

The Llanos—A Neglected Grazing Resource

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THE Llanos are unique in being grasslands lying within 10 degrees of the Equator and at elevations nowhere exceeding 1,000 feet above sea level. The region is covered by a variety of plant associations broadly termed savanna. The word was apparently first used in 1535 by Oviedo in referring to the Venezuelan Llanos. In this paper savannas are regarded as plains whose dominant vegetation is grass. However, when the rainfall is greater or the soils collect and hold more moisture, the savanna may support trees growing close enough to form woodland. In some savannas the grasses are tall, in others short, corresponding apparently to zones of greater or lesser moisture.

In this huge natural landscape bounded by the Andes Mountains and the Orinoco River, the population of both man and domestic animals is small and the region is not of great import. This is puzzling, for superficial consideration of the map indicates that the Llanos should be a truly great cattle country. It consists largely of grassland, it is relatively near the sea, from its first occupation by white men it has been used primarily for cattle raising, it is served by the Orinoco—one of South America's major rivers, and the populations of both Colombia and Venezuela are badly in need of meat produced at home. Further study, however, discloses that neither country is realizing the potentialities of the Llanos for cattle production. It is the purpose of this paper to present the highlights of this great grassland, to point out the reasons for its economic neglect, and to suggest ways

in which the region could support more cattle in the future.

Regional Features

Terrain and Drainage

The Llanos comprise a huge level to undulating alluvial plain, slop-

Perspective on a relatively undeveloped grazing resource in the Tropics of South America—the Llanos of Venezuela and Colombia. Dr. White is Head of the Department of Geography at Stanford University and a student of Latin America for many years. Mr. Thompson was born in South America and lived part of his life there.

ing south and southeastward from the Andes to the Orinoco. As considered here, the region is divided into the Eastern, Central and Southern Llanos (Fig. 1).

The region is traversed by a number of streams having their

sources in the highlands to the north. Starting as swift mountain torrents, they flatten out into sluggish, muddy streams, with the reduction in gradient in the lowlands.

During the season of high rainfall these rivers swell tremendously, overflow their banks and inundate huge areas along their lower reaches. There is a difference of 43 feet between high and low water in the Orinoco. During the latter part of the heavy rainy season, it is believed that more than a third of the Llanos is inundated. The flooded lands have every appearance of swamps, being soon clothed with a rank vegetation and with water-plant growth (Fig. 2).

Flooded for months at a time, travel by land becomes impossible and human beings must move about in dugouts.

During the dry season the flow of water is so drastically reduced that many of the rivers dry up into pools and swamps. Some dry up completely.

Climate

Rhythm in the rainfall is the outstanding characteristic of the climate, the year being divided into two seasons—the dry referred to locally as *verano* lasting from June to March inclusive and the wet—

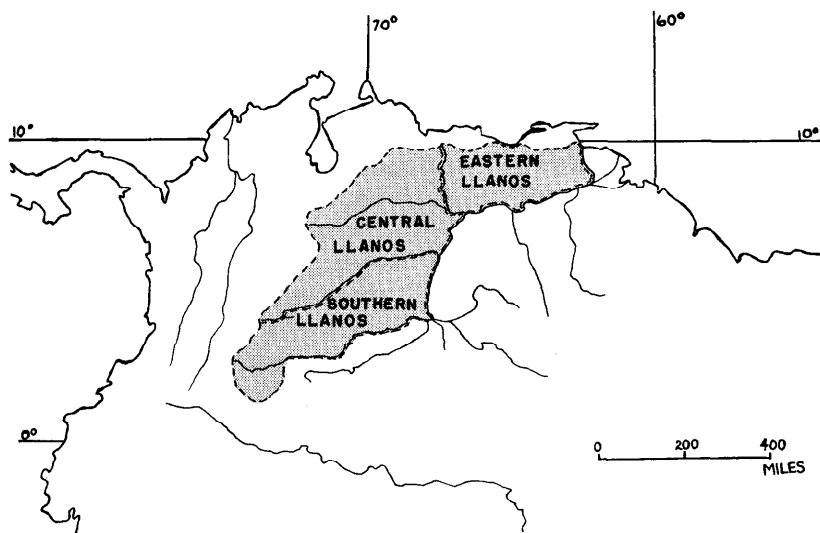


FIGURE 1. Map of northern South America showing the subregions of the Llanos.

invierno—lasting from June to October inclusive. April and May, November and December are transition months. The arrival and duration of the seasons varies from year to year and from place to place. In general the wet season shortens and the annual rainfall diminishes northward. Annual precipitation varies from 39 inches at Ciudad Bolívar to 52 inches at San Fernando de Apure. Nearly all of this rain falls during the six months May to October inclusive.

During the dry season the shade temperatures approach maximas in the middle and low 90's. Monthly

duced fires have yielded a wide variety of plant associations over the Llanos (Fig. 3). However, uniformity does not characterize the region; never should the Llanos be regarded solely as "a great monotonous sea of waving grass". Grass does hold sway in some parts but trees do in others. The grass is of the bunch type and is not matted as are our prairie and steppe grasses. In the Central Llanos where the water table is sufficiently high, as along the Apure and Portuguesa rivers, the grasses are green and palatable for stock the year round. Green meadows also may be

clothed with a sparse, short-grass vegetation of low nutritional value. Here *Trachypogon* appears to be the most common form of vegetation. Palms, trees and shrubs are thinly scattered in the eastern mesa country, while a considerable area of monte or chaparral or open scrub forest overlies the northern half of these plains.

Generalizing on the Llanos grasses, it may be said that they have low nutritional value. While the succulent green new growth at the beginning of the wet season and following fires is eaten by the stock, the large, coarse mature grasses become hard and unpalatable with progression of the dry season. Because the llaneros believe that firing improves the vegetation, they burn off large areas during the dry season. Actually this practice is partly responsible for the poor quality of the forage, particularly in the Eastern Llanos. Here inferior grasses which are more resistant to elimination by fires, are replacing the better grasses.

One of the biggest hurdles to range improvement to date has been the difficulty in finding grasses other than the native variety that can stand the extremes of climate.

Causes of the Llanos

There is no agreement among botanists, ecologists and geographers regarding the origin and causes of the Llanos cover. One school of thought considers the savanna vegetation to be a climatic climax formation; another as an edaphic climax dependent on special soil conditions. Both views, however, agree that the savanna landscapes were pre-Columbian, but that the grasses grew much taller then than now.

Schimper (1903) defines the climatic requirements of a savanna to be an annual precipitation of 35 to 59 inches (90–150 cm.), an effective 4- to 5-month dry season and a range in the monthly mean tem-



FIGURE 2. Criollo cattle caught on flooded land during the rainy season in Apure, Venezuela (Central Llanos). Vast areas become covered with water and livestock losses are large during this season. (Photograph by Consejo de Bienestar Rural).

averages are 10° to 20°F. lower. During this season the northeast trade winds blow almost constantly making the period more bearable to man than the wet season. In the latter season, though monthly averages are 4° to 9°F. lower, the combination of higher relative humidity and of reduced air movement results in higher sensible temperatures. Even during the brief spells of dry weather that interrupt the wet season, there is little relief from its discomforts.

Natural Vegetation

The variations in climate, soils and terrain along with man-in-

seen as concentric rings of vegetation about an evaporating flood or seepage-created lagoon, but the shallow-rooted plants dry up quickly as the water recedes. However, the coarse, hardy grasses are able to endure the severe conditions.

Scattered throughout the grassy area are such trees as chaparro, merrey, alcornoque and copaiba. Streams are almost always bordered by gallery forests. In places occur small forests called "matas" by the natives and belts of moriches which follow streamlets and which the inhabitants call "morichales".

Much of the Eastern Llanos is

peratures up to 14°F. Under this regime, according to Schimper, there is a struggle between savanna and forest vegetation, the outcome of which is decided largely by the amount of rainfall during the growing season.

Another view on the distribution of savannas holds that we do not know whether their occurrence corresponds to the real ecological conditions. This school asserts that man, through periodic burning and grazing, is the cause. A. Aubreville (1949) doubts that there is a specific savanna climate in the tropics. Myers (1933) regards the Llanos vegetation as a fire-climax, although he believes soil conditions may also be involved. However, so little is known scientifically regarding South American soils that it is unsafe to speculate regarding this factor.

The authors believe that the chief determining factors for the savanna cover of the Llanos are not always the same; the evidence of climatic dominance is not everywhere decisive. The range of climatic conditions under which the savanna occurs in this part of South America, the abrupt boundary between forest and savanna, and the presence of savanna pockets between zones of forest all tend to challenge the thesis of climatic theory. It would seem that human interference, particularly fire, has been a major causal factor on this relatively flat, wind-swept (dry season) landscape. There can be no doubt that the savanna vegetation has been much modified by fire. According to Myers (1936):

"I have never seen in South America a savannah however small or isolated or distant from settlement which did not show signs of more or less frequent burning."

Fires undeniably play a dominant role in giving sharp boundaries to the savannas and have thus favored grasses and herbaceous vegetation at the expense of woody plants.

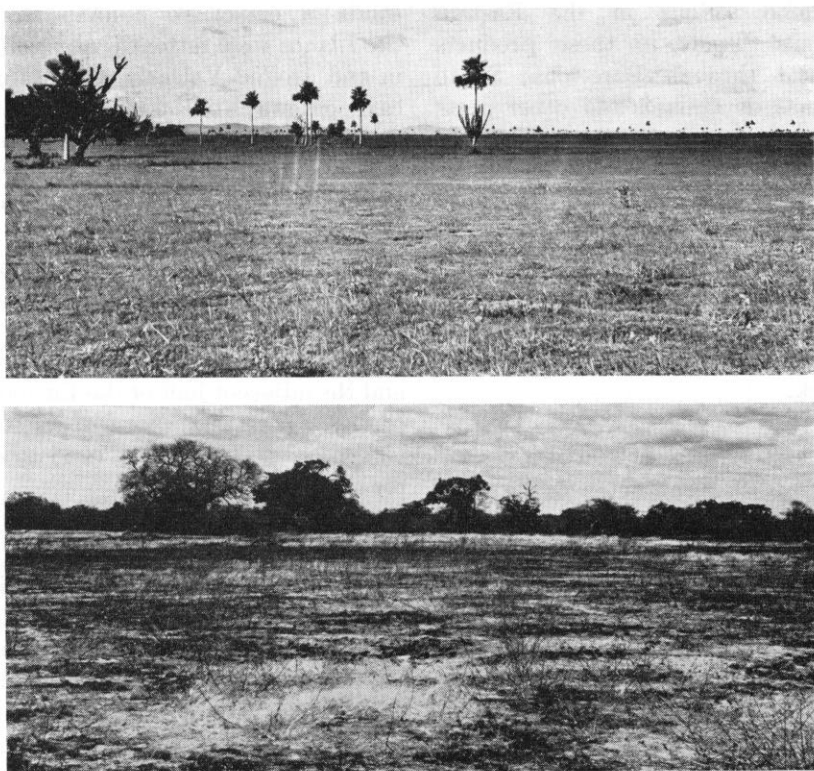


FIGURE 3. *Upper.* Vegetation in the northern part of the Central Llanos in the State of Cojedes near El Baul. *Lower.* Vegetation in the Eastern Llanos in Anzoátegui at the end of the dry season. (Photographs by James H. Kempton)

Occupancy of the Llanos

Colonial Period

When the Spaniards arrived in this part of the New World, they found the Llanos (particularly the eastern half) occupied by small numbers of Indians engaged in patch farming, hunting, fishing and gathering. Lacking any large herbivorous animals, however, they made virtually no use of the great grassy expanses. Even the close grazing effects of the small Llanos deer and, on river margins, of the capybaras, scarcely had any effect ecologically. The Spaniards introduced close-grazing horses and cattle. According to reasonably accurate reports, the first livestock were taken into the Central Llanos about 1550 when a small herd of horses and cattle became the nucleus of a ranch in the Guárico watershed. A decade later the Guárico-Apure watershed was supporting some 12,000 to 14,000 cattle and half as many horses.

Missionaries first entered the Llanos near the end of the sixteenth century. They encouraged the Indians to grow native and introduced crops, to raise livestock and to develop crafts. Their success is attested to by the results—the Capuchins had herds numbering 50,000 head of cattle in the Eastern Llanos by 1759, the Jesuits 80,000 head by 1767.

The comparatively small effort attendant upon animal husbandry resulted in expansion of secular ranching. As white and mestizo (mixed blood) settlers moved into the Central and Eastern Llanos, the missions and Indians gradually disappeared. Many ranches had from 10,000 to 12,000 cattle in the early 1700's as well as many horses and mules. Herds in the Guanare area became so large that their owners knew not how many animals they owned.

Rustling and illicit slaughtering for hides, tallow and dried beef

became serious in the Eastern Llanos. Trade in these products passed through Barcelona, Santo Tomas de Guiana and other ports destined for the Lesser Antilles and the Guianas. Livestock and their products from the Central Llanos destined for the Greater Antilles moved through Puerto Cabello, Coro and Maracaibo. La Guaira, though an active port, had too rough a roadstead for loading livestock.

Nineteenth Century

In 1812, Venezuelan cattle were estimated at 4,800,000 and horses and mules at 430,000 and 270,000 respectively. The herds were seriously reduced in size, however, during the bitter campaigns for independence from Spain when private ownership of Llanos livestock was to all intents and purposes disregarded. After Bolivar established himself at Angostura (now Ciudad Bolivar) the livestock on the Llanos were largely rounded up by his agents and sent to the West Indies to pay for the exorbitantly priced war supplies purchased on credit from American, British and Dutch merchants. The cattle population dropped from 4,800,000 head in 1812 to a mere 250,000 eleven years later. From the termination of this struggle to the beginning of the Five Years' War (1866-1870), the number of cattle rose to 6,000,000 head only to toboggan to 3,500,000 head as a result of hostilities. In the 1880's the number climbed to 8,500,000 only to fall again as a result of frequent revolutions. A major factor affecting cattle production in Venezuela was General Juan Vicente Gomez, who *was* Venezuela from 1908 until his death in 1935. While the number of cattle on the Venezuelan Llanos increased during his regime, he controlled the industry. He and his friends and family gradually gained possession of the lands where tens of thou-

sands of emaciated animals from the Llanos were fattened, especially in and around Valencia and Maracay—gateways to the Llanos. When Gomez began his political career he was in comparative poverty; when he died his personal fortune was valued at \$200,000,000.

During recent years cattle numbers in Venezuela have been estimated at 5,000,000 head, divided equally between the Central Llanos and the adjacent half of the Eastern Llanos. The estimate for all of Colombia is 14,500,000 head and for the Llanos 750,000.

Present-day Ranching

The plains were gradually divided into vast estates—cattle ranches known as *hatos*. To this day most of the *hatos* remain unfenced and are so huge that the half-wild cattle roam over them almost without care. Boundary lines between grants are "notoriously vague". These holdings were organized as feudal units. Since population was sparse, towns few and transportation with the outside world almost lacking, the *hatos* had to become as nearly self-sustaining as possible. Therefore, besides cattle and horses, the lands were made to provide crops such as plantains, corn, beans, yuca (cassava) and native fruits. Some villages, usually little more than "crossroads," and a small number of towns sprang up at strategic points. Several of these are today small cities of considerable regional importance.

Cattle ranches on the Llanos are large, averaging around 3,000 acres. For the most part proprietors take little interest in improving their property, pastures or stock. Some have installed wells, windmills and watering troughs but many have done nothing; it is by no means a rarity for some animals to walk as many as six miles in search of water.

Reference was made earlier to

the frequent burning of the vegetation on the Llanos. Burning is an annual affair and the llaneros do it to improve the quality of the vegetation (they believe burning results in palatable young grass) and to kill ticks. There seems to be some grounds for both theories. According to Bennett *et al.* (1942), new grass appears within 10 or 12 days following a fire and the cattle head out of the old grass towards the tender grass in the burns.

Llanos cattle face more than their share of hardships and dangers. During floods the herds must be driven to higher ground—to the margins of the foothills and to the low mesas that stand like islands above the flood. Obviously the area available for grazing is restricted since so much of the region is flooded. Alligators, electric eels and the ferocious and voracious little fish, the Caribes, all exact their toll. During the dry season, the tall grasses virtually become inedible, water is scarce and the cattle have to move southward to the damper areas near the Orinoco. At this time insects are at their worst. The jaguar takes his toll and countless vultures prey on new-born calves. Thus Llanos cattle are forced to wander far and wide, just to remain alive.

Annual and biannual round-ups interrupt the independent existence of the cattle to permit branding and castration. Many steers are set aside for trailing to pre-market fattening pastures. Sometimes the stock are rounded up into manageable groups every week or so and brought into corrals for salt. This practice, together with dipping, is quite recent.

Most of the cattle of the Venezuelan Llanos are raised in the states of Apure and Guárico, the two accounting for about two-fifths of the total. The Colombian Llanos is much less important to the country's total cattle production than is the case with Venezuela,

for Colombia has several much better regions—the Caribbean Coastal Plain, the Sabana de Bogotá and the Cauca Valley.

The Livestock

The early Spaniards brought with them to the New World their European livestock. The descendants of these European cattle as found today in the Llanos are known as "native" or "criollo" (Fig. 2). These early importations soon reverted to a semi-wild state but they thrive and reproduced rapidly. Some authorities believe that the stock has degenerated over the past several hundred years because of the marked seasonal changes, the many pests and diseases, interbreeding and the lack of scientific care and feeding. The early cattle industry here amounted to little more than the periodic rounding up and slaughtering of a certain number of animals mainly for hides and tallow.

Actually the criollo cattle have adapted themselves quite effectively to the physical environment, becoming relatively resistant to the pests and local diseases that flourish largely uncontrolled. They have learned the ways of the wild animals that prey upon their calves. They appear to sense the appropriate time during floods to leave the lowland for high ground. And they are able to subsist wholly on what nature provides. Possession of such self-reliance and hardiness is a genuine asset in a region where survival is as difficult as it is in the tropical Llanos.

Mature criollo cattle are small, long-horned, slow-maturing and vari-colored (Fig. 2). Crossing with Zebu stock is resulting in larger, hardier and generally more vigorous animals. Zebu cattle have a higher heat tolerance than European cattle and this characteristic carries over to the progeny. They also show greater resistance to insect pests. Imported Zebu bulls should be of

the very highest quality rather than the leggy, late-maturing, weak-hipped type introduced by many stockmen in recent years.

The criollo is an excellent foundation animal upon which to build crossbred types. The cross-breeds yield a higher percentage of edible meat when dressed. This is important, for the reproductive efficiency (the number of calves raised annually per 100 cows) of Llanos cattle is extremely low—less than 50 percent.

Unlike the Argentines of the Pampas, the Colombians and Venezuelans of the Llanos have shown no interest in Herefords, Shorthorns or Aberdeen-Angus breeds.

Marketing Activities

There is considerable variation in the age, weight and size of marketed cattle. Most animals ready for slaughter are 4 to 6 years of age and carcass weights average 375 pounds.

Most llaneros, not yet convinced that it is wise to slaughter younger animals, fail to realize that by so doing they would reduce the number of cattle on *hatos* thereby enabling the youngest animals to get more feed, gain weight faster and render greater profit to their owners.

The animals destined for slaughter come from the Llanos without any special fattening. They are lean, their dressing percentage is low and their meat is of low quality—tough and fibrous.

Changes are taking place, however, in the manner of marketing cattle. Some animals are hauled by truck from points where good highways meet the trails and some are shipped by river steamer on the Orinoco. One-fourth of the meat consumed in Caracas is now flown in as sides of beef. The cost of living in this boom city is the highest in the world and many of the people living there can afford to pay a high price for beef. In

general, consumption of meat, in both Colombia and Venezuela, is limited chiefly by high prices. The masses of the people in neither country can afford costly meat.

Trails and market centers of today are largely those of the past. Herds from as far away as the Orinoco, Arauca and Apure rivers may be driven for many weeks over the braiding grassland trails that lead in Colombia to Villavicencio and lesser pasturing centers at the foot of the highlands and to Valle de la Pascua, Calabozo, San Carlos, Barinas, San Fernando de Apure, Valencia, Maracay and elsewhere in Venezuela (Fig. 4). In the streets of Villavicencio one sees herd after herd of emaciated cattle which have just finished their gruelling march and are resting before being driven to Bogotá over a mountain range approximately 10,000 feet high. Annually some 35,000 head, perhaps 3 percent of the national annual slaughter, make the six-day climb to Bogotá. Feed is so scarce along the way that as much as 20 percent shrinkage occurs. Similar results occur with the smaller annual flow of cattle which enters more northerly areas from the Llanos.

A similar situation holds for Venezuela. Depreciations in weight resulting from difficult drives into the Venezuelan highlands result in 20 percent weight loss. These losses are in addition to the estimated 5 percent through straying and drowning. Some animals are lost to alligators, jaguars and electric eels as the herds cross rivers. Another 10 percent of the herd possibly reaches the end of the trail lame or sick. It is little wonder that such inroads occur, for the treks are made over rough and dusty trails where forage is meager and water in short supply.

Not only are the drives costly in terms of depreciation in the animals but a number of men must be employed for a week or more before

the market is reached. On the Llanos herds are managed in groups of 300 to 400 head but those driven over the mountains are broken up into units of 80 and 100 head. A mounted corporal and three or four *peons* on foot are required to handle each of the smaller groups (Fig. 4). These cattle may be given a chance to fatten near market towns but a 1- or 2-day wait before killing is common. Cropland and dairy requirements near urban centers are tending to eliminate some of the beef-fattening areas, particularly in the Valencia Basin of Venezuela. One of the principal fattening areas

incentive for producing meat. On the other hand, the ranchers seem to share a traditional disinterest in stock and range improvement. This is indeed unfortunate in countries characterized by rapidly growing industrial and urban populations with increasing requirements for beef. It is believed that both Colombia and Venezuela have sufficient cattle to supply domestic needs; the big problem is to get the animals from the remote Llanos to the consuming centers.

The government road-building programs and the work of experiment stations and agricultural col-

ment, for control then would be possible.

The incidence of diseases and pests in the Llanos of Colombia probably is somewhat higher than in Venezuela. Control of infestations such as *aftosa* and tick fever and general improvements of range and stock will occur as the government restores order to the region. Here, as in Venezuela, improved roads, trails and watering facilities would be beneficial to the beef cattle industry.

Improvement of the transportation network would also be a real benefit to commercial agriculture along the margins of the Llanos. Improved irrigation facilities in certain favored areas and the preparation of new cropland would facilitate commercial agriculture. However, the costly mechanized operations required are beyond the means of the private land holders. Then too, the *llanero's* preferred position astride a horse will be hard to exchange for a job behind a mule or on a tractor.

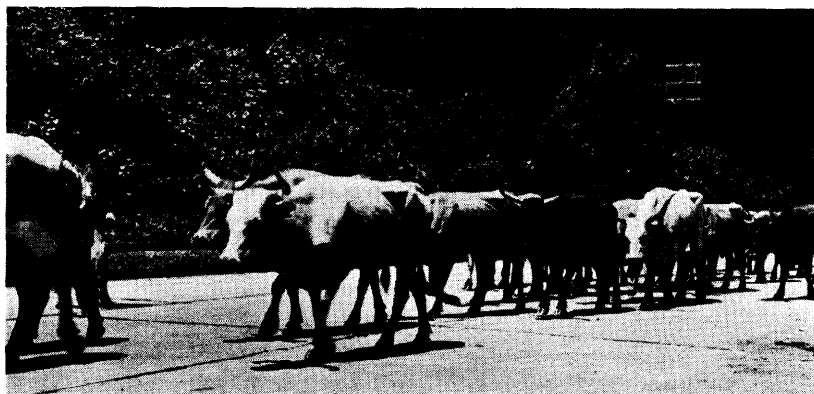


FIGURE 4. Criollo cattle arriving in Maracay, a principal fattening area, after the long drive from Apure in the Central Llanos. They have travelled only a short distance on a hard surface road. (Photograph by James H. Kempton)

in Venezuela is the area south of Lake Maracaibo in the State of Zulia.

Large, modern meat-packing establishments are lacking. In fact, few facilities for refrigeration exist except in the large cities. In Venezuela the largest number of animals handled at one point in a 24-hour period is 200. The bulk of the beef is killed, cooled and quickly delivered to market in ventilated trucks. In both countries the consumer prefers fresh-killed beef. Wastage obviously is appalling.

Current Problems Affecting Llanos Economy

Ranchers claim that government price-fixing and regulations so interfere with the movement of stock to market as to have almost killed the

onies are steps in the direction of greater production and improved quality of beef. However, there could be and should be more vigor in the governments' efforts. The creditable campaign that has been waged against *aftosa* (foot-and-mouth disease) might be extended to the elimination of other common infections and the control of pests. The governments could assist greatly in improvement of watering facilities (ponds and wells) in ranching areas, particularly along the cattle trails. Many cattle die of thirst during the dry season and yet water could be had at a reasonable depth by drilling. Perhaps the enforcement of fencing laws will lead to required forage conservation, pasture and stock improve-

Conclusions

It has been shown that though the Llanos do furnish forage for a considerable proportion of Colombian and Venezuelan cattle, the number supported is relatively small considering the size of the region. The authors do not foresee a bright future for the cattle industry for a long time, if ever. The main reasons for this pessimism are: (1) the tropical location and low altitude of the region; (2) the marked rhythm in drought and rainfall which imposes a serious handicap by forcing cattle to the higher areas during floods and to water holes and river banks during dry seasons; (3) the pestiferous insects which, at times and in certain areas, make life almost unbearable to man and beast alike; (4) the widespread distribution of the cattle tick, screw worm and *gusano de monte*; (5) the poor transportation facilities

(there are few good roads, no rail-ways, and even the Orinoco was not a good highway until recently dredged to Puerto Ordaz); (6) the inferiority of native grass pastures and the difficulties encountered in planting such introduced grasses as Guinea, Para, Napier, Guatemala and Natal, which can be grown only on fertile, well-watered soils of small valleys; (7) governmental interference and civil strife; (8) the un-scientific methods of handling the range and cattle with consequent unsatisfactory results; (9) the uncontrolled fires which annually destroy the better soils and vegetation, fences and houses; (10) the difficulty of securing credit on livestock; (11) the antiquated methods of handling meat; and (12) the llanero himself—his individ-

uality, his philosophy of accepting what comes and making the best of it, and his lack of progressiveness.

What improvement in the situation is possible? The cattle industry could be made more productive and profitable by: (1) improving pastures (difficult and costly but not impossible); (2) supplying nitrogen and other essential minerals to the soils; (3) introducing more fencing; (4) installing more windmills; (5) reducing fires, particularly in the Eastern Llanos; (6) growing feed crops adapted to local conditions for fattening the range animals; (7) building more and better highways into the Llanos; (8) improving the quality of the livestock and giving the animals better care; (9) constructing more slaughter houses in the vicinity of strategically located

towns. Should these hurdles ultimately be surmounted, cattle raising on the Llanos might become a business enterprise rather than just a way of life.

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