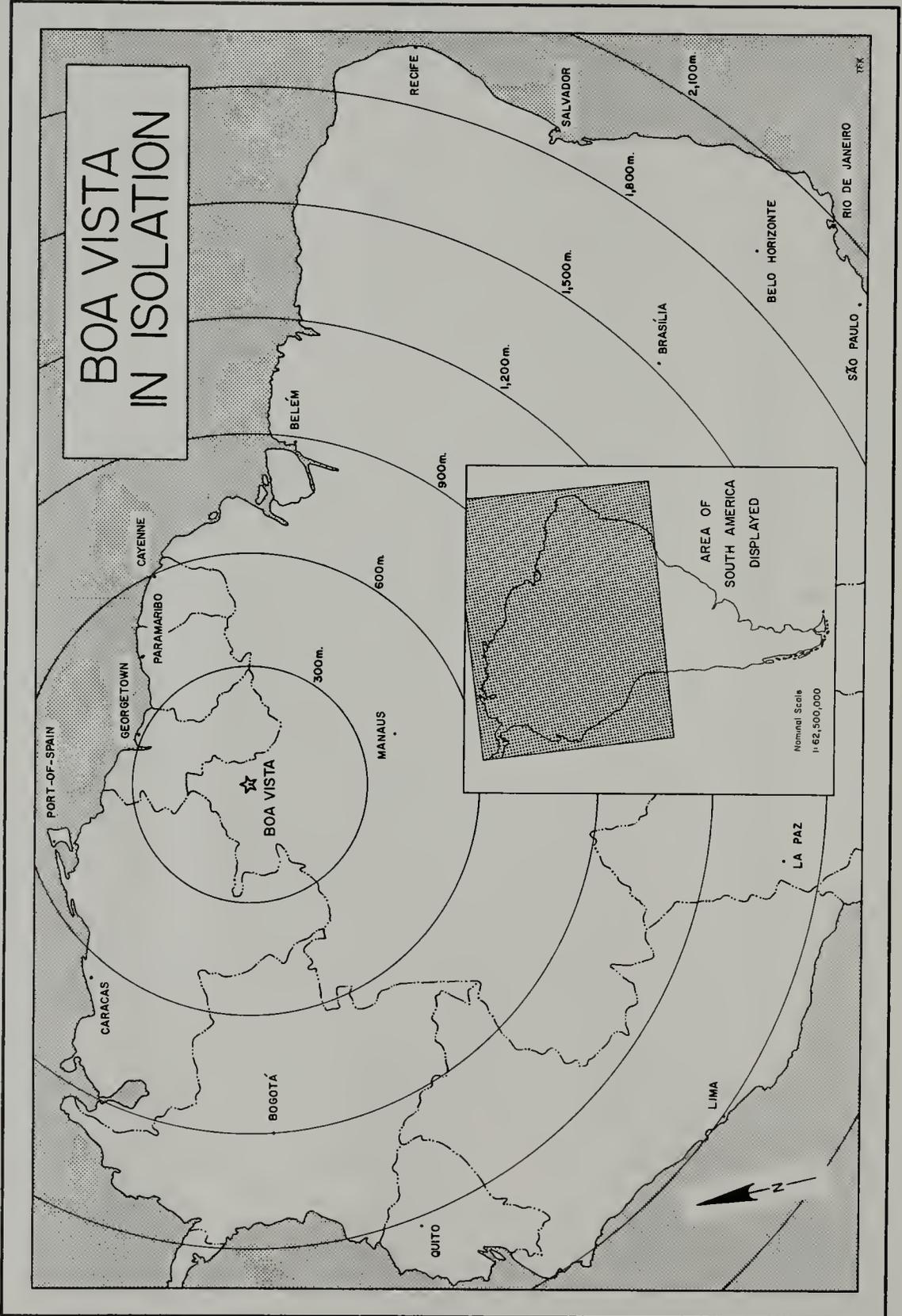


Figure 4

River Transportation

Even though the airplane has brought the territory closer to a major center, i.e., Manaus,⁷ in terms of travel time, the river still remains as Roraima's life line with the exterior. As a transportation route, however, the river leaves much to be desired. During the rainy season, May through August, navigation is possible without hindrance from Manaus as far north as Caracarai, a distance of some 420 miles. From Caracarai to Bôca da Estrada, a stretch including many rapids, navigation requires a very experienced and skilled river pilot who has a detailed knowledge of these rapids. From the latter point to Boa Vista navigation is once again free from hazards. (Figure 5) During the eight month dry season several sand beaches and islands appear as the level of the river recedes. Accompanying this alluviation there is constant movement and relocation of navigable channels, making passage extremely difficult.⁸ (Figure 6)

On the passage between Manaus and Boa Vista the average trip upstream requires eight to ten days and the trip downstream four or five days during the rainy season when the river is at high levels. During the dry season anywhere from 15 to 20 days are required to ascend from Manaus to Boa Vista while the return run takes from eight to ten days.

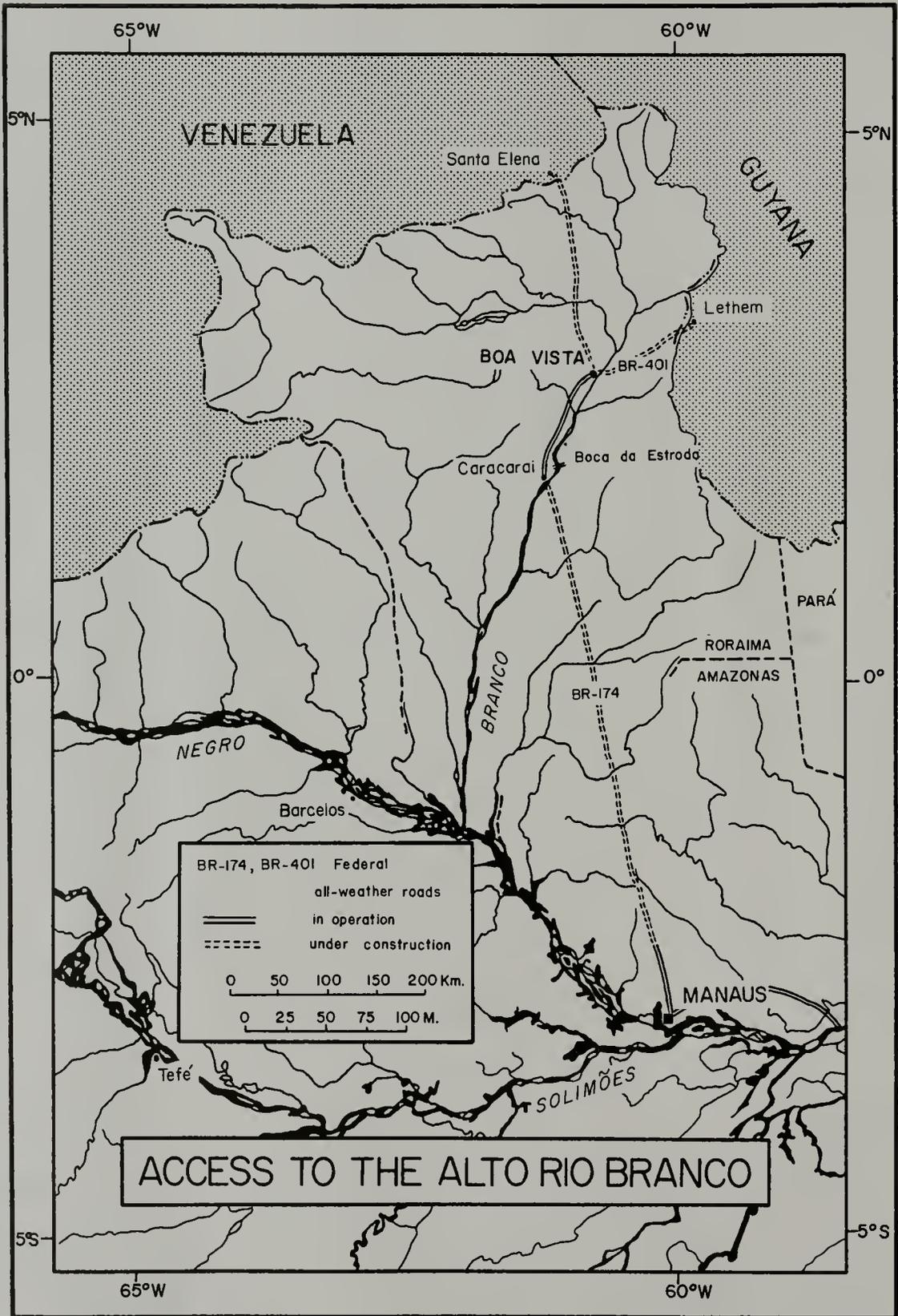


Figure 5



Figure 6

The Rio Branco During Dry Season

A view from Boa Vista looking southwestward. This portion of the river at this time is navigable only for small craft. Further south, rapids impede nearly all traffic at this time.

On the lower Rio Branco⁹ launches and motor boats of about five tons, dead weight, and of shallow draught haul barges which can carry cargoes of 50 to 60 tons. On the upper reaches of the river the transports are generally smaller and carry lesser loads.

An immediate consequence of the disrupted nature of the navigation and the small load capacity of the river crafts is the high price of commodities in Roraima caused by the high cost of freight. Since almost nothing is therefore produced in the territory and practically everything must be imported from the exterior, the cost of living in Roraima inevitably has to be very high. It is not at all unusual to pay at least double what one would normally pay in Rio de Janeiro or São Paulo for the majority of consumer items.

Roads

To date, the Alto Rio Branco does not have any roads which allow access to the area from the exterior. This, coupled with the seasonal problems of navigation, has kept Roraima in isolation. Yet after hundreds of years of discussion and expectation,¹⁰ an all-weather road is now, in fact, being carved through the rainforest of Amazônia.¹¹

It was felt by many that the first link of a highway from Manaus northward to the Brazil-Venezuela border should

be a stretch of road connecting Caracarai and Boa Vista.¹² The village of Caracarai is located at the head of that stretch of the Rio Branco which is freely navigable. From Caracarai to Bôca da Estrada, a fluvial distance of some 30 miles, the smooth flow of the river is interrupted by a series of rapids and low falls, formed by resistant granites and gneisses which outcrop in this area. From Bôca da Estrada northward the river is once again navigable for vessels having a shallow draught. For at least eight months of the year Caracarai functions as Boa Vista's port. Prior to the existence of the Boa Vista-Caracarai road, supplies which arrived in Caracarai from Manaus were taken overland to Bôca da Estrada where they were once again placed aboard watercraft for trans-shipment to Boa Vista.

By virtue of the signing of Presidential Decree Number 18,509 of November 23, 1928, the Benedictine missionaries who were in the territory initiated the road on behalf of the Industrial Company of Rio Branco, which belonged to the Monastery of São Bento. This work progressed only a short distance and was ultimately abandoned. During 1944 and 1945, when the road project was renewed under the governorship of Ênio Garcês, it was pushed further southward but still did not reach Caracarai. After another halt in construction the road finally reached Caracarai during the summer of 1948-1949.

The stretch approaching Caracarai apparently resembled a trail. This road underwent two more cycles of abandonment and reopening in 1950 and 1953.

The principal reason for the slow and spasmodic construction of the Boa Vista-Caracarai road was primarily political. When the National Highway Plan (Plano Rodoviário Nacional) was formulated in the 1940's, at least one road in each of the territories in the Amazon Basin, which would be considered vital to national interests, was planned by the federal government. Unfortunately, in the study of the distribution of the National Highway Capital Fund, the National Congress excluded the territories from the privileges of drawing funds from this source. Furthermore, the Department of National Highways (Departamento Nacional de Estradas de Rodagens) was unable to undertake construction of roads in the territories with its allotted sum from the National Highway Capital Fund because those tentative roads were not included in the program entitled the Plan of Primary Urgency (Plano de Primeira Urgência) which was also the brain-child of the National Congress.¹³

The construction of the road itself has been no small feat considering the meager building resources at hand and the terrain over which the road has been established. The first stretch of the road, from Boa Vista to the Rio Mucajai,

a distance of 35 miles, passes over savanna landscape, save the final two miles to the river, which is through dense selva. In order to make this road usable throughout the year, however (i.e., during the rainy season as well as the dry season), it was necessary to construct eight one-lane bridges (obras de arte) over streams and then to face the problems of traversing the Rio Mucajai, a river of considerable size and depth. (Figure 7) It was decided that, given the sparse population and traffic flow it would serve, a bridge would be too costly to construct. The solution was to install a barge, powered by a motorized auxiliary craft, capable of transporting fully-loaded trucks, one or two at a time, depending on the size of the truck. (Figure 8) From the Rio Mucajai to Caracarai the road has been sliced through 55 miles of jungle, crossing no less than 15 streams and shallow lakes, breaking out onto savanna once again only four miles from Caracarai.

Until recently the entire 94 miles of this road was used only during parts of the dry season. Today, however, the situation has changed. Presidential Decree Number 61,599 of October 24, 1967, published in the Official Journal of the Union (Diário Oficial da União) on October 26, 1967, has secured the political means to execute the Preferential Plan of Federal Road Works (Plano Preferencial de Obras Rodoviárias Federal), giving absolute priority to the program of the



Figure 7

The Rio Mucajai

This is one of many sizeable rivers feeding into the Rio Branco which must be crossed by ferry or bridge.



Figure 8

Crossing the Rio Mucajai

As shown, the barge is capable of carrying fully loaded trucks. The tug is privately owned but it is employed under a government contract. On the far bank the structures for a bridge are beginning to appear.

opening and implementing of fundamental roads needed for national security, economic development and the infrastructure essential to the process of settlement, agricultural production, and the betterment of health. Included within this plan are the highways BR-174, Manaus-Boa Vista-Venezuelan border (in the direction of Santa Helena), with a branch to Lethem in the Republic of Guyana and BR-319, Pôrto Velho-Manaus, which will integrate by highway the State of Amazonas and the Territory of Roraima to the rest of the nation. (See Figure 5).

From the point of view of Presidential Decree Number 61,599, highway BR-174, which will extend a distance of 582 miles (970 kilometers), has as its objective the more intensive exploitation of an extensive area of the extreme northern section of the Brazilian frontier. It is thus hoped that the people of this region will bring about a permanent and continuous interchange with other areas of Brazil. As a part of the international plan, the highway system described here will form a section of the alternative link of the Pan American Highway System, connecting the Brazilian highway network to bordering nations, initially with Venezuela and ultimately with the Republic of Guyana, the latter being called BR-401 (Boa Vista-Republic of Guyana), with a length of 84 miles (140 kilometers).¹⁴

The actual implementation of these road projects is well under way, but construction moves ahead haltingly. That portion of the Manaus-Boa Vista-Santa Helena highway (BR-174) which is to pass from Boa Vista northward to Venezuela is being constructed by a unit of the Brazilian Army, a unit created specifically for this particular undertaking. From Boa Vista to Manaus the project is headed by the Department of National Highways (DNER). The rivalry existing between these two organizations leaves the Brazilian Army unit with decided advantages. The physical region through which the Army must build a road is, on the one hand, mostly open savanna. Much of the surface material is laterite and nearby there are igneous inselbergs offering good surfacing road metals. DNER, on the other hand, must build its portion of the road through some 400 miles of dense tropical rainforest. (Figure 9) Less is known about this region and materials suitable for surfacing the road must be brought in from distant areas.

Advanced planning for the road has been minimal. Owing to a paucity of accurate accounts of terrain, surface materials, stream drainage, and human settlement, financial budgeting for this project has been most difficult. The first phase of constructing highways through the rainforest has been first to study photos from aerial traverses. Next,



Figure 9

The Selva of Amazonas and Roraima

It is through this terrain that BR-174 must pass between Manaus and Caracarai.

a small right-of-way is cut through the forest to permit surveyors to determine the topography. The right-of-way is then widened and the surface is pushed into a road with the aid of huge bulldozers and earthmovers. After the surfacing of the road with crushed rock, the final stages of construction are the building of bridges or the installation of ferries. Funds are requested from the federal government only when it becomes evident how much money will be required to complete each segment of the road.

Since the beginning of the actual construction of this road, Brazil has been governed by its military establishment. Thus it follows that in the competition for road-building funds the federal government tends to favor the military unit responsible for the segment of road stretching from Boa Vista to Brazil's border with Venezuela. This has, in fact, proved to be so and this section should be completed by the end of 1970. The only major obstacle is that of bridging the Rio Uraricoera, a project not yet begun. Partly because of the difficulty in procuring funds and partly because of difficult terrain and hostile Indians, the section of road being constructed by DNER is at least three to four years from completion.

The secondary roads servicing the cattle area of Roraima are passable for only part of the year, that being the dry

season. These "roads" range from roads comparable to that stretch which passes between Boa Vista and Caracarai to what in the United States would be labelled "trails" or "wheel ruts." Even in the dry season travel on these secondary roads becomes difficult because of passage through small streams and low, swampy depressions.

Air Transportation

It stands undisputed that it was the airplane which brought Boa Vista closer to the city of Manaus, the former's nearest Brazilian urban neighbor. From a jaunt of several days of travelling by river, the airplane has reduced the travel time between Boa Vista and Manaus to 100 minutes.

From as early as 1945, Boa Vista has been served by regularly scheduled flights out of Manaus by the company Serviços Aéreos Cruzeiro do Sul, Ltda. In December 1953 Cruzeiro do Sul inaugurated an international service to Georgetown, Guyana from Manaus, with a stop at Boa Vista. Today the original DC-3's have been replaced by a Japanese-produced turbo-prop passenger liner having a far greater passenger and cargo capacity than its predecessor. Boa Vista now receives flights three times weekly from Manaus, two of which go on to Georgetown and return the same day.

In addition, the Brazilian Air Force constantly flies into Boa Vista, bringing troops and supplies to the army battalion stationed there, as well as vehicles and materials destined for both military and civilian use. It is in truth the Air Force which is responsible for the operation of the airport at Boa Vista.

The airport itself is small but modern. The runway is paved, kept in excellent condition, and, since it measures 6,500 feet in length (2,000 meters) by 131 feet in width (40 meters), is capable of receiving most jet aircraft, even though it is not on the jet run at the present time. Moreover, this particular airport serves as a base for several single-engined aircraft used by ranchers, diamond dealers, and missionaries and the old amphibious twin-engined Catalinas, which are used by the Brazilian Air Force to distribute troops and supplies to border areas, to deliver mail, to carry essentials to Indian tribes, and in general to serve the public.

As part of a chain reaction, Manaus has also greatly increased its contacts with the highly developed regions, such as Rio de Janeiro, Brasília, and São Paulo to the south. The result has been that such things as newspapers and magazines now reach Boa Vista from as far away as São Paulo and even Pôrto Alegre within two days.

With respect to human travel time, spread of information, and shipment of high-value/low-bulk items, the advent of the airplane has obviously been a boon to Roraima. Yet in terms of development and the free flow of goods and services to and from the region, air travel has not proved to be the definite and final answer.

To the great majority of people living in Roraima Territory the equivalent of \$25.30 U.S. necessary for a round-trip to Manaus by air is beyond their means. Thus, Manaus remains for them several days travel by uncomfortable river navigation. The cost of transporting essential goods such as rolls of barbed wire, heavy machinery, consumer goods in bulk quantities, animal feed supplements, and others by air continues to be prohibitive. Finally, the practice of bringing in much needed fuels such as bottled gas and gasoline by air is forbidden. It stands, then, that while air transportation has made great strides in bringing Roraima Territory out of isolation, other lines of access must be improved or implemented before this remote area of Brazil's North can effectively join the nation.

Communications

The Federal Territory of Roraima does possess a system of communications but its existence is somewhat tenuous. Table 3 shows the radio-telegraphy network and its state of development in the year 1954.

Since 1954 much of the communication system has ceased to operate or has failed to increase in efficiency of service. Any citizen of Boa Vista will readily profess that the mail service leaves much to be desired. For eight or nine months of any given year the announcement board in the Manaus Post Office will have, after the listing of surface mail to Boa Vista, the word parado (stopped), because the level of the Rio Branco is too low for continuous navigation.

Much of the radio equipment maintained by the government has become obsolete or is not in working order. Since February 1968 there has been no telegraph service out of Boa Vista. When the telegraph is functioning as intended there should be contact between Boa Vista and Manaus. One of the more dependable means of contact is that of an amateur radio operator (ham) who relays messages not only to Manaus, but all over the world!

Taken at any level of the time-space continuum Roraima and Boa Vista are inadequately prepared for the second half

Table 3

Radio-Telegraph Network for Roraima Territory, 1954

Regions		Operating	Being Installed	Projected
Outside	Manaus	X		
Roraima	Belém	X		
	Rio de Jan.	X		
Lower	Caracarai	X		
Rio	Santa Maria	X		
Branco	Bôca do Rio Branco			X
	Serra da Lua		X	
Middle	Alto Caume			X
Rio	C. Fernando	X		
Branco	Costa			
	C. Bras de Aguiar			X
	Boa Vista	X		
	Perseveranca			X
Zona Tacutu	Normandia	X		
Mau- Cotingo	Mutum Maracanã			X X
Zona	Vila Pereira	X		
Surumu- Amajari	Tepequem	X		
Uraicoera	União or Copacabana		X	

Source: Antônio Teixeira Guerra, Estudo Geográfico do Território do Rio Branco, Biblioteca Geográfica Brasileira, Publicação No. 13, da Serie A "Livros," Instituto Brasileiro de Geografia e Estatística, Conselho Nacional de Geografia, Rio de Janeiro. 1957. p. 240.

Note: The ultimate source was the Five-Year Plan presented to the Superintendency of the Economic Valorization Plan of Amazônia by Dr. Valerio C. de Magalhães in 1954.

of the twentieth century. None of the present channels of communication suffices in its present form to connect the territory with the rest of Brazil or its foreign neighbors. Inevitably, in dealing with the shortcomings of the economic infrastructure, increased productivity, and innovative techniques the author must revert again and again to this theme. Nothing, in fact, is more central to his purpose than highlighting each facet of accessibility, or rather the lack of it, in such a promising "El Dorado."

NOTES

¹The governor of the State of Amazonas during the year 1905 was the Honorable Dr. Antônio Constantino Neri.

²Dr. Antônio Constantino Neri, "Message," read before the Congress of Amazonas at the opening of the third regular session of the Fifth Legislature. Manaus, Amazonas, 1906, p. 39.

³Auguste Plane, L'Amazonie. (Paris, 1903), p. 192.

⁴Raimundo Pereira da Silva, "Comunicações de Manaus com o Alto Rio Branco," Revista do Clube de Engenheiro, October 1938, p. 2400.

⁵These excruciating circumstances have plagued the inhabitants of Roraima continually from the beginning of settlement in the 1700's. See, for example, a petition to the government given by the Chamber of Commerce of the State of Amazonas in 1940, expressing itself as follows:

Another problem to solve in the area of beef cattle activities in the state is the transport of cattle for slaughter from the distant ranches of the Alto Rio Branco to the city of Manaus where the majority of the consumption takes place.

Despite the expensive and unsuccessful attempts to construct a road, without appropriate planning, which claimed a heavy sacrifice of federal lands, the difficulty of transport, in the present situation, is one of the major obstacles to the compensating utilization of the large herds which exist there. Diverse formulae and suggestions have been proposed by technicians and studious types, some favoring the construction of a railroad and others favoring the planning

of a highway. All, however, have not been accompanied by series of meticulous studies which require further understanding. Without a doubt, the solution to the problem of shipping cattle from the Alto Rio Branco to Manaus lies in one of these two ways or a combination of both, with the help, furthermore, of river navigation. It seems the opportune time for us to ask the government of Your Excellency to study this important question, from its several angles, in order to decide upon the best solution.

In "Problemas da Amazonia." Petition from the Chamber of Commerce of Amazonas (Manaus, Amazonas), 1940, p. 63.

⁶While the author was residing in Boa Vista, in the month of March (1969), he witnessed a resultant shortage of sugar, coffee, powdered milk, kerosene, gasoline, bottled gas, and beer. Several of the author's trips to ranches in the interior had to be temporarily postponed for lack of gasoline. Indeed, it is most difficult to carry on economically and administratively with the occurrence of major interruptions caused by material shortages.

⁷Obviously, and compared with Boa Vista, Manaus is indeed a major center (population 244,000 in 1967), but it also suffers from isolation. Located some 1,000 miles upstream from the Atlantic Ocean and Belém, its nearest urban neighbor in terms of accessibility, Manaus is the commercial center and capital for the State of Amazonas (898,000), with a population density for the entire state of 0.02 inhabitant per square mile. For a detailed discussion of the subject, see: "The Functional Relationship of Manaus to the Amazon Basin." Unpublished dissertation (University of Florida, 1969) by Jerry R. Williams.

⁸The late deputy Antônio Martins, in a speech delivered before the Chamber of Deputies on October 7, 1947, expressed the seasonal difficulties of navigation on the Rio Branco and the resultant human hardships as follows: "It should be pointed out that the lower Rio Branco, in its course of 400 kilometers, starting from its mouth, is only navigable without great hindrance from May to August up to the village of Caracarai, on the right bank. In the remaining eight months of the year when the river's volume of water is considerably lower, navigation is permitted only to small engines, hauling

barges with reduced tonnage and having a draught of not more than two and one-half feet, devoid of the most fundamental elements of comfort and hygiene."

⁹The lower Rio Branco is that portion of the river's course from its juncture with the Rio Negro northward to Caracarai. The upper Rio Branco is that part of the river lying north of Caracarai, passing Boa Vista to the point where the Rio Uraricoera and the Rio Tacutu merge to become the Rio Branco.

¹⁰Reference is made in Clóvis Nova da Costa (O Vale do Rio Branco) to the length of time that better access to the Alto Rio Branco has been considered. He states:

Whoever writes the history of the Rio Branco will have to reserve a special chapter to the Boa Vista-Caracarai road, whose attempted construction dates back to the seventeenth century when the problems of transport stimulated the imagination of the pioneers, looking for the solution to the difficulties of access and the flow of production. The fundamental stage of the daring project of connecting Manaus and Boa Vista by road, only after two hundred years of expectation, is that which opened the expected way of communication, within a day's journey, whose principal facts we lay aside here (sic), as the contribution to the history of the major undertaking of the sort now accomplished in the basin of the Rio Branco." p. 130.

¹¹The Brazilian planners have had a complete change of rationalization with respect to highway construction. Witness the thinking of Raimundo Pereira da Silva (see page 43) as being typical of previous thinking. Prior to building a road through an area there had to exist already a population large enough to generate economic production capable of justifying the allocation of capital necessary to carry out such an endeavor. The result of a turnabout in this policy is vividly brought to light in David Crease's article on the new road connecting Belém and Brasília. ("Joining the Two Brazils," Geographical Magazine, XXXVII, No. 59 (July 1964), 184-197). The town of Imperatriz, some 500

miles up the Rio Tocantins in the State of Maranhão, northern Brazil, had a population of 6,000, one truck, and no road to the exterior in 1960. By 1964 the Belém-Brasília highway connected Imperatriz to the exterior both to the north and to the south. The 6,000 people there have now become more than 20,000. The rice crop has jumped in a few years from 8,000 sacks to 500,000! The monthly count of vehicles in transit through Imperatriz now exceeds 1,000.

¹²For example, the engineer, M. Pacheco de Carvalho, upon studying the transportation problems of the territory, expressed his thoughts as follows:

The solution for the normal transport of merchandise...is evidently the construction of a road connecting Caracarai to Boa Vista which would allow transport by truck from Caracarai to Boa Vista in four years. Seeing that the land is flat or gently rolling, it allows the construction of a road having the best qualities.

The construction of this road, which is of vital federal importance since it is part of BR-17 [now BR-174], brings to mind the colonization of the forest which runs alongside the major part of its extension.

This was a note on the connection by highway between Boa Vista and Caracarai as a stretch of BR-17 (unpublished) drawn from Guerra, p. 234.

In another statement by Dr. Pacheco de Carvalho, who was also ex-director of the Division of Construction and Conservation of the Department of National Highways, he stated: "At this time the most necessary task is the construction of a highway connection from Boa Vista to Caracarai, which is the river port situated at the end of the freely navigable stretch of the Rio Branco bearing vessels of up to three feet of draught the entire dry season." "Plano Regional de Recuperação e Colonização da Amazônia," Boletim Geográfico, X, No. 109 (1952), 415.

Captain Clóvis Nova da Costa, former governor of Roraima, referring to the importance of that road, has said:

The Boa Vista-Caracarai road constitutes

the axis of a system that will guarantee the circulation with the economy of the bordering countries. From there, i.e., Boa Vista, there will be the construction of another road, parting from the capital, on the left bank of the Rio Branco, going to Conceção do Maú, on the border with British Guiana. Later, with a branch in the direction of Santa Helena, Venezuela, the economies of the basins of the Amazon, Demerara and Orinoco will become joined.

O Vale do Rio Branco, Suas Realidades e Perspectivas (Rio de Janeiro, 1949), p. 131.

¹³Manuel Pacheco de Carvalho, "Plano Regional de Recuperação e Colonização da Amazônia," Boletim Geográfico, X, No. 109 (1952), 416.

¹⁴Amazonas Brasil, and Ray A. C. Lins, "Projeto Agropecuário, Fazendas Brasil, S.A., Território Federal de Roraima," Manaus, 1968, pp. 12-13. (Mimeographed)

CHAPTER V

THE PRESENCE OF BEEF CATTLE IN RORAIMA

Historical Background

Given the cultural background of the people and the nature of the physical milieu, it is not at all surprising to find that extensive livestock raising has always been the predominate economic activity on the savannas of Roraima. Latin Americanists have long recognized that in the Luso-Hispanic colonization and development of the Americas cattle raising has played an important role.

It is a well documented fact that the entire system of large-scale livestock raising was imported to the New World from the Iberian Peninsula.¹ Cattle have been raised almost everywhere in Europe and America, but raising cattle and cattle ranching are not the same thing! Bishko provides a definition of the latter by stating that ranching "implies the ranging of cattle in considerable numbers over extensive grazing grounds for the primary purpose of large-scale production of beef and hides."²

Historically, as an extensive productive activity,

ranching required large tracts of grazing land and more specialized techniques than those required for the care of a few dairy cows or small herds which served as an adjunct to agriculture. With the possible exception of the Hungarian Plain and western portions of the British Isles,³ medieval Iberia appears to have been the only part, as it was undoubtedly the most important part, of medieval Europe to advance to this third level of cattle raising.⁴ Although the precise circumstances are still obscure, the available charters (cartas) and statute-laws (fueros) provide evidence that a genuine ranch cattle industry evolved in the Iberian Peninsula in the late eleventh and twelfth centuries, under Alfonso VI and Alfonso VII of Leon-Castile. The birthplace of this activity was that portion of the subhumid or arid interior tableland of the Meseta Central lying between the middle course of the Duero (or Douro) River and the mountains of Gata, Gredos and Guadarrama.

From this area of origin, cattle ranching, on an ever expanding scale, spread southward along with the reconquista colonization. By the late twelfth century it had moved into the broad pasturelands of New Castile, Extremadura, both in Spain, and Alentejo, in Portugal. Alentejo, by all available accounts, is the cradle of the Portuguese ranching system which was later extended into Algarve, the Archipelago of

Madeira and the Brazilian sertão. On the southern half of the meseta, primarily to the west of a line passing through central New Castile, Castilian and Portuguese military orders, nobles and townsmen grazed thousands of cattle, although in both numbers and economic importance these were less significant than the great sheep flocks of the Mesta and other owners. But this situation was reversed after 1250, with Ferdinand III's reconquest of Andalusia, when royal repartimientos assigned to cattlemen rather than sheep raisers the bulk of the extensive lands in the valley of the Guadalquivir River. As a result, the Andalusian plain (including part of the Portuguese Alentejo district) became in the latter Middle Ages the one region of the Peninsula, and perhaps of all Europe, where pastoral life, and indeed agricultural life in general, was dominated by a thriving, highly organized cattle-ranching economy. The fact that many of the early colonists of the Canaries and the islands of Madeira, and later the New World, came from these southern Iberian cattle kingdoms, which were at their heights in the fifteenth and early sixteenth centuries, provides one significant clue to the promotion of cattle over sheep ranching in the American colonies.⁵

The types of cattle found in early Castilian and Portuguese ranching were most likely the results of various

degrees of crossing between lighter-colored European types of the all-purpose cow and the wild, or semi-wild, black, dark red and dark brown descendants of a cattle strain unique to Iberia, Bos taurus ibericus, the ancestor of the modern fighting bull. These two strains mingled on the meseta and, as the reconquista frontier was pushed southward, these two razas produced a very hardy hybrid stock, displaying an amazing variety of color and color combinations from creams, yellows and grayish-browns to deep browns, reds and blacks. This was a stock characterized by markedly feral instincts and often complete wildness. Such cattle were valuable chiefly for their tough hides and stringy beef. These cattle then, unsuited for dairy or draft purposes, compelled those who pursued this productive activity in Castile and Portugal to abandon their "cozy little cowpastures" for the open range, to take to the horse for herding, to perfect systematic methods of long-distance grazing (or even transhumance), periodical round-ups, branding, overland drives, etc.--in short, to invent cattle ranching!

Across the sea in the New World, the Spanish found, in what is now northern Mexico and the United States' Southwest, an area similar in many respects to the Meseta Central, i.e., a semi-arid grassland poorly suited to the growing of crops. Being accustomed to the dry plains of Castile, the Spaniards

were quick to realize the geographical limitations and adapted themselves to the conditions of climate and topography which they encountered in the Americas. Livestock raising presented a means for utilizing the available natural resources to provide a livelihood and food supply for those settlers willing to endure the hardships of pioneer life.

In North America the Spanish Crown issued land grants which corresponded to the requirements of the cattle industry. Far better than the Anglo-Americans, the Spaniards recognized the need for large tracts of land for grazing and pasture.⁶ Walter Prescott Webb pointed out in his classic study of the Great Plains that the Anglo:

thought in terms of the possibilities of utilization and production. To him a hundred acres was a sufficiency....No provision had been made in law for the ranchman who was using or trying to use the semi-arid land.⁷

On the other hand, the Spanish authorities, with experience in semi-arid environments, took into account the climate and proposed land use in determining the size of the land grants. The grants reflected either agricultural or pastoral use; land suitable for irrigation and farming was divided into small units, while dry land and pasture were allotted in larger portions.⁸

The rise of ranching in Spanish Texas, as investigated

by S. L. Myres, was quite similar to the course of the introduction of ranching into Roraima.⁹ In northern Mexico the Spanish system of landholding led to the establishment of the hacienda, a huge landed estate in the possession of one family that approximated the feudal holding of Europe. The hacienda, not infrequently containing more than 300,000 acres, became a self-sufficient economic unit which included farming, mining, and a number of commercial enterprises in addition to stockraising. Some of the largest estates were communities in themselves, with fields, flocks and herds, wooded areas, flour mills, forges and workshops. Each had its church and several hundred or even thousands of inhabitants, with villages for the Indians and workers, as well as the casa de hacienda occupied by the hacendado and his family.

In Texas, however, the Spanish were forced to adapt their methods of stockraising and land utilization to frontier conditions. Common pasture and stockraising grants provided grazing for large herds of livestock on the grasslands and dry plains, while the river valleys and well-watered areas were reserved for farming and agriculture.¹⁰

In addition to the individual land grants, collective holdings were available. For many centuries, the towns of Castile and Portugal had been landholding bodies possessing

more or less extensive territories belonging to the towns and administered by their officials. Such lands included propios, rented out for cultivation; ejidos, reserved for a variety of purposes such as dump grounds and slaughtering pens and not used for buildings or cultivation; and dehesas or baldios, common pasturage on vacant lands in the open range.¹¹ Stockmen pastured animals on baldio lands under license from the viceroy or governor until such time as the lands were granted to individuals. In Texas agreements were occasionally worked out between missionaries and townspeople as to the extent of grazing privileges on the dehesa between the Guadalupe and San Antonio rivers.¹²

During the period of early Spanish settlement, despite the pleas of the Church, the missions in Texas were not opened until Spanish borders were menaced by the French. Then, and only then, were the missionaries allowed to begin their work and garrisons were constructed and ranches were established to protect and support them.

Within this context it is important to note the development of ranching as an appurtenance to the garrisons,¹³ those tiny outposts of the Spanish Empire charged with the responsibility of protecting the missions and warding off the rush of intruders--French, Indian, and English--who desired to prey upon Spanish possessions. As one of the most isolated of

Spain's frontier domains, Texas was far removed from main communication and supply routes, and scarcity of food, clothing and equipment plagued presidial commanders and provincial governors throughout the colonial period. Ranching offered a partial answer to these problems not only by providing meat, but also oxen for plowing, mules for hauling provisions and supplies, and horses for mounting and maintaining the garrison troops.¹⁴

Contrast the introduction of ranching into the far-flung Texas region of the Spanish Empire with the rise of this same activity in what is now Brazil's Northeast.¹⁵ The history of the growth of cattle ranching in the Northeast, beginning with the arrival of the first heads of cattle in Salvador from the island of Madeira, is intricately tied to the settlement of that region's interior. It was the breeding and grazing of cattle, more than any other activity, that promoted the advance and settlement of the Portuguese into the Brazilian sertão. The entradas and the bandeiras only exploited the region for Indians which they would sell into slavery along the coast, or they scoured the area looking for mineral wealth and were merely temporary dwellers.

The objective of each adventurer and miner was to make his fortune as quickly as possible and return to the city so that any settlement by these types of individuals was, at

best, of a temporary nature. On the other hand, the men who were founding fazendas for cattle raising moved into the interior continuously and in a "one-way" fashion.

The lands were obtained from the Portuguese Crown by means of grants which were known as cartas de sesmaria.¹⁶ The actual amount granted was called a sesmaria. At the same time that the nobles were dealing with the authorities in the sitting rooms of the Viceroy in Salvador, or the Governor of Pernambuco in Olinda, seeking final agreement on the lands whose occupation they had been promised, the vaqueiros were receiving the word from those same nobles to push on with land settlement as far as possible..."into all of the interior of Bahia, Pernambuco, Alagoas, Sergipe, Rio Grande do Norte, Ceará, Piaui, large parts of Maranhão and Minas Gerais."¹⁷

With the passage of time the nobles received more cartas de sesmaria and took possession of their newly acquired lands, thereby creating extensive latifundios. One example of the benefactor of sesmarias is the Grupo Garcia D'Avila, today the wealthy family of the Casa de Torre, in Salvador. This family was so successful in accumulating lands that their fazendas extended from coastal Bahia on into Piaui, Pernambuco and Ceará. Along the banks of the Rio São Francisco, for example, this family owned some 320 miles of land. They owned territories larger than most European countries.¹⁸

Land distribution through cartas de sesmaria was discriminatory and unequal. The right of ownership was granted, with grim consistency, to those who knew nothing about the land. The process of granting the land, however, was done in a somewhat orderly manner. The Portuguese Crown declared that a fazenda would consist of three leagues' distance (approximately 12 miles) along a given watercourse. There would be one league of land left between fazendas so that there would be no question about the property lines of a given piece of land.¹⁹

Population continued to increase along the coast and the resultant demand for meat was too large for the existing ranches of the interior to fill. It was the evergrowing demand for meat that gave rise to the rapid growth of the fazendas in the interior. This numerical increase was greatly facilitated by the extremely simple manner in which a fazenda was established. All that was necessary was to build a crude straw shelter for the vaqueiro and his helpers, or his family; construct a very crude corral where they would place the cattle for the purpose of formar os cascos, a period of quarantine to tame the unruly cattle for easier handling on the range; after this the cattle would be turned out into the wild caatinga, leaving them to feed themselves and reproduce with almost no human care. In this way a

fazenda was established and a stretch of land about 12 miles along a watercourse was "settled."

In a very narrow sense of the word, fazendeiro is synonymous with the owner of a fazenda. But in the early times the landowners lived on the coast and only received news and profits occasionally from their fazendas. Thus, for all practical purposes, it can be stated that the first fazendeiros that established themselves in the Northeast were the wild vaqueiros, pioneers who, with the cattle that they received from the quarteação,²⁰ leased lands and began ranching for themselves.

The rent from the sítios, leased lands generally a square league each (43.57 square kilometers or 16.8 square miles, or 10,762 acres), was about 10 mil reis per year. This was during a period when one steer was worth about two mil reis so that payment corresponded to the value of five steers per year.²¹

In retrospect, the vaqueiro brought the cattle into a given area, took on all the risks and performed all the necessary tasks of operating a fazenda, and finally saw to the settlement of the leased area for which he had worked 10 to 15 years to obtain, often leasing for a high price the very land that he himself had "conquered."

On a fazenda, initiated in this manner, the workers' lives

differed from those who lived on the large landed estates. The former vaqueiro, upon establishing his ranch, was not able to pay anything to the workers, who most often turned out to be his children, who carried out the tasks of the fabricas (helpers to the vaqueiro).

The system of quarteação gave rise to a new class of people in the sertão. Considering that there had been a change only in the name, to fazendeiro from vaqueiro, to entrepreneur from laborer, but without the possibility of paying workers, and the specific chores were still the same, the preferred name for these fazendeiros was fazendeiros de vaqueiro autônomo.²² It should also be added that the fazendeiro de vaqueiro autônomo did not care for his own cattle any better than he had cared for those belonging to his former patrão.

When field crops began to appear on the fazendas it became necessary to build fences. The fazendeiro now worried about his crops so that the cattle were left to roam more unattended than ever, but now fenced in on one particular fazenda. The use of fences brought an end to the practice of apartação (rounding up and sorting out cattle that had grazed in common but were owned by different fazendeiros) because the cattle no longer bred and grazed on common pasture.

As was true throughout the Americas in the history of ranching, the appearance of fences brought on a more sophisticated form of cattle ranching and gave new importance to the fazendeiro de vaqueiro autônomo, who tried to purchase the lands he had been leasing. If the fazendeiro lived in a nearby city, he supervised a system of foremanship in administering the affairs of the fazenda, and he himself tended to business in the city, such as acquiring breeding stock, seeds and equipment, and selling that which his fazenda had produced.

When the change came to the fazendas owing to the advent of fences, the vaqueiro capataz, the foreman of the city-dwelling fazendeiro, began receiving his salary in cash. This occurred because the fazenda began a phase of more sophisticated livestock ranching, utilizing a system whereby it was possible to improve the quality of the herd by crossing the cows with newly purchased breeding bulls. When the quality of the cattle improved, the fazendeiro was no longer interested in sharing his stock with his foreman by means of the quarteação. In this way the vaqueiro experienced an increase in importance of role on the fazenda but in economic terms he was demoted because financially his real salary turned out to be worth less, thus greatly reducing the possibility of his ever owning his own fazenda.

The origins of cattle ranching on the remote savannas of Roraima have been obscured by time. At best, historical accounts and evidence of this are extremely sketchy and tend to conflict with one another. However, while some of the specific information is lacking, the general purpose and pattern of establishing ranching as the primary economic activity in this region can be clearly discerned. The early situation in Roraima bears a strong resemblance to what had occurred a century earlier in Spanish Texas. The areas of the upper Rio Negro, the Solimões, and what is now Roraima were regions where the colonial interests of Spain, Portugal and the Dutch had clashed during the seventeenth and eighteenth centuries.

There are fleeting references to European penetration into the extreme north of Brazil in the eighteenth century, but the intentions of the early intruders were not those of establishing permanent settlement. For example, Lawrence Belfort, a wealthy Irish entrepreneur who had settled in Maranhão, travelled to the interior of Amazônia seeking slaves as labor for his various agricultural enterprises. On one particular occasion, in 1740, he reached the valley of the Rio Branco.²³ Nicholas Hortsman, a German representing the interests of the Dutch on the northeast coast of South America, contacted the Indians of the Rio Negro in the

year 1741 by passing down the Rio Branco system,²⁴ advancing from the Essequibo Region, which, at that time, was Dutch territory and later became a British possession.

The Treaty of Madrid in 1750 was arranged to settle a dispute between the Spanish and Portuguese Crowns which centered on the Plata region, but the regions of the Orinoco and Negro rivers far to the north were not insensitive to this highly tentative agreement. As a result of this treaty, Francisco Xavier de Mendonça Furtado, Governor of the Captaincy of Grand Pará, was appointed by the Crown as the principal commissioner for boundaries of the North in 1752.²⁵ He was charged with the duty of meeting a Spanish expeditionary team to delimit the boundaries in Amazônia between the Spanish and Portuguese possessions.²⁶ The Treaty of Madrid was declared null and void in 1761 and two years prior to that Mendonça Furtado had returned to Portugal, never having fulfilled his boundary-delimiting mission.

The Treaty of Santo Ildefonso, in 1777, produced another commission to fix the boundaries between the Spanish and Portuguese possessions in the New World. The Portuguese Crown appointed João Pereira Caldas, Governor of Grand Pará, to head its commission. Caldas took up residence in Barcelos, the seat of the Captaincy of São José do Rio Negro, and worked vigorously for a number of years there attempting to

promote economic activity and permanent settlement which would aid the Portuguese in their claims for extended boundaries.²⁷ Upon suffering a stroke, Caldas was replaced by his former assistant in Grand Pará, Manoel da Gama Lobo d'Almada, Governor of the Captaincy of São José do Rio Negro.

Lobo d'Almada was a most ambitious man. He explored the upper Rio Negro and discovered major tributaries connecting that river with the rivers Japura and Solimões. He brought sparsely scattered Indians into settlements, he developed the agricultural industry of growing mandioca for the production of farinha, he activated indigo growing with an eye to shipping it to the European market, and he encouraged settlement in the savannas of the Rio Branco.²⁸

As early as 1775, Spanish forces invaded the savanna area in Roraima and began to establish a garrison to fortify the Rio Uraricoera.²⁹ The Spanish had entered this area seeking the fabled lake of El Dorado. The Portuguese sent a force out from Barcelos led by Filipe Strum, a German in the service of Portugal, which drove the Spaniards out that same year. Besides forcing the Spaniards back, Strum seized this opportunity to select a site and construct a fort to defend the Rio Branco savannas from further intrusions by the Spanish or the Dutch. He selected a site on the left bank of the Tacutu river where it joins the Uraricoera to

form the Rio Branco. Following the construction of the fort of São Joaquim, Carmelite missionaries, coming from the Rio Negro, moved into the area to set up small settlements of Indians. By the time Lobo d'Almada visited there in 1787 there were five tiny mission settlements with a total population of approximately 930 souls.³⁰

The primary purpose for introducing people and cattle into the savannas of Rio Branco was to provide the Portuguese jurists with grounds to present a case of uti possidetis (Latin, as you possess) in the boundary dispute among Portuguese, Spanish and Dutch interests.³¹ The judicial principle of uti possidetis assigns to the actual holder of a given area the right to retain it. Cattle ranching was an important adjunct to garrison and missionary activity on the outer fringe of the Spanish Empire, i.e., the solidification of the hold on Spanish Texas; by the same token, the Portuguese Empire on the Portuguese-Spanish-Dutch frontier of northern South America established ranches to bolster their claim.

The year 1787 appears as the most appropriate starting point for the cattle tradition in Roraima. It was during that year that Lobo d'Almada had passed through the savannas and observed that the establishment of a cattle ranching economy in that area should produce commodities which would help develop the interior of that captaincy. He had visions

of not only supplying fresh meat to the populace at Barcelos, but also of producing beef jerky and leather for export to other regions.³²

There are various accounts offering dates and events pertaining to the founding of the three initial fazendas on the savannas of Roraima. The fact that in 1787 Lobo d'Almada declared that there should be three fazendas set up in that region is not in question. The actual implementation of his statement is what causes minor disagreement among scholars. One account states that Lobo d'Almada ordered the fazendas São Bento, São José' and São Marcos to be founded in 1787. However, there is no mention of those areas from which the cattle were to be introduced, nor the year in which this was to be. The version offered by Andre Fernandes de Sousa seems most complete and reasonable.³³ He maintains that in the year 1783, Portuguese forces under the direction of Lobo d'Almada drove Spanish settlers out of the village of Ega (now Tefé) situated on the Rio Solimões. (See Figure 5, Chapter IV) During their hasty retreat, the Spaniards left their cattle behind. The cattle were taken back to Barcelos and then sent up the Rio Branco to stock those fazendas. Besides this single incident, over a period of time cattle were obtained in the Spanish territory which bordered the Brazilian Amazon, primarily the upper Rio Negro and Solimões.

The cattle were either acquired by purchase or they were seized on the occasions of confrontation.³⁴

Figure 10 shows the location of the original three fazendas in Roraima. The national fazenda was called São Bento, in honor of the King of Portugal. It was situated on the left bank of the Rio Branco and had its casa-grande (headquarters) very near, but across the river from, the colonial fort of São Joaquim. Its territory included that area between the rivers Cauamé, Branco, and Uraricoera. Owing to the fact that the western boundary stretched all the way to the frontier with Venezuela, this fazenda covered a vast area of some 6,950 square miles (approximately 4,450,000 acres).³⁵

The fazenda São José was founded by Captain José Antônio Evora, a prosperous and well known settler from the Rio Negro region. São José had as its southern boundary the creek called Surrão, which is a tributary of the Água Boa. Its northern and eastern boundaries were delimited by the courses of the rivers Tacutu and Branco. Originally its headquarters was the site of the fort and village of São Joaquim. This fazenda was abandoned in 1841 and its territory of some 3,088 square miles (1,976,000 acres) was annexed to the national fazenda São Marcos.

Fazenda São Marcos was founded by Captain Nicolau de Sá Sarmiento, commander of the fort of São Joaquim. The ranch

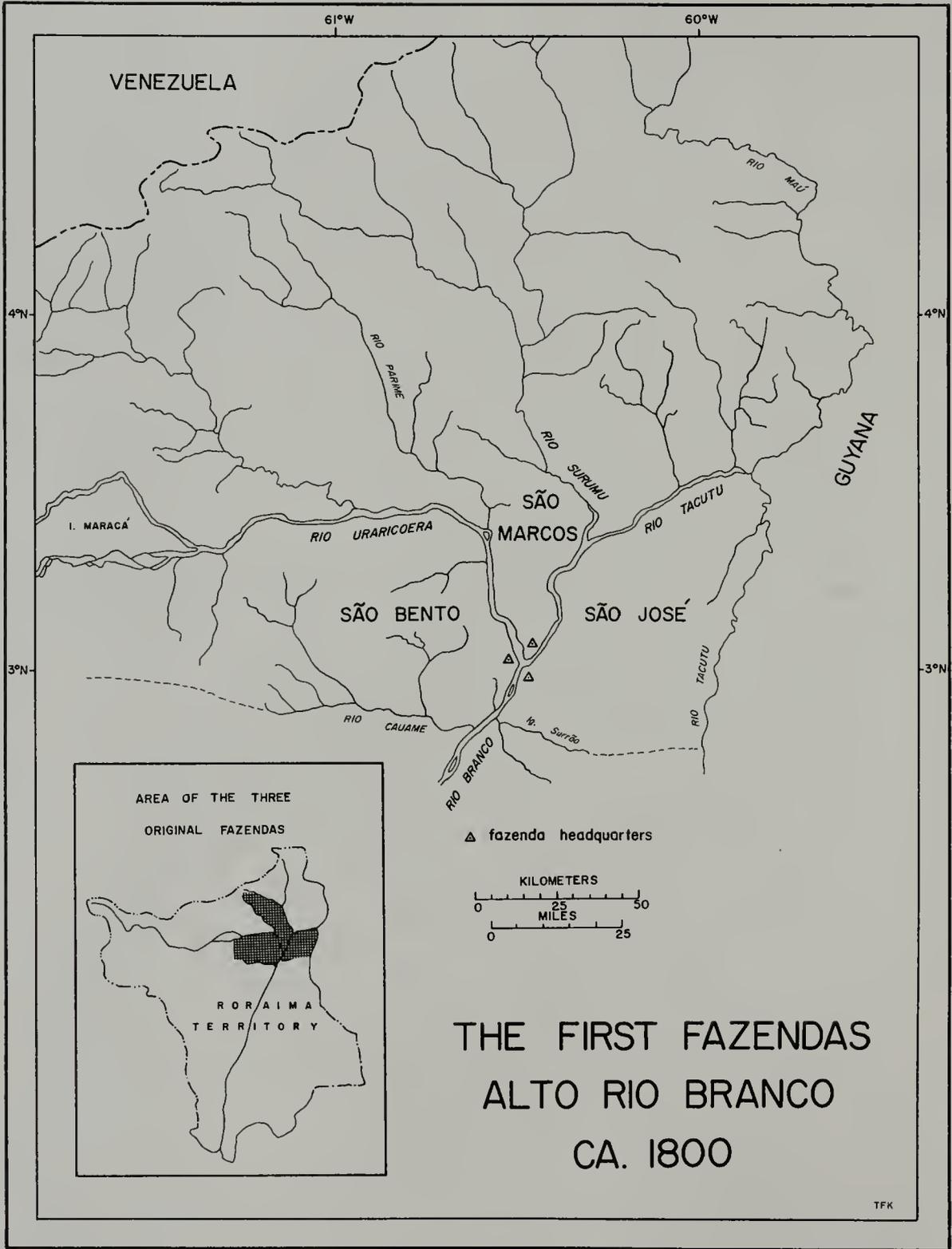


Figure 10

was situated in a zone formed by the land between the two rivers Uraricoera and Tacutu. It was bounded on the east by the river Surumu, on the south by the Uraricoera and the Tacutu, and on the west by the river Parimé.

Although the headquarters of these fazendas were in close proximity, there was little contact among them because they were separated by major watercourses and the cattle from the three fazendas seldom intermingled. Of the three initial ranches, only part of São Marcos is still in existence.

On a trip which took him through the savannas of Roraima in 1797, Francisco José Rodrigues Barata observed that the three fazendas were truly in a state of infancy. He estimated that each fazenda possessed about 300 head of cattle at that time but he was not optimistic about the future of cattle ranching in that area. Barata observed that during the dry season the cattle had to walk extremely long distances to procure water, and the mountains which offered shade and other amenable conditions were far away.³⁶

Scant references show that from 1797 through the early 1860's all of the ranching activity took place exclusively on the original three fazendas. By 1863 the herd had grown to an estimated population of 10,000.³⁷ Between 1860 and 1900 the savannas began to be divided into a number of private fazendas. As early as 1906 the entire area of the old

national fazenda of São Bento had been sectioned into numerous private ranches. By 1885 Coudreau noted that there were some 32 private fazendas in the upper Rio Branco valley, and he estimated the stock to be at 20,000 head of cattle and 4,000 horses.³⁸

The emerging pattern of the increasing number over time of ranches and cattle resembles the settlement of the interior of the Northeast, but detailed information pertaining to the process of land acquisition is indeed scarce.³⁹ From what the author has been able to piece together, the process of claiming the land has been, in a word, chaotic! The charter which created the Captaincy of São José do Rio Negro gave the governor the power to grant sesmarias to favored Christian Portuguese, as had been the practice in the Northeast. However, there is no mention of sesmarias with reference to the founding of the first three fazendas in the Rio Branco savannas, nor do the boundaries of the original fazendas conform to the established pattern of the sesmarias. Noting that no other cattle ranches existed there until the 1860's implies that sesmarias were not granted there because the year 1850 marked the end of the Crown's practice of granting lands by the sesmaria system.

Sources which allude to the formation of Rio Branco fazendas during the last four decades of the nineteenth and

on into the beginning of the twentieth century imply that the process was anything but controlled. In 1895, a federal inspector, one Bento Martins Pereira de Lemos, had a few choice comments in his report pertaining to land grabbing in Rio Branco:

It is common knowledge among everyone in Rio Branco that all the former managers and tenants, with the exception of just one, have become wealthy fazendeiros at the expense of the national fazendas. Some have transported entire herds, stolen from the national fazendas, to pre-selected grazing areas on the campos, which is still the property of the Nation, where the benefactors spent the greater part of their lives happily engaged in a lucrative business. There was one former tenant who, perhaps because of his newly gained wealth and power, was even so bold...as to stake out a huge fazenda for himself within the boundaries of São Marcos. That fazenda, besides losing tens of thousands of its cattle, was robbed of its own land. I am referring to the affairs of the fazenda Flechal. Besides these material setbacks suffered by São Marcos, the federal government came under sharp criticism for its apparent permissiveness. And this I tell you is nothing more than one small incident of many that were related to me by very old and venerable residents of Rio Branco.⁴⁰

The Amazon Homestead Act of 1903 was intended to introduce order into land settlement in the North.⁴¹ The government announced that unclaimed lands would be granted gratuitously to native or naturalized Brazilians, residing in the country, who applied for up to 640 hectares (1,591 acres)

for the purpose of cultivating the soil. The grant consisted of a deed drawn up by the Land Department in which the concessionaire obliged himself to cultivate the land, build and reside on it and have it measured and surveyed within five years. At the end of five years, if the land had been measured and surveyed and it was proven by documents at the Land Department in Manaus, a clear title of ownership was issued, giving the location and declaring that all obligations had been fulfilled.

The maximum size of the homestead precludes, for all practical purposes, the use of this method of land distribution for the establishment of the Rio Branco cattle ranches which require much more land for extensive grazing. In addition, by 1885 some 32 private fazendas were already established.

Further evidence that the formation of fazendas in the early twentieth century was not beyond reproach is cited by Guerra.⁴² He states that the firm of J. G. Araujo and Company, one of the largest and most important supply houses in Manaus, established itself in the município of Boa Vista in August of 1918, settling on the lands of the national fazendas. The 1924 report of Inspector Bento M. Pereira de Lemos of the Indian Protection Service does not exactly pay high tribute to the actions of this firm:

The action maintained by this inspectorship against those exploiters who boldly dispute the rightful property and goods of the Government of Brazil has been truly troublesome. The most obstinate of all is the businessman J. G. de Araujo who, not satisfied with the fine lands justly accorded to him by the division of the abandoned national fazendas of São Bento and São José, as well as part of the fazenda São Marcos which he succeeded in obtaining in a questionable manner, is still trying to usurp other tracts of land from São Marcos.⁴³

Even though land in Roraima is purchased and sold through the proper procedures today, disputes and alleged illegalities still pervade the local gossip of the sidewalk and tavern conversations in Boa Vista. More will be said about land ownership in a later discussion on factors which limit the level of productivity.

Cattle Population and Distribution of Ranches

The figures for the size of the herd in Roraima from the last decade of the nineteenth century to the present differ widely from one source to another. Nevertheless, two general tendencies can be noted. First, the number of fazendas has increased steadily and second, the total herd size for this region has fluctuated through periods of growth and decline.

In 1906 there were 143 fazendas of varying sizes. By 1952 this number had grown to be 467. The latest available

data show that in 1967 there were 760 fazendas bearing titles to the land. To the ranchers of Roraima these figures are overstated. Only those who possess more than 100 head of cattle are considered as owning a fazenda (regardless of the amount of land stated on the title) and are called fazendeiros. Those having less than this number are called criadores (breeders) and under no circumstances is the house of the criador called the sede de fazenda or casa-grande (ranch headquarters). The source which lists the 760 fazendas by name, ownership, and number of cattle contains approximately 250 entries having less than 100 head of cattle.⁴⁴

Only seven years after the herd size had been estimated at 20,000 in 1885,⁴⁵ Wallis, in 1892, estimated the total cattle population at 60,000.⁴⁶ By 1903 Gonçalves reveals that the Rio Branco savannas supported some 55,000 cattle and 5,000 horses.⁴⁷ A 1906 reference, Ourique, states that there were 96,865 head of cattle and 5,293 horses there.⁴⁸

According to the government census of 1920, there were 177,528 head of cattle in Roraima that year. On the other hand, two other sources, Dr. Mário Guedes⁴⁹ and Avelino Inácio de Oliveira,⁵⁰ estimated the cattle population on the savannas to be 250,000 head during that same year. Some of the ranchers whose families have been engaged in this activity for generations tell of a herd which numbered 300,000 during

the period between 1930 and 1939. This sizeable figure, unfortunately, cannot be substantiated by available records. At any rate, as the number of fazendas continued to increase, the total herd size for Roraima fluctuated wildly. Using census figures for consistency, Table 4 illustrates this pattern.

The distribution of the cattle in Roraima presents a kind of geographic riddle to the observer. First of all, it must be remembered that in the overwhelming majority of cases the cattle that are owned by one fazendeiro may graze on land owned by another. While the practice of fencing has come to be most common in much of Brazil, it is rare in this area; to present a map equating cattle distribution with the location of the sedes de fazendas would be a gross misinterpretation of the actual situation.

The only available maps depicting the distribution of ranch headquarters were obtained by the author only after several weeks of persistent inquiry in Boa Vista. For the purpose of planning a systematic approach to eradicate foot-and-mouth disease in Roraima, the Division of Production, Lands and Colonization (Divisão de Produção, Terras e Colonização),⁵¹ part of the Ministry of Agriculture of the Federal Territory of Roraima, prepared a series of maps in January 1968. Figure 11 delimits that area of Roraima within

Table 4

Total Cattle Population for the Rio Branco Savannas

Year	Cattle Population
1920	177,528
1940	120,247
1941	180,000
1942	216,000
1943	118,000
1944	n.a.
1945	n.a.
1946	138,000
1947	143,140
1948	130,000
1949	130,000
1950	132,000
1951	140,000
1952	160,000
1953	185,000
1954	n.a.
1955	140,000 (186,000) *
1956	n.a.
1957	140,000
1958	150,000
1959	130,000
1960	168,000
1961	175,000
1962	175,000
1963	191,000
1964	201,000
1965	223,000
1966	215,000
1967	n.a.
1968	223,861**

* Volume 16 (1955) of Anuário Estatístico do Brasil reports the lower figure while the following volume (17) shows the higher figure in reporting the triennium.

**The 1968 cattle population was taken from the special cattle census taken in Roraima to prepare for the systematic eradication of aftosa.

Source: Anuário Estatístico do Brasil, Fundação IBGE--Instituto Brasileiro de Estatístico, Rio de Janeiro, Volumes 1-28.

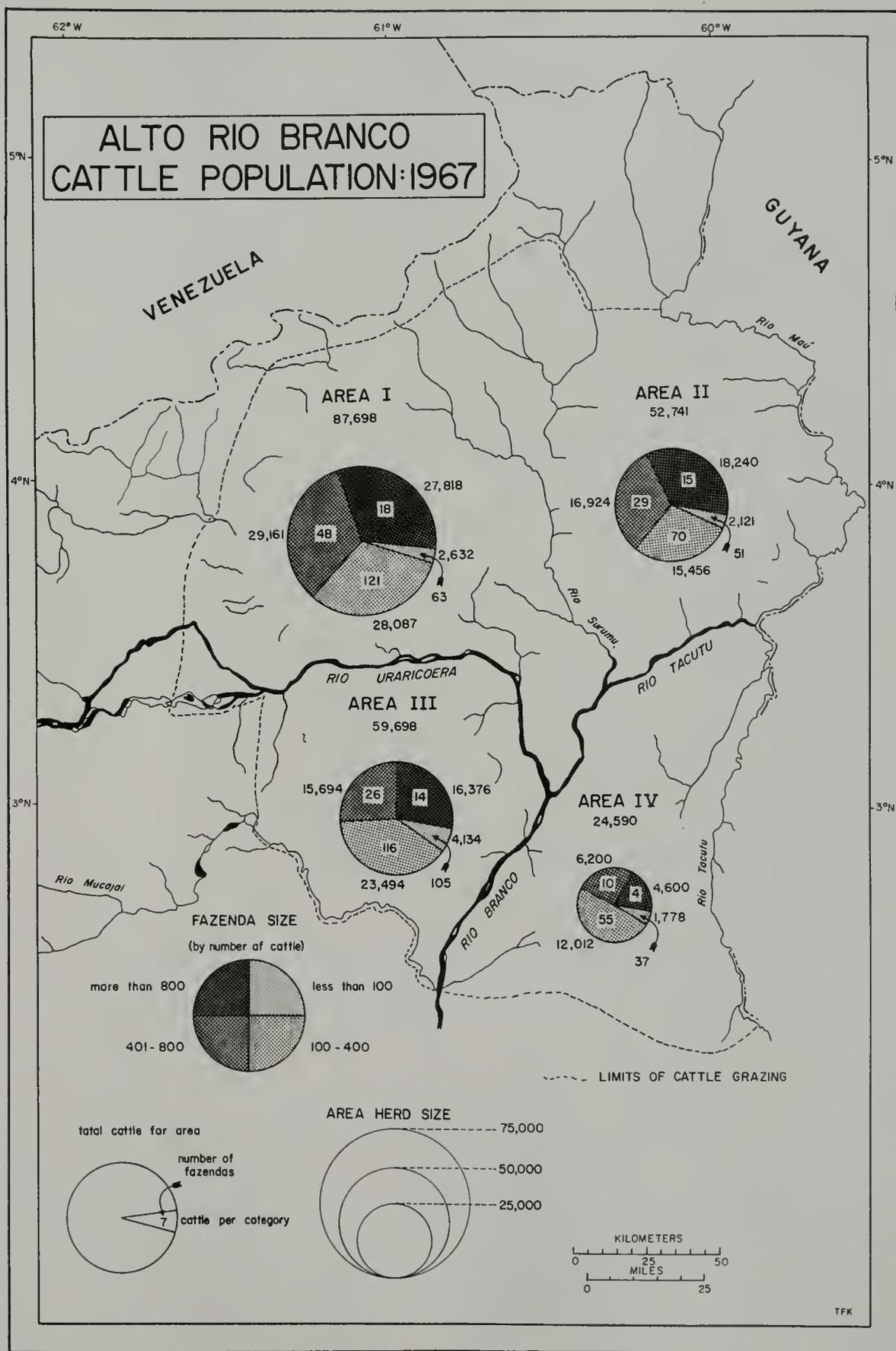


Figure 11

which the ranching activities are undertaken and illustrates the four regional divisions of ranching in the Territory. The D.P.T.C. also prepared a series of rough maps, by area, on a larger scale, indicating the distribution of the ranch headquarters and assorted bits of information pertaining to each location. Figures 12 and 13 are examples. Notice that the breakdown of cattle population per ranch is extremely gross, i.e., 1 to 100, 101 to 1,000 and more than 1,000. The other information shown indicates whether or not a given ranch headquarters has a vehicle (jeep, pickup, or large truck), an air strip, a cattle chute and corral for branding, inoculating, etc., and a refrigerator.

Unfortunately, the most revealing maps (Figures 12 and 13) were not constructed to constant scale. The boundaries of the four divisions are not aligned when placed upon a single sheet and the map distance in all directions does not coincide with actual distances. A project undertaken to remedy this situation would warrant a doctoral dissertation in itself.

Nevertheless, it is possible and worthwhile to describe the distribution of ranches as perceived by the capatazes and fazendeiros of Roraima. Area I, the largest in terms of numbers of cattle and total area, is that area which lies north of the river Uraricoera, west of the river Surumu, south of

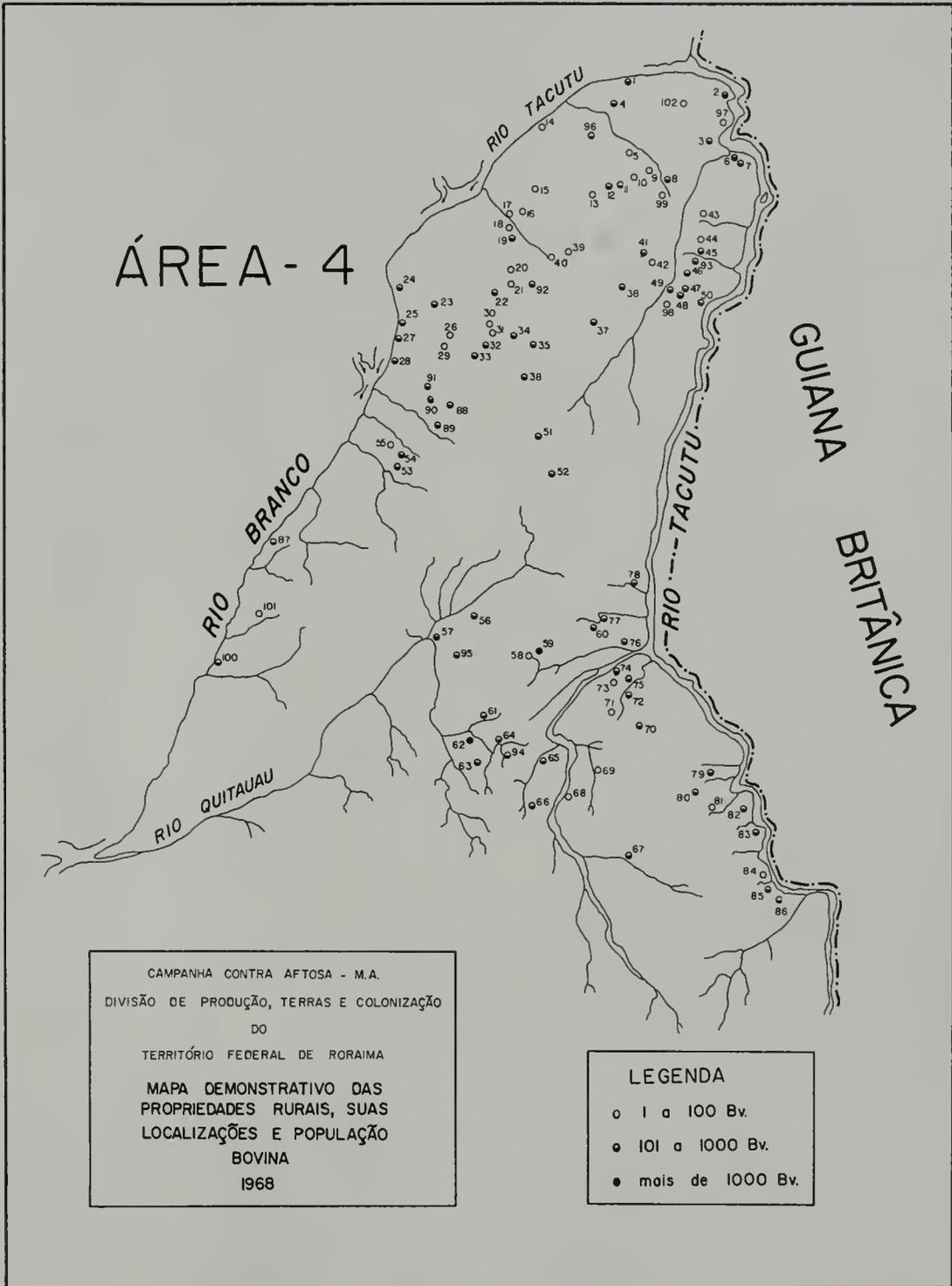


Figure 12

Example of the Area Map Showing the Locations of Ranch Headquarters and the Cattle Populations.

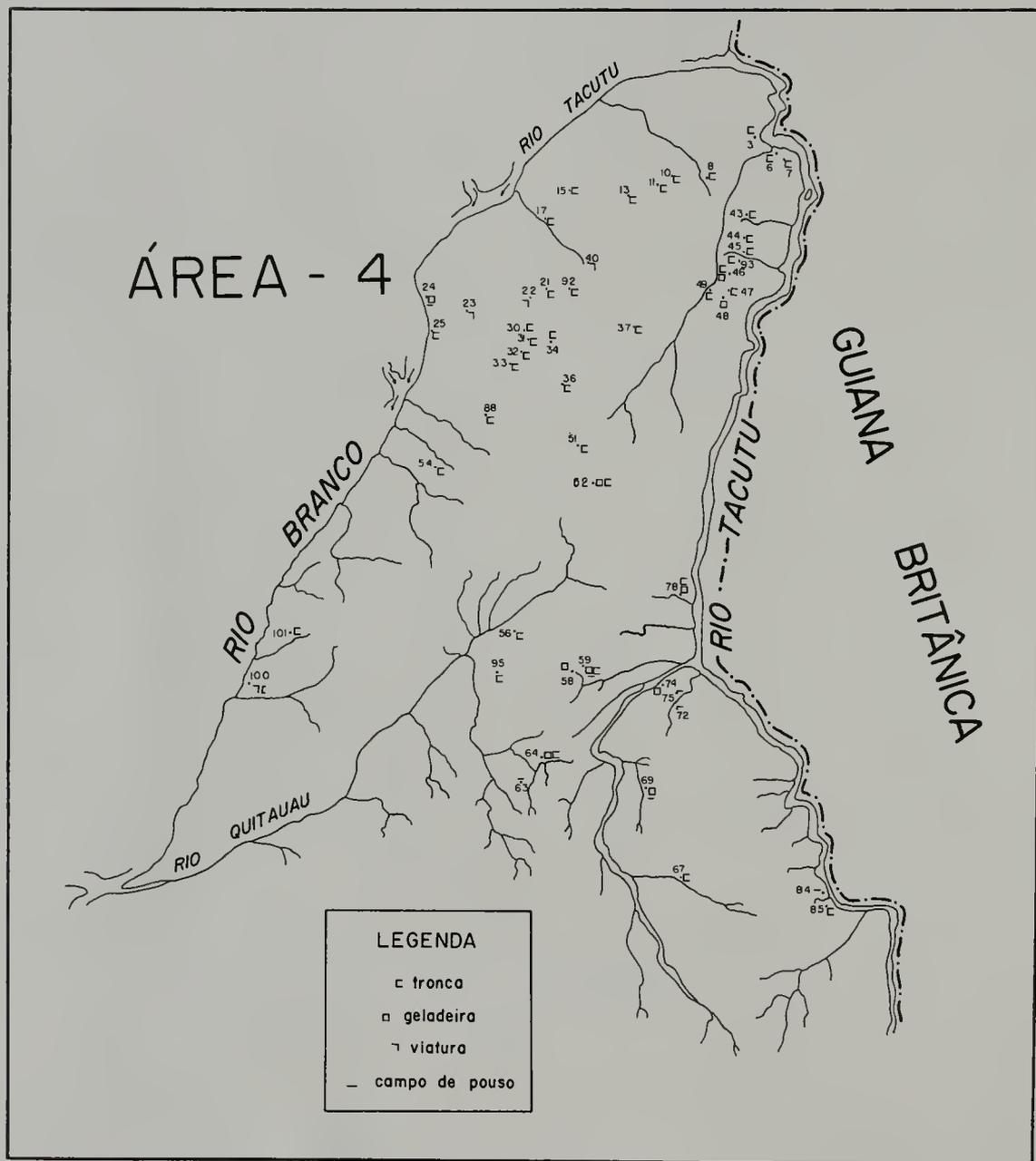


Figure 13

Example of the Area Map Showing Locations of Chutes, Refrigerators, Vehicles and Landing Strips.

the Pakárama Range and the border with Venezuela, and east of a distinct boundary between savanna and forest. That boundary would form a north-south line which would intersect the river Uraricoera on the island of Maracá.

Area II contains that land bounded on the south by the river Tacutu, the north by the borders with Venezuela and Guyana, the east by the border with Guyana, and the west by the river Surumu. Much of this area was once included within the original territory of the fazenda São Marcos.

Area III contains the greatest number of titled ranch properties, 261 as of 1967, but has some 28,000 less cattle than Area I. It is delimited on the east by the Rio Branco and it extends as far north as the Uraricoera. The southern extension is marked primarily by the river Mucajai, but there are a few small ranches, primarily fattening pastures for a few invernistas (those who buy a few head of cattle for fattening), which have recently been literally "carved" out of the forest. The western margin of Area III, a southern extension of Area I, is marked by the sharp line between forest and savanna.

The fourth region, Area IV, contains the fewest properties, 106, and least total number of cattle, 24,590. Its northern and eastern limits are marked by the course of the river Tacutu; the western limit is the Rio Branco, and it

extends southward to the river Quitauaú and the mountain Serra da Lua.

A fazendeiro seldom, if ever, expresses the location of his ranch as being in "Area I, II, etc." Rather, there are innumerable local regional names which usually refer to a section of a certain river or creek, or a prominent mountain. For example, the fazenda Milagres, located in Area III, is considered to be in the Alto Cauamé region, that is, the fazenda is located in the upper reaches of the river Cauamé. The fazenda Olho d'Agua, in Area IV, is to be found in a region which is known as Serra da Lua, this being the name of the dominating mountain in the far southeastern corner of Area IV. Thus, after spending a considerable period of time travelling about the savannas, one becomes aware of the locations which correspond to such regional names as Cotingo, Amajari, Parimé, Itacutu, Taiano, and so forth.

Figure 11 shows an arbitrary breakdown of ranch sizes according to number of cattle possessed by each titled property for each major division. It is felt that this is more representative of the various scales of ranching than to show scale as being related to size of area stated in the owner's deed. Owing to the fact that fencing is rare and common grazing is still the rule, it is quite feasible for a fazendeiro to own perhaps 150 hectares of land but graze 1,000

head of cattle. The converse situation is also possible and does exist whereby a fazendeiro possesses a huge tract of land but grazes very few cattle. Of course the ideal way to spatially represent the distribution of cattle and ranches in a modern stock raising situation would be to combine size of landholding with number of cattle, but, to reiterate, the fact that cattle do roam largely at will over extensive areas would render this approach as being a misrepresentation of the actual situation in Roraima.

Cattle Breeds

Dating back to the origins of the introduction of cattle into the Roraima savannas in the 1790's, the predominant type of stock that has roamed the range searching for the precious little nutritional grasses for sustenance has been the crioulo (in Spanish, criollo) cattle. This semi-feral animal developed over the centuries in the Iberian Peninsula, as discussed in the opening passages of this chapter. The crioulos eventually were brought into the Amazon via Quito and Caracas by the Spaniards and by way of the Canary Islands, Madeira, Marajó and the lower Amazon Basin by the Portuguese. In Roraima the term crioulo is heard much less often than pe' douro, an appropriate name for these cattle which is translated literally as "hard foot."

To say that the pé douro is a rugged individual is indeed an understatement. Over the decades and now even centuries it has become immune to tick-borne disease. To survive in Roraima the pé douro, and for that matter any cattle, must endure periods of prolonged drought, severe flooding, and submit itself to foot-and-mouth disease, rabies, tuberculosis, etc. It is prey for the jaguar, the puma, a variety of venemous snakes, and the legendary piranha. The pé douro can stand being driven long distances over trails to river loading points without stopping for food and water. Finally, this creature has proven its ability to survive trips of 10 to 20 days on a crowded cattle boat bound for Manaus without taking in water or food. The pé douro has so many hardships to endure under the present methods of production that its meat is tough and stringy, its reproduction rate is low, and it is looked upon as the poorest quality beef cattle for commercial purposes. In this case, by no means is "survival" to be taken as being synonymous with "quality." (Figure 14)

During the early 1950's a few fazendeiros began to bring improved breeds of tropical cattle into Roraima to cross-breed them with their pé douro stock in an effort to improve the quality of the herd. As is typical of all of tropical Brazil, the improved breeds are those of the Gir, Nellore



Figure 14
Pé Douro Cattle

and Guzerat breeds of Indian cattle.

The Nellore (Indian Ongole) is attracting the attention of breeders more and more every day. (Figure 15) This preference for the Nellore is consistent with the functional viewpoint of the modern stock breeder and with attributes of this particular breed of beef cattle. Among the favorable attributes are vitality, early maturity, good weight and high meat yields, greater longevity, high fecundity and a preputial conformation which is less conducive to the development of acrobystitis under the extensive system of breeding which persists in Roraima.⁵² The Nellore are white in color, but the hump, the neck and parts of the head of the bulls are dark gray. The hide, which is fairly thick, is loose, elastic and bears fine hair.

The Gir is present in Roraima, but its popularity as a meat producer seems to have declined, and it is being regarded more as a dual-purpose (beef and dairy) breed. Williamson and Payne describe this breed in the following manner:

There are several points of conformation which easily distinguish this breed from all others; they are: the pronouncedly convex, broad forehead overhanging the eyes so that it gives a heavy-eyed appearance, very long pendulous ears running to a pointed extremity near which there is a notch, peculiarly curved horns and an



Figure 15

A Nellore Bull

excessively loose skin with a large low-hanging sheath in the males. The colour is often mottled red of varying intensity but is more generally white with clearly defined patches of red, brown or even black; roaning is not uncommon.⁵³

The Guzerat (Indian Kankrej) ranks third numerically in Brazil today as an improved breed, but over the years it has exerted a strong influence in mass cross-breeding. In fact, it was already present in Minas Gerais and Rio de Janeiro prior to World War I. Although inferior to the Nellore and Gir with respect to the conformation of its fore and hind-quarters, some of the fazendeiros maintain that the Guzerat excel in terms of early maturity and meat yield. They are large upstanding animals. The head is carried high and bears strong, lyre-shaped horns connected at the base with a very prominent crest. The color is steel gray, darkening to the extremities, but at birth it is russet.⁵⁴ The skin is fairly thick and very loose.

All three of these breeds tend to have loose skin and long legs, two favorable attributes for production under tropical wet and dry conditions. The increased surface area resulting from the loose skin, combined with the short sleek hair coat, enables the animals to eliminate body heat more rapidly than improved European breeds, thereby making these tropical breeds more heat tolerant. The strong, long limbs

of these beasts are requisites for covering great distances in search of sparse-growing, coarse fodder and water or trekking to river loading points or the Boa Vista market.

Beginning in 1962 and occurring as an annual event, Boa Vista has been the site for the Exposition of Animals and Economic Products (Exposição de Animais e Produtos Economicos) of the Federal Territory of Roraima. It is this exposition which serves as the primary vehicle for transactions between the fazendeiros of Roraima and the fazendeiros and cattle sellers of improved tropical breeds from such distant states as Bahia, Minas Gerais, São Paulo and Goiás, to name a few. Aside from this fair, cattle sellers travel to Boa Vista from these states throughout the year in an attempt to procure buyers in Roraima.

Most of the fazendeiros of Roraima are highly skeptical of purchasing improved breeding stock under present conditions, and rightfully so. All of the "glowing" reports about meat yield, reproduction rates, docility, etc., of Gir, Nellore and Guzerat are based upon data which pertain to cattle raised under very different circumstances from those in Roraima. Not only does the physical environment differ from place to place, but also such things as market conditions, transportation facilities and carriers, levels of capitalization and credit availability.

The immediate prospects for positive returns on capital inputs in Roraima ranching are very grim. Ranchers cannot export cattle to demanding foreign nations at the present time owing to their failure to eliminate foot-and-mouth disease. Short-term bank loans for ranch improvement are almost unknown and the interest rates on the few that are granted are phenomenally high. Access to their major domestic market, Manaus, is limited to two months out of each year because they must rely solely on the whims of the Rio Branco.

The purchase of the breeding stock is an expensive proposition and the risks of failure loom larger than the rewards in a venture of this nature, as is inferred by the hardships that pé douro must overcome merely to survive. Even though a fazendeiro pays the equivalent of \$10,000 U.S. for three bulls and 15 female Nellore,⁵⁵ his expenditures are just beginning. If he is to be successful in improving his rates of efficiency and productivity, he must also invest in fencing, seed of improved tropical grasses, feed supplement, equipment for a dependable supply of water, serums and medicines, building materials for a modern corral system, and the list goes on and on. This huge investment is made in spite of poor and incomplete market information, climatic uncertainty, lack of transportation, difficult and expensive access to materials and supplies, and perhaps most important,

to an absolute dearth of local technical research information.

Ranching Efficiency and Productivity

Livestock efficiency depends on several factors; among the significant ones are: carcass weight of meat (per animal slaughtered), slaughtering rate (number of animals slaughtered as a per cent of total cattle inventory), fattening rate (time required to achieve weight for slaughter), and reproduction rate (the proportion of calves born, less the mortality of calves up to one year of age, per dam per year).

Average cattle reproduction rates in Latin America reach a maximum of about 65 per cent in Argentina compared with over 85 per cent in the United States. In Uruguay the rate is 60 per cent; in Colombia, Venezuela and Brazil it is approximately 50 per cent.⁵⁶ For Brazil, as in most other Latin American nations, there is insufficient information available on the reproduction rate for the cattle population, but it is very obvious that this rate varies from one state or territory to the next.

The highest figures for calving rates in Brazil, 60 to 80 per cent, or even more, have been recorded on individual farms in São Paulo, Minas Gerais, Rio Grande do Sul, and Paraná. Compare this to the present calving rate in the

United States, which currently hovers around 90 per cent. The lowest birth rate occurs on the extensive ranches in the North and Northeast where most cows calve once in two years.⁵⁷

If the death rate among calves under a year old is subtracted from the birth rate, the rate of reproduction is obtained. The variations in the rate of reproduction from one state to another are even greater than for the calving rate, because of the unequal incidence of disease and causes of death among calves. In Roraima, where the death rate among calves is rather high (perhaps 15 to 20 per cent, or more), the proportion of weaned calves per 100 cows is only 40 to 50 per cent.⁵⁸ A high rate (about 72 per cent) is found on some of the stock farms of Campanha, Rio Grande do Sul, as the result of a high calving rate of 80 per cent and low mortality rate of 6 to 8 per cent.⁵⁹ Of course, the general situation for cattle production in Rio Grande do Sul is much more favorable than in Roraima.

The factors responsible for the very low reproduction rate in Roraima include late impregnation of the cows, widely spaced births, and a generally low level of reproductive efficiency, in conjunction with inadequate feeding, lack of minerals, inefficient management and the large number of diseases and pests to which breeding cattle are subject. These and other factors are considered in the subsequent

chapter on factors that limit production.

The Brazilian beef cattle industry as a whole is also very deficient with respect to the slaughtering rate, and is believed to have one of the lowest indices of livestock production for consumption. Brazil's average slaughtering rate of 10 to 11 per cent for the 12 years from 1949 through 1960 is far below the figures of 40 per cent in the United States, 39 per cent in New Zealand, 28 per cent in Australia and 22 per cent in Argentina.⁶⁰ Even within Latin America, Brazil's rate is exceeded by that of most other countries.⁶¹

Within Brazil the range of slaughtering rates in 1960 by geo-economic regions went from a high of 10.07 per cent for São Paulo, Minas Gerais and Rio de Janeiro to a low of 8.26 per cent for the states of Acre, Amazonas and Pará and the territories of Amapá, Rondônia and Roraima.⁶² The Fazendas Brazil Cattle-Raising Project report reveals an incredibly low slaughtering rate for Roraima.⁶³ For the triennium 1963-1965 the slaughtering rate for the Roraima herd was a mere 7.2 per cent. Broken down by year, 1963's rate was 6.1 per cent, 7.4 per cent for 1964, and in 1965 it rose to 8.0 per cent. This index of efficiency was actually a production rate based on the number of cattle slaughtered locally (i.e., in Boa Vista, Caracarai, and at the homestead), the number exported to other areas (primarily Manaus), and

the increase in the herd population, in relation to existing stock. These rates are perhaps somewhat underestimated owing to the fact that the exact number of cattle sent to other centers for consumption is not known, either because of incomplete records of animal movements, or because there are inter-state (and territory) movements that are not recorded.⁶⁴

The low slaughtering rate is a result of the late age at which the animals are usually sent to the abattoirs, which for steers is generally somewhere between four and five years, cows seven to eight years. In areas where cattleraising is really efficient and productivity is high, cattle are slaughtered at an early age, and, consequently, the slaughtering rates are high. In the United States, for example, steers are prepared for slaughtering at the age of from one and a half to two and a half years.

Probably the most adequate indicator of the level of yields is the meat production per animal (total weight of production divided by total number of the herd). This measure combines the carcass weight (meat yield per animal slaughtered) and the slaughtering rate. Beef production per head of cattle has averaged less than 30 kilograms (66 pounds) for Latin America as a whole, with little increase over the pre-World War II level. The ratio is 45 kilograms

(99 pounds) in Australia and New Zealand, and well over 70 kilograms in the United States and the intensive stock-farming countries of Western Europe.⁶⁵

Within Latin America, Argentina's yield of more than 50 kilograms per animal in the total herd far exceeds that of any other country in the region, is about 10 kilograms higher than New Zealand's average, and is also somewhat above the Australian level. Uruguayan yields are a few kilograms over the regional average, yields in Venezuela are less than half and Brazil produces only about 20 kilograms per animal.⁶⁶

Grunwald and Musgrove point out that over the past few decades meat yields have not increased in Brazil.⁶⁷ During the periods 1934-38, 1945-50, 1954-57, 1958-61 and 1962-65, the meat yields per head were 20.2, 20.8, 19.6, 19.7 and 17.1 kilograms respectively.

As expected, the 1960 agricultural census in Brazil revealed wide regional disparities.⁶⁸ The North yielded a mere 12.1 kilograms per head as compared with 13.9 for the Northeast and the eastern part of the North, 19.7 for the stock-farming area of central Brazil and 19.0 for the Far South.⁶⁹

By using the information from the Fazendas Brasil's Cattle-Raising Project proposal, it was possible to compute the meat yield per head of Roraima's herd for the 1963-65

triennium. The resultant figures were very low, but the author strongly suspects that the actual yields are somewhat higher. Using official data recorded by the Inspetoria Regional de Estatística⁷⁰ and the Ministry of Agriculture, both in Boa Vista, the following results were obtained: 1963, 9.6 kilograms per head; 1964, 10.9 kilograms; 1965, 12.8 kilograms.⁷¹

This chapter has been devoted to a discussion of the evolution of ranching on the savannas of Roraima, against its historic background and the geographic setting. The types of cattle introduced and the gradual growth of an extensive beef cattle industry with an extremely low level of production are discussed in depth.

The development of this remote, isolated ranching area still lags far behind that of other areas of Brazil, and in the rest of the world. Roraima is a frontier area par excellence, both technologically and geographically. The chapters that follow will bring into focus the cultural and technological lag that characterizes the remote interior of Roraima, a kind of seventeenth century manorial outpost in the modern world.

NOTES

¹See, for example, the classic article by Charles J. Bishko: "The Peninsular Background of Latin American Cattle Ranching," Hispanic American Historical Review, XXXII (1952), 491-515.

²Bishko, p. 494.

³For both of these areas, studies on this topic are still sadly lacking. Perhaps herein lie future doctoral dissertations for historical geographers.

⁴The first two stages are contained in a passage from Bishko:

Cattle were raised almost everywhere in medieval Europe, for their dairy products--milk, cheese, butter; as draft animals--i.e., the indispensable ox; and for their meat, tallow and hides. Such cattle were either a subordinate element in manorial crop agriculture, in which at best peasants might own a few cows and a yoke or two of oxen; or they were bred, e.g., in certain parts of Normandy, Wales and Ireland, on small dairy or feeder farms. p. 493.

⁵Just why medieval Castile and Portuguese Alentejo became the sites of this widespread ranch cattle industry is an extremely complex question which passes beyond the scope of this dissertation. However, Bishko presents a succinct summary related to this query which will eventually shed light on the beginnings of ranching in Roraima. The really decisive factors determining the development of medieval Iberian cattle ranching appear to have been four in number, all of them native to the Peninsula:

1. the presence, as in almost every phase of medieval Luso-Hispanic life, of numerous

active, enterprising and ambitious individuals, many of whom were already familiar with Humid Crescent pastoralism and swiftly realized the broader opportunities presented by the conquest of the meseta grazing lands. Whether nobles, churchmen or towndwelling ganaderos, such men were the first true prototypes of the cattle ranchers of the Indies.

2. The transformation imposed upon Castilian and Portuguese agriculture by the frontier advance from northern, rainy, good-soiled "European" conditions onto the subhumid plains of the meseta (Koppen BS; Thornthwaite DB'd, DB's), with their scarcity of water, poor soils and predominantly matorral-type bush vegetation (the monte bajo of the stockman)--an environmental change that affected medieval Iberian life as radically as, in the view of W. P. Webb, occupation of the Great Plains did American. Extremes of aridity and deficiencies of browse restricted cattle ranching chiefly to the western half of the meseta; Aragon was always strong sheep country, and in eastern New Castile, i.e., La Mancha, cattlemen were relatively few.
3. The Reconquista, which for centuries created frontier areas on the meseta where Christians and Moors often raided or fought; where the population huddled in large, widely spaced towns separated by despoblados; where rural labor was scarce and crop-farming hazardous; and where cattle and sheep, being mobile and little demanding, had obvious advantages. Royal colonization policies, with their predilection for large seigneurial and municipal grants, further accentuated pastoral trends.
4. The special breed of cattle that developed on the meseta and the Andalusian Plain, cattle unique in medieval Europe. Moorish strains, as already observed, never became prominent; some North African stock was brought in, but

these were, as the reference to them in Cabeza de Vaca shows, the brown Atlas shorthorns still found in Morocco, and not to be confused with the native breeds of the Peninsula. Bishko, pp. 496-97.

⁶The specific topic of Spanish and Portuguese land grants in the New World is one which is complex, large, and varies from one colonial territory to the next. However, much insight into this topic can be gained from reading still another classic. See Duvon C. Corbitt: "Mercedes and Realengos: A Survey of the Public Land System in Cuba," Hispanic American Historical Review, XIX (1939), 262-285.

⁷Waltér Prescott Webb, The Great Plains (Boston: Ginn and Company, 1931), p. 393.

⁸The work of Virginia Rau, Sesmarias Medievais Portugêsas (Lisbon: Bertrand, 1946), is an outstanding example that the Portuguese, as well as the Spanish, were very perceptive on the matter of associating land use with the physical environment and the size of the grant.

⁹Sandra L. Myres, The Ranch in Spanish Texas, 1681-1800 (El Paso, Texas, 1969).

¹⁰Myres, p. 21. In Texas the smaller grants included a solar, or town lot; a labor, approximately 177 acres, a unit for farming similar to the Anglo quarter-section or 160 acres; and a caballeria, approximately 100 acres. These types of grants were used for farming or for small stock-farms, and they were common in East Texas and along the rivers. The larger stock-raising grants were of three types, each called a sitio: (1) the sitio de ganado mayor, for large animals such as cattle, horses, mules, and burros; (2) the sitio de ganado menor, for smaller animals such as sheep, goats and hogs; (3) the sitio de criadero de ganado mayor, for the cattle breeder. The large stock ranch contained approximately 4,336 acres; the small stock ranch, 1,920 acres; the cattle-breeding ranch, 1,084 acres. In Texas the sitio de ganado mayor was frequently referred to as a "league," meaning a square league or 4,428 acres. Live-stock owners generally applied for two or three sitios at one time and they frequently purchased or leased additional land. Corbitt, op. cit., also gives a somewhat detailed account of the various types and sizes of land grants in colonial Cuba.

¹¹George M. McBride, The Land Systems of Mexico (A.G.S. Research Series No. 12), (New York: A.G.S. 1923), 105-11.

¹²It should be noted that in the nineteenth century Anglo cattlemen adopted a somewhat similar system of common pasture or open range. Hemmed in by restrictions imposed by Eastern legislatures, the Western stockman frequently filed on the section of land available to him under the law and then turned to open grazing or "free grass" to feed his stock and carry on large-scale ranching activities.

¹³In Spanish Texas these outlying garrisons were known as presidios.

¹⁴Myrés, p. 54.

¹⁵A rather lengthy account of this is deemed necessary by the author because the overwhelming majority of Roraima's ranchers, and for that matter the entire population, have come from the Northeast. That regional customs, pride and methods of ranching originating in Maranhão, Ceará, Rio Grande do Norte, Piauí, Pernambuco, Alagoas, Paraíba and Sergipe have been transplanted to Roraima is very obvious, even to the casual observer.

¹⁶Cartas de sesmarias. These charters and the process of granting them closely parallel Spain's merced grants. The charters evolved during the Reconquest in the Iberian Peninsula. The origin of the term sesmaria and the eventual formulation of the Law of the Sesmarias is carefully documented in the work by Virginia Rau, Op. cit., pp. 35-41 and 61ff.

¹⁷Renan Monteiro Soares, Aspectos Sociológicos da Pecuária Nordestina (Recife, 1968), p. 24.

¹⁸Soares, p. 24.

¹⁹However, this did not preclude the possibility of property conflicts resulting from the depth of the possessions away from the watercourses.

²⁰Contrary to the case of the adventurers who roamed through Brazil looking for mineral wealth and people to exploit and then withdrew, the vaqueiro, in a manner similar to the English colonist in New England, permeated the sertão with the finality of creating fazendas and living there with

his family. Always having with him from two to four helpers (fabricas), the vaqueiro was the man charged with the responsibility of running the fazenda. According to the carrying capacity, a fazenda had to have two or more vaqueiros. As payment for his work, the vaqueiro received, besides the necessary items for minimum subsistence for the family, one head of livestock out of every four that had been born. This was the quarteação. Even though this payment was realized once every five years, with two or three payments the vaqueiro was able to establish the beginning of his own ranch on land rented from the large landowners.

²¹Soares, p. 47.

²²Ibid.

²³Arthur César Ferreira Reis, Épocas e Visões Regionais do Brasil (Manaus, 1966), p. 181, fn.

²⁴J. Lucio de Azevado, Os Jesuítas no Grão-Pará (Rio de Janeiro, 1938), p. 260, fn. 1.

²⁵Mendonça Furtado was the brother of the Marquis of Pombal (Sebastião José de Carvalho e Melo), the powerful prime minister of José I. The Marquis of Pombal ruled the Portuguese Empire practically as a dictator from 1751 to 1777.

²⁶Anísio Jobim, Três Municípios Amazonenses (Manaus, 1965), pp. 13-20. It was decided that two expeditions would meet in the interior, the Portuguese advancing up the Amazon to the Rio Negro and the Spanish were to enter from Venezuela by means of the Orinoco, at the mission of Mariuá (Barcelos) on the Rio Negro. In the year 1754, Mendonça Furtado arrived at this sad, run-down little village with a party of nearly 700 men, consisting of troops, scientists, chaplains and servants. To receive the Spanish in style, Mendonça Furtado ordered the restoration of Mariuá which had suffered extensive loss of life and property during General João Maia da Gama's campaign against the Jesuits. During the wait for the arrival of the Spanish party, the Portuguese constructed a palace, barracks, houses, bridges over the creek which passed through the village, and a wharf. The Spanish commission never arrived and Mendonça Furtado returned to Belém after a three-year wait.

²⁷The Royal Letter (Carta Regia) of the Creation of the Captaincy of São José do Rio Negro was issued by King José I

on 3 March 1755. In that letter, Francisco Xavier de Mendonça Furtado, Governor and Captain General of Grand Para and Maranhão, was ordered to establish a captaincy which was to contain the area which today consists of the State of Amazonas and Federal Territory of Roraima. It was not until 6 May 1758, however, that this new captaincy came into existence. The official letter and its fascinating details can be found in: A Amazônia na Era Pombalina, II (Subtitle, Correspondência Inédita do Governador e Capitão-General do Estado do Grão-Pará e Maranhão, Francisco Xavier de Mendonça Furtado, 1751-1759) (Instituto Histórico e Geográfico Brasileiro: São Paulo, 1963), pp. 652-655.

²⁸Jobim, p. 19.

²⁹Arthur Cézár Ferreira Reis, A Amazônia Que Os Portugêses Revelaram (Manaus, 1956), p. 41.

³⁰Antônio Teixeira Guerra, Estudo Geográfico do Território do Rio Branco (Biblioteca Geográfica Brasileira, Serie A "Livros," NO. 13, Rio de Janeiro: Instituto Brasileiro de Geografia e Estatístico, Conselho Nacional de Geografia, 1957), pp. 126-127.

³¹Prior to the founding of the Carmelite missions, the indigenous population avoided the savannas and instead, inhabited the forests and mountains.

³²This was Dr. Araujo Lima in: Guerra, p. 168.

³³André Fernandes de Sousa, "Notícias Geográficas da Capitânia do Rio Negro no Grande Rio Amazonas," Revista do Instituto Histórico e Geográfico Brasileiro, X (1848), 456.

³⁴Reis, A Amazônia Que Os Portugêses Revelaram, p. 50.

³⁵Guerra, p. 169.

³⁶H. A. Coudreau, Voyage au Rio Branco, Rouen, 1886, pp. 24-25.

³⁷Guerra, p. 197.

³⁸Coudreau, p. 25.

³⁹The author spent many laborious hours diligently searching for information on this topic in libraries in

Manaus, the University of Florida, the University of Illinois (which has the most complete holding of Brazilian materials in the United States), private collections of contacts in Manaus and Boa Vista, and this effort was frustrating and woefully unproductive.

⁴⁰Jacques Ourique, O Vale do Rio Branco (Manaus, 1906), pp. 14-15.

⁴¹Lopes Gonçalves, O Amazonas, Esboço Histórico, Chorográfico e Estatístico Até o Anno de 1903 (New York, 1904). See Appendix for the legal details of the Amazon Homestead Act.

⁴²Guerra, p. 185, f.n. 133.

⁴³Ibid.

⁴⁴Unpublished report entitled "Ministério da Agricultura, Campanha Contra A Febre Aftosa, Levantamento das Propriedades e Regiões" (Boa Vista, Roraima, 1968). This special census was taken to aid government veterinarians in planning a systematic approach to the eradication of a very serious epidemic of aftosa.

⁴⁵Coudreau, p. 25.

⁴⁶Guerra, p. 196.

⁴⁷Gonçalves, p. 85.

⁴⁸Ourique, p. 20.

⁴⁹Mario Guedes, Os Seringais (Rio de Janeiro, 1920), p. 108.

⁵⁰Avelino Inácio de Oliveira, "Bacia do Rio Branco," Boletim do Serviço Geológico e Mineralógico do Brasil, XXXVII (1929), 20.

⁵¹Divisão de Produção, Terras e Colonização will hereafter be cited as D.P.T.C.

⁵²United Nations, Economic Commission for Latin America and Food and Agriculture Organization Joint Publication, Livestock in Latin America, Status, Problems and Prospects, II, p. 14. Hereafter cited as Livestock in Latin America.

⁵³G. Williamson and W. J. A. Payne, An Introduction to Animal Husbandry in the Tropics, Second Edition (London: Longmans, Green and Co., Ltd., 1965), p. 150.

⁵⁴Ibid.

⁵⁵During many of the conversations and interviews with fazendeiros, vaqueiros and capatazes, the author received replies which were quite obviously given to impress upon him the very high level of efficiency and productivity a given ranch had achieved as opposed to neighboring ranches. However, among the many there were a few fazendeiros who were very objective and were willing to reveal what precious little reliable financial and other personal information the author was able to obtain. In exchange for this information, the rancher's name and the location of his land shall not be stated. The cost figure equivalent to \$10,000 U.S. was a result of a purchase made at the Eighth Exposition of Animals and Economic Products of the Federal Territory of Roraima in February 1969.

⁵⁶J. Grunwald and P. Musgrove, Natural Resources in Latin American Development (Baltimore: Johns Hopkins Press for Resources for the Future, 1970), p. 411.

⁵⁷Livestock in Latin America, p. 25.

⁵⁸Personal interview with Amazonas Brasil, March 1969.

⁵⁹Livestock in Latin America, p. 25.

⁶⁰Ibid.

⁶¹It should be kept in mind, however, that the maximum slaughtering rates are registered in countries where the slaughtering of calves is high because of the practice of milking without calf.

⁶²Livestock in Latin America, p. 65.

⁶³Brazil and Lins, p. 25.

⁶⁴This raises the soul-searching problem of how to treat the subject of illegal movement of commodities, i.e., smuggling. It is a well known fact that contraband abounds in Roraima, owing to its proximity to Guyana and Venezuela

and its isolation from the rest of Brazil. High-value, low-bulk items, such as gold, diamonds and whiskey are the most legendary, but cattle have been known to "show up" in Georgetown or Manaus without records as to how they arrived. Highly confidential sources revealed to the author that in some years the size of unrecorded cattle movements tends to be "very substantial," i.e., in the thousands.

⁶⁵Grunwald and Musgrove, p. 422.

⁶⁶Ibid.

⁶⁷Ibid.

⁶⁸Livestock in Latin America, Brazil, p. 65.

⁶⁹The North includes Rondônia, Acre, Amazonas, Roraima, Pará and Amapá. Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe and Bahia comprise the Northeast and the eastern part of the North. The stock-raising area of central Brazil consists of Minas Gerais, Espírito Santo, Rio de Janeiro, Guanabara, São Paulo, Paraná, Mato Grosso and Goiás. The remaining two states, Santa Catarina and Rio Grande do Sul, make up the Far South.

⁷⁰The Inspeção Regional de Estatística is a subdivision of the Instituto Brasileiro de Estatística which in turn is a part of the Fundação do Instituto Brasileiro de Geografia e Estatística.

⁷¹If the number of cattle which "left the Territory" unrecorded were taken into consideration, the meat yield might be a small amount higher. It also appears that the special cattle census taken in late 1967 for the campaign against aftosa contains very large numbers of estimates. For example, upon observing the lists of propertied ranches, many of them show herds of 100, 200, 300, 400, etc., as opposed to more precise counts such as 113, 247, 371, 453, etc. The author suspects that some of the estimates are high while others are low. At any rate, Roraima is the rule rather than the exception. If adjustments were made for all states and territories, Roraima's present position of having one of the lowest meat yields in a country whose national average meat yield is far below many of its Latin neighbors and certainly the technically advanced nations would not be substantially altered.

CHAPTER VI

FACTORS THAT LIMIT PRODUCTION

There are a number of direct and indirect causes of the low yields and low productivity in the ranching industry of the Roraima savannas. On the one side there are the factors relating to type of soil and environmental conditions, and on the other the quality of the livestock, the technical level on the ranches and the type of ranch administration. For the most part, this section deals with factors relating to production itself that are subject to control by the fazendeiro or capataz, unlike the other group of factors such as credit, market conditions, etc., which, although they definitely have a limiting effect on production, cannot be changed through independent action by the fazendeiro.

Inadequate feeding, animal diseases and pests, problems with respect to breeding techniques, the type of land tenure system and inefficient ranch management--all these main obstacles to the development of the ranching industry in Roraima can be more or less successfully dealt with by the fazendeiro himself. Although, of course, these problems are interrelated,

for the purpose of getting these rather negative aspects more clearly into focus, each will be discussed separately.¹

Inadequate Feeding

Seasonal forage shortages. The scarcity of forage due to climatic factors, in conjunction with technical and managerial deficiencies, results in a low carrying capacity for the range and low cattle density per unit of land grazed.² While there are no precise data available on the losses suffered every year by the ranching economy of Roraima as a result of seasonal forage shortages, a rough estimate can be made that will indicate the magnitude of the problem, at least with respect to cattle production. The North as a whole exhibits the highest average loss of live weight per head in Brazil, estimated at 50 kilograms (110 pounds) in 1963.³ This estimate is made on the basic assumption that three months of the year is the average period for which pastures and ranges are very bare. Considering the fact that the climatic regime of the upper Rio Branco is marked by eight months of a distinct lack of precipitation and forage is insufficient for a period far surpassing three months, the estimated 50 kilograms of annual live weight loss is, in all likelihood, too conservative. There are few who would refute the statement that at the end of the dry season the skeleton

of a steer weighs more than the meat. /

This loss of weight means a loss of potential and real income to the fazendeiro. To make matters worse, the seasonal forage shortage brings about additional costs entailed by the refattening and reconditioning of cattle, a higher rate of death and a low reproduction rate during the long dry season. In view of all of these problems it must be remembered that in the overwhelming majority of cases the cattle are left grazing on the savannas right up to the moment of sale.

Range and pasture problems. The absence of sub-division on range land is a common problem throughout Latin America and is highlighted by the situation in Roraima. Primarily, it is due to the fazendeiro's preference for grazing his herds on large tracts of land, and although this eliminates certain watering problems, the lack of barbed wire fencing in handling the stock leads to the deterioration of the land through continuous and heavy grazing. With few fenced pastures it is obviously impossible to have pasture rotation; it is equally impossible to separate cattle by groups or categories, to provide a variety of pastures suitable for different seasons, to make intensive use of pastures or to let them lie fallow when necessary.

This is not to say that fencing is virtually unknown in Roraima, for indeed there are fazendeiros who have invested capital and labor in constructing barbed wire fences. Nevertheless, taken as a whole, fencing is still in the formative stages. The barbed wire itself is extremely expensive, mainly because of the high cost of transportation. For example, in the mid-1960's the average price for the wire in the United States was \$10.50 per roll, whereas in Brazil the price was \$15.00.⁴ However, the price paid by the fazendeiro in Roraima was at least double the national average owing to the high cost of inefficient transportation over great distances.

The primitive state of ranching affairs is shown by the fact that if all owners were suddenly to invest heavily in fencing and posts so that all properties could be fenced and sub-divided, thousands of cattle would surely perish within the first few months of the dry season. During the dry season there are many properties which do not have water supplies suitable enough to maintain even one steer or cow. In other words, the introduction of fencing on a grand scale is not, in itself, the key to modernization. If investment in fencing is to be a beneficial move, the fazendeiro must, at the same time, secure an assured water supply, he must plant improved tropical pasture grasses, he must

construct cattle dips or sprays, build a modern, strong corral with a crush (or chute), educate himself or his manager in the skills required for maintaining quality pastures, rotating and sorting the herd, recognizing and treating diseases, and so on. The list is long and expensive. In view of the primitive nature of the market structure and the prevailing low prices for beef, over which no single fazendeiro can exact control, capital investment in such an essential and elementary item as fencing is not considered to be a frugal move, even at the present time.

Not only is the procurement of wire for fencing an expensive proposition, but the problem is magnified by the difficulty of manufacturing and transporting fence posts. Many fazendas are located where wood suitable for use as fence posts is not directly available, i.e., the properties consist of open savannas or contain small trees not suitable for posts, and thus wood for posts often must be transported from distant sources. Furthermore, tools such as power saws, with which to make cheap, sturdy posts, are sadly lacking. Treatment of posts to prolong their life is also too expensive at present; hence, posts fall prey to termites or are consumed by fire from the burning savannas.

There are a few brave souls who have proceeded with the construction of fencing, but, for the most part, to say that

a fazenda has been completely cercado (fenced) simply means that a fence has been installed around the outer edges of what the owner believes to be his property boundaries. Within that area the cattle still graze at will on natural grassland.

Excluding the small-scale invernistas, there is evidence of a change in attitude among fazendeiros with respect to fencing, but it is based upon high risks and the future. Fazendeiro "J," for example, purchased a clear title to 5,600 hectares of land in 1967.⁵ The land itself contained a house (of sorts), which had no electricity, refrigeration, etc., but the land was not fenced, it had no cattle and about one half the area was heavily forested. For "J," ranching is not his primary occupation. Capital accumulated in non-ranching activities has been invested in large amounts in material inputs for his fazenda. His is probably the only large fazenda in Roraima which has been completely fenced and sub-divided; 35 miles of three-strand barbed wire fencing have been constructed. On his fenced-in land he is experimenting with various tropical pasture grasses such as capim colônião (a paspalum grass, P. densum), gordura (guinea grass, Panicum maxicum) and elefante (Napier grass, Pennisetum purpureum), to be used as pasture for his recently purchased Nellore stock. Water is available in the fenced

area. All of this investment is based on his faith that in the future he will be able to export his improved beef to Venezuela and Guyana or that the domestic market will improve to the point of his making a return on his investment. For those whose only source of income is ranching, this course of action cannot be taken; it is too dear, too risky.

Grazing "systems" are described at best as rudimentary. Since edible forage is found only in small, scattered locations, the cattle do not graze in large herds. In many cases the cattle wander across the savanna completely unattended in search of water and forage which they usually find in the campos de baixada. In the higher areas water is in extremely short supply and the grasses tend to be very tough and fibrous owing to repeated burnings.

Groups of cattle are moved by vaqueiros in response to flooding during the wet season and depletion of grass and water during the dry season. During the times when it is deemed necessary to move cattle to different grazing areas, the scene most commonly observed is that of two vaqueiros on horseback guiding a group of 50 to 100 scrawny cattle slowly across the savanna. As the cattle graze extensively throughout a given year, it is said that the vaqueiro is the overseer who sees very little. The only thing of importance to him is knowing how many cattle have died.⁶

While the previous statement is rather drastic, it is not far from the plain truth. In addition to observing the cattle, the vaqueiro will occasionally take a newly born calf and its dam back to the ranch headquarters where the pair can be protected and cared for so that their chances for survival will be greater than if they were left to fend for themselves on the open range (which they often are). However, often times the cattle graze at such great distances from the sede da fazenda that this practice is not feasible. Then too, quite frequently the vaqueiro does not find the calf and dam just after birth has occurred and the calf dies from the extremely harsh conditions of the savanna which greet it as it enters the world.

Since the cattle do graze at great distances from the ranch headquarters, it is the established practice for one or two vaqueiros to maintain a retiro, a grazing area far from the sede da fazenda which has a crude shelter for the vaqueiro.⁷ For months on end the vaqueiro may be away from the ranch headquarters keeping watch over the cattle, trying to prevent them from wandering on into the forest where the cattle become very difficult to retrieve and eventually become wild.

Thus, in a country where even the best areas of grazing can support only 20 head of cattle to the square mile (32

acres to every animal) and under normal conditions where the carrying capacity is only one head to 60 or 70 acres, the old "open range" grazing system still prevails.⁸ Once a year, or even biennially, depending upon the decision of the fazendeiro or the capataz, the cattle are rounded up for breeding and steer selection by vaqueiros on horseback. The roundup (campear) is an event of major excitement in this lonely outpost of civilization. Besides the vaqueiros from the fazenda which is carrying out the roundup, the fazendeiro is aided by cowboys and owners of neighboring fazendas.⁹

During the past 50 years there have been sporadic attempts to introduce artificial pastures of improved tropical grasses into the ranching industry of Roraima, but the extensive type of grazing on the natural pastures still prevails. When Hamilton Rice passed through this area in 1926, he observed that on the fazenda of São Marcos there were open fields of capim colônião (P. densum), gordura (Panicum maximum), and elefante (Pennisetum purpureum) where cattle were grazed during the wet season.¹⁰ Upon the visit of Antônio Teixeira Guerra to the same ranch in 1954, there were no vestiges of these grasses.¹¹ The 1950 census shows that Roraima's grazing lands contained 99.7 per cent natural pastures and a mere 1,475 hectares (3,643 acres), or 0.3 per cent, of artificial pastures.¹² The 1960 census reveals a

slight upswing in the percentage and absolute area of planted pasture, 12,485 hectares (30,738 acres), or 1.8 per cent, but this is still a trifle.¹³ Furthermore, much of the increase of improved pasture is accounted for by the increase in the number of individuals who are small-scale *invernistas* whom the *fazendeiros* regard as mere dilettantes.

The obstacles to the successful implementation of improved pastures are enormous. Aside from the fencing problem already discussed, the practice of burning the savannas is a primary source of difficulty with respect to a whole host of factors necessary for improved production, among them improved tropical grasses. According to government officials, agronomists, and some *fazendeiros*, fire is the scourge of the savannas.

The practice of burning the savannas preceded the arrival of Europeans as it is claimed that the various groups of Amerindians had fired the grass to aid them in the hunting of wild game. Ranchers adopted the practice to facilitate their cattle-raising activities. The burning of the savannas has been a feature of ranching since the inception of the latter activity in the late eighteenth century. Henry Coudreau, upon passing through the Roraima savannas during the dry season of 1884-1885, was most impressed with the burning practice as is evidenced by the fact that he devoted

a beautiful passage of his book to "the fire" (incêndio) of the savanna. He states, "At night, whether on the road or in some maloca where by chance we had stopped, I was amazed to see, for hours on end, the burning campo. Ah! It's a beautiful spectacle, that burning prairie at night."¹⁴ Even today in Roraima it is indeed an eerie and beautiful sight to see the savanna burning out of control far in the distance on a clear, star-studded evening, but the effects of this pyrotechnic display are not at all conducive to improved production. In fact, the long-term effects of repeated burnings is the virtual destruction of the vegetation cover. However, in the eyes of those fazendeiros who base their practices on tradition, the burning of the savanna is justified. They have observed through time that the grasses and sedges in the lavrados (low spots), if allowed to grow continuously, become tall, thick, fibrous, and undesirable for cattle forage. Since this also occurs on the elevated areas and to an even greater extent, the cattle are left with precious little to eat. If, on the other hand, these grasses are burned, soon after tender young shoots sprout forth and are devoured by the ravenous cattle. The proper time to burn to achieve this effect is shortly before the onset of the wet season.

Unfortunately, through ignorance or the eagerness to

achieve gains over a short period of time, many ranches burn pastures several times each year, totally oblivious to the fact that they are reducing what little nutrition there is in the few palatable grasses available for grazing. Among other things, the phosphorus content of the soil and the vegetation is noticeably reduced by repeated burnings. In time, fire destroys the grass and scorches the soil, causing the death of micro-organisms which are responsible for the nitrogen fixation of the soil and the aeration (ventilation) of the active part of the vegetation layer.¹⁵ When the grass is burned after the rainy season has begun, the burned grasses do not retain any nourishment during the very severe months of the dry season and little by little the patches of burned land are transformed into a rather bleak landscape of worthless sandy areas, devoid of any vegetation. (Figures 16 and 17)

Firing the grass to enhance its palatability is not the only justification for resorting to this practice. Two factors that contribute significantly to the high mortality and morbidity rates of livestock in Roraima are the presence of the carrapato (tick) and the venemous cobra (snake). In spite of the fact that a fazendeiro may be fully informed as to the detrimental effects of burning, he may be forced by an economic necessity to burn as the lesser of several



Figure 16

The Savanna Landscape After Repeated Burning

The slightly elevated areas contain sandy soils which gradually become worthless and devoid of vegetation after several burnings.



Figure 17

Uncontrolled Burning in the Heart of the Dry Season

evils. Owing to the primitive nature of the marketing and production systems, it is economic suicide to invest in such things as cattle dips, sprays, and pesticides. At the time of the author's field investigations (1968-1969), there were virtually no cattle dips or sprays and the use of pesticides and herbicides to rid grazing areas of insect and reptile pests and toxic plants were also unknown in these savannas. The method to achieve these ends is simply to put a match to the grass once every two or three years just before the rains begin in late April.

Those individuals who represent various agencies of the government, those who represent the interests of a ranching cooperative, and many fazendeiros, all whose interest lies in the improvement of ranching in Roraima, will readily admit that this practice of burning--counterproductive in the long-run--must be stopped. But the question is how? One other point about the fires has been omitted thus far in this discussion. Very often a fire burning out of control on a fazendeiro's land is not set intentionally, but instead is born out of the careless discarding of a lighted cigarette by a passing traveler! Suppose a certain fazenda has invested capital, labor and time toward fencing and planting improved tropical grasses and has purchased improved cattle for breeding and upgrading the herd. A three- or

four-strand barbed wire fence does not stop fire. In an uncontrolled range fire the fence posts are consumed, the improved grass is ruined and the improved livestock is destroyed! The very real threat of fire looms as a major obstacle to development. What is needed is a highly coordinated effort on the part of everyone who lives in or passes through these savannas to stop setting fire to the grass. At the same time, a suitable alternative must be found to handle the problem of ticks and snakes. This tremendous task must be carried out in an area where communication in general is extremely difficult, the location of the decision-makers (owners or managers) is highly dispersed, and jealousy, suspicion and mistrust of one's neighbors characterize many of the personal relationships among residents there.

Diseases

Roraima's ranching industry suffers heavily from losses caused by the more common infectious and parasitic diseases. There is an urgent need to increase veterinary prophylactic campaigns and control of the infectious and parasitic diseases that cause the highest mortality. Contrary to general belief, the person directly responsible for the care of the cattle in Roraima knows little about the nature of what are

generally referred to as "pests" or how to control them. What is even more serious, he is usually reluctant to take the systematic measures that are needed to prevent diseases or reduce their incidence. There is no doubt that most ranchers resort to the veterinary or the official technical assistance services in this field only when their animals are already being decimated by an epizootic (animal epidemic) disease or by pests.

Infectious and contagious diseases. The most dreaded enzootic disease, raiva (rabies), is known to be transmitted by the vampire bat of the species Desmodus rotundus. Raiva was first identified in the Territory in 1931, although it most certainly was present there before that year, and it is this disease, more than any other, which has been responsible for the wild fluctuation of Roraima's total herd size. (See Table 4, page 97) This disease has killed tens of thousands of cattle in as brief a period as a single year. Clinically, raiva has two characteristic appearances--as a paralytic form and as a form of madness. The majority of the cases in Roraima are of the paralytic type, but a few cases of madness have also been reported.

Rabies first becomes noticeable in cattle by disturbances in the digestive system, accompanied by a loss of appetite, irregular chewing of the cud, dried up stools, and clear,

stringy drivel running from the mouth to the ground. Soon the first signs of difficulty in walking appear and the standing animal has a posture which differs from unaffected cattle. As a rule, paralysis occurs in the hind legs, but there have been a few instances where the front quarters have become immobilized. In both forms, paralysis and insanity, death usually occurs approximately seven days after incubation.

The savannas of the Alto Rio Branco, in addition to suffering dramatic losses of cattle from rabies, also have been the scene of countless frustrating attempts to eliminate aftosa (foot-and-mouth disease). Although foot-and-mouth disease does not in itself have a high mortality rate, it is properly regarded as an acute disease which causes great economic losses to the ranching industry. In ordinary mild epizootics the mortality rate among affected cattle is only about 5 per cent, and malignant forms of the disease have resulted in nearly 50 per cent losses. Great losses in weight often occur in the surviving animals because they are unable to eat. In surviving milk-producing animals the flow of milk is sharply curtailed. Mastitis and abortion are common. Secondary infections are frequent, especially around the feet. The failure of all efforts to eradicate aftosa here stands as a major obstacle to the distinct possibilities

of reaching new foreign markets such as Venezuela, Guyana and Surinam.

What does the fazendeiro do to combat these infectious and contagious diseases? By and large he folds his arms, assumes a philosophical attitude, and allows his cattle to die one by one to the point where periodically many fazendeiros are completely "wiped out!" The problems which confront any control campaigns are multiplied by Roraima's position of geographic isolation, reinforced by the lack of both external and internal lines of communication and transportation. Even though the federal government has offered, free of charge, the services of veterinarians and their trained assistants to aid in the vaccination of animals, these two diseases continue to be endemic, largely unchecked and unabated, inflicting tremendous losses.¹⁶

While it is true that qualified technical assistance is available, the fazendeiro must bear the responsibility and cost of procuring the necessary vaccines. For the great majority of the ranchers, vaccinating the cattle as a prophylactic measure is economically unsound. Fazendeiros have found, through years of experience, that it is more beneficial to endure the risk of rabies at no cost than to spend what precious little capital they might have to vaccinate their cattle and then experience a year when there are no

outbreaks of raiva, even among the unvaccinated cattle. However, if they choose not to vaccinate as a protective measure and rabies do strike their cattle, they are in big trouble! It may require a given fazendeiro or capataz anywhere from several hours to two days to reach Boa Vista simply to inform the proper parties within the Ministry of Agriculture that his cattle have been afflicted and to enlist their aid in inoculating the remaining unaffected cattle. At the same time the rancher must make arrangements to acquire the necessary vaccine, which in itself is a major undertaking.

Throughout Brazil there is a scarcity of vaccine and it is available at only a few widely scattered points. For the ranchers of Roraima, the nearest source is the Instituto de Pesquisas e Experimentação Agropecuária do North (IPEAN) in Belém, Pará. To send an order, arrange the finances, and transport the serum, anywhere from 10 to 14 days may elapse. By the time the trained manpower and the vaccine arrive at the fazenda most of the herd is dying or already dead. To make matters even worse, the vaccine must be kept at temperatures far below those of a tropical environment. This requires special handling during transport which, of course, increases the procurement cost. Once the vaccine arrives at Boa Vista, there is a good chance that spoilage will occur before it can

be utilized. The special cattle census, taken in late 1967, included a numerical tabulation of available key facilities such as corrals, crushes, landing strips for airplanes, etc. Of 760 total properties there were only 60 refrigerators. These are kerosene refrigerators and, as this observer personally noted, many of them are inoperative at the present time. Thus, that which is a reasonably simple matter in more developed regions of the world still persists as a major hindrance to the effective control of raiva in Roraima.

Foot-and-mouth disease is often confused with two similar virus diseases--vesicular stomatitis and vesicular exanthema. Traditionally the disease is correctly diagnosed by testing three or four different animals. Foot-and-mouth, also vesicular, is a disease to which cattle, swine and guinea pigs are susceptible but horses are not. All four types of animals are susceptible to vesicular stomatitis and vesicular exanthema affects only the cattle and guinea pig.

Distinguishing foot-and-mouth disease from the others is only the first step in attempting to eradicate this dreaded disease. Immunity to foot-and-mouth disease is complicated by the existence of seven known types of disease virus. An animal recovering from foot-and-mouth disease is immune only to the type of virus that caused the disease but is susceptible to the other six known types. Many animals can be stricken

by the same virus after a period of one year so that immunity from any given strain is not permanent. Adding to the complexity of the problem are variants of the disease virus within a type.¹⁷ The commonest agent in the spread of foot-and-mouth is the infected animal itself, especially in the early stages of the disease. The active virus, leaving the infected animal, contaminates its surroundings and can be carried mechanically by living beings--people, horses, dogs, etc.--or on feed, litter, tools and other objects. When contaminated material comes in contact with susceptible animals, the latter can be readily infected.

Control of foot-and-mouth disease requires a very high degree of cooperation and coordination between the ranchers and animal health officials, plus a huge amount of material resources, many of which do not exist in Roraima. There are two methods generally in use throughout the world to control and eradicate the disease. The most drastic approach is to slaughter and dispose of all the animals, thus to remove at once the greatest source of active virus and avoid the possibility of having carriers remain alive. This is immediately followed by a thorough cleaning and disinfection of the premises and of materials possibly contaminated with virus to remove and destroy whatever virus may remain active after a proper burial or burning of the slaughtered carcasses.

After this has been completed, test animals--including cattle and especially swine--are allowed to feed and graze where they will come in contact with all parts of premises and objects which may have been contaminated with the virus of foot-and-mouth disease. If any virus has escaped the cleaning and disinfecting processes, the test animals should reveal it by contracting the disease.

To implement a strict quarantine there must be excellent control over the movement of cattle and other animals, as well as over the grazing pastures. In Roraima, where effective fencing is the exception rather than the rule, control appears to be impossible at this time. During 1967, the beginning step towards a concerted effort to control aftosa was undertaken by conducting a census of the herd. This was no easy task, as communication was a major problem. There were no maps to indicate the precise location of each ranch headquarters so there was a real possibility of not contacting a fazendeiro or capataz to inquire about the herd size and the availability of such facilities as refrigerator, corral, cattle chute, motor vehicles and landing strip for planes.¹⁸ Furthermore, since the great majority of the animals graze far and wide on common pasture and are rounded up only annually or biennially, on different ranches at different times, the precise count was not known by many of

those persons contacted by the census officials.¹⁹ Nevertheless, this was probably the most accurate census taken to date.

The overall plan was to inoculate virtually all cattle on the savannas in as short a period of time as possible to eradicate the disease. There was no mention by the ranchers or the animal health officials that they were aware of the various types of known disease virus. Their simplistic attitude was that once all the cattle were inoculated, aftosa would cease to be a major problem.²⁰ This is by no means what would or does occur. The vaccines which have been developed and used to date do not assure immunity for long periods of time. In a given year when aftosa is raging, the fazendeiro finds it necessary to inoculate his cattle every four months. This undertaking is possible only if the fazendeiro has the capital, materials, facilities, and information necessary to procure and administer the vaccine.

The chance for a successful massive campaign against foot-and-mouth disease in Roraima is slim. To illustrate, this observer had the opportunity to be present at several strategy meetings of the veterinarian and his staff who were to furnish the technical skill and systematic guidance in a massive inoculation program sponsored by the Division of Production, Lands and Colonization of the Ministry of

Agriculture of Roraima. The reference maps used were those produced as a result of the special cattle census and were not drawn to scale. (See Figures 12 and 13, Chapter V) The locations of the ranch headquarters were approximate and land surface approaches (i.e., roads and trails) were not indicated. The men did not have at their disposal air photos on any scale, nor did they have access to large-scale topographic maps. In other words, the basic survey information for this part of the world has yet to be collected and displayed.

Under these adverse conditions, these men were attempting to formulate a route of travel which would maximize the use of their time and resources. However, with the gross lack of critical information, only approximate linear distances could be calculated, whereas economic distance, which includes a consideration of time, expense, physical effort and highway distance, would yield much more meaningful planning information. Their prime concerns were the linear distances between ranch headquarters (or wherever the animals were to be gathered for inoculation) and the number of cattle to be inoculated at each ranch. They were completely frustrated by the absence of information pertaining to the terrain to be covered and the time, cost and effort elements related to travel. With nearly all of this critical information missing, a realistic budget for the project defied accounting.

The two major and immediate obstacles that were universally acknowledged were the lack of infrastructural facilities in the interior and the lack of physical resources. Trained, competent technical assistance was present and eager to begin. The ranchers most certainly desired and awaited the service, but the two major problems persisted. Owing to an acute lack of an effective way to disseminate information rapidly, the vaccination team could not contact those people at the ranch headquarters to set up a schedule so that each fazenda would be ready and waiting when the team arrived.²¹ Even if this could have been accomplished it would have been to little avail because of the problem of procuring and maintaining the vaccine. The great shortage of refrigeration and the difficulty of obtaining the vaccine from Belém paralleled the difficulties encountered in combating rabies.²²

As Table 5 indicates, the ranches in the Territory are woefully lacking in the critical equipment, vehicles and facilities so necessary for a successful health campaign or, to broaden the spectrum, modern ranching per se. Simply listing numbers of cattle crushes, vehicles, etc., does not provide enough information. This observer noted, for example, that on several of the ranches that did possess cattle crushes (chutes), the construction was neither suitable nor strong

Table 5

Ranch Facilities, Roraima Territory, 1967

Area	Vehicles	Landing Strips	Cattle Crushes	Refrigerators
Area I	43 jeeps 10 pickups	22	19	10
Area II	58 jeeps 0 pickups 1	33	16	22
Area III	96 jeeps 2 pickups 2 trucks	24	30	14
Area IV	5 jeeps 0 pickups 0 trucks	6	35	14
Total	194 jeeps 12 pickups 3 trucks	85	100	60

Source: Ministério da Agricultura
 Campanha Contra a Febre Aftosa
 Levantamento das Propriedades e Regiões
 D.E.M.A.--D.P.T.C. 1968

enough to handle the semi-feral, horned cattle.²³ In many cases the operators of the corral system had no idea of the proper capacity and would confine far too many cattle at one time to allow efficient handling. Very often the cattle, accustomed to unhindered movement on the range, would panic, break through the barriers and scatter themselves far and wide on the savanna. This, in turn, required much additional time to regather the animals and proceed with whatever activities were being undertaken. Thus, viewed in the light of all the existing inadequacies in terms of physical resources, means of communication and transportation, the possibility of successfully carrying out a systematic inoculation campaign against foot-and-mouth disease at the present time is indeed slim.

Further losses have been experienced in the past by the fazendeiros of Roraima owing to the presence of brucellosis, or Bang's disease, but the incidence of the disease today is rare (at least the reported incidence) because of compulsory vaccination. This is one disease of which the entire populace of Roraima is aware, primarily because this disease is transmitted to humans by way of fresh milk and causes great amounts of discomfort. The impetus for compulsory vaccination stems from the increasing flow of improved breeds of cattle into Roraima from such areas as

Minas Gerais and São Paulo.

Although brucellosis can be contracted by both bulls and cows, the economic loss occurs primarily through the cow. Brucellosis is a uterine infection which results in premature birth, death of calves, temporary or permanent sterility in cows, abortion, and reduced milk yield. The infection gains access to a new victim through the mouth, having been scattered over grass in the uterine discharge of an aborting animal. Some authorities hold that an infected cow never rids herself of the infectious organisms, though she herself may eventually become sufficiently immune to make possible her calving at the normal time.

The federal Ministerial Decree 438, issued April 30, 1958, sets the procedure for combating brucellosis in Brazil. All female calves, between the ages of six and 10 months, must be vaccinated with a living brucella culture known as strain 19 Brucella abortus. The vaccinated calves must be branded with the mark 'V' on the left side of their faces. The owners of the animals are required to possess a certificate stating that their calves have been vaccinated with this prophylactic agent and a duplicate copy must be placed in the state or territorial office of the Divisão de Defesa Sanitária Animal. If, at age 18 months, an animal reacts positively to

an agglutination test, it must be eliminated from the herd.

It is the means by which infected cattle are disposed of that poses a real threat to the health of the Roraima herd. Infected animals should be slaughtered, but in economic terms this is the worst of the possible alternatives. The most popular method of disposal is to sell the animals having positive reactions to other ranchers, preferably in areas where policing controls are weak. As a precautionary measure, virtually all cattle, bulls and cows alike, regardless of age, which have been brought into Roraima Territory must undergo an agglutination test for brucellosis.²⁴ These animals are the Nellore, Gir and Guzerat breeding stock which are brought to the annual animal exposition for sale or are purchased by ranches from individual dealers throughout Brazil. Even though the marketed cattle may be accompanied by proper documents stating that they have been vaccinated and tested for brucellosis, there are virtually no exceptions to this requirement. Thus brucellosis, a major cause of economic loss in many areas of Brazil, appears to be under effective control in Roraima as a result of a strict, uncompromising policy on the part of government health officials and the cooperation of fazendeiros engaged in the importation of improved breeds from distant areas.²⁵

Parasitic infestation. Parasitic infestations are known to exist in Roraima and present additional problems to the beef cattle producer. When the cattle graze in the low-lying humid areas during the heart of the dry season, much of the water is contaminated so that the cattle come into direct contact with roundworms and lungworms. From this contact the cattle are attacked by infestations of the respiratory and gastrointestinal tracts.

The most suitable way to rid the animals of the intestinal parasites is to practice regular vermifuge administration. However, in view of the market returns per head of cattle, this practice is economically unsound. Nevertheless, at least one fazendeiro in Roraima doses his cattle on a regular basis. The two vermifuges utilized by one of the more wealthy and better informed ranchers bear the trade names of Phenovis and Ripercol. The former is a toxic powder containing phenothiazine, copper and cobalt. Mixed with organic solvents, it is administered into the mouth of the animal with a dose syringe at a cost of approximately \$0.15 per head per dose. Ripercol is a non-toxic organic compound in solution administered in the same fashion at an average cost of \$0.50 U.S. per head per dose.²⁶ To be effective in the savanna region, both vermifuges must be administered two times per year. Phenovis must be prepared and administered

by a knowledgeable person for if it is prepared incorrectly the animals could be poisoned. In addition, Phenovis cannot be given to cows within one month before or after calving. Ripercol is a superior product because it treats the animal's lungs as well as the gastrointestinal tract and it can be administered right up to the time of calving and immediately after birth. While mistaken overdosage is expensive, it does not result in loss from toxication. But whether at \$.30 U.S. per head or \$1.00 U.S. per head, the cost of treating cattle for intestinal parasites in this manner is beyond the means of ranchers whose techniques have progressed almost not at all during the past century and a half.

The carrapato, or tick, infests the entire savanna region of Roraima and is a major cause for the intentional periodic burning of the grazing areas. The tick is responsible for transmitting both piroplasmiasis and anaplasmosis, infectious blood diseases with harmful effects such as muscle tremors, labored breathing, great reduction in milk flow, marked depression and loss of appetite. All of these effects lead to great losses in beef production.

The most practical and effective method of control is the destruction of the tick on the host by utilizing an application of chemical substances. Application is usually performed by using a cattle-dipping tank or a cattle spray

race. However, given the extensive grazing pattern of the cattle and the great shortage of material inputs in Roraima ranching, this is not a suitable solution.²⁷

Burning a grazing area requires no capital, just a match, but by the same token the use of fire is not nearly as effective as a tick control as are chemical substances applied directly to the cattle. While the burning process may destroy the ticks in the fired area, ticks will reappear there in a very short time simply by riding on their hosts and dropping off onto the ground to lay eggs under stones and in crevices. After hatching, the larvae or "seed ticks" which emerge climb up the tender young blades of new grass to a position advantageous for attaching themselves to a host which is sure to come to feast on the new grass.

Mineral deficiency problems. The minimal amount of basic soils research which has been undertaken in the savanna area of Roraima indicates that much of the grazing land is underlain by latosols (Oxisols). Latosols are among the most strongly weathered soils in the world and are almost entirely depleted of weatherable minerals. The fertility of latosols under savanna vegetation is extremely low. Such soils are deficient not only in the primary plant nutrients, nitrogen, phosphorus, and sometimes potassium, but also in the secondary nutrients, calcium, magnesium and sulfur, as well as in the

micronutrients, zinc, molybdenum and boron.²⁸ It is also strongly suspected that trace elements such as copper and cobalt are missing.²⁹ In areas where gneisses dominate, the soil is so deficient that the forage without calcium shows its effect in some cattle, whose bones become soft or cartilaginous and bend under muscle pressure.

It is known that mineral deficiencies can be remedied by providing properly prepared mineral salts, but the cost of procuring and transporting the salts to this remote area limit the possibility of eliminating the mineral deficiency problem. Nearly two decades ago, in 1951, a government official strongly urged that the federal government (since there is no state government owing to Roraima's status as a federal territory) should obtain, for resale at cost to the fazendeiros, the necessary amounts of bulk mineral salt.³⁰ No action was taken on this suggestion.

In 1968, the government of Roraima selected four fazendas whose headquarters were located within viewing distance of the most heavily traveled routes as pilot or demonstration ranches for the feeding of mineral supplement to cattle. These ranches were to be supplied with mineral salt which would be placed in troughs and the cattle given free access to it. Of course, within a very short time the supply of salt was exhausted, no more was forthcoming, and there

were no visual physical improvements in the cattle that had consumed the salt.

There are, however, several ranchers who purchase and carefully dole out commercially prepared mineral salts to their recently purchased breeding stock. Because of the gross absence of precise data pertaining to mineral deficiencies in Roraima, there is a possibility that the salt may not be as effective as it might be if such information were available. Frequently, the formula of commercial preparations is appropriate only for the deficiencies found in the soils in the restricted region where the original research on which the formula is based was carried out.

While mineral deficiencies are certain to exist in the Roraima herd, the magnitude of this problem is not nearly as great as the control of infectious and parasitic diseases. If the connecting of Roraima with beef markets and material supply centers by road does lower considerably the cost of transportation, then the widespread purchase and administration of mineral salt will be economically justifiable.

Breed Improvement

The productivity of the local pé douró cattle is so low that ranchers are of the opinion that grading up with any improved tropical breed is a desirable goal. However, many

of the ranchers are not aware that breeds from other parts of tropical Brazil might not be very productive and may lack resistance to diseases. As a rule, improvement is not automatically attained by the indiscriminate introduction of exotic cattle, except where it is economically feasible to ameliorate the local environment. The savannas of Roraima may well be the exception to the rule. Most observers continue to maintain that Mother Nature is solely responsible for the fate or fortune of the Roraima herd. In other words, precious little has been done to make the local environment more amenable to improved beef cattle production.

When a herd has maintained itself in a single physical region for more than a century and a half, as is the case in Roraima, a state of equilibrium between its members and the environment exists. In the course of time natural circumstances have eliminated the grossly unsuitable individuals, have restricted the survival and reproduction of the less adaptable, and have, to a greater or lesser extent, favored the multiplication of the rest so that the population is composed of individuals with certain essential characters in common. Thus, the pé' douro has evolved, small in stature, slow to gain weight, semi-feral and able to survive while burdened with a variety of diseases.

In view of the primitive and highly extensive nature of

ranching, the breeding plans are correspondingly "rustic." Fazendeiros who possess herds consisting entirely of pé douro simply permit their stock to roam and breed at will. Once a year, or perhaps only once every two years, the animals are rounded up by vaqueiros for branding and market selection. Thus, for many ranches there is no breeding "program" as such.

Many of the Nellore, Gir and Guzerat animals have been purchased by Roraima fazendeiros as a result of "salesmanship" on the part of cattle dealers from the more developed areas of Brazil. While the local fazendeiro cannot recite extensive and precise performance figures pertaining to his pé douro cattle, he has developed, from years of observation and experience, an acute sense of their abilities and shortcomings. Thus, when the cattle dealer confronts him with printed brochures expounding the many virtues of the improved tropical breeds, the fazendeiro quickly makes a mental comparison and rationalizes that to breed such qualities as tameness, rapid weight-gain, long legs, high fertility, etc., into his rugged pé douro would be a wonderful and economically rewarding undertaking. However, the research which led to the results shown in the brochures was conducted in such distant locations as Minas Gerais, São Paulo and Paraná. These places have environments which differ greatly from that

of Roraima. There is a danger, therefore, that these improved breeds, purchased at great cost to the local rancher, may not even approach the performances cited in the research records and the venture might prove economically disastrous to the fazendeiro.³¹

Nevertheless, the importation of improved tropical breeds in Roraima is continuing at an increasing rate and two types of breeding "programs" are being carried out. The most rudimentary method in use is to permit a Nellore, Guzerat or Gir bull to breed indiscriminantly with the degenerate scrub cows and heifers in an effort to change the character of the herd. The bull represents a substantial investment and its movements are watched much more closely than the herd as a whole. Moreover, the bull is fed mineral supplements, is dosed with vermifuges and quite often is inoculated against rabies and foot-and-mouth disease. In this manner it is hoped that the progeny of the purebred sire and pé' douro dam will acquire such favorable traits as faster weight-gaining capacity, longer legs and greater reproductive ability, while retaining the heat tolerance and disease resistance of the local range cattle.

This method of crossbreeding, which crudely resembles grading, is strictly a "hit or miss" process and the results that the few ranches engaged in this activity have received

have not been recorded.³² As of March 1969, there were no formal, conscious efforts in Roraima to carry a grading plan to its end. This is entirely understandable, however, in light of the difficulty of controlling cattle movements and activities without the aid of fences, improved pastures, trained personnel, and reliable technical information. When dealing with these large domestic animals in the harsh savanna environment, the number involved and the length of time elapsing between each generation (which may be as much as five years in Roraima) and the impracticability of really close inbreeding, makes but slight progress possible within the life time of one breeder. It is also highly probable that, sooner or later, it will be found necessary to introduce additional characteristics from without the group and thus endanger any progress made. One possible solution to this rather dismal situation is to have the enterprise undertaken on a cooperative basis whereby several individuals working under a common breeding policy would develop each his own line founded on three to five sires of the breed. In this way each group could develop its own pool of genes towards a variety of the desired strain. When implementation is required it could be made from one of the associated groups, and thus while the nullifying effect of too intensive inbreeding could be avoided, a reasonable rate of progress

could be maintained with consistency of direction and avoidance of confusion by the unintentional introduction of undesirable traits; at the same time adaptability and power of variation can be maintained.³³

Williamson and Payne have issued a forewarning to those who select the grading method of crossbreeding and it is most appropriate for the Roraima situation:³⁴

If intermating of the graded stock is carried out before a really appreciable homogeneity has been attained, it might be thought that an excessive variety of indifferent types could result. It has, however, been pointed out that, in practice, where quantitative characters are mostly due to environment and the genetic factor is controlled by many pairs of genes, excess variability has not been a feature of early interbreeding in any wide cross in cattle for which detailed experimental information is available. If large enough numbers have been used it may be possible to select sufficient individuals for further intermating on a very reduced scale and thus to fix a type at that point. The selection may be unfortunate, economy may forbid the heavy discarding found to be necessary, or controlled direction may become impracticable and the stock lapse to their original state.

The other method which is being used in Roraima to improve the quality and performance of the herd is to change one breed for another merely by supplanting pé douro individuals by those of Nellore, Gir and Guzerat. This requires the importation and purchase of heifers as well as the sire

and represents a large and risky initial capital outlay. For example, a purchase made by a fazendeiro in February 1969 of three Nellore bulls and 15 Nellore heifers amounted to \$10,000. The animals were from Minas Gerais and had been shipped to Roraima for sale at the Eighth Exposition of Animals and Economic Products of the Federal Territory of Roraima which was held in Boa Vista.

Following the arrival of the new breed at his ranch, other costs began to accumulate rapidly. To insure survival of the new stock, the rancher imported high-quality feed supplement via the Guyana Stockfeeds at Demerara, Guyana. The feed itself was manufactured by The Quaker Oats Company in Chicago, Illinois. To feed his 20 Nellore he must purchase five sacks each month at a cost of \$7.00 U.S. per sack. When asked how he could afford to keep buying the feed as his Nellore herd increased the rancher replied, "Nao sei, talvez não posso," (I don't know, perhaps I can't).

This particular situation was atypical. The fazendeiro maintained his ranch as a secondary and future interest. His primary source of income came from other activities and he lived in Boa Vista. His property has been fenced at great cost. He was experimenting with improved tropical grasses strictly on a trial-and-error basis and had only begun. He purchased vermifuges and vaccines for all of his cattle, his

herd consisting of 350 pé douro and 20 Nellore. He made several trips each month from Boa Vista to various places in Guyana to purchase and bring back supplies. He made several trips each month from Boa Vista to his ranch headquarters to personally administer medicines to his animals, mix the feed and dole it out to his Nellore and check with his ranch manager on the progress of such undertakings as land clearing, burning, corral construction, and other material improvements.

The rancher was fully aware of the adverse effects brought on by burning, but he felt at the time that he had no alternative. The cost of building a cattle dip was prohibitive. Since he had only just begun his ranching operation he had not undertaken a cost accounting. His investment entailed very high risk because his intended market was not yet established. His overall plan was to raise high quality beef (i.e., high quality for that area of the world), free of foot-and-mouth disease, rabies, etc., and export it to foreign markets, possibly in Venezuela, Guyana or Surinam where prices ranged from three to five times higher than those within northern Brazil. All of the foreign markets are aware of the disease problems in Roraima and, therefore, are very hesitant to accept meat from that area. While this one fazendeiro's goals are high and his intentions are noble, his

disregard for ranch economics and his willingness to accept high risk on his capital investments renders him foolhardy in the eyes of his fellow ranchers.

Other ranchers who are attempting to supplant pé' douro cattle by improved breeds find the process difficult owing to the extensive and primitive nature of their beef cattle operations. When the cattle breed, the fazendeiro hopes that all his improved heifers become impregnated by the improved sires, but in most cases "hope" is all he can do. Without the aid of fences, permanent water supplies, assured forage, etc., it is most difficult to manipulate cattle. As a result, all cattle, pé' douro and improved breeds alike, roam the range. The fazendeiro allows his stock to breed haphazardly and accepts the results as inevitable. Many of the improved heifers are sired by pé' douro or even by scrubby, undesirable bulls which were not castrated in the annual roundup. Indeed, in all likelihood the progeny represents an improvement over the pé' douro but the desired result is prolonged until at least the next calving. Thus, even though two "methods" of breed improvement are being implemented in Roraima, for all practical purposes the results of just one, the rudimentary form of grading up, can be seen at the present time.

Other Limiting Factors

Management. In the words of one Brazilian scholar, "Cattle production [in Roraima] is simple, rudimental. The savanna is the lord of the cattle. The vagueiro is the overseer who sees very little. The only thing of importance to him is knowing how many cattle have died....Many a fazendeiro in Rio Branco knows how he should raise cattle, but he has to follow the traditional way, that which is most economical."³⁵ General statements of this sort abound in discussions of the Roraima beef cattle situation. While it is certainly true that several fazendeiros are aware of some (but by no means all) of the steps they might take to improve production were it not for prohibitive costs, there are a number of shortcomings stemming from low administrative efficiency and routine management with inadequate methods.

Absentee ownership is very common among the owners of the larger properties and, as Table 6 (Page 182) shows, the land ownership pattern is one of dominance by large landowners. For example, the largest landowner on the savannas is José Gomes de Araujo, a powerful and highly successful businessman who resides in Manaus, Amazonas, and owns 24 properties in Roraima, containing a total of 28,465 head of cattle. (Appendix B) These properties have been incorporated

into a business enterprise known as Gado da Amazônia, S. A. Even though J. G. de Araujo began acquiring property in Roraima in August of 1918, he has never set foot on any of his ranches. His ranches are characterized by very low levels of efficiency and productivity per unit of area, but his holdings are so vast and his inputs are so small that he receives a large and easy income regardless.

Communication between an absentee fazendeiro and his capataz is very infrequent. Given the low level of applied technology with its attendant periods of inactivity, the owner is not pressed to pass on new technical information he may acquire. The implementation of modern ranching techniques requires capital inputs which the owner cannot afford to lay out. Therefore, occasions for contact between absentee owner and foreman arise only when it is time to round up the cattle for branding or selection and transportation to market, or when it is necessary for the capataz to secure wages and supplies. Often weeks or even months pass without any communication.

The average educational level of the savanna population is very low so that many of the smaller fazendas are owner-operated with human resources ill-equipped to cope with modern ways. Where illiteracy exists, it is often accompanied by suspicion and superstition, thereby making such cooperative

efforts as disease control and the elimination of burning very difficult to carry out.

The ranch foreman is expected to produce as many animals as he can while using almost no material inputs. For most, the incentive to do so is very low. All but a handful of capatazes now receive monthly salaries for their services and chances for accumulating enough capital to purchase land and stock to begin their own ranching operations are very slim. The salary, or monthly wage, of a capataz is paid partially in cash, the remainder in kind. According to the Statute of the Rural Worker (Estatuto do Trabalhador Rural), the value of room and board given by the employer can be considered as part of the wages.³⁶ However, the house which the employer furnishes (which has required minimums of sanitation and hygiene) must not exceed 20 per cent of the minimum wage and the food supply (which must be wholesome and sufficient) cannot be worth more than 25 per cent of the regional minimum salary.³⁷ The monetary value of the combined cash and kind monthly wages of the capataz in Roraima varies between an equivalent of 25 and 50 dollars per month.³⁸ There still are no strict regulations which represent the familiar economic relationship between capital and labor. The capataz and the vaqueiro gain very little from long, uninterrupted periods of service to the fazendeiro. The foreman and the cowboy

have a saying which states, "We are 'nobodies' on the fazenda until the day we emerge as a relative of the patrão, ready to make use of the work we have begun."

There are a few ranches in the Territory which still operate under the sorte system. This method of operation closely parallels the quarteação which was used in the North-east in the early days of ranching there. (This is discussed in Chapter V) Under the sorte, the absentee owner shares a portion of the stock with the capataz. At first glance, this system appears to provide incentive to maintain or improve productivity on the part of the foreman. At a time agreed upon between the fazendeiro and capataz, usually at one or two year intervals, all the stock which the ranch supposedly possesses, horses as well as cattle, is rounded up and brought to a central point for branding. According to age and sex, one out of every four animals becomes the property of the capataz. The vaqueiros lasso and take down four animals which appear to be approximately the same age. Once the animals are contained and on the ground, the owner arbitrarily numbers the animals one through four with the capataz looking on. The owner then places four round stones numbered one, two, three and four into a small pouch, pulls the drawstring shut and shakes the pouch. Without looking directly into the pouch, the capataz reaches into it and pulls out one stone.

The animal on the ground which corresponds to the number on the stone then becomes the property of the capataz. All four animals are branded with the mark of the fazenda and one receives a second brand, that of the capataz.

The capataz is free to do whatever he pleases with his stock and his alternatives are several. He can sell his animals for cash; he can continue to graze his own animals along with the owner's on the owner's land, or he can resign as capataz, purchase some land and begin his own operation with his share of the stock, thus elevating himself to the status of fazendeiro. However, as the capataz, he has to requisition certain supplies for his workers and the ranch operation from the fazendeiro. The fazendeiro pays for the supplies and keeps a running charge (which includes 10 per cent interest) against the capataz. Before leaving the ranch, the capataz must repay the fazendeiro in full.

The effects of this system are profound in terms of level of productivity and the spread of ranching. In an effort to keep his debt to the patrão as small as possible, the capataz tries to maintain his operation with as few material inputs as possible. He relies on luck and Mother Nature to produce a good calf crop and prays that jaguars, snakes, flood, drought or disease do not take a heavy toll.³⁹ Thus, the sorte tends to perpetuate primitive, extensive beef cattle

production with its attendant low levels of output.

In addition, if a capataz should persevere in his position for several years, he may eventually accumulate enough cattle and capital to begin his own operation. The sorte system, then, is capable of increasing the number of entrepreneurs engaging in the same activity and competing against one another for a severely limited market. It was the eventual realization by the fazendeiros of this occurrence that led to the transmutation of the sorte to a cash-kind wage as the compensatory system utilized by most of the absentee owners in Roraima. At any rate, owing to the payment system in effect, ranch management by capatazes continues to be inefficient as a result of lack of incentive.

Land tenure. In Brazil, as a whole, many of the people making land-use decisions possess properties too small to reach sufficient or desirable scales of production. Others hold parcels too large to encourage an intensity of use consistent with optimum input-output relationships. Still others are not capable of allocating their resources effectively because of their value systems or lack of skills. The composite of individual decisions made within this context results in low agricultural production and low incomes in the rural areas and high prices for agricultural commodities in cities. These are conditions that pervade the national

economy and which slow economic development.

Given the nature and level of beef cattle production in Roraima, it would appear at the outset that there are few, if any, problems associated with the structure of land ownership. Cattle cross freely from one property to the next in search of grasses and water. In this situation it is quite feasible for a fazendeiro to possess a herd exceeding the carrying capacity of his own finite amount of land merely by grazing his cattle on lands owned by his neighbor. Problems would arise when the level of ranching reached the stage of fenced ranges and other capital inputs. One need read only one of the hundreds of accounts of ownership disputes during the development of ranching in the American West to imagine what might possibly lie in store for the ranchers of Roraima.

On the other hand, the efforts of the federal government may disrupt the relative tranquility of land ownership in Roraima long before the overall development of ranching begins to generate property disputes. On November 30, 1964, the Land Statute (Estatuto da Terra) became the law of the land. This complex, 53-page document enables the President of the Republic to decree land-reform measures. The thrust of the statute is toward the shaping of an agricultural system consistent with continuing economic expansion and the promotion of economic and social justice in the rural environment.

Ideally, the Brazilian government wants rural property-owners to make adjustments in the size and operation of their holdings that will bring them to higher levels of performance. If they do not make such adjustments voluntarily, it is presumed that they can be coerced into doing so, or can be replaced by owners who will. From the government's point of view, a property is desirable only if it meets clearly defined quantitative standards of size and operation. All other holdings are undesirable. Even though the Land Statute establishes a system of classification in which four types of holdings are recognized, the government chooses to view Brazilian rural properties as belonging to one of two categories: the desirable, known as empresas rurais; and the undesirable, categorized as minifúndios, latifúndios by size, and latifúndios by use. Any property which lies in the last three categories may be subject to expropriation or cessation of free disposal.

At the same time a property is classified, a tax is levied upon it. The rate of tax depends upon the size, location, productivity, and social condition of each parcel of land. A quantitative assessment of these characteristics results in four coefficients whose product is the basis for calculation of the tax. Thus, any property owner can conceivably lower his tax rate by modifying one or more of these

characteristics, and in so doing may alter a co-efficient sufficiently to change the property's status from undesirable to empresa rural.⁴⁰

The Brazilian Land Statute created two organizations charged with the responsibility for administering the articles of the Statute. The Instituto Brasileiro de Reforma Agrária (IBRA) is responsible for the classification and taxation of properties, expropriation of properties in priority areas, and general application of the regulations of the Statute. Less strategic in importance, the second agency, the Instituto Nacional de Desenvolvimento Agrícola (INDA), is charged with the shaping of long-run agricultural development policy, but, in addition, it is expected to participate, along with IBRA, in the design and implementation of colonization schemes.

The complicated system of classification directed by the Land Statute required much information about landholding which the Brazilian government did not possess at the time of the Statute's conception. To accomplish the task of collecting, assembling, and analyzing landholding information in accordance with Article 46 of the Land Statute, IBRA conducted Brazil's first comprehensive land inventory, beginning in late 1965 and continuing through early 1967. Each property owner (or a legal proxy) was required to purchase and

fill out a four-page questionnaire about his property.⁴¹

The response to the questionnaire was good, considering the difficulty of communication and travel, especially in remote interior areas such as Roraima. There were definite incentives to cooperate as illustrated by the fact that an owner had to make the declaration in order to obtain a Cadastral Certificate, without which he would be unable to obtain credit or financing, request any form of technical assistance, receive a guarantee of minimum prices in sales of his products, or divide, rent, sell, mortgage or otherwise transfer his property. By May, 1967, more than 3.4 million questionnaires had been returned.

The inventory can easily be questioned as to its degree of accuracy. It can be safely assumed that many errors resulted from the small, illiterate farmer's ignorance of his own land. Other errors can be attributed to misinterpretation of or inattention to the many details of the questionnaire. Some errors, no doubt, are the result of deliberate falsifications. These inaccuracies may be further reduced in the future since the Land Statute requires an inventory every five years and IBRA is constantly trying to improve upon its methods of data collecting. Coded, punched on cards and programmed through a computer, these data determined where a particular property fitted into the classification

system and what tax rate would be applied to it.

It is estimated that there are approximately 3.5 million rural properties in Brazil, but fewer than 10 per cent have been classified as empresas rurais.⁴² The human resources and capital required to bring the remaining 90 per cent of the holdings from substandard to prescribed norms, or for that matter even half of them, would amount to a staggering sum. By the same token, a sudden, total transformation is not necessarily desirable. If all these farm units were suddenly brought within the prescribed norms, tremendous strains would be placed on the Brazilian economy and societal structure.

Brazil's leaders are fully cognizant that the agricultural problems and resulting economic pressures and social tensions vary in intensity from one area to another. Consequently, the Statute calls for the establishment of priority areas where corrective measures can be instituted immediately.

According to Ludwig and Taylor:⁴³

The Statute requires that IBRA delimit areas whose problems are acute and can best be treated by a concentrated dose of reform embodied in regional plans. Each of these priority areas is under the aegis of Delegacia Regional, or regional agency, of IBRA (generally referred to as IBRAR), which is instructed to make lavish use of the expropriation weapon. The Delegacia fixes regional priorities, determines the extent and

location of expropriatable areas, lays plans for needed development, and estimates the costs of all these works.⁴⁴

Even though those properties which comprise the savannas of Roraima are not among the priority areas, the threat of expropriation does exist there. This threat of expropriation should be sufficient to force owners to make decisions about the internal organization and use of their properties that will bring them into the empresa rural class. The only holdings exempt from expropriation are those outside priority areas whose owners are already in the process of carrying out IBRA-approved plans directed toward a change in status within a specified time. Owners who attempt to improve conditions on their lands without prior IBRA approval may petition for a change of status, but only after IBRA confirms that the internal alterations have, in fact, occurred can a change of status be granted.

Tables 6 and 7 illustrate quite dramatically the domination of large landholdings and low output per unit of area. This, of course, is evidence supporting the claim that productivity is very low in Roraima Territory. Slightly more than one third of the total number of properties account for just under 75 per cent of the total useable area! This is not a priority zone, however, because the population pressure on the land is very low. Note that less than 6 per cent of

Table 6

Rural Properties--Classes of Area
Território Federal de Roraima, 1967

Hectares	Number of properties	Per cent of total	Total area (hectares)	Per cent of total area	Average area/category
10	116	5.7	357.4	0.17	3.08
10-99	319	15.6	14,258.8	0.67	44.70
100-999	899	44.0	558,979.2	26.27	621.78
1,000-9,999	704	34.5	1,513,147.8	71.12	2,149.36
10,000-100,000	3	0.1	40,950.0	1.92	13,650.00
Total	2,041	99.9*	2,127,693.2	100.15*	

*Total does not equal 100.00 owing to error in rounding.

Source: Anuário Estatístico do Brasil, Fundação IBGE, Instituto Brasileiro de Estatístico Rio de Janeiro, XXIX (1968), pp. 129, 132, 135.

Original source: Instituto Brasileiro de Reforma Agrária, Great Land Inventory, 1965-1967.

Table 7

Rural Properties--Land Statute Types
Território Federal de Roraima, 1967

Land Statute Types	Number of Properties	Per cent of Total	Area (Hectares)	Per cent of Total
Total	2,041	100.00	2,127,693.3	100.00
Minifundio	376	18.42	10,313.4	0.48
Latifundio by size	---	---	---	---
Latifundio by use	1,407	68.94	1,772,974.5	83.33
Empresas rurais	258	12.64	344,405.4	16.19

Source: Anuário Estatístico do Brasil, Fundação IBGE, Instituto Brasileiro de Estatístico, Rio de Janeiro, XXIX (1968) pp. 129, 132, 135.

Original source: Instituto Brasileiro de Reforma Agrária, Great Land Inventory, 1965-1967.

the properties contain less than 10 hectares (average size, 3.08 hectares). In most crisis areas, the very small properties represent a very high percentage of the total number of properties, while accounting for a very small portion of the total area.

In terms of the Land Statute types, more than 80 per cent of Roraima's useable land falls within an acceptable size range, but at the present time this land is not producing at the government's expected performance level.⁴⁵ Most of the values for Roraima land were based on low market potential and extensive grazing as the major land use. Of the approximately 3.5 million rural properties in the country, fewer than 10 per cent have been classified as empresas rurais, while more than 12.6 per cent of the properties in Roraima are included in this desirable category. Because of this, the poor market situation (to be discussed subsequently), and their remoteness from effective government control, the ranches of Roraima are not greatly concerned about the immediate possibility of expropriation.⁴⁶

This pessimistic discussion of the many shortcomings in the savanna ranching industry of Roraima repeatedly implies that the lack of accessibility to markets and supplies is a key to the remedy of the many developmental obstacles over which the fazendeiro might exercise some degree of control

but does not. These limiting production factors merely reinforce the statement that Roraima is truly a frontier area, carrying on ranching today much as it had been conducted in Spanish Texas and colonial Brazil centuries ago.

NOTES

¹Unless stated otherwise, the subjective material under discussion in this chapter is based upon the author's field investigation in Roraima, Brazil during the academic year 1968-69.

²Chapter III contains the detailed discussion about the physical setting of the savannas so that terms used in the present chapter, which may or may not be defined, can be found in greater detail in the aforementioned chapter.

³United Nations, Economic Commission for Latin America and Food and Agriculture Organization Joint Publication, Livestock in Latin America: Status, Problems and Prospects. II (New York 1964), p. 30. Hereafter cited as Livestock in Latin America.

⁴John A. Hopkins, The Latin American Farmer, Economic Research Service, ERS-Foreign 257 (Washington, D. C.: Government Printing Office, 1969), p. 133, Table 12.

⁵As stated in Footnote 55 of Chapter V, in exchange for information the author expressed his willingness to maintain anonymity with respect to ranchers' identification.

⁶Moacyr Paixão e Silva, Sôbre uma Geografia Social da Amazônia (Manaus, Amazonas, 1943), p. 99.

⁷The term retiro is one of those Portuguese words which defy a suitable translation into the English language. However, one of the most vivid descriptions of a retiro and the vaqueiro's lonely life there can be found in a recent novel which focuses on a similar area of extensive, rustic cattle production in western Mato Grosso. See the truly exciting novel by Ellen Bromfield Geld: The Garlic Tree (Pau d'Alho), (Garden City, New York: Doubleday & Co., Inc., 1970).

⁸These stated carrying capacities have been extrapolated from works which refer to the same type of cattle grazing on

the open range across the border on the Rupunini savannas of Guyana. In all likelihood, even these are rough guesses. This information is to be found in two sources: Stanley E. Brock, "Longhorns of British Guiana," Geographical Magazine, XXXVI (February 1964), 588; and K. F. S. King, Land and People in Guyana, Commonwealth Forestry Institute, University of Oxford (Oxford, 1968), p. 61.

⁹The author strongly suspects that this mutual aid and good will is not given entirely out of concern for one's fellow man. In view of the fact that many of the cattle range far and wide, fazendeiros from neighboring ranches like to be on hand when the animals are brought into the corral for branding, sorting and the like so they can observe the cattle in the hopes of not recognizing any of their own which had been "accidentally" rounded up.

¹⁰Hamilton A. Rice, "O Rio Branco, Uraricuera e Parima," Anais da Comissão Especial do Plano de Valorização Econômica da Amazônia, III (Rio de Janeiro, 1949), pp. 46-47.

¹¹South American Savannas, Comparative Studies, Llanos and Guyana, McGill University Savanna Research Project, Savanna Research Series, No. 5 (Montreal: Department of Geography, McGill University, December 1966), p. 10. (Hereafter cited as Llanos and Guyana); Antônio Teixeira Guerra, Estudo Geográfico do Território do Rio Branco, Biblioteca Geográfica Brasileira, Serie A "Livros," No. 13 (Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística, Conselho Nacional de Geografia, 1957), p. 187.

¹²Livestock in Latin America, II, p. 64.

¹³Anuário Estatístico do Brasil, Fundação IBGE, Instituto Brasileiro de Estatístico (Rio de Janeiro, 1968), XXIX, p. 90.

¹⁴H. A. Coudreau, Voyage au Rio Branco, Rouen, France, 1886, p. 31

¹⁵Personal interview with agronomist Roberto Schoeller, February 1969, Boa Vista, Roraima.

¹⁶This technical assistance service was initiated in 1951 under the auspices of the Serviço de Defesa Animal and is still functioning.

¹⁷Nathan Brewer, "Foot-and-mouth disease," Encyclopaedia Britannica, 1971 Edition, IX, 565-566.

¹⁸A crude series of maps, not to scale, was made as a result of this survey rather than as a requisite preparation for the census.

¹⁹While this was not openly admitted, one need only to glance down the columns of the census to see that herd sizes were stated in round numbers such as 100, 200, 300, etc., to a degree which far surpasses coincidence.

²⁰This statement, of course, is not to be taken as an insult. It merely reinforces the fact that the level of ranching technology and information here is still rather primitive. This observer indeed encountered some fazendeiros who understood the nature of the disease and the many problems of overcoming it. Furthermore, Dr. Jerônimo da Silva, a most intelligent and well-trained veterinarian in the service of the Ministry of Agriculture, and his staff of able assistants were very perceptive of the situation at hand.

²¹This is a critical element in the program because some fazendas may need several days to round up and sort their cattle from those of their neighbors. In addition, a round-up requires the use of more vaqueiros than a fazenda normally employs so that coordination, timing and cooperation are required simply to bring the cattle to a central point.

²²At the time of the author's departure from Roraima in March of 1969, the problems of financing the project and assessing charges for the vaccine still had not been resolved and the systematic inoculation of the cattle had not begun. The several efforts of the author to secure further information on this situation have proved futile.

²³A cattle crush (also called a chute) should be constructed strong enough to contain any beast placed in it. It should be so built that damage to the animal is prevented, and so designed that it offers the necessary facilities for handling with the minimum of labor. A common fault in design is the provision of too much room for the individual animal; this encourages struggling, attempts to jump restraining barriers and to crowd into already occupied standings. The most common fault is the provision of too great width at ground level in the crush.

²⁴Dr. Jerônimo da Silva, "Comunicação aos Pecuáristas," Tribuna do Norte (Boa Vista, Roraima, February 8, 1969), p. 6.

²⁵The Federal Territory of Roraima is one of the least known areas of Brazil. Massive research is needed in all areas of endeavor. Undoubtedly there are many other types of infectious and contagious cattle diseases present in Roraima besides foot-and-mouth disease, rabies, and brucellosis, but these three are the ones most often cited as actual or threatened animal health problems in the Territory. Calf pneumonia is present in Roraima owing to the presence of parasites and an adverse environment. From time to time there have also been reported outbreaks of strangles (o garrotilho) and infectious equine encephalomyelitis among the horses which are raised on the ranches to aid in rounding up and moving herds of cattle. These diseases are kept under control by vaccination and do not present a major animal health hazard.

²⁶part of the difference in cost between Phenovis and Ripercol is directly attributed to the higher degree of sophistication, capability and safety of the latter. But it also should be pointed out that phenovis is a domestic product, fabricated in São Paulo State. Ripercol is a product of American Cyanamid Company, Wayne, New Jersey and is manufactured by Cyanamid de Argentina, S. A. in Buenos Aires. From there it is shipped to Rio de Janeiro where it is re-packaged and distributed. This additional cost of transportation and handling drives the price of Ripercol far above that of Phenovis.

²⁷As of March 1969 there were virtually no dipping tanks or spray races in Roraima. The fazendeiros' uniform reply to the question "Why not?" was "Too expensive, can't get the necessary materials, not justified by returns for sale of cattle." One estimate for the construction alone, not the supplies and maintenance, of a cattle dip in Roraima places the cost at \$1,850 (U.S.), based on 1967 prices, exclusive of transportation charges.

²⁸Jacob Bennema, "Nature and Potential of Tropical Soils," in Rural Development in Tropical Latin America, ed. by Kenneth L. Turk, Loy V. Crowder (Ithaca, N. Y.: Cornell University, 1967), p. 213.

²⁹For evidence of this, see: P. Sutmoller, et al., Mineral Imbalances in Cattle in the Amazon Valley (Amsterdam: Netherlands Royal Institute for the Tropics, 1965).

³⁰The official was Dr. Valério Caldas Magalhães, Director, Division of Production, Lands and Colonization, Ministry of Agriculture, Federal Territory of Roraima.

³¹Across the border in Guyana, on the Southern Savannas of the Rupununi District, ranchers have been trying to improve the quality of the well-established criollo range cattle. In 1954, Santa Gertrudis bulls and heifers were imported from Texas and placed on the British-financed Dadanawa Ranch. Composed of three eighths zebu and five eighths Shorthorn, this breed is considered to be a heat-tolerant animal suitable for poor grazing areas. These animals have not performed well, however, except when crossed with the local stock and grazed on the better pastures. It appeared that the five eighths Shorthorn in the Santa Gertrudis made it a little too much of a temperate climate animal to thrive in a year-round shade temperature of nearly 90°F, within three degrees latitude of the Equator. As a result, in 1957, 10 bulls and 10 heifers of the American Brahman breed were acquired from Jamaica, and others were imported from the United States at a later date.

In some respects the Brahman has been very successful in adapting to the savanna environment of the Rupununi. It has proven itself to be a hardy, fly-resistant, drought-resistant, relatively fast-maturing animal, having a long set of legs enabling it to cover extensive areas in search of palatable grass. However, even though the Brahman is very tranquil with regular handling, by nature it is a highly strung temperamental beast. Roaming the range, to be seen and handled once a year by man, it becomes completely wild and its long, slender legs enable it to run at astonishing speed.

³²Grading is used to improve low grade stock by mating the females to sires of a more productive breed and backcrossing to such sires to the fifth generation. The result is a decrease of genes peculiar to the dams, i.e., the low grade stock, and an accumulation in the individuals of each generation of those peculiar to the sire. The extent of the difference between the progeny and the sire is halved at each generation until at about the fifth the whole population has assumed in most respects the characters of the breed from which the sire came.

³³This suggestion was made by J. L. Lush. See: J. L. Lush, Animal Breeding Plans (Ames, Iowa: Collegiate Press, Inc., 1945).

³⁴G. Williamson and W. J. A. Payne, An Introduction to Animal Husbandry in the Tropics (London: Longman's, Green and Co., Ltd., 1965), p. 118.

³⁵Moacyr Paixão e Silva, Sôbre uma Geografia Social da Amazônia (Manaus, 1943), pp. 100-101.

³⁶Nilza Perez de Rezende, "O Salario do Trabalhador Rural," Revista dos Criadores, XXXIX (August 1968), 44, 68.

³⁷The legal wording of the Statue of the Rural Worker (Estatuto do Trabalhador Rural) contains many relative terms such as "wholesome" and "minimum" with no precise criteria accompanying them. Owing to the harshness of the savanna environment, there are certain foods that are in extremely short supply; specifically, green vegetables, Irish potatoes and citrus fruits. However, in terms of quantity, those types of food that are available are served up in more than ample quantities to the capataz and his workers. As an example, during one meal at the fazenda headquarters, the table contained rice, bananas, fish, fresh beef, jerked beef, dried beef, mutton, farinha, coffee with milk and a candied jelly made from guava. Many fazendas produce cheese, butter and milk for their own consumption. The only foods which are purchased off the ranch are rice, farinha, and, if available, oranges.

The "house" which the fazendeiro furnishes is very basic. There is no regular supply of electricity, although battery-operated radios abound, and occasionally a ranch headquarters will have a gasoline-fueled Japanese-made portable generator. The minimum of sanitation means that the structure is sprayed with DDT to suppress the very real possibility of malaria. Bathing is usually done in streams and plumbing facilities for kitchens and bathrooms are almost unknown. To live on a ranch in Roraima is to live very close to nature.

³⁸Precise information about wages and supplies proved to be a sore or embarrassing topic to discuss with the fazendeiro. Many owners admitted that their employees received payment below the national minimum regulations. Being on the outermost fringes of the national territory, isolated from the more developed regions, laws which exist in print often do not exist in practice in Roraima. The vaqueiro's pay is even lower,

ranging from about \$15 to \$25 U.S. per month, much of which is included in kind in the form of food, tobacco and clothing. The vaqueiro's "house" is a barracão, a tropical frontier version of the traditional bunkhouse of the American West. It is a long, low structure having open or thatched sides and a thatched roof. The ever-present hammock (rêde) of the vaqueiro is slung beneath the roof. The material belongings of the vaqueiro are simple and few, but very necessary. Many vaqueiros possess a rifle to protect themselves and the cattle from the jaguar, a side arm for personal security against their human enemies as well as snakes, a shotgun for hunting game, the fishhook and net for fishing, and a canoe to travel where a horse cannot go. Of course, not all vaqueiros possess all of these items, but most do possess some type of firearm. Each vaqueiro makes his own lasso (laço), bridle (redea), quirt (rebenque) and saddle (sela). During a roundup, the cowboy carries a chicaca, a long whip which makes a cracking sound, to facilitate his herding duties. When the vaqueiro travels he carries a long rubberized bag which contains his hammock, dried food and tobacco, tied to the outside of his saddle by a fine leather strap.

³⁹precise data are lacking for the calving rate in Roraima, but several fazendeiros have observed that most cows calve once in two years. The calves are born without human assistance on the range. When breeding is allowed to occur haphazardly, as it is in Roraima, many of the calves are dropped at a time such that cows can gather sufficient food for their needs only by covering great distances. The calf, weak after being carried in a period of semi-starvation by the dam, finds itself unable to run with the dam and loss of life frequently results. If the calf is dropped at the end of the rainy season, it will be grown, weaned and keeping itself on fodder by the time dry-weather conditions are advanced. The capataz relies on chance that the latter will occur.

⁴⁰For an excellent contemporary analysis of Brazil's complex agrarian reform, see: Armin K. Ludwig and Harry W. Taylor, Brazil's New Agrarian Reform, An Evaluation of Its Property Classification and Tax Systems, Praeger Special Studies in International Economics and Development (New York: Frederick A. Praeger, Inc., 1969).

⁴¹Where applicable, the owner also was required to fill out annexes regarding sharecroppers and tenants and to supply information on additional property holdings in Brazil. The reference in Note 40 contains the questionnaire, translated into English, in an appendix.

⁴²Ludwig and Taylor, p. 6.

⁴³Ibid., p. 60.

⁴⁴Thus far, five priority zones have been established. They are:

1. In the Northeast, the eastern half of the state of Paraíba and the eastern third of Pernambuco.
2. The entire state of Ceará, also in the Northeast.
3. The entire states of Rio de Janeiro and Guanabara and parts of the states of São Paulo and Minas Gerais, forming a contiguous zone.
4. The Distrito Federal around Brasília.
5. The entire state of Rio Grande do Sul.

⁴⁵In addition to the four basic types of land classification, the Statute establishes six major land-use types. Arranged in descending order of their estimated potential for generating income per unit of area, these categories are: (1) market gardening; (2) perennial-crop farming; (3) annual crop cultivation; (4) intensive grazing; (5) extensive grazing; (6) forest exploitation. IBRA's method for deriving a value for each zone of market potential and land use is quite complex. For a full explanation, see: Ludwig and Taylor, pp. 12-23.

⁴⁶At the time of the author's field investigation in Roraima, the IBRA agency in Boa Vista was closed, and had been for some time. The national agrarian reform is a gigantic undertaking considering the tremendous size and complexity of Brazil. Manpower is dear and must be allocated to those zones which require immediate attention. Roraima, having only 0.05 per cent of the nation's population, is not a focal point for agrarian reform. It was indeed unfortunate that the coded information from the Land Inventory questionnaires could not be made available to the author. Since these questionnaires contained descriptions of parcel locations, it might have been possible to construct a map, thereby cartographically displaying the ownership pattern in Roraima. This is definitely a project which should be pursued.

CHAPTER VII

FROM RANGE TO MARKET

The problems of marketing beef from the savannas of Roraima should be dealt with, not only because marketing is often a factor contributing to a bottleneck in the beef cattle economy, but also it has serious repercussions on supply and demand and, by that very fact, on the interests of producers and consumers. Owing to a lack of available precise information in this part of the world, many of the aspects of the market for beef will be analyzed in a somewhat superficial manner, but the immediate problems can be readily grasped.

Before discussing the many shortcomings in collection, transport, grading, processing, transfer, distribution and other phases of the marketing of beef, it should be pointed out that a considerable improvement in the commercial and technical structure of markets is occurring in the more densely populated areas of Brazil. In this connection, mention might be made of the progress achieved in central Brazil (focusing on the urban agglomerations of São Paulo and Rio de Janeiro) with the establishment of modern slaughterhouses and large

industrial processing centers for livestock and meat.

Many market problems are a reflection of the anomalies and shortcomings at the primary production level; in fact, the low productivity, seasonal variations and high costs at that level and the highly perishable nature of meat have a powerful impact on the size of the market, on the processing of primary products and on prices. There have been cases where the producers have been paid prices equal to or below cost and this has, over the long-run, brought on a stagnation or even a reduction in supply, thus creating supply problems, reducing commercial activity and raising retail prices.

Marketing is strongly affected by the pattern of final demand for products. The extremely limited purchasing power of vast sections of the population, the relatively high price of animal products and certain eating habits have caused lower-income consumers to adapt themselves to the conditions of a scarce and inefficient market with respect to services and the quality of the products. However, present and future prospects for the domestic beef market of Brazil are far from gloomy. Prosperity in states such as Guanabara, São Paulo and Rio Grande do Sul has clearly brought about a general improvement in markets, and the rapidly rising personal income level has produced a greater demand for better quality

products and improved packing and distribution.

The following are some of the defects contributing to the difficulty of the marketing of beef throughout Brazil, and especially in the North: problems created by the lack of means of communication and transportation, and to some extent, the inadequate organization of these services; obviously backward methods for the slaughtering and processing of meat; the monopolistic action of the major processing enterprises; the existence of abattoirs operating at low levels of use and productivity and with very little health control, or none at all; frightful losses and wastage from the time the product leaves the producer until it reaches the consumer; the deplorable operating conditions of retail distributors as far as hygiene and organization are concerned; lack of regular, systematized information on the conditions and trends of supply, demand, prices and other market factors.

The commercial markets for the Roraima ranchers focus essentially on just two centers, Manaus and Boa Vista. It will be necessary to discuss each market separately as they differ distinctly in terms of size, organization, supply areas, and so on.

Transportation

In a country where extensive grazing still prevails and the cattle are allowed to roam almost at will, the initial step of the journey to market is difficult, time-consuming, and often times dangerous. Once a year, and sometimes only once very two years, the cattle are rounded up by vaqueiros on horseback for branding and market selection.¹

One of the chief enemies of the open range is the tendency of the stock to go "wild" if they are grazed without sufficient handling over too large an area. Exciting stories of the older fazendeiros tell of the situation in the 1930's when the savannas were reported to be vastly overstocked.² Thousands of cattle were wild, unbranded "renegades" that had never seen a corral; many had never seen a man at close range. Wild bulls ran in bunches of 20 and 30 without a cow. It was commonplace to find dead bulls, gored to death in combat. During a roundup in those days, which could last for months, an average of one horse was gored a day. Each vaqueiro used as many as five, six, or even seven grass-fed horses.

Today the roundup for a single ranch requires the aid of vaqueiros from neighboring ranches to form a roundup gang large enough to gather and move the cattle into a corral. Depending upon the size of the ranch and the number of cattle,

a gang consists of anywhere from eight to 16 individuals. Breaking up into groups of two or four, the vaqueiros begin at daybreak on what are believed to be the extremities where a given ranch's cattle have roamed, moving in the direction of the corral. The cattle, when sighted by the vaqueiros, invariably run as soon as they are aware of the horsemen's approach. The riders, in turn, gallop after them and head them off. In instances where the cattle are relatively tame the bunch will slow down and eventually turn and stop. Then they are moved slowly across to another group held by other vaqueiros to form the nucleus of a herd that can then be driven to the corral. Where the cattle have become wild, often times the vaqueiros will be unable to turn or hold them, and the whole bunch will usually scatter and head for thick cover. In their dash to regain freedom, the fleeing cattle do not hesitate to attack any horse that comes too close or tries to block their path. When this situation occurs, the vaqueiros must fan out once again and begin their drive anew.

Once the cattle are gathered in the corral, the sorting procedure begins. Cattle plainly marked with brands other than those belonging to the fazenda which is undertaking the roundup are removed from the herd. There are some cattle, most of them very young, which bear no marks at all and

sometimes the issue of ownership of these animals becomes a heated debate between the fazendeiro or capataz in charge and the neighbors who have come to "help out." As the majority of corrals do not have chutes, the branding and selection process is a long and physically exhausting one.³

In the North, more so than any other region of Brazil, conditions for the transport of cattle are very unsatisfactory. As was emphasized in Chapter IV, there is a dearth of roads which connect production areas to markets. In the case of Boa Vista, virtually all cattle reach the municipal matadouro either by being driven on the hoof overland, or by being crammed onto a boieira, a primitive cattle barge pushed by a smaller diesel-powered craft (Figure 18) and floated on the river to market.

Although the distances from even the most remote savanna grazing areas of Roraima to Boa Vista are not great, the trip to market is long, dangerous, tedious and can result in severe losses as a result of improper arrangements.⁴ More often than not, an overland drive on the hoof can take days. In fact, up to eight days are required to move cattle over the traditional cattle trails to Boa Vista or to a loading point for river transport. Since the trails have been in existence for several decades and cattle movement over them is heaviest during the dry months of September through April,



Figure 18

A Boieira

These crude cattle barges haul loads of 30 to 60 cattle to Manaus, over 500 miles away.

the availability of desirable grasses to serve as forage along the way is at an absolute minimum. Besides, since the vaqueiros are paid a daily wage during the trip (NCr\$5.00 or \$1.43 U.S.), they are under orders to move the cattle as quickly as possible, not stopping to graze or water the cattle during the daylight hours. The size of any single group of cattle moving towards the Boa Vista market is small, usually less than 100 head, and can be tended by two mounted vaqueiros.

In places the going is so difficult that only the strongest of the cattle can make it. Frequently there are losses from fatigue and some of the weaker animals drown while attempting to cross the numerous rivers en route. Other natural hazards include the jaguar and puma, the smell of which is often enough to cause the worst catastrophe of all-- a stampede. A stampede can result in considerable loss because the running cattle scatter in all directions with many of the semi-feral beasts escaping into the large, dense "bush islands" nearby.

The journey from the savannas to the matadouro in Manaus is an incredibly arduous ordeal. During the height of the rainy season, July and August, when the Rio Branco is at its highest level and navigation is relatively free from hazards,⁵ some eight marchantes (cattle buyers) come to the Territory from Manaus to arrange for the purchase and shipment of cattle

to Manaus. The entire procedure is rudimentary to say the least. Of the 11 established loading points in the Alto Rio Branco, only three are equipped with scales to enable the accurate tabulation of live weight to be shipped. Figure 20 implies that many fazendas in Areas I and II are far removed from these loading points so that a long overland drive to the river is required. The cattle will have to be guided through extensive areas which are easily traversed in the dry months but are under depths of water ranging from a few inches to three or four feet during the rainy season!

Perhaps as many as two hundred head of cattle will be driven into a balança at the river's edge. (Figure 19) A balança is a small corral where the cattle are assembled for purposes of weighing and loading onto the boieira. Where the balança has no scale, as is the case in eight of the 11 points of embarkation, the fazendeiro and the marchante observe the cattle and estimate the total weight standing in the corral! Invariably the marchante's estimate is lower than that of the fazendeiro and a negotiating session ensues between the two parties as they sit on the corral fence. When a total weight is mutually agreed upon, the marchante pays the fazendeiro for his cattle on a per kilo basis.⁶ From this point on the cattle are the property and responsibility of the marchante and he must bear the risks and costs



Figure 19

A Balança

The small corral on the far bank of the Majari is not equipped with scales.

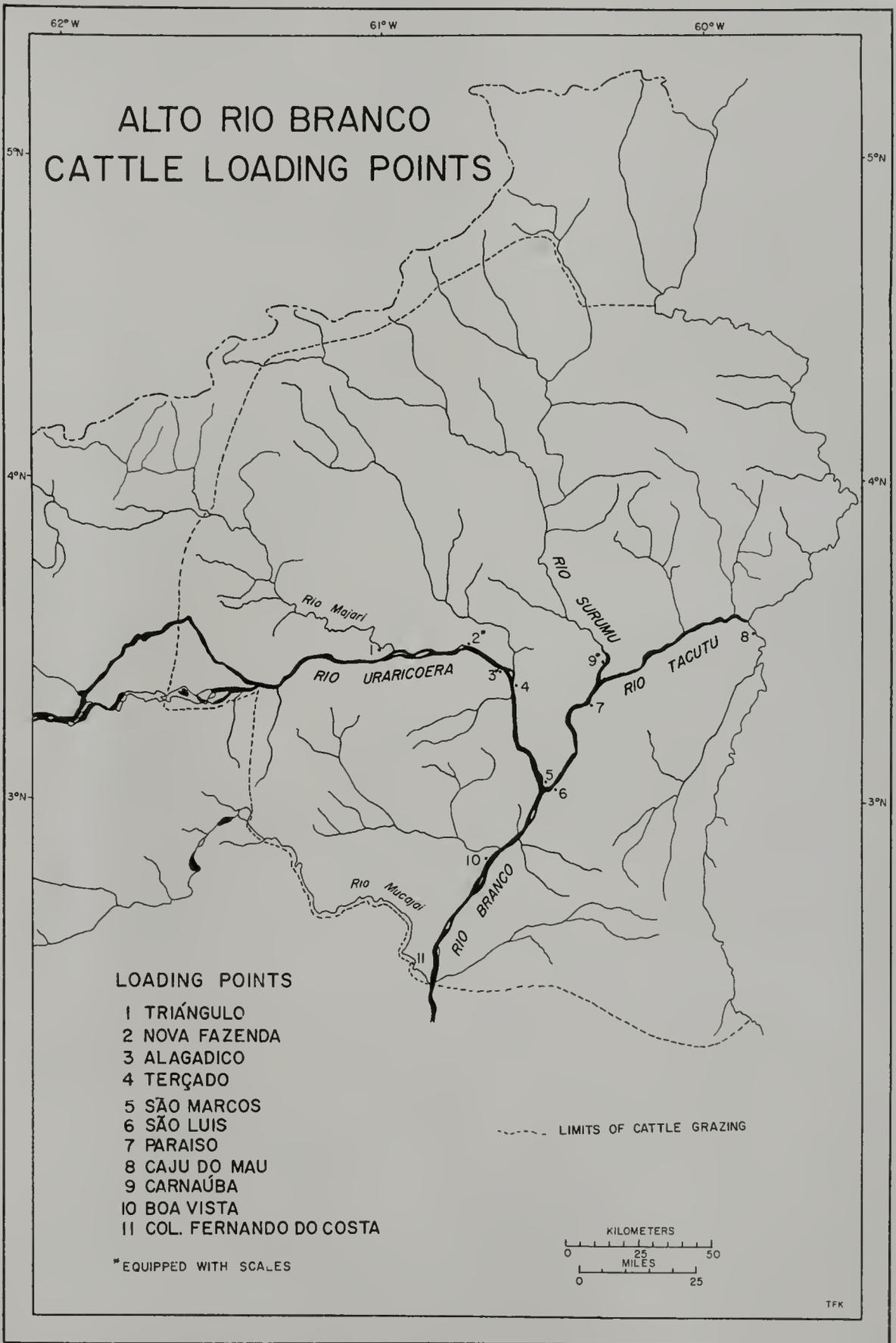


Figure 20

of moving the cattle to Manaus.

Between 30 and 60 cattle are prodded from the corral and crammed onto the crude boieira. Depending on such factors as the level of the river, the total draught of the craft and the skill of the river pilot, the trip down the river may require anywhere from five to 10 days. During this time the cattle are neither fed nor watered. In one reported instance, a group of cattle were driven on the hoof for eight days without food and water, just to reach a balança. Once there, the cattle were watered but not fed.⁷ The journey to Manaus required an additional 10 days and the cattle were given absolutely nothing during the time of the trip.

Needless to say, the cattle arrive at the Manaus market in pathetic condition. Packed into extremely tight quarters, the horned beasts gore one another, thus rendering the hides of little commercial value. Emaciated, weak and hungry, the cattle finally reach their point of debarkation--Igarapé São Raimundo, well within the urban limits of Manaus. No ramps are used in the unloading "procedure." Instead, the cattle are literally kicked out of the boieira, not onto land, but into the filthy water of the Rio Negro inlet. The water is filled with waste material which flows from the nearby slaughterhouse.⁸ Following their swim and walk through the shallow water, they arrive at pens totally covered with the

filth of solid waste matter.

These descriptions of the difficult trips to Boa Vista and especially Manaus illustrate clearly the primitive state of the economic infrastructure. All other things considered, movement of cattle by truck over permanently passable roads would benefit producer, supplier, and consumer, for the condition of the cattle upon the time of their market arrival could be vastly improved.

Slaughtering and Processing

The Matadouro Municipal de Manaus, operated under the jurisdiction of the Secretaria de Finanças da Prefeitura (the financial bureau of city hall), maintains a monopoly of slaughtering in the capital. The matadouro itself is located on the steep banks of the igarapé São Raimundo, an inlet of the Rio Negro. Upon arrival, cattle are placed in small holding pens (currais de espera), but they remain there a brief period, a few days at most.

The operating conditions of the slaughterhouse are truly primitive. The animal is lassoed in the pen and after what is quite accurately and literally described as a "bullfight," the doomed beast is dragged, pushed, and beaten into the so-called slaughtering room of the matadouro. Should the animal be extremely filthy, it is given a quick "dunk" in the putrid

waters of the São Raimundo inlet on its brief trip from the holding pen to the slaughtering point.

Once in the slaughtering room the animal is bludgeoned to death and falls to the floor. The processes of blood-letting, disembowling and skinning the hide are carried out on the very spot where the animal falls. After these tasks have been performed, the carcass is raised off the floor with the aid of a block and tackle device to facilitate the quartering process. The carcass having been sectioned by fourths, the quarters are then marked, weighed, counter-marked and carried to a loading dock.

There are a number of short statements which can serve to describe the wretched conditions of the matadouro operation. For example, the method of disposal of the blood and bowels is to simply dump this material into the São Raimundo inlet. This section of the city is a veritable paradise for the local vulture population. According to official sources, sizeable numbers of cows are slaughtered while in advanced stages of pregnancy. In the final two weeks of June 1966, there were 80 judged to be in final one third of the gestation period which were slaughtered. Since the slaughterhouse functions only three days each week, this number of cows is substantial indeed!⁹

The carcasses are inspected by the veterinário inspetor, who is in the employ of the Manaus Inspeção Sanitária. The inspector, whose salary is extremely low, often feels constrained to pass meat which might otherwise be condemned. A sizeable portion of the condemnations results from meat being ruined by the blows delivered in the act of slaughtering.

The rate of slaughtering in the Municipal Matadouro is far below capacity. When the supply of cattle is sufficient (by Manaus standards), the slaughterhouse functions three days a week--Monday, Wednesday and Saturday. Of the three days, Saturday is when the greatest amount of activity occurs, accounting for approximately 45 per cent of the week's total slaughtering. Monday and Wednesday account for approximately 23 per cent and 32 per cent respectively.¹⁰ During periods when slaughter cattle are in short supply, the matadouro functions only on Saturday.

The Municipal Matadouro has virtually no facilities for the chilling or freezing and storing of meat. All meat produced by the slaughterhouse must be consumed the same day the animals are slaughtered. There are no feed lots or fattening pastures in the immediate vicinity of Manaus'. The holding pens at the matadouro have no facilities for feeding animals as they are intended to confine animals for very short periods of time.

From the loading platform, the quarters of fresh beef are tossed by hand onto the open bed of a single-body truck. The meat is heaped up in the early morning sun and rarely is it covered with a tarpaulin after the loading has been completed. The individuals whose responsibility it is to load and unload the meat ride, while the meat is in transit, directly on top of the heap. As is implied, all hygienic norms are fully ignored.

The meat is taken in the early morning hours to the municipal market which is located on the north bank of the Rio Negro itself, in the heart of Manaus. Upon arrival at the market, the quarters are then distributed to a number of butchers (agougueiros) who rent space within the market. The agougueiros proceed to cut the meat in a number of ways. The several cuts of meat, while normally made to cater to different cooking uses, are generally governed by the habits of individual butchers and the whims of the consumers instead of being part of a sound grading system. The cuts are laid out in the open on concrete or wooden tables and are nearly obscured from view by swarms of flies.

In addition to the municipal market, the quarters of beef are also taken to the several butcher shops (agougues) scattered throughout the outlying bairros (neighborhoods) of Manaus. The butcher shops operate the same way as the

municipal market. There are no cooling facilities and sanitation is at a minimum. The major portion of the "packaging" of the meat is done by the consumer. In most cases, the highest level of packaging sophistication is attained when the butcher rolls the meat up into an old newspaper. Often times the purchased quantity of raw meat is simply tossed directly into the customer's basket or paper bag. To observe a young child walking along the street carrying raw meat in his hand as he returns home from the butcher shop is commonplace.

The distribution of the beef quarters to the outlying butcher shops is erratic. Not infrequently, meat which has been slaughtered and loaded onto a truck does not reach the butcher shop until afternoon; still other times, on certain slaughtering days the number of available cattle is so small that some shops receive no meat whatsoever. The erratic, short supply, in turn, encourages a host of illegal procedures whereby the butcher assures himself (hopefully) of a more dependable supply of meat.

The Matadouro Industrial de Boa Vista (Figure 21), operated by the municipal government of Boa Vista, is much smaller than that of Manaus and it is also better organized. Built in the early 1950's, it is much newer than that of Manaus. The matadouro complex contains the following



Figure 21

The Matadouro Industrial de Boa Vista

facilities:

- a) a concrete block and masonry building, with an area of 371 square meters (or 444 square yards) composed of a loading platform, a room for slaughtering cattle, a smaller room for slaughtering hogs, a disemboweling room, an area for assembling edible meat and industrial fats,
- b) a house which serves as the administrator's residence,
- c) a storage area for hides, 71 square meters (or 85 square yards) in area,
- d) a generator for producing power,
- e) an elevated water tank of reinforced concrete with a capacity of 15,000 liters (or 3,960 gallons),
- f) two holding corrals, one measuring 262 square meters (or 313 square yards) in area, the other 160 square meters (or 191 square yards).

From the smaller of the two corrals a chute connects the holding corral with the "stunning box" (caixa de estonteamento) where the beasts are stunned before entering the room where they are actually killed and bled.

While the organization of the Boa Vista matadouro is more sophisticated than that of Manaus, the degrees of sanitation in the overall procedure of slaughtering and distributing the meat are comparable. The meat leaves the slaughterhouse as quarters and again it is heaped upon the bed of an open truck. With the riders perched on top of the raw meat, the truck makes its journey from the matadouro, located 3.7 miles (6 kilometers) south of Boa Vista on BR-174,

to the municipal market, located at the end of the Boa Vista business district on the bank of the Rio Branco. Like the Manaus market place, the quarters are distributed to the agouqueiros who rent space within the structure when they proceed to cut the quarters into the usual retail cuts. This event occurs just once each week, late Saturday afternoon. Both at the matadouro and at the municipal market there are virtually no cooling, freezing and storage facilities for the fresh meat.

Grading

Both in Manaus and Boa Vista meat is not graded by types of cattle. A distinction is made between first-, second- and third-class meat obtained from the same carcass but the distinction appears to be quite arbitrary and unrealistic. It is arbitrary because the term does not necessarily imply the concept of quality. Meat classified as second class which comes from the forequarters of an improved tropical breed of steer which has matured to marketable size in just 18 to 20 months (a purely hypothetical example for this part of Brazil) is certainly of better quality than meat classified as first class but coming from the hind-quarters of a 10 year old cow, an ox, or a tough, scrawny pé douro animal who has endured the arduous journey to market.¹¹

This type of grading is unsuitable because the system can be used to deceive the consumer and as an excuse for charging prices which bear no relation to the quality of the meat offered. To consume beef as it is sold in Manaus and Boa Vista today, one needs the following personal attribute and equipment: an incredibly strong maxilla and mandible, capable of enduring extended periods of vigorous chewing action; a forged aluminum or cast iron hammer-like device to bludgeon the "filet" in the name of "tenderization"; a large kettle for making beef broth from bones and the usually inedible parts of the carcass; and a pressure cooker to prepare the meat for direct human consumption.

Problems of Supplying Manaus

In the chapter on factors limiting production, attention was drawn to the seriousness of the adverse effects of seasonal forage shortages on beef production. The critical scarcity of suitable grasses during the dry season is in sharp contrast with the position in the rainy period, when pasturage is much more plentiful and beef productivity shows a marked improvement. Seasonality, combined with very serious transportation deficiencies, causes marked periods of inadequate supplies of cattle to the Manaus market.

Figure 22 shows two periods when the number of cattle slaughtered in Manaus are far below the average 2,304 head for the triennium June 1963-May 1966. Consumers and marchantes refer to June as the first or short period of inadequate supply (primeira or pequena entressafra) and the three-month period of September, October, November as the second or great period of cattle shortage (segunda or grande entressafra). The remaining eight months of the year when supplies are normal (but not necessarily adequate) is called the safra.

Analyzing the information contained in Table 8 for Manaus:

- a) the slaughtering rate per month for the triennium is 2,304 head;
- b) the slaughtering rate per month for the safra (December-May, July and August) is 2,677;
- c) the slaughtering rate per month for the entressafra (June, September, October, November) is 1,559 head of cattle.

Considering the normal level of slaughter as that registered in the safra, the rate of slaughtering during the entressafra represents only 58 per cent of the normal rate, that is, a 42 per cent reduction. Even when compared to the overall monthly average of 2,304 head, the shortage period shows a 32 per cent decrease.

Even during the months when supplies of slaughter cattle are "normal" it is plain to see that the consumption is not

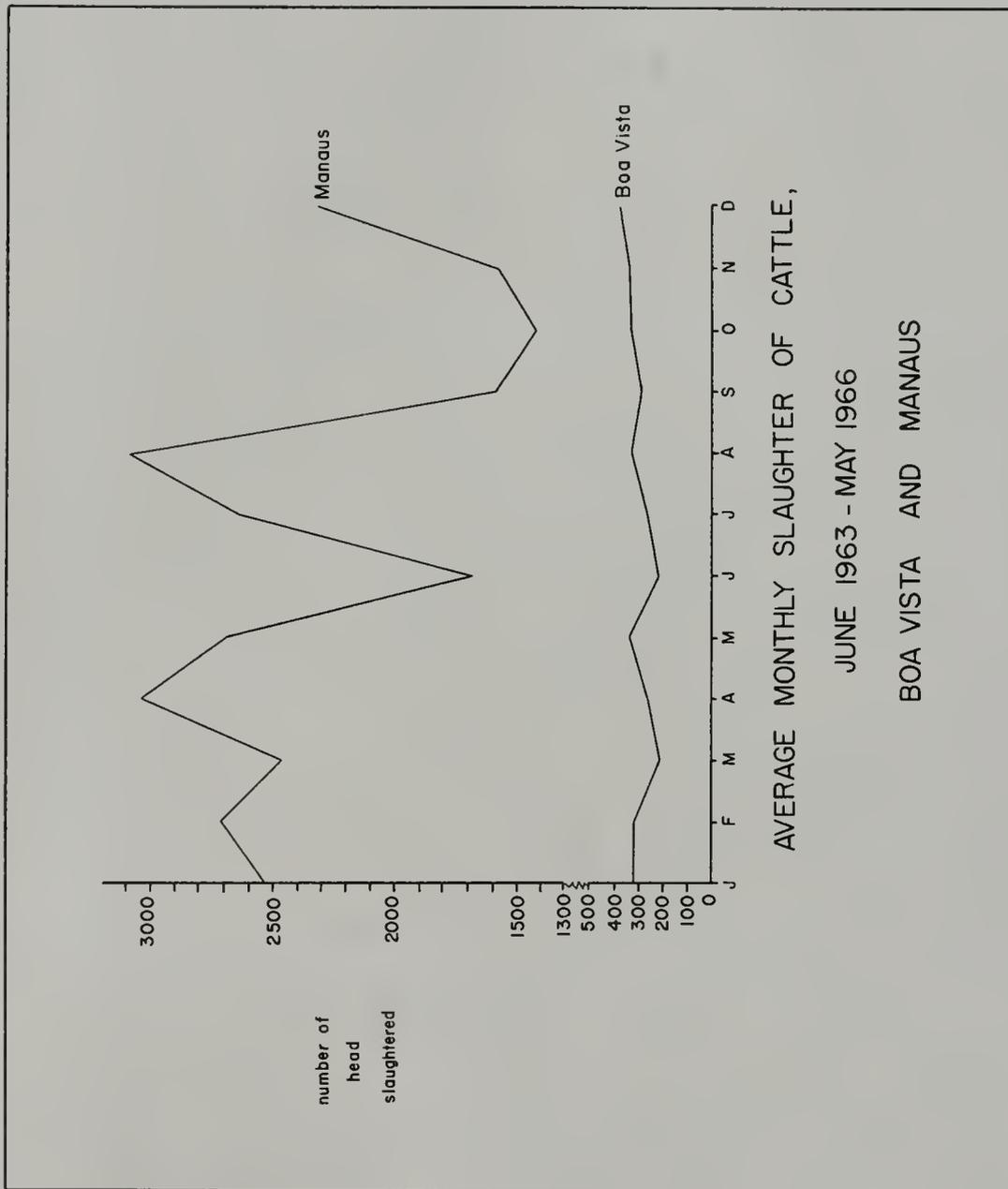


Figure 22

Table 8

Average Monthly Slaughtering Rates for Manaus
and Boa Vista, June 1963 - May 1966

Month	Number of Cattle	
	Manaus	Boa Vista
January	2,521	324
February	2,701	318
March	2,452	204
April	3,037	252
May	2,687	349
June	1,675	221
July	2,625	261
August	3,090	336
September	1,579	291
October	1,411	331
November	1,571	341
December	2,303	373
Total	27,652	3,601

Source: Manaus Agência Local do Departamento de Promoção Agropecuária, Plano de Assistência a Pecuária Bovina do Amazonas, Manaus, Amazonas, 1966, p. 48.

Boa Vista June 1963-August 1965, Prefeitura Municipal de Boa Vista, Secretaria de Administração, Boa Vista, Roraima

September 1965-May 1966, Fundação IBGE, Inspeção Regional de Estatística, Boa Vista, Roraima.

entirely satisfied. Customers who wish to purchase meat in the Municipal Market gather in the early hours of the morning to push and crowd for a position nearest to their favorite butcher's table. When the quarters of beef arrive from the Municipal Matadouro customers begin shouting to the butcher for their specific amounts and cuts of meat. Seldom does the meat lie on the table for more than a few minutes. By 9:30 A. M. almost all activity ceases as virtually all of the meat has been purchased. If a visitor, unfamiliar with this situation, were to visit the Municipal Market shortly after 10:00 A. M. it is highly likely that he would conclude that the main meat market must be located elsewhere in the city because the only on-going activities he would view would be those of customers purchasing fish, dry goods and a tremendous variety of fresh fruits and vegetables. The section of the market where meat is sold would appear as a large empty room.

At the onset of the second or great shortage period (September-November) the impending supply shortage becomes an issue of major proportions. This is reflected by the nature of several newspaper articles which appear at this time. The Superintendência Nacional de Abastecimento (SUNAB), a federal agency charged with the responsibility of setting consumer prices and ensuring the supply of foodstuffs and consumer durables, is called on constantly by the consumers

to "remedy the situation."

On September 23, 1968, the newspaper A Critica printed an article which tended to place SUNAB in an unpopular position. "Although SUNAB guarantees that there is a sufficient stock of cattle available for slaughter in the Matadouro, several marchantes say that the supply of fresh meat in the markets will soon dwindle....The period of slack supply from Baixo Amazonas has already begun and the slaughtering stock for Manaus has decreased with the cessation of cattle from Roraima. At the end of this week the Municipal Matadouro will have fewer than two dozen head on hand to slaughter...."¹²

Ten days later the situation had become more acute. Still another newspaper article issued the reassuring headline "Meat: SUNAB has the Solution."¹³ The article stated that the head of the SUNAB office in Manaus proposed the immediate acquisition of 2,000 head of cattle from Roraima. The Coordenador of SUNAB bemoaned the fact that the grande entressafra occurred "through absolute lack of infrastructure, having neither a refrigeration system nor a suitable amount of fattening pastures" in the immediate vicinity of Manaus. Ironically, no mention was made of the lack of roads, the key obstacle to moving beef out of Roraima when the Rio Branco is low. "The final decision about the steps to be adopted will be announced this week after the necessary contacts are established with the proper parties. The goal of SUNAB, the

Coordenador emphasized, is to sustain the populace with a supply of meat without requiring an increase in retail prices." At week's end no further information was forthcoming to the public.

These two newspaper articles contained statements which were either vague or illogical. For many years the consumers in Manaus have experienced the two periods each year when slaughter cattle have been in short supply and they were fully expecting this in 1968. A verbal guarantee from SUNAB was in direct opposition to the evidence at hand. The people were quite aware that the normal supply of cattle from Baixo Amazonas was dwindling and that no cattle could be obtained from Roraima because the river was impassable for cattle-laden boieiras. Thus, the usual market scene during the grande entressafra of long lines of anxious, nervous, pushing consumers, vying with one another for the scant supply of fresh beef, prevailed in 1968 as it had for many years prior to that time.

On a free-market basis, as the supply of stock begins to wane to a critical point, prices for cattle and meat tend to rise and distributors are faced with a shortage of fresh meat. As prices continue to rise, public opinion demands strict price controls and seasonal supply difficulties bring into the open the problems of the slaughter of dams and

steers not yet ready for market. In Brazil SUNAB has responded to demands of the consumer and has set a series of strict price controls for the meat trade in Manaus.

In spite of explicit SUNAB directives and official supervision for meat pricing, black market and speculative activities abound in Manaus during the entressafras. The events and activities alleged to have taken place during October of 1968 will serve to illustrate this point.¹⁴ Second-class meat was being sold in the Municipal Market at the rate of NCr\$3.00, far above SUNAB's directive of NCr\$2.10 per kilo. Consumers were paying up to NCr\$4.00 per kilo, instead of NCr\$2.40, for first-class meat, while the filet was being purchased at "astronomical" prices.¹⁵ As justification for their prices, the butchers claimed that they were receiving meat from the Municipal Matadouro at NCr\$2.00 per kilo whereas they should have been charged only NCr\$1.70.

Newspaper sources discovered that those who delivered the meat from the Matadouro to the butchers (i.e., the marchantes) were charging prices beyond those stipulated by SUNAB. At the moment of delivery, the supplier was paid a sum of money based on the official NCr\$1.70 per kilo price. Later the same day, after the official revenue agents had checked on the meat delivery, an employee of the marchante visited the butcher to collect the remainder of the actual

sum charged which was based on the illegal rate of NCr\$2.00 per kilo. To make up for the extra cost of procuring a supply of meat, the butcher, in turn, raised his retail prices.

Problems of Supplying Boa Vista

To the residents of Boa Vista, the terms safra and entressafra have very little meaning, other than the fact that some of the people are aware that distant markets are affected by seasonality. Compared with Manaus, the volume of slaughter for Boa Vista is nearly eight times smaller. Figure 22 shows that monthly fluctuations during the triennium were much less acute for Boa Vista than for Manaus.¹⁶ For that same triennium, the ratio of cattle per human being was 5.9:1 for Roraima and 0.3:1 for Amazonas. Nationally, Roraima ranked second only to Mato Grosso which had a ratio of 10.6:1.¹⁷ Regardless of the season, fazendeiros are able to get a few cattle to the Boa Vista Matadouro.

The problem with respect to the Boa Vista market is not one of seasonal supply shortages, but rather one of who shall supply the matadouro and when. If a free market situation existed, those fazendeiros owning large herds would monopolize and flood the market so that prices would reach such a low level as to prohibit any positive economic returns for raising cattle. At the present time, however, there are

essentially just two suppliers: Fazendas Brasil, S. A. and the Cooperativa Pastoril de Boa Vista.¹⁸ The cooperative has a membership of approximately 330 fazenda owners, which includes the great majority of criadores and fazendeiros who occupy the savannas of the Alto Rio Branco. Cattle from the ranches of Fazendas Brasil account for 26 per cent of the annual Boa Vista market supply. This firm supplies the local matadouro one week out of every four. The remaining three weeks of each month the supply comes from the members of the Cooperativa. When a fazendeiro who belongs to the Cooperativa has a number of bois (steers) ready for slaughter, he reports this number to the office of the Cooperativa where it is duly recorded. The man in charge (o chefe) at the Cooperativa then notifies the fazendeiro when he should bring his cattle to the Matadouro for slaughter.¹⁹

The incentive to sell cattle for the Manaus market rather than in Boa Vista is great. For example, during the 1968 season, marchantes from Manaus were offering NCr\$0.50 per kilo of live weight. The carcass weight in the North is believed to be one of the lowest in terms of per cent of live weight anywhere in Brazil and is estimated to average 147 kilograms per animal. If the ratio of carcass weight to live weight of 0.45:1 is used, then the average live weight per animal upon arrival at the Manaus slaughterhouse is 301

kilograms. Although the amount of weight lost between the balança in Roraima and the slaughterhouse at Manaus has never been calculated, it is suspected that it is great. A survey undertaken by the Livestock Production Service of the São Paulo Department of Agriculture shows that cattle transported by rail lose from 31 to 52.5 kilograms over distances of 500 to 815 kilometers.²⁰ The average distance by water from the loading points in Roraima to Manaus is 888 kilometers; the time required for the trip is at least double that for rail and there are no provisions for feeding or watering the cattle en route. If the weight loss is "guesstimated" to be 60 kilograms, then the average live weight of cattle at the time the marchante pays the producer is 361 kilograms. At NCr\$0.50 per kilo, the average price per head shipped to Manaus was NCr\$180.50 in 1968. The prices offered for live cattle at the Boa Vista market during July and August of the same year ranged from a low of NCr\$91.20 to a high of NCr\$140.00 per animal.²¹ This evidence affirms the Roraima fazendeiro's claim that Manaus is the preferred market.

It would appear at the outset, observing Figure 22, that the Roraima ranchers are in a good position to supply increased amounts of cattle to the Manaus market during the grande entressafra, upon completion of an all-weather road connecting the savanna region with Manaus. Traditionally

Manaus has received its cattle from essentially two areas. The bulk of its supply comes from western Baixo Amazonas where the cattle are raised close to the Amazon River in the municípios of Parantins, Nhamunda, Barreirinha and Maues, all of which are in the easternmost part of the state of Amazonas. On occasion, cattle from the state of Pará also are sent to Manaus, but this varies from year to year according to the fortunes of weather, pasture conditions, availability of fat stock and the market demands in Belém do Pará and Manaus.²² Cattle from the Alto Rio Branco form the bulk of the Manaus supply during the months of July and August.

The major factor preventing fazendeiros located in Baixo Amazonas from supplying Manaus continually and at a constant rate throughout the year is seasonality. The availability of fat stock in Roraima complements the seasonal shortage along the Amazon. Owing to a lack of physical access to Manaus from the Alto Rio Branco during the months of September through June, the fazendeiros of Roraima are unable to take advantage of this situation.

The purpose of this chapter has been to set the scene for possible change. Brazil as a whole, and the North in particular, is undergoing a period of rapid growth and development. Events and developments elsewhere in Brazil will have a profound impact on the cattle industry of the Alto

Rio Branco. The present chapter reveals the primitive state of the beef trade which focuses on Manaus as a market and Roraima as one of the distant supply areas. The subsequent and final chapter will consider and discuss the future prospects for raising beef in Roraima and remedying the unsatisfactory supply of the growing Manaus market, considering such things as the effects of new roads upon supply areas, and the attraction of foreign markets.

NOTES

¹The vaqueiros are hardy individuals, many of whom originated in the impoverished Northeast. The nordestino hails from Ceara, Piaui, Paraiba, and Pernambuco for the most part. His cultural origins are reflected in his distinctive habits of dress, such as the hand-tooled leather hat of the piauiense, various food dishes, songs, and idle topics of conversation. Rare are the caboclos of Amazonia who have taken up the life of a vaqueiro, but there are a few. In addition, many of the ranch hands are descendants of the Arawaks, the original inhabitants of the region. These Indians are members of three groups--the Macuxi, Uapixana and Munaico.

²Although there were no official estimates during the 1930's, many individuals claim that the total herd size on the Roraima savannas approached 300,000 head of cattle.

³This process is described in Chapter VI with reference to the sorte system.

⁴In terms of linear, straight-line distance, no ranch is further than approximately 125 miles (200 kilometers) from Boa Vista. With respect to route traveled, it is doubtful that this distance would increase beyond 50 miles, that is, 175 miles or 282 kilometers, in the extreme case.

⁵Even when the water level is at its peak, the portion of the Rio Branco from Bôca da Estrada to Caracarai, a stretch including many series of rapids, is passable only when the craft is guided by a very experienced and skilled river pilot.

⁶For a discussion of the prices paid, see a subsequent section of this chapter, pages 221-222.

⁷The overland cattle drive to the balança causes the animal to lose weight which, in turn, reduces the income for the fazendeiro since he is paid solely on the basis of live

weight. The water consumed at the balança replaces some of the weight and the fazendeiro recoups some of the loss, but this occurs only where there are scales available. At the balança where weight is estimated by appearance, financial loss is permanent.

⁸During the months of October and November, when the waters of the Rio Negro are at a seasonal low, often times the water depth is so shallow that the animals must be unloaded more than a half mile from the holding pens and then animals must wade through the polluted waters the remaining distance.

⁹Agência Local do Departamento de Promoção Agropecuária, Plano de Assistência a Pecuária Bovina do Amazonas (PLANAPAM) (Manaus, Amazonas, 1966), p. 51.

¹⁰Ibid.

¹¹The implication here is that the young steer which has matured in 18 to 20 months has been able to do so because it was raised intensively. The animal has spent a minimal amount of its energy grazing for food and water. Instead, the animal has been provided with shade, water, improved grasses, feed grain, vitamin and mineral supplements; it has been treated for the common detrimental diseases and protected from natural predators. Compared to the input costs for range animals, the costs for producing animals intensively are many times higher. In fact, the costs far outstrip the returns and, hence, dictate against intensive methods of producing beef.

¹²"Carne Pode Escassear Mas o Peixe É Farto," A Critica, September 23, 1968, Manaus.

¹³"Carne: SUNAB Tem Solução," A Critica, October 3, 1968, Manaus.

¹⁴"Problema da Carne É Caso de Polícia," Diário da Tarde, October 14, 1968, Manaus.

¹⁵The author was living in Manaus at this time and can reaffirm the newspaper allegations. If he desired filet he had to be at "a certain butcher's establishment" at "a certain time," on Thursday afternoon. The butcher charged NCr\$7.00 per kilo (i.e., more than \$1.00 U.S. per pound) for

filet. This meat, in order to be edible, had to undergo further "surgery" upon arrival at the author's residence. Muscle had to be cut away, and after a sound thrashing with a tenderizing hammer, cooking could begin. The cooked "filet" was a far cry from its United States counterpart and the jaws of the diners were called upon for yeoman's service.

¹⁶In the case of Roraima, a small but unspecified proportion of the animals butchered is not declared and is, therefore, not taken into account in the supply statistics. A few of the animals are slaughtered to supply the village of Caracarai and periodically animals are killed to feed the workers attached to the fazendas. With respect to the latter, the meat remains outside of the cash economy.

¹⁷Amazonas Brasil and Ruy A. C. Lins, "Projeto Agropecuário, Fazendas Brasil, S.A., Território Federal de Roraima," Manaus, 1968, p. 18. (Mimeographed)

¹⁸Personal interview with Amazonas Brasil, March 1969.

¹⁹The largest cattle firm in Roraima, Gado da Amazônia, S. A., maintained a herd of 28,465 cattle on 24 different ranches at the time of the special cattle census taken in late 1967. It was alleged that this company was at odds with government authorities and was prohibited from marketing any of its cattle. From time to time, however, their cattle did reach the market in an indirect, circuitous fashion. Whenever Fazendas Brasil found itself short of slaughter cattle at the time it was to supply the Boa Vista market, it would purchase cattle from Gado da Amazônia.

²⁰United Nations, Economic Commission for Latin America and Food and Agriculture Organization Joint Publication, Livestock in Latin America: Status, Problems and Prospects, II (New York, 1964), p. 38.

²¹Boa Vista prices were obtained from the Inspeção Regional de Estatística, Boa Vista, Roraima.

²²The cattle areas of the Baixo Amazonas, i.e., Santarém, Alenquer, Monte Alegre, Oriximiná, Prainha and Óbidos, all along the Amazon River within the state of Pará, have traditionally been the source of supply for Belém, along with cattle raised on Marajó Island.

CHAPTER VIII

WHITHER THE BEEF INDUSTRY OF RORAIMA?

Since 1920 the world's consumption of all kinds of meat has increased much faster than its consumption of food in general. Estimates calculated by FAO indicate an increase in per capita meat consumption of almost one quarter during the 1950's alone.¹ Although the income elasticity of demand for meat on the average is higher than for other foods, it shows great variation among countries: from a low of close to zero in Argentina, Uruguay, and Oceania to one or more in Asia. Generally the level is higher for the poorer countries than for the wealthier ones. Also, the upward trend has not been uniform throughout the world and in some cases, such as Brazil, per capita consumption has actually declined.²

(Table 9)

Beef's share of meat consumption has greatly increased since World War I. With veal, it now accounts for over half of all meat consumption in the world; pork accounts for approximately one third and poultry, mutton and lamb for most the remainder. Consumption data for the various kinds of meat consumed in Brazil reveal a preference for beef, which

Table 9

Brazil: Per capita Meat Consumption, 1948 - 1967*

Year	Per capita consumption (kilograms)
1948	26.94
1949	27.57
1950	27.34
1951	28.64
1952	27.44
1953	27.19
1954	27.21
1955	25.82
1956	27.75
1957	28.03
1958	29.31
1959	27.08
1960	26.07
1961	25.90
1962	25.90
1963	25.50
1964	25.90
1965	24.50
1966	23.60
1967	23.20

*Carcass weight basis: includes beef, veal, pork, mutton and goat.

Sources: 1948-1960 United Nations, Economic Commission for Latin America, and Food and Agricultural Organization Joint Publication, Livestock in Latin America: Status, Problems and Prospects (New York, 1964), II, 74, Table XXIV.

1961-1967 J. Grunwald and P. Musgrove, Natural Resources in Latin American Development (Baltimore, 1970), 423, Table 15-5.

accounts for about 74 per cent of total consumption of red meat.³

Per capita meat consumption in Brazil is manifestly low, not only in relation to recommended standards of diet, but in comparison with the levels prevailing in other countries; it is equivalent to only one fourth of the volumes registered in Argentina and Uruguay and to approximately one third of the United States figure, and also falls short, although in lesser measure, of consumption in several other Latin American countries.⁴ (Table 10)

It must be emphasized that average consumption data are given only for reference purposes, as averages in themselves often times bear but little relation to the real state of affairs. There is, for example, a considerable difference between levels of consumption in the urban and rural populations, and the gap is continually widened by the increasing disequilibrium in purchasing power. The rural dweller consumed only 10 kilograms of meat annually, as opposed to a corresponding figure of 50 kilograms for the urban population of Brazil during the early 1960's.⁵ There are innumerable examples of minimal consumption, or none at all, among the underprivileged, low-income classes and in rural areas, and of better or satisfactory levels in the large urban centers.

Table 10

Per Capita Meat Consumption for Selected Countries, 1967*

Country	Per capita consumption (kilograms)
Uruguay	103.2
New Zealand	101.4
Argentina	96.4
Australia	87.3
United States	80.9
France	72.3
Canada	67.7
United Kingdom	62.7
Paraguay	61.4
West Germany	56.4
Union of South Africa	35.4
Soviet Union	32.3
Italy	30.5
Venezuela	25.0
Chile	24.1
Brazil	23.2
Colombia	22.3
Mexico	16.8
Philippines	16.4
Peru	15.9
Japan	9.1

*Carcass weight basis: includes beef, veal, pork, mutton, lamb, goat and horsemeat; excludes edible variety meats, lard, rabbit, and poultry meat.

Source: J. Grunwald and P. Musgrove, Natural Resources in Latin American Development (Baltimore, 1970), 423, Table 15-5.

In Rio de Janeiro, São Paulo, Curitiba, Pôrto Alegre and a few other places per capita consumption of fresh, chilled or frozen meat exceeds 50 kilograms.⁶ In the North and North-east consumption is deficient in both quantity and quality.⁷ For the triennium 1963-1965, there were notable regional disparities in the per capita consumption of beef. For example, the states of Amazonas and Pará had average annual consumption levels of 5.75 and 8.98 kilograms per capita respectively; the level in Minas Gerais was 15.6, in São Paulo, 32.84, Rio Grande do Sul, 34.83, and in Brazil as a whole, only 18.24 kilograms.⁸

In keeping with the world trend, Brazil exhibits a pronounced tendency towards urbanization. The preliminary results of the 1970 national census indicate that a total of 56.0 per cent of Brazil's 93.2 million people now live in cities. The North's two major urban centers, Belém and Manaus, have experienced tremendous population increases during the decade of the 1960's. From a 1960 population of 360,000, Belem had grown to 573,000 by 1970, making it the seventh largest city in the nation.⁹ The population of Manaus in the year 1960 stood at 154,000. A special city census in 1967 enumerated 228,313 inhabitants, a 48.2 per cent increase in seven years.¹⁰ Spurred by the implementation of a free trade zone, the 1970 national census showed

that Manaus had a population of 303,155, a 32.8 per cent increase in a period of just under three years!

With the long-term goal of effectively populating a region that at present has only about 0.2 persons per square mile, a policy of integrating Amazônia with the rest of Brazil has been put forward and development programs based on those already being undertaken in the Northeast are being implemented. Furthermore, although Western Amazônia (the states of Amazonas and Acre, and the territories of Rondônia and Roraima) was to benefit from the arrangements made to encourage growth and development in Amazônia as a whole, largely because of its isolation from the rest of Brazil, a plan to establish a special development center in Manaus was given particular emphasis. Following a series of studies undertaken during the Castello Branco administration, a decree-law was issued in February 1967 authorizing the establishment of the Manaus Free Zone (Zona Franca de Manaus), covering an area of 10,000 square kilometers (3,861 square miles), including the city of Manaus and territory adjacent to the Rio Amazonas and Rio Negro. In August 1967, detailed regulations were issued for the operation of the Zone, and as a final step, in December 1968, following a visit of the President and Cabinet to Manaus the previous August, the concessions and incentives granted for Brazilian goods in

the Zone were extended to the whole of Western Amazônia. Specific provision was made for the distribution of foreign goods imported into the Zone in the remainder of Western Amazônia.

The introduction of the system of fiscal concessions for a 32-year period (which may be extended at the discretion of the leaders in Brasília) has had a marked positive effect on living conditions and economic activity in Manaus. In the past, Manaus has suffered from its isolated position and, with the possible exception of air transport, from inadequate communication links with the rest of Brazil, with high freight rates affecting prices and deliveries of foodstuffs and other goods. The implementation of the Free Zone, with its industrial products' tax and import duty concessions, reduced the prices of many Brazilian food products and greatly increased the availability of foodstuffs imported from abroad. Figures published by the Manaus office of SUNAB for 1967 showed that in December the average retail prices of 17 out of 35 items of food were actually lower than in January; some, such as rice, potatoes, beans, tomatoes, powdered milk, cottonseed and soya oils, margarine, butter, and cheese, were much lower. A large proportion of these products was imported and represented a marked improvement in quality and packaging on products previously available. The local decline

in prices was especially remarkable in that in 1967 there was a 25 per cent increase in Brazilian living costs, which included a 14 per cent increase in the price of foodstuffs. Data from a June 1968 national price study by the Instituto Brasileiro de Geografia e Estatística showed that food prices in Manaus continued to compare favorably with those in the remainder of Brazil.¹¹

Just prior to the official beginning of the Manaus Free Zone, a flurry of commercial activity began in Manaus in anticipation of the concessions to follow. According to information published by Comissão do Desenvolvimento Econômico do Estado do Amazonas (CODEAMA), already in January and February 1967, 460 new firms had registered with the Junta Comercial de Manaus. During the remaining 10 months of 1967 a total of 898 additional firms was registered, of which 116 were medium-sized firms while the rest were primarily small units operating in services or in retail trade. About 65 per cent of the medium-sized firms were engaged in the importation of both domestic and foreign goods under the Free Zone arrangements.¹²

The present aim of development policy is to establish around Manaus a commercial, industrial and agricultural area supplied with sufficient human and physical resources to allow its development in the face of adversity. The present

emphasis is on stimulating new activities with the help of various government agencies. The Superintendência da Zona Franca de Manaus (SUFRAMA) passes approval or rejection on development projects to be set up in the Free Zone. The Superintendência do Amazonas (SUDAM) sets forth incentive schemes which, following the method already employed for several years in the Northeast by SUDENE (Superintendência do Nordeste), relies mainly on funds made available from federal revenue and income tax concessions to foster development.

By November 1968, SUDAM had approved 12 development projects in the state of Amazonas and another 9 were under serious consideration. Almost all of these projects are being established in or very near Manaus, where an industrial estate is being set up. The existing plants and future projects in Manaus include a wide variety of activities such as shipbuilding, cold storage, jewelry manufacturing, iron and steel products, plastic pipes, cement, hosiery, furniture, domestic appliances, chemicals, petrochemicals, hotels, prefabricated houses and tiles. The expansion of existing jute, plywood and food-processing plants is also being undertaken.

The growth in commercial and industrial activity in Manaus has certainly had beneficial effects on the labor situation. Increased commercial and industrial employment,

the stimulus given to building activities in the city, and the more expansionist view taken by local businessmen have done much to increase the purchasing power of the resident population. In turn, increased real income per family should bring about a greater demand for beef as more and more people acquire the ability to improve their diets through the purchase of a better variety of foods.

The beef supply problems cited in Chapter VII were present long before the recent surge of economic activity and growth in Manaus. What does this growing urban demand for beef mean to the Roraima producers? How will the new land surface connection (BR-174) between Manaus and the Alto Rio Branco affect the cattle situation in Roraima? An investigation of an apparent analagous situation in Eastern Amazônia may shed some valuable light on the answers to these far-reaching questions.

The completion of the Belém-Brasília road (BR-14) has had a profound impact on supply patterns for the urban market of Belém. (Figure 23) Prior to the construction of the road the traditional sources for beef in Belém were the island of Marajó and the region of Baixo Amazonas, where animals were (and still are) raised in a manner very similar to that of Roraima. A brief description of ranching on Marajó will reveal the similarity between the two regions.¹³

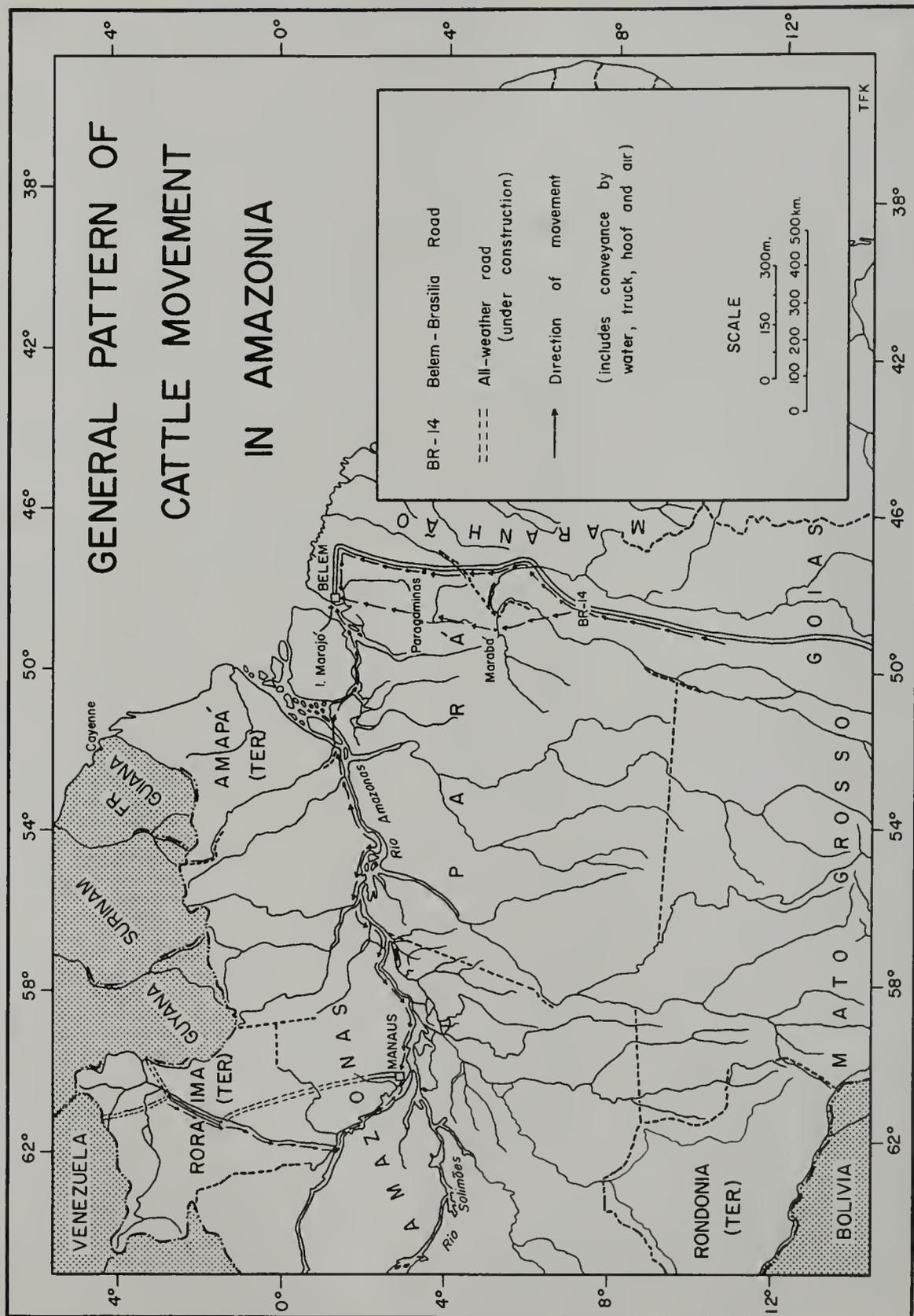


Figure 23

Few of the fazenda boundaries on Marajó are distinctly marked and in the majority of cases there are no fences to separate them. The fazenda owners are not certain about the number of cattle they own since the animals can easily wander across the open grassland or through patches of forest to mingle with cattle from other fazendas which are also roaming at will. This gives rise to a periodic roundup whereby vaqueiros from several ranches must collect the cattle and drive them to a specific predetermined location. The next step is to perform the apartação, that is, sort the cattle by recognizing brands or ear marks and return the cattle to the rightful owners. Following this, a group of unmarked cattle is led into a corral which is then closed to prevent the cattle's escape. Those adult cattle which bear no ownership markings are branded either on the side of the neck or on the upper part of the rump with a red-hot iron. Subsequently, the calves are marked in the same manner. The young males (novilhos) are wrestled to the ground and a knife is used to make the fazendeiro's ownership mark on the ears.

When a corral is not available, or its capacity is small, sometimes the branding procedure is carried out in the open near the ranch headquarters. In this instance the cattle are lassoed and thrown to the ground whereupon their legs are tightly bound by thin strips of leather. The

animals suffer regardless of the season. During the dry season they must lie on the ground, bound up and fully exposed to the sultry heat of the tropical sun; in the rainy season they must lie in a quagmire awaiting the painful touch of the branding iron. Sometimes a particularly wild beast must be dragged, while bound, across the ground and into a corral by a horse. The marks made by several brands on one animal over a period of time further reduce the economic worth of the animal by injuring the hide.

On the fazenda, an animal is slaughtered approximately every 15 days (which is also true of Roraima) to provide meat for the vaqueiros and other workers. On certain occasions, such as the apartação, a few additional cattle are killed to fete the vaqueiros from neighboring ranches who have given of their labor.

The raising of cattle on Marajó Island is characterized as being extensive. Of land, labor and capital, land is by far the most important input. Labor is minimal and capital inputs rival those of the Alto Rio Branco. The cattle breed at will on the open range, generally without any care or assistance on the part of the vaqueiros or fazendeiros. The major portion of the Marajó herd is not made-up of pure breeds since nearly always a purebred breeding nucleus quickly degenerates as a result of cross breeding.

As the rainy season approaches and before the low-lying grasslands become inundated, the cattle must be moved to the few slightly elevated areas. The wet/dry climatic cycle presents the same serious difficulties on Marajó that are present in Roraima. Loss by drowning is common and loss of weight owing to poor forage in the dry season is the rule. Soil erosion, leaching, and eluviation occur without any human effort to check them.

The principal market for Marajó's cattle is the city of Belém. Like the Alto Rio Branco, the cattle are moved over-land to loading points where watercraft, similar to the boieiras which ply the Rio Branco, take them on a few hours' journey to the Matadouro do Maguari in Belém. Each craft has a small capacity, ranging from 30 to 60 head of cattle. The slow barge-like boats can make one trip per day.

Belém is enjoying a healthy period of economic growth and development and the urban consumer demands are far greater than those of Manaus. For some time now there has been a shortage of fresh beef in Belém and the public has been clamoring for a greater off-take from nearby Marajó. Some fazendeiros prefer to sell their cattle to the very lucrative, but severely limited, foreign market of Cayenne, French Guiana. Government officials maintain that the beef cattle production on Marajó is insufficient to supply both the

domestic and foreign demand simultaneously. The great upsurge of urban demand for meat, brought on by rapid growth as a result of the completion of the Belém-Brasília road, brought about a slaughter in the early 1960's for which the Marajó ranchers were unprepared. With the ranchers frequently finding themselves in a precarious financial situation, unable to obtain credit, they were (and still are) forced to sell their breeding animals in the prime of their reproductive age so that while the off-take ratio increased, some of the poorer and smaller criadores suffered greatly owing to a loss of replacement stock. In the majority of cases the criador cannot improve his grazing land or his herd because such endeavors are beyond his financial capabilities.¹⁴

Table 11 reveals the drastic changes in the supply pattern which have occurred as a result of the completion of the Belém-Brasília road. From 1962 through 1966 the number of cattle coming from Marajó has increased steadily but then 1967 showed a marked decline (possibly a result of over-kill the previous year). However, when viewing the contribution made by Marajó as a portion of the entire Belém beef cattle supply, the dominant role of supplier which Marajó had enjoyed since 1726 has been greatly reduced. In 1962 cattle from Marajó accounted for 81 per cent of all cattle slaughtered

Table 11

Belém: Slaughter of Cattle and Buffalo
According to Region of Origin, 1962-1967

Region	Steers	Cows	Buffalo	Total
<u>1962</u>				
Marajó Island	21,553	3,706	108	25,367
Baixo Amazonas*	<u>5,480</u>	<u>341</u>	<u>64</u>	<u>5,885</u>
Total	27,033	4,047	172	31,252
<u>1963</u>				
Marajó Island	24,780	4,085	91	28,956
Baixo Amazonas	3,425	1,722	170	5,317
Goiás and Maranhão	<u>810</u>	<u>92</u>	<u>---</u>	<u>902</u>
Total	29,015	5,899	261	35,175
<u>1964</u>				
Marajó Island	25,963	4,584	212	30,732
Baixo Amazonas	5,064	994	112	6,170
Goiás and Maranhão	<u>879</u>	<u>208</u>	<u>---</u>	<u>1,087</u>
Total	31,879	5,786	324	37,989
<u>1965</u>				
Marajó Island	31,412	12,421	2,197	46,030
Baixo Amazonas	7,905	2,231	634	10,770
Goiás and Maranhão	<u>26,732</u>	<u>517</u>	<u>---</u>	<u>27,249</u>
Total	66,049	15,169	2,831	84,049
<u>1966**</u>				
Marajó Island	32,183	10,701	2,624	45,508
Baixo Amazonas	10,390	344	343	11,077
Other regions of Pará	630	---	---	630
Goiás and Maranhão	<u>32,582</u>	<u>323</u>	<u>---</u>	<u>32,905</u>
Total	75,785	11,368	2,967	90,120
<u>1967**</u>				
Marajó Island	24,996	9,411	2,795	37,202
Baixo Amazonas	10,140	173	566	10,879
Goiás and Maranhão	<u>26,931</u>	<u>---</u>	<u>---</u>	<u>26,931</u>
Total	62,067	9,584	3,361	75,012

*Cattle from the Baixo Amazonas originate in the municípios of Prainha, Santarém, Monte Alegre, Porto de Moz, Almerim, Alenquer, Faro, Oriximiná, Juriti, and Óbidos, all of which are in the state of Pará.

**Data are subject to modification.

Source: Manoel José de Miranda Neto, A Foz do Rio-Mar (Rio de Janeiro, 1968), Appendix I, Table 24.

Original sources: Matadouro do Maguari and Cooperativa da Industria Pecuária do Pará, Ltda.

in Belém; the remainder came from Baixo Amazonas with no cattle being shipped from Goiás and Maranhão. Data for 1963 marked the beginning of the great changes to come. With improved access to a growing urban market, cattlemen in the states of Goiás and Maranhão found it economically feasible to sell their cattle in the Belém market, using the Belém-Brasília road as the transportation route. The trickle began in 1963 when Marajó was responsible for 83 per cent of the total supply while Goiás and Maranhão sent 902 head, representing just 3 per cent of the total slaughtered. The trickle soon became a flood. The recorded slaughter for 1964 indicates that Marajó's share had slipped to 54 per cent while the supply from Goiás and Maranhão had zoomed to 33 per cent. In absolute terms both supply areas were increasing their output but Goiás and Maranhão increased their share in number of cattle by a tremendous margin. Marajó displayed an increase of 13,131 head over the 1963 figure (an increase of 44 per cent); cattle from Goiás and Maranhão grew in number by 26,162 (an increase of approximately 2,400 per cent).¹⁵

The Belém-Brasília road has had temporal as well as spatial impacts on the cattle complexes which supply Belém. Some 294 road-kilometers (192.5 miles) to the south of Belém (or about 140 due south) the município and cattle region of Paragominas has been created along a 91-kilometer (56-mile)

stretch of BR-14.¹⁶ Settlement here is typical of newly colonized lands along the northern portion of the road. Rather than being occupied by settlers from the impoverished Northeast, Paragominas has been peopled initially by individuals from Goiás, São Paulo, Bahia and Minas Gerais.

Although the development of this area is a direct result of the opening of the Belém-Brasília road, the groundwork for settlement was well under way prior to the road's actual construction. People from southern Brazil foresaw possibilities for this region as (to their eyes) it resembled lands in northern Paraná, but without the threat or menace of frost. Goianos and mineiros (people from southern Goiás and Minas Gerais) maintained a strong speculative interest in the area in the late 1950's. From the time the first settler arrived from Bahia in 1958, the population had grown to 6,500 in 1965, most of which was concentrated in the zona das invernadas (cattle fattening area).¹⁷

As opposed to the extensive grazing on Marajó, Paragominas functions primarily as a series of fattening lots for range cattle brought in by hoof or trunk from Goiás and Maranhão. This represents an increase in the level of sophistication over the simple system which prevailed prior to the completion of BR-14. Formerly, the cattle which reached Belém were, for the most part, pe dourado which had survived the rigors of open

grazing with minimal human attention from four to six years on Marajó and then were shipped directly from the range to the market. Now an increasing portion of the cattle which arrive in Belém are Guzerat, Gir and Nellore which have been born and grazed in Goiás, fed intensively on improved grasses and mineral salts, etc., in Paragominas and trucked the remaining distance to Belém, arriving in prime condition.

By 1965 the pastures of Paragominas had a total area of 36,300 hectares (91,661 acres) and were capable of feeding from 18,000 to 20,000 head of cattle at any given time.¹⁸ Since the period required for fattening averages five to six months, this area can prepare upwards of 40,000 cattle for market in a given year. Local fazendeiros boast that their best pastures can carry two to three head per hectare whereas the best range lands on Marajó can support only one half to one head per hectare.¹⁹

The financial responsibility for the feeding process in Paragominas is an interesting one. As a rule, the owner of the cattle in Goiás must rent a pasture from the invernista (feeder) at a small monthly charge per animal. In addition to this, the animals' owner is responsible for the labor cost incurred from the toil of the vaqueiros and peons. When cattle use a pasture for a brief period a verbal agreement is made, but when several months of feeding are required,

a written contract is produced which establishes the rights and obligations of the two parties involved.

Besides fulfilling the function of a fattening zone, Paragominas is becoming a breeding area as well, as more and more of the forest is cleared for pasture. The breeding stock is either Nellore, Guzerat or Gir, with Guzerat being the most preferable, as the fazendeiros claim it is the most durable and the best milk producer of the three breeds. In August of 1965, the local herd had already reached a population of approximately 3,500.²⁰

In general terms, the Belém-Brasília road has had a profound effect on zones of cattle production, levels of applied technology, and availability of meat to the Belém consumer. While the traditional supply areas of Marajó and Baixo Amazonas continue to send cattle to Belém, the road has given another established grazing area, Goiás, access to a new market, Belém. The fact that the traditional source areas were unable to fulfill the urban demand can be seen by the sharp increase in slaughter between 1964 and 1965. (Table 11) Belém was able to absorb the sudden influx of cattle from Goiás, via Paragominas, in addition to the increased numbers from Marajó and Baixo Amazonas.

The beef from Goiás and Paragominas is being raised by people whose levels of applied technology and sophistication

of management practices surpass their Baixa Amazônia counterparts. Capital is now a very important input in Paragominas even though its lack of availability presents a major problem. The end result is that the quality of the meat from the south is superior to that raised along the Amazon River. The consumers are becoming aware of the differences in quality and are expressing a preference for meat finished on improved grasses and supplements.

In summary, the construction of the Belém-Brasília road has had both a positive and a negative impact on the suppliers of beef to Belém. The road has brought about a dramatic opening up of a new region which could not have been developed without it. It has made possible faster, safer and more dependable transport service which in turn has allowed a greater movement of cattle per unit of time. Improved truck transportation has enabled cattlemen to ship cattle in prime condition with minimal weight loss or damage en route as opposed to the crude cattle barges on the Amazon.

On the other hand, that which has been expansion and development along the road has been competitive with another region. The influx of improved beef from Paragominas has left the rancher on Marajó at a decided disadvantage. Not only are his cattle of poorer quality when compared to those coming in on the Belém-Brasília road, but his access to

market is also inferior in terms of economic distance. Ranching on Marajó in the past has been anything but capital intensive. Given the current supply of available capital, the traditional attitudes, and poor transportation, the future for ranching on Marajó looks very much like the present.

Can it be inferred that upon completion of BR-174, the cattle industry of Roraima will suffer the same unpleasant consequences as those which were incurred on Marajó as a result of the completion of BR-14? To view the similarities of the general patterns of cattle production and movement between Marajó and the Alto Rio Branco, each in situ, and conclude that indeed Roraima is destined for still poorer times would be highly simplistic. Granted, the levels of applied technology and management in each region are similar, inefficient transportation by small watercraft is used in both cases and communication difficulties abound in both places.

Upon a closer investigation of the two situations, a number of differences appear. Ranchers on Marajó are much closer to the most reliable and recent source of technical information on tropical beef production, i.e., IPEAN in Belém. They are also close to the only source of serum for treatment of animal diseases such as rabies and foot-and-mouth disease, again Belém. On the other hand, the probability of

establishing a land surface route from Marajó to Belém in the near or very distant future is remote. The point here is that while both areas presently suffer from isolation, the kinds of isolation are not the same. Even though Marajó is very close to its market, the production area is an island, with the treacherous waters of the Bay of Marajó acting as a barrier rather than a resource for efficient movement of cattle. The Alto Rio Branco is considered isolated in terms of the distances which lie between it and urban centers. A land surface connection to Manaus will soon become a reality, thus greatly reducing the degree of isolation.

The present situation in Roraima is unlike that of either Marajó or Goiás in terms of accessibility to market and the role of a new road. The Belém-Brasília road opened up a new market for the grazing areas of Goiás whereas BR-174 will make the already established Manaus market more accessible for the Roraima ranchers. Marajó's importance as a supply area declined as a result of the establishment of a more efficient system of production closer to Belém in economic distance. The following discussion will show that this is not likely to happen in Roraima.

Since BR-174 has not been completed, the following conclusions must be a priori. At the outset it would appear that the fazendeiros of Roraima would welcome the improved

access to their most lucrative market. However, numerous conversations with the ranchers revealed a great deal of apprehension on the part of the ranchers with respect to the road. They view the new road as playing a "permissive" role in the development of Roraima's cattle industry.²¹

On the negative side, they look to Marajó as an example of what will happen to them. All of Amazônia is undergoing a rapid transformation as the present federal government views the empty and economically lagging North as a target for development and settlement regardless of whatever unfavorable recommendations may arise from economic feasibility studies. In the eyes of the present leaders, the goal of national security is on a par with economic development and they feel that by tying the undeveloped North to the booming South by means of a road network they can achieve both goals simultaneously. Manaus soon will be connected by road to Pôrto Velho, and, hence, to the industrialized South. The fear in Roraima is that land closer to Manaus will be cleared for cattle grazing to raise animals for the expanding Manaus market on a more sophisticated basis and thus pre-empt the present position maintained by the savannas of Roraima. This would be an occurrence similar to the creation of Paragominas with its consequent negative impact on Marajó.

On the positive side, the fazendeiros of the Alto Rio

Branco look forward to the road's completion to enable them to have easier access to material inputs such as fencing, seed, motors, tools and other equipment needed to improve productivity. With the rapid growth of industry in the Manaus Free Zone, the importation of foreign goods at attractive rates, and the announcement by the Federal Government that Manaus is to become a principal supply center for Western Amazônia's development,²² the ranchers tend to view their future operations as being dependent on Manaus for supplies, but not as a market.

Many of the ranchers have personally seen, heard of, or read about the prices of beef in such foreign urban centers as Caracas, Georgetown and Paramaribo. Such prices are often two, three or even five times higher than those of Boa Vista and Manaus. The fazendeiro's knowledge of the structures and demands of foreign markets, patterns of supply, and current developmental undertakings in neighboring countries is, at best, minimal. A careful reading of Chapters 4 and 8 of the excellent work by Brewster and Thomas shows quite plainly that the market for imported fresh beef in Guyana and the West Indies is and will continue to be very small for some time to come.²³ Nevertheless, some fazendeiros have made some preliminary contacts in Georgetown and Paramaribo to pursue the possibility of marketing meat in

those two cities.²⁴ No concrete arrangements have been made for the sale of Alto Rio Branco cattle outside of Brazil for one major reason: aftosa, or foot-and-mouth disease, must be eradicated in Roraima before cattle will be accepted in foreign markets. In view of the difficulties involved in controlling aftosa, it appears that Roraima cattle will be confined to the Manaus and Boa Vista markets.

There remains a great margin for possible improvement of beef production in Roraima. An all-weather road would permit the flow of cattle from the savannas of the Alto Rio Branco to Manaus during the critical shortages now occurring in September, October and November. There are studies currently under way to determine the feasibility of establishing a series of fattening pastures within 100 miles of Manaus along BR-174.²⁵ If this area should develop in a fashion similar to Paragominas, then the savannas of Roraima would be ideally suited to produce feeder and stocker cattle.

The law of least comparative disadvantage (the opposite of the law of comparative advantage) is a resource concept which applies directly to the savannas of Roraima. This law states that a commodity will be produced where it suffers the least disadvantage from competing areas. Are there regions in Brazil that are unable to produce even one product better than any other region? The savannas of the Alto Rio

Branco are one. More cattle can be produced per hectare or per new cruzeiro of capital in the state of São Paulo than in Roraima. São Paulo farmers do not plow up their crops and compete with cattle fazendas in the Pantanal, for example, in cattle production because they have a greater comparative advantage in producing commercial crops than in producing feeder and stocker cattle. Although it is true that they could produce more cattle per hectare than they do (São Paulo produces large amounts of fat cattle now), they have found that they can increase their incomes more by producing grains for feeding cattle and hogs than by using the land for pasture and importing feed from other areas. São Paulo farmers can outproduce Roraima ranchers in cattle as well as in feed crops, but can outproduce them more in feed crops than cattle only.

Then why should the Alto Rio Branco continue to produce cattle? The fazendeiros have found that even though other areas can outproduce them in cattle as well as all other products, they are outproduced less in cattle than any other commodity. Thus the Roraima ranchers are at less of a comparative disadvantage with cattle.

In all likelihood the completion of BR-174 will have a positive impact on cattle production in Roraima and the supply of beef to the Manaus market, but several steps must

be taken to bring about improvements. Some of the major improvements which lie ahead are as follows:

1. There is an urgent need for the undertaking of massive basic surveys to gather reliable information on the physical environment of the Alto Rio Branco savannas.
2. Communication by radio, newspaper, extension agent, etc., must be greatly increased to facilitate the rapid dissemination of market and technological information. In conjunction with this, the general level of education of the owners, managers, and workers must be elevated.
3. A more suitable classification system for beef must be put into use so that cattle of superior quality will bring greater financial returns than unimproved range cattle.
4. If price controls are going to exist, they should be based on production costs as well as on the consumers' purchasing power.
5. Greater research is needed to identify all the diseases present in the animal population on the savannas and programs to control or eradicate diseases must be put into effective action.
6. A laboratory to produce serums and vaccines to combat animal diseases should be established in Manaus.
7. Range fires, intentional or accidental, must be controlled and stopped.
8. Financial credit must be made more readily available.
9. Slaughtering facilities in Manaus must be vastly improved with respect to efficiency, sanitary conditions, and storage.

10. More than one experiment station must be established and staffed by competent individuals to carry on research in such areas as improved pasture grasses, breeding practices, pasture rotation, improved animal breeds and supplemental feeding.
11. Dependable economic data must be gathered, carefully and frequently, to give ranchers an opportunity to be able to justify needed or desired financial credit.

Improvement in the productive performance of the Roraima herd will not occur overnight. Massive amounts of public and private capital are required to successfully bring about the needed improvements listed above. The quality of the human resource must be improved and the Alto Rio Branco must have greater access to material resources.

The President of Brazil has affirmed that the revolutionary state would remain in being for the time necessary to complete the reform of the country's political, administrative, legal, social, and economic institutions, so as to ensure that all Brazilians might achieve a certain minimum standard of living. Among other things, the National Development Plan (1972-1974) calls for the placing of Brazil among the developed countries in the world within a generation and the doubling of income per head between 1969 and 1980, raising it to a figure of U.S. \$500 by 1974.

The Plan proposes several ways to accomplish the goals.

Briefly, they are as follows: the decentralization of economic decision-making; the raising of incomes so as to develop consumption through cooperation between the state and federal governments and the private sector; the modernization of local concerns, with particular interest on increasing competitiveness; the further strengthening of the financial system and capital market; more official financial support, so as to allow small and medium-sized firms to expand; a national technological policy to include the establishment of research centers for all basic economic activities; the development of human resources through the reduction of illiteracy, the increased use of vocational training facilities and educational reforms at all levels; an integrated regional development strategy, to include the establishment of new growth areas in the South, Amazônia, the Central Plateau and the Northeast; and the completion of programs representing investments equivalent to over one billion U. S. dollars over a five-year period, involving petrochemicals, steel, shipbuilding, transport and communications, mining and electricity.²⁶

Manaus most certainly will continue to grow and prosper as it becomes integrated with the remainder of Brazil. All evidence points to a continual growth of the demand for fresh beef. As the populace becomes more affluent, competition

will increase and hopefully force necessary structural changes in the meat market.

Considering the economic principles of opportunity cost and the law of comparative disadvantage, and the geographic location and physical environment of the Alto Rio Branco, the savannas of Roraima will continue to be characterized as an area of extensive cattle production far on into the future. However, with the completion of roads to Manaus, and eventually to potential markets in Venezuela and Guyana, the fazendeiros will be able to make many improvements in their level of productivity if they so desire.

NOTES

¹J. Grunwald and P. Musgrove, Natural Resources in Latin American Development (Baltimore: Johns Hopkins Press for Resources for the Future, Inc., 1970), p. 413.

²Ibid.

³United Nations, Economic Commission for Latin America, and Food and Agricultural Organization Joint Publication, Livestock in Latin America: Status, Problems and Prospects, II (New York, 1964), p. 50. Hereafter cited as Livestock in Latin America, II.

⁴Table 10 may be somewhat deceiving. In Latin America as a whole, beef represents over 70 per cent of the total meat consumption--an inflated figure owing to the high per capita consumption in the Rio de la Plata countries (about 85 kilograms per year in the early 1960's or roughly twice the level for Oceania and the United States). United States beef consumption has increased steadily and now exceeds that of Oceania but is still less than two thirds of the Rio de la Plata level. In West Germany pork is the principal meat.

⁵Livestock in Latin America, II, p. 49.

⁶Ibid., p. 50.

⁷The recommended nutritional standard for consumption of meat in general is 50.44 kilograms per year, within a diet comprising the equivalent of 3,000 calories daily.

⁸Amazonas Brasil and Ruy A. C. Lins, "Projeto Agropecuário, Fazendas Brasil, S.A., Território Federal de Roraima," Manaus, 1968, p. 26. (Mimeographed)

⁹"News Review: Brazil, Census," Bank of London and South America Review, V, No. 59 (November 1971), 664.

¹⁰Jerry R. Williams, "The Functional Relationship of Manaus to the Amazon Basin" (Unpublished Ph.D. dissertation, University of Florida, 1969), p. 51.

¹¹"Brazil: The Manaus Free Zone and Western Amazônia," Bank of London and South America Review, III, No. 27 (March 1969), 147.

¹²Ibid.

¹³The following description of ranching on Marajo is based on the work by Manoel José de Miranda Neto, A Foz do Rio-Mar (Rio de Janeiro, 1968), pp. 139-140.

¹⁴This is not to say, however, that no attempts are being made to improve ranching on Marajó. On the contrary, there are efforts to implement better management practices and introduce superior tropical breeds of cattle. The Instituto de Pesquisas e Experimentação Agropecuária do Norte (IPEAN), whose operations are based in Belém, is trying to disseminate information pertaining to improved ranching methods, improved breeds and material inputs. In Maicuru and Fordlândia IPEAN maintains cattle experiment stations to test the suitability of various improved breeds, grasses and management practices. The Institute sponsors animal expositions and sells the purebred Nellore and Guzerat offspring from their experiment stations to fazendeiros at cost or even below. In addition, when their own restricted resources permit, the Institute sells barbed wire, seed of improved grasses and other materials to the fazendeiros at below-market prices. It must be emphasized, though, that the incentives given by IPEAN and various other government agencies are only just beginning to spur activity on Marajó. To be effective, there must be a greater change of attitude on the part of the fazendeiros of Marajó. There are still far too many ranchers who are content to cling to the traditional, rudimentary way of life.

¹⁵One must be wary, of course, of growth expressed as a percentage. When the base number is small, as was the case for cattle from Goiás and Maranhão, absolute gains will yield large percentages.

¹⁶Paragominas, the newest of Pará's municípios, was created from lands taken from the municípios of São Domingos do Capim and Vizeu on 4 January 1965. Its area measures

some 36,000 square kilometers (13,896 square miles). The name is derived from its location, in the state of Pará, and the area of origin of the majority of its settlers, Goiás and Minas Gerais.

¹⁷For a detailed account of how the land was subdivided and sold, see: Orlando Valverde and Catharina V. Dias, A Rodovia Belém-Brasília (Fundação IBGE, Instituto Brasileiro de Geografia, Rio de Janeiro, 1967), pp. 128-131.

¹⁸Valverde and Dias, p. 132.

¹⁹Ibid.

²⁰Ibid., p. 133.

²¹Implied here is the idea that the development process involves a complex interaction between human and material resources with investment in transportation offering the possibility for developing other resources. This viewpoint of transportation's role argues that development is not a deterministic process and the singling out of a single component of capital formation as a causal agent is a gross oversimplification of a very complex problem.

²²"News Review: Brazil, Development Plan, 1972-1974," Bank of London and South America Review, V, No. 59 (November 1971), 659.

²³Havelock Brewster and Clive Y. Thomas, The Dynamics of West Indian Economic Integration (Institute of Social and Economic Research, University of the West Indies, Jamaica (1967). See specifically: Chapter 4, "Agriculture and the Economic Integration of the West Indies," pp. 103-133; and Chapter 8, "Dynamic Demand Factors and the Gains from Integration," pp. 285-294.

²⁴In 1968, the Federal Government had officially granted ranchers in Roraima permission to sell and ship their cattle to other nations. However, during the author's field investigations, no cattle were being sold to foreign buyers.

²⁵Ministério do Interior, Amazonas, Boletim Informativo, 1970, Superintendência da Zona Franca de Manaus (Manaus, 1970) p. 8.

²⁶"News Review: Brazil, Development Plan, 1972-1974," Bank of London and South America Review, V, No. 59 (November 1971), 659.

GLOSSARY

- apartação--a cattle roundup carried out by cowboys from several fazendas. After the cattle are assembled, they are sorted by observing brands and ear marks; the ownership of unmarked cattle is decided and the animals are branded.
- balança--a small, crude corral at the river's edge where cattle are weighed, sometimes with the aid of scales but most frequently by estimation, and held for loading onto a boieira.
- boieira--a small, roofed cattle barge having a capacity varying from 30 to 60 head of cattle. The barge is pushed by a smaller, diesel-powered craft.
- capataz--foreman or manager who is responsible for operating the ranch of the absentee owner.
- criador--one who breeds and raises cattle. In Roraima, a criador is one who has a very small ranch, usually less than 100 head of cattle, and is looked down upon by the fazendeiro.
- fazenda--a large rural property used to produce crops or raise cattle on a large scale. In Roraima, fazenda is synonymous with cattle ranch, whereas its counterpart in southern Brazil (Rio Grande do Sul) is called an estancia.
- fazendeiro--one who owns a fazenda.
- igarapé--a small stream or creek.
- invernada--"winter" pasture or wet season pasture. In Roraima, invernada connotes a fenced pasture of improved grasses used to finish steers for market.

invernista--one who purchases feeding stock from criadores and fazendeiros and fattens the stock for market on his invernadas. These individuals operate on a very small scale and are few in number in Roraima.

latifúndio--a vast rural property.

marchante--a supplier of beef cattle to urban markets. This individual purchases cattle from the producers, transports the animals to the slaughtering facilities and distributes the carcasses to retail outlets.

matadouro--a slaughterhouse.

minifúndio--a very small rural property.

município--in Brazil, a division of local government corresponding roughly to a county.

pé d'ouro--in Roraima, the tough, scrawny range cattle introduced in the eighteenth century by Portuguese and Spanish settlers.

sertão--back country, the interior, land beyond the areas of concentrated settlement.

vaqueiro--a cowboy.

APPENDICES

APPENDIX A

SAMPLE QUESTIONNAIRE

Número de entrevista _____

Nome do dono ou da fazenda _____

Nome do homem dando a informação _____

Data

A locação da fazenda

I. Inventário e descrição do uso do terreno e trabalho
(Inventories and description of land use and work)

II. Pessoas assalaridas (wage-earning personnel)

Classificação:

número de trabalhadores _____ (number of workers)

horas por dia _____

dias por ano _____

salário por dia _____ (daily wage)

outras benefícios (other benefits)

trabalhadores permanentes (permanent workers) _____

trabalhadores temporários (temporary workers) _____

III. Inventário de gado (Inventory of cattle)

Classificação:

número de cabeças _____ (number of head)

valor avaliado por cabeça _____ (estimate value per head)

observações (raças preferidos, etc.) especificar-se
(observations--improved breeds, etc.) (specify)

APPENDIX A (Continued)

vacas - pé douro (native range cattle-female)
 raças melhoradas (improved animals)
 raça pura (especificar) (pure breeds)

touros (pais) (bulls-sires)

pé douro

raças melhoradas

raça pura

bezerros de 0-1 ano (calves-male)

garrotes de 1-2 anos (bulls)

garrotes de 2-3 anos

bezerras de 0-1 ano (calves-female)

bezerras de 1-2 anos (heifers)

novilhas de 2-3 anos (heifers)

reprodutor (bull-not yet sired)

animais para abate (animals ready for slaughter)

IV. Inventário de máquinas agrícolas
 (Inventory of agricultural machinery)

V. Programa sanitária (Sanitary program)

tratamento	freqüência	custo por animal por ano
------------	------------	--------------------------

observações

APPENDIX A (Continued)

vacinação contra aftosa (foot-and-mouth disease)
 vacinação contra raiva (rabies)
 vacinação contra brucelose
 vacinação contra outras (especifica) (others, specify)

Tem contrôle de insetos e parasitos?
 (Do you try to control insects and parasites?)

Tem contrôle de mastite das vacas?
 (Do you try to control mastitis in your cows?)

VI. Quanto é o custo total para os serviços dum veterinário durante o ano passado?
 (What was the total for professional veterinarian services during this past year?)

VII. Que suplemento mineral usa?
 (What mineral supplements do you use?)

Qual é a quantidade e a frequência?
 (What is the quantity and frequency?)

VIII. Está tentando, o senhor, melhorar as novilhas, as vacas e os touros?
 (Are you trying to improve your heifers, cows and bulls?)

Que é a sua programa?
 (Would you describe your program?)

IX. Qual é a percentagem da sua crias por ano?
 (What is your calving rate per year?)

Qual é a percentagem de mortalidade entre o nascimento e a desmama?
 (What is the mortality rate between birth and weaning?)

Qual é a percentagem de mortalidade entre a desmama e a venda do gado?
 (What is the mortality rate between weaning and the sale of the cattle?)

X. A que idade leva o gado para mercado e por quais meios de transporte?
 (At what age do you take your cattle to market and how are they transported?)

APPENDIX A (Continued)

- XI. A que idade ou peso desmama o gado?
(At what age or weight do you wean the cattle?)
- XII. A que idade ou peso castra os bois?
(At what age or weight do you castrate the steer?)
- XIII. Quanto tempo é necessário para engordar os animais
(nas pastagens) que não nasceram na fazenda?
(How much time (average) is required to fatten animals
(on the range) that were not born on the fazenda?)
- XIV. Qual é o desfrute?
(What is your off-take ratio?)
- XV. Pastagens:
- número de metros quadrados ou hectares _____
(number of square meters or hectares)
- capins (grasses)
- tipos de solo (soil types)
- Que minerais e elementos faltam o solo?
(What mineral elements are lacking in your soil?)

APPENDIX B

PROPERTY AND HERD OF GADO DA AMAZÔNIA, S.A. (1967)

	Property Name	Region	Number of Cattle
Area I			
1.	Rosa Branca	Parimé	1,517
2.	São Sabastião	Parimé	633
3.	São Gregório	Surumu	1,581
4.	Ponta da Serra Maruai	Surumu	4,495
5.	Maruai	Surumu	3,004
6.	Bonfim	Surumu	--
7.	Jutai	Surumu	407
8.	Nova Fazenda	Uraricoera	517
9.	Taramé	Parimé	1,830
10.	Lago	Parimé	1,811
11.	Destêrro	Uraricoera	654
Area II			
1.	Iracema	Surumu	1,802
2.	Volta Redonda	Cotingo	700
Area III			
1.	Ponta da Serra de Murupu	Uraricoera	603
2.	Santa Fé	Cauamé	917
3.	Santa Maria	Cauamé	650
4.	São Salvador	Cauamé	1,458
5.	Alagadiço	Uraricoera	120
6.	Santa Adelaide	Uraricoera	1,350
7.	Serrinha	Uraricoera	350
8.	Pau Rainha	Uraricoera	1,832
9.	Titiarri	Cauamé	1,158
10.	Caranã	Cauamé	861
Area IV			
1.	São Pedro	Rio Branco	215
		Total	28,465

Source: Ministério da Agricultura, Campanha Contra A Febre Aftosa, Levantamento Das Propriedades e Regiões, D.E.M.A. - D.P.T.C., Boa Vista, Roraima, 1968.

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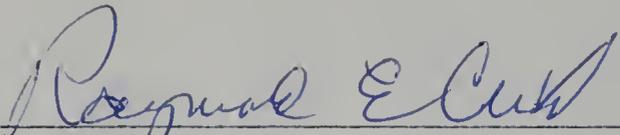
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Thomas Fisk Kelsey was born September 14, 1942, at Wellsville, New York. In June 1960, he graduated from Wellsville High School. In May 1964, he received the degree of Bachelor of Arts with a major in Geography from the University of Michigan. In 1964 he enrolled in the Horace H. Rackham School of Graduate Studies of the University of Michigan. He worked as a research assistant and a teaching fellow in the Department of Geography until August 1966, when he received the degree of Master of Arts. From September 1966 until August 1969, he pursued his work toward the degree of Doctor Philosophy, including field experiences in Costa Rica and Brazil. He worked as a research assistant in the Department of Geography for the academic year 1966-67. From 1967 through the spring of 1969 he held a NDEA Modern Foreign Language, Title VI, Fellowship and was awarded a Graduate School Fellowship for the summer of 1969.

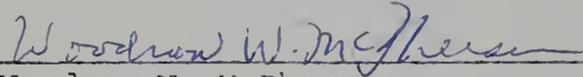
Thomas Fisk Kelsey is married to the former Dorothea Lohmann Naylor and is the father of three children. He is a member of the Association of American Geographers, Gamma Theta Upsilon, Conference of Latin Americanist Geographers, and the Pan American Institute of Geography and History.

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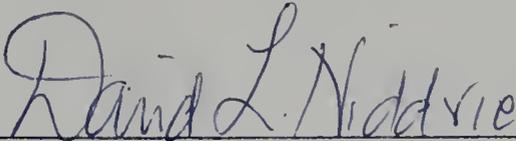
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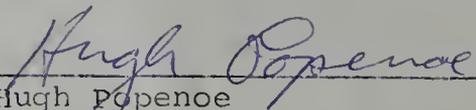
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Hugh Popenoe
Director of International Programs

This dissertation was submitted to the Dean of the College of Arts and Sciences and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

June, 1972

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