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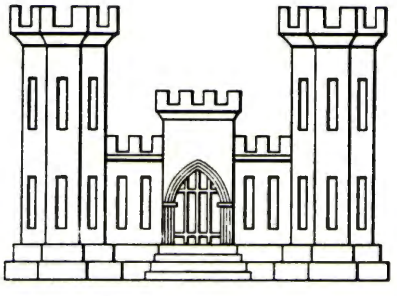
NATIONAL RESOURCES INVENTORIES

A REPORT TO
THE COUNSELOR-CHAIRMAN
POLICY PLANNING COUNCIL
DEPARTMENT OF STATE



For

Agency for International Development

By

Department of the Army
Engineer Agency for Resources Inventories
Washington, D. C. 20315

A REPORT TO
THE COUNSELOR-CHAIRMAN
POLICY PLANNING COUNCIL
DEPARTMENT OF STATE

on
The Economic Development Potential
of South America

Prepared Under
the General Direction of the
LA/ID Rural Development Division,
Agency for International Development

By the

Engineer Agency for Resources Inventories
Department of Army

DEPARTMENT OF THE ARMY
ENGINEER AGENCY FOR RESOURCES INVENTORIES
6500 Brooks Lane,
Washington, D. C. 20315

ENGTE-R(31001) 14 February 1966

Dr. Walt W. Rostow
Counselor-Chairman
Policy Planning Council
Department of State

Dear Dr. Rostow:

Thank you for including me in the meeting you held in the Office of the Assistant Secretary of State for Latin American Affairs on January 28 1966 to explain the interest of the President of the United States in obtaining a comprehensive appraisal of the opportunities for development which may exist within the central reaches of the South American continent.

As I indicated to you during the meeting, the Corps of Engineers has a long and successful history of appraisal, analysis and subsequent development of geographic regions, and welcomes the opportunity to contribute to the Policy Planning Council of the Department of State information which the Corps feels will be of value to the President in the decision-making process.

The twelve maps of South America, presented at a scale of 1:7,000,000, were especially compiled for the above purpose in a period of ten days, utilizing the best available sources. The material under this cover was assembled in an equally short period of time. Owing to the pressure of time, it does not include material which is easily available to the Department of State from other sources.

We will welcome the opportunity to refine the material presented, or to expand it to greater depth, if there is any requirement to do so.

Sincerely,

Robert L. Thomson

ROBERT L. THOMSON
Chief

ENGINEER AGENCY FOR RESOURCES INVENTORIES

Special Working Group Reporting on

THE ECONOMIC DEVELOPMENT POTENTIAL OF SOUTH AMERICA

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TABLE OF CONTENTS

Page

REASONS FAVORING EXPANSION OF THE INTERIOR

I A relatively inelastic agricultural situation exists among the Andean population and the commercial agriculturalists of the West Coast and Northeast Brazil.

Andean regions devoted to sedentary subsistence agriculture are mature, but show a high population relative to available resources. The population is technologically untrained.

Within the area, concentration must be on improved agricultural techniques - not expansion of acreage. Even then, age-old habits resist change.

Investment is dictated more by political necessity, than economic prospect. Therefore: economic return per unit invested is low.

Commercial agriculture of the west coast and northeast Brazil does not offer the same opportunity for the growth of a modern, broadly-based agricultural system that is afforded by the development of small, medium and large land holdings in the interior.

Industrial growth of the west coast is restricted to narrow coastal valleys. Movement of goods is ocean-oriented.

YET

II Yet the following situation confronts South America:

Acreage of wheat, corn, rice and beans must double by 1980 to meet the internal demand. Lands for this purpose exist in the interior.

The North American, European and Japanese demand for South American tropical and semi-tropical products is expanding at a healthy rate. Such products can be produced in the interior.

Population increased more rapidly than agricultural production in Brazil, Ecuador, Peru and Venezuela (1945-1960 figures).

South America is a net importer of products processed from wood, while vast forests are under-utilized.

South America is a net importer of milk and dairy products, yet only 5 percent of the land area is under agricultural production and large regions of savanna are under-exploited.

Per capita consumption of animal protein has diminished in Argentina and Chile (1948-1959 figures) while failing to increase as much as 1 percent for the entire continent.

A large export market exists for meat products from South America.

MEANWHILE

III Meanwhile the Interior has an unexploited potential for growth.

Surface configuration of the interior of South America favors the exchange of peoples and ideas that are necessary for rapid growth.

The unrestricted movement of peoples and ideas stimulates and encourages commercial and industrial activity, both large and small. Surface configuration of the interior favors the development of surface transportation to feed and nourish the commercial activities.

Potentially productive lands of the interior show a low population in comparison with resources, but technology is lacking.

Much of this land is reasonably located in respect to areas of South America with a higher technological level. Select migration should lead to more advanced agricultural techniques than those in use in the mature regions of sedentary agriculture, while decreasing the relative influence of the areas devoted to plantation style agriculture.

IV Brazil Should Be Ready To Lead The Way.

Brazil has reached a state of growth where economic development is marked by the progressive emergence of a system whose main dynamic center is the domestic market.

The country has passed through the period where a rapid expansion of its external sector permits a high degree of capital formation, and paves the way for technical progress.

WHILE

While the external sector of Brazil will continue to expand, the importance of foreign trade will continue to be modified as the importance of domestic production for the domestic market continues to increase.

It is to be expected that the center of Brazil will play a significant part in the increasing growth of the domestic economy.

This expansion should initially take the form of an extensive agricultural economy, where the increase in productive capacity is largely the result of the balanced incorporation of labor and natural resources.

Deforestation, extending agricultural holdings, opening roads, increasing herds, and rural building activities, all of which are forms of capital formation, must play a significant role in this domestic growth. This, in turn, will lead to the requirement for a relative increase in investment in the industrial sector and subsidiary services, as the demand for mechanical equipment increases.

GENERAL

South America has about the same number of people as North America yet the combined gross domestic product of its member countries amounts to about 10 percent of that in North America. Even allowing that exchange rates prevent precise comparison and exaggerate the gap, and that some production is not recorded in South America because it is of a subsistence nature, living standards must be at least several times as high in North America as in South America.

The far-flung nature of the region, the difficulty of communication by land between different parts, and the generally unfavorable deployment of population and resources in relation to one another should be noted. Since independence early in the nineteenth century the region has been divided into 13 political units, each concerned with its own problems, and several in recent decades deliberately pursuing a policy leading towards self-sufficiency in manufacturing. There has never been a single large market and rarely the opportunity to build large establishments in those branches of industry that benefit from economies of a large scale. Until very recently, nationalism has prevented any move towards continental cohesion. Surface configuration has encouraged Nationalistic attitudes in the past but increased growth in the center of the continent where the level or undulating surface encourages the exchange of ideas - will do much to create a unity of purpose for South America.

Many moves towards achieving superior material conditions have been stifled by a social structure inherited from the colonial period, by attitudes indifferent to or even hostile to the growth of manufacturing and the changes this would bring, and by lack of financial and other institutions necessary in a manufacturing economy. These structures and attitudes are presently undergoing modification. Matters are complicated, in the short run, by a very high rate of natural increase of population. Ultimately this will create larger markets and provide settlers to open up new areas, but in the early stages of industrial growth it means that a large proportion of the population is under employable age and that the economy must expand at about 3 percent per year merely to keep pace with population growth. It must expand at more than twice this rate to achieve even modest material progress. Although pressure of population on resources is felt acutely locally in South America, in most regions there is plenty of slack to take up, and South America as a whole has a population/resource balance far superior to that of India or China.

Returning to the question of differences in gross domestic product and therefore in living standards in the Americas, it should be appreciated that although the gap is enormous between North and South America, the latter is not one of the poorest of the major regions of the world. Below are 1958 figures:

Region	Total gross domestic product in thousand million U.S. dollars	Per capita gross domestic product in U.S. dollars
North America	437	2 300
Latin America	59	300
West Europe	246	810
Asia (excl. U.S.S.R. and China)	99	106
Africa	29	121

SURFACE CONFIGURATION
(For use with accompanying 1:7,000,000 scale map of South America)

Surface configuration in South America has traditionally constituted the greatest barrier to settlement in the interior area, and, at the same time, has been the largest determinant of the local climatic conditions which up to the present time have had such an unfavorable effect on the growth of the interior region of the continent. The Andes to the west, and the great escarpment of Brazil to the east effectively isolated the interior up until the advent of modern transportation.

Since the close of World War II, air traffic has been sufficiently developed that it has become a positive factor in the growth of the region. Likewise, improvement in automotive vehicles has allowed man to breach the mountain barriers in a number of places and to make economical viable areas which, prior to the advent of motor, could not be properly utilized because of isolation.

Surface configuration in the heart of the continent constitutes a positive factor in the development of the region: level and gently rolling lands, such as comprise the central region of South America, being synonymous with the easy flow of goods, peoples, and ideas in all developed parts of the world.

Three chief surface divisions form the major features of the continent of South America. On the west are the relatively young Andes, high, folded mountains; on the east are the Brazilian and Guiana highlands, geologically much older than the Andes, now partly covered by stratified rocks and lava flows, and in places surmounted by the massive stumps of ancient, worn-down mountains; and in the central portion of the continent lie the plains of the Orinoco, the Amazon, and the Paraguay-Paraná-Plata, filled with debris from the erosion of the highlands on either side.

The high mountains of low latitudes, especially in Colombia, are characterized by the greatest variety of vertical zoning--the sharply defined differences in climatic conditions and natural vegetation with change of altitude.

Intermont basins at various altitudes are important areas of Andean settlement. They are numerous in two chief sections: in Venezuela, Colombia, and Ecuador; and in Bolivia,Peru, Northern Chile, and Argentina. They are most common in areas of active volcanoes, or in the dry areas.

These basins are surfaces of gentle gradient, often bordered by alluvial fans. Rivers, after crossing the fans, meander with sluggish currents through broad valleys forming swamps and even lakes in the center of the basins.

The pattern of surface configuration in South America east of the Andes is quite different in its details. The greater part is made up of highlands, which extend with few interruptions from southern Colombia and Venezuela across Brazil to the northern bank of the Plata River, and which appear again in Patagonia.

A unique feature of relief in the coastal areas of southern Brazil is the Great Escarpment, a steep, wall-like slope. It is irregular in altitude and in distance from the coast. Back of Rio de Janeiro and Santos it rises to an elevation of 2,600 feet. Between latitude 18° S and 30° S the Great Escarpment is crossed by the deeply cut river valleys of the Río Doce and the Río Paraíba; otherwise it remains scarcely notched along its crest.

The arrangement of the plains of South America is very different from that of North America. The Orinoco Plain is separated from the Amazon Plain by a belt of highlands. The Amazon Plain, which is wide along the eastern base of the Andes, narrows to only a ribbon of floodplain along the main stream east of Manaus. Southward along the Andes the plain of the Amazon is joined with the plain of the Paraguay-Paraná-Plata system, where the alluvium brought down by the rivers from both the Andes and the Brazilian highlands has covered all but a few of the more prominent features of the underlying rock surface. Unlike North America, there is no coastal plain along the Atlantic.

CLIMATE

About half of South America has not been developed for production of most commercial agricultural commodities because it is too hot and humid, just as half the United States and Canada is too cold for them. The area has too much rainfall in most of its tropical lowlands and too little on the west coastal plains of Peru and northern Chile, and western and southern Argentina. Because of its narrowness in the south, the South American Continent has only a relatively small area of the middle-latitude lowlands that are suitable for agriculture.

Principal agricultural producing regions of South America are in southeastern Brazil, the plains of the River Plata, Central Valley of Chile, irrigated coastal valleys of Peru, and in the Andes where altitude offsets the tropical climate of these latitudes.

The tropical latitudes of South America, however, are favored with other highlands, the Brazilian and Guiana Highlands, where the climate makes for comfortable living and is suitable for the production of commerical agricultural products.

The great areas of potential production are in the tropical lowlands. These are the regions that will supply an increasing part of South America's economic products.

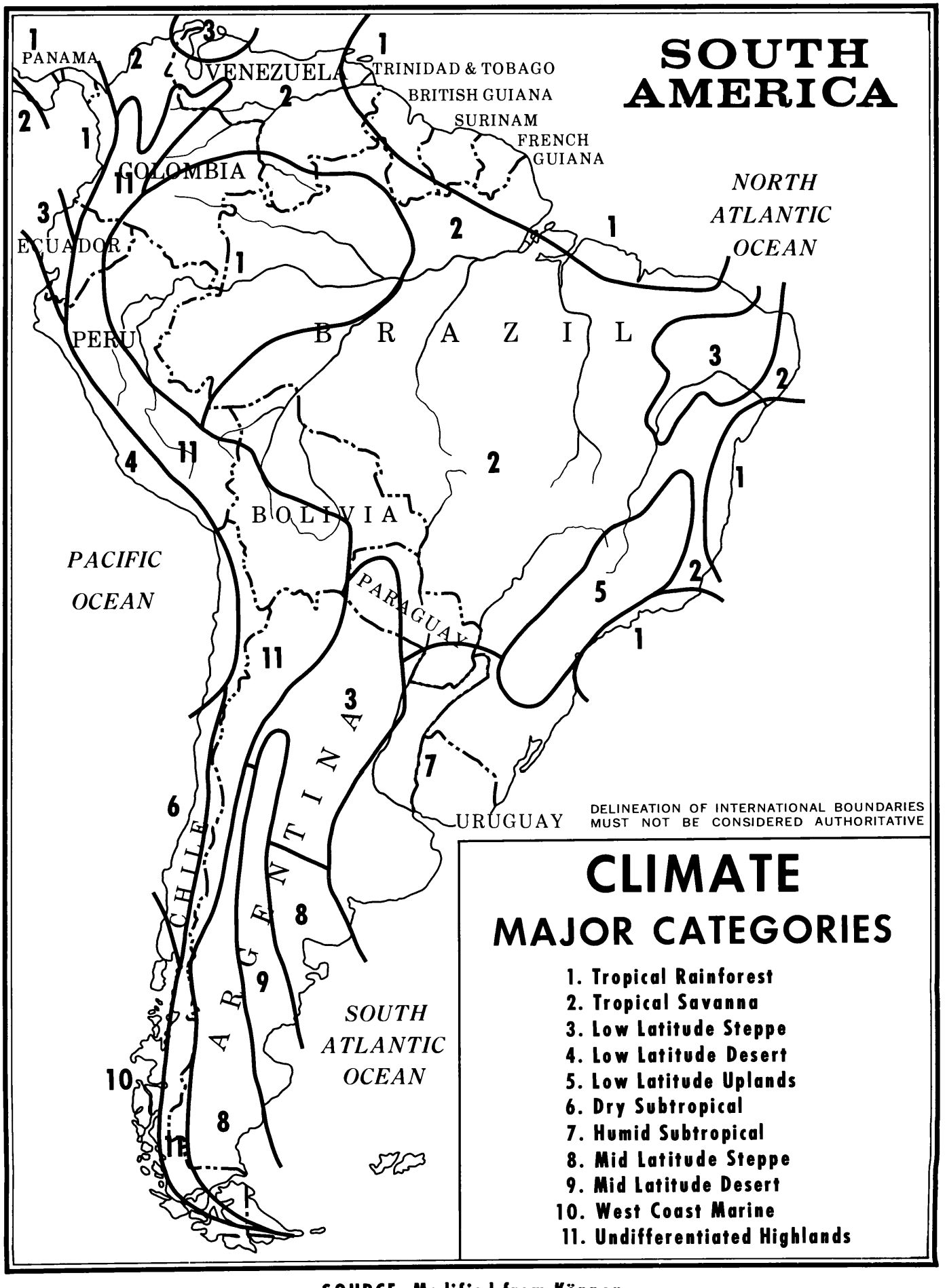
South America has a highly varied climate, although most of the land lies within the Tropics, or low latitudes. The variety arises from the great length of the area, its separating two oceans--sometimes by a few miles only--and the presence of many mountains, among them some of the world's longest and highest. Throughout most of their length, the high mountain chains form an effective barrier, climatically as well as physically, greatly influencing the climatic pattern of this region.

Climatic diversity is especially great in the Andes. There, as in any mountain region, the kind of climate depends on exposure to sunlight and to rain-bearing winds and on elevation; each 300-400 feet of altitude makes a difference of 1 degree in temperature.

South American climate resembles Africa's more closely than it does North America's; for most of North America lies in the intermediate latitudes, while both South America and Africa have broad expanses of territory within low latitudes.

However, South America projects far into temperate latitudes; it is the only southern continent that does so. It tapers poleward and its narrow southern portion is not subject to extremes either of heat or of cold. The Polar air masses around the southern tip of South America are maritime and moderate in temperature. Even in Tierra del Fuego--over 55 degrees south of the Equator, the temperature averages above 32 degrees F. in the coldest month. In general, temperatures unusual for a given latitude in South America are to be found at the elevated levels of the Andean region, all the way from the Isthmus of Panama to Cape Horn.

Source: Foreign Agricultural Service, USDA.



SOURCE: Modified from Köppen

NATURAL VEGETATION [1/]

(For use with accompanying 1:7,000,000 scale map of South America)

The accompanying map portrays the natural vegetation of South America in 18 categories. For purposes of discussion, these may be grouped into five major units.

The first of these five major categories is made up of the Tropical Forests, of which there are three types. On the border of the deserts, commonly associated with semiarid or subhumid climates, is the Tropical Scrub Woodlands. This is a formation composed of low scrub trees which are broad-leaved and deciduous, since they drop their leaves during the dry season. In some cases the trees grow in thickets, interspersed with grassy openings; in others they are scattered over the land with savanna grasses covering the forest floor. In either case, the separation of the dry savanna from the tropical scrub forest is not easy, since both formations are composed of scrub trees and tall grasses. The Tropical Semi-deciduous Forest is composed of large broadleaf trees, including a mixture of evergreen and deciduous species. The latter drop their leaves during the dry season. In some places this forest may be so dense that it can be called a jungle. The Tropical Rainforest, or Selva, is the world's most luxuriant forest type, growing only where rainfall is heavy and temperature never low. This forest is broadleaf and evergreen. Unlike the midlatitude forests, the Selva comprises a very great variety of species, some of which grow to great heights and others of which are smaller and grow in the shade of the larger trees. This type of forest is not a jungle, for there is little underbrush on its shaded floor. Only where the light can reach the ground, as along stream banks, on steep mountain slopes, or where clearings have been made and abandoned, is there a dense growth of smaller plants. The term "jungle" must be reserved for spots of tangled underbrush, whether in the Selva or the semideciduous forest. Tropical forests are widespread in South America. The largest area of Tropical Rainforest is in Amazonia and extends several degrees north and south of the equator.

The second of these major vegetation categories is described as Desert Vegetation. The Latin American dry lands are mostly covered with xerophytic shrub, a scattered growth of low, drought-resistant plants. An impoverished scrub forest, however, actually invades the dry lands of Argentina. This formation of low, dwarf trees is known as monte. In northern Chile and in the coastal region of Peru there are stretches of absolutely barren land, covered with plants only after the rare occurrence of a rain, a heavy dew, or a fog. Generally speaking, the distinguishing feature of the so-called "desert-vegetation" is the absence of a complete cover over the surface.

The areas of desert in South America are bordered by both grasslands and scrub forests. The Grasslands, the third major category of vegetation, includes three types. In cool regions, as the effective moisture increases, the xerophytic shrub gives way to a short grass Steppe, which completely covers the ground with a sod. The Steppe is restricted in South America, however, to narrow patches along the eastern front of the Andes in Patagonia. In places where the climate is distincly humid the short grasses are crowded out by tall grasses, or prairie. This grassland formation, which covers the Argentine Humid Pampa, Uruguay, and part of southern Brazil, is entirely lacking in trees except along the streams. The native tall grasses of Argentina differ from those of the North American prairies in that they are bunch grasses, and each plant stands separately without forming a sod. In addition to steppes and prairies, the grasslands also include the Tropical Savannas--a vegetation type which covers vast areas of South America, especially in the interior of Brazil. There are two kinds of savannas: wet savannas, which occur in areas subject to inundation, and which are commonly marked by tall rank grasses and by an absence of trees; and dry savannas which occur in areas that are well drained and subject to droughts, and which are commonly so mixed with scattered scrub trees that they are difficult to distinguish from tropical scrub forests. In both wet and dry savannas, as in the prairies, the banks of the streams are usually covered with a dense ribbon of forest, known as galeria--literally a "tunnel forest", since the narrower streams flow beneath an arch of foliage.

On the cool side of the deserts on the continental west coasts, where the climate is distinguished by its winter rains and summer droughts, a very distinctive type of vegetation is found. This fourth category is named after the chief and best-known area of such climate--the Mediterranean Scrub. In South America this forest type occurs in middle Chile, where the landscape bears certain striking similarities to the landscape of the coast of southern California. The trees and bushes are broadleaf and evergreen.

The fifth category of vegetation is the Midlatitude Mixed Forest, a type which is found in South America only in southern Brazil, southern Chile, and in the higher altitudes of some of the mountain regions. In southern Brazil the Araucaria forest is composed of mixed pine and broadleaf species, like the pine-oak forests of the southern Appalachians. In southern Chile the forest is composed of a variety of broadleaf species which are mostly deciduous. The very rainy western slopes of the Andes in southern Chile are covered with a dense Midlatitude Broadleaf Evergreen Forest, which differs from the Tropical Rainforest in the relatively small number of kinds of trees and in the dense growth of underbrush.

On most maps no attempt is made to indicate the distribution of the various types of vegetation in mountain areas, although very intricate patterns of distribution and many different types of vegetation do occur.

In the area designated as Undifferentiated Highlands on the accompanying map, each of the five major categories of vegetation discussed above are present. It is estimated that they occur in the following approximate proportions of the total highlands area: Tropical Forest, 45 percent; Desert Vegetation, 8 percent; Grasslands, 30 percent; Mediterranean Scrub, 1 percent; and Midlatitude Mixed Forest, 1 percent. The remaining 15 percent consists of various other kinds of mountain vegetation.

The natural vegetation, in its broader patterns, is a good indicator of the prevailing climatic conditions. Where climate stations are widely spaced, or where their records are short, the map of natural vegetation offers a fairly reliable guide to climatic distribution. The location of population with reference to the fundamental features of the land can be observed by comparison of the population map with the maps of surface configuration and natural vegetation.

1/ Sources: "Latin America", JAMES, Preston E. "Latin America, An Economic and Social Geography", COLE, J. P. "Agricultural Geography of Latin America", Foreign Agriculture Service, USDA. "Natural Vegetation", KIRCHLER, A. W.

POPULATION

(For use with accompanying 1:7,000,000 scale map of South America)

During the twentieth century and particularly since the 1920s, the population of South America has increased rapidly, probably doubling between 1930 and the early 1960s, and has changed in distribution. An investigation of population changes in major civil divisions of South American countries between 1935 and 1960 shows that population has become more concentrated.

During 1930-1960 the total population of South America roughly doubled. During that period the population of the largest towns increased more than 3-1/2 times. The rate of growth of capital cities in total has only been slightly faster than that in other medium and large towns.

In recent decades there has been some movement of population from overcrowded rural areas to more promising pioneer agriculture lands but the number of people involved here has been small compared with the number moving into towns.

The new areas of pioneer settlement are primarily in northeast Argentina, up to and across the Paraná in Brazil, into the oilfields in Venezuela, and into specially prepared resettlement areas in Bolivia.

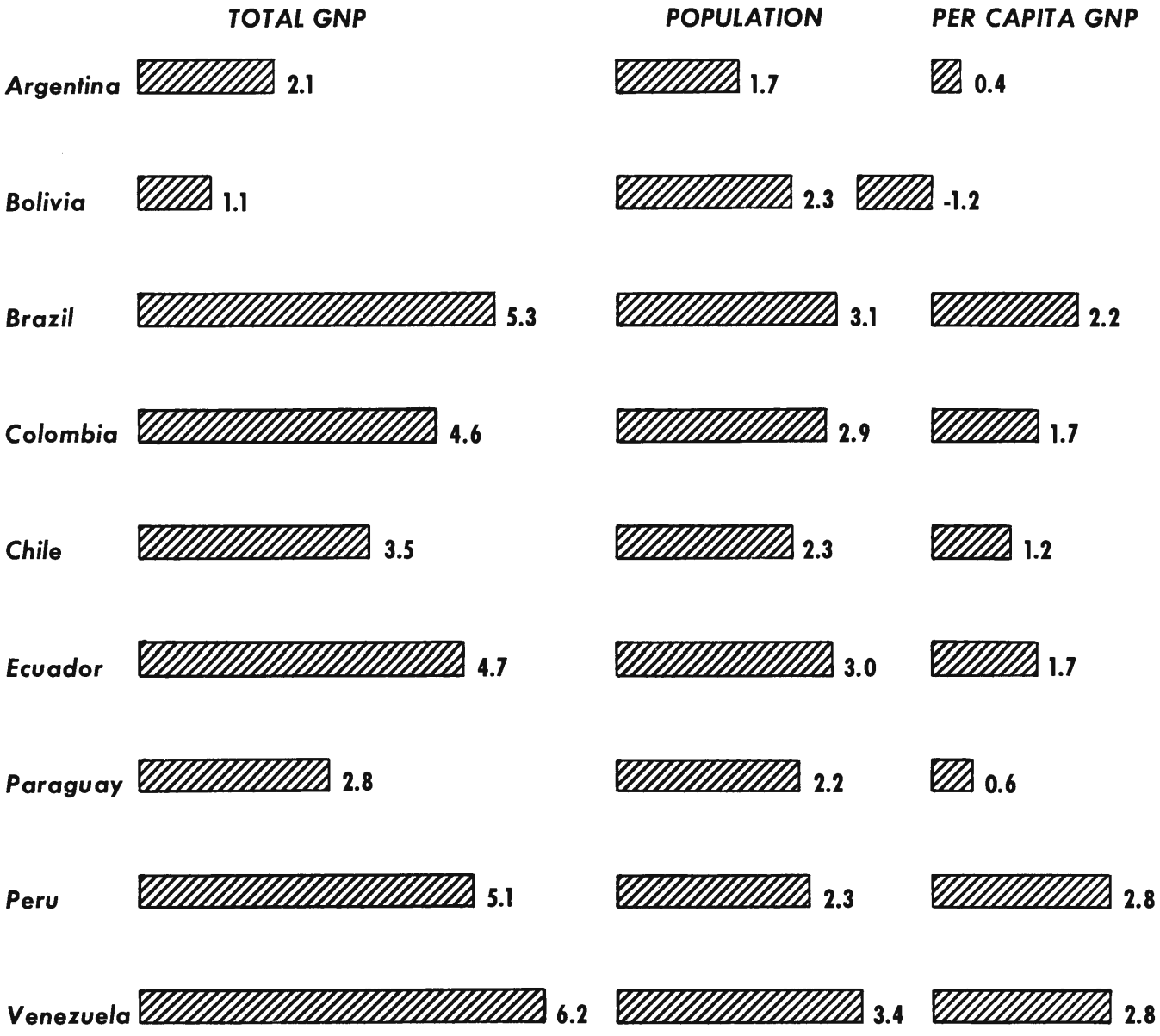
There is much evidence of movement of population from low income to high income areas whether into larger towns with manufacturing and services, or into new mining or agricultural areas. The movement into new mining regions is occurring in the oilfield areas of western and eastern Venezuela, the Orinoco iron ore area, new mining centers in Peru and Chile, and also movement into agricultural lands in which new developments are taking place: new irrigated areas in Peru, Chile, Venezuela, new commercial agriculture in coastal Ecuador, eastern Bolivia, Goiás and Mato Grosso in Brazil.

There has so far been little migration from one country to another. Exceptions are worth noting: Colombians migrate officially or even infiltrate into Western Venezuela, and Chileans into the Argentine. Caracas has become an attraction to professional people from all over South America. In each case the movement is clearly from a relatively poor country to one associated politically or adjoining territorially, either with better jobs to be obtained or with land to spare.

The best prospect for Latin America for some time to come is to encourage the rapid growth of the economy in a limited number of large concentrations and to establish new

poles of attraction and growth centers, both agricultural and industrial, rather than encouraging indiscriminately wide spread movement.

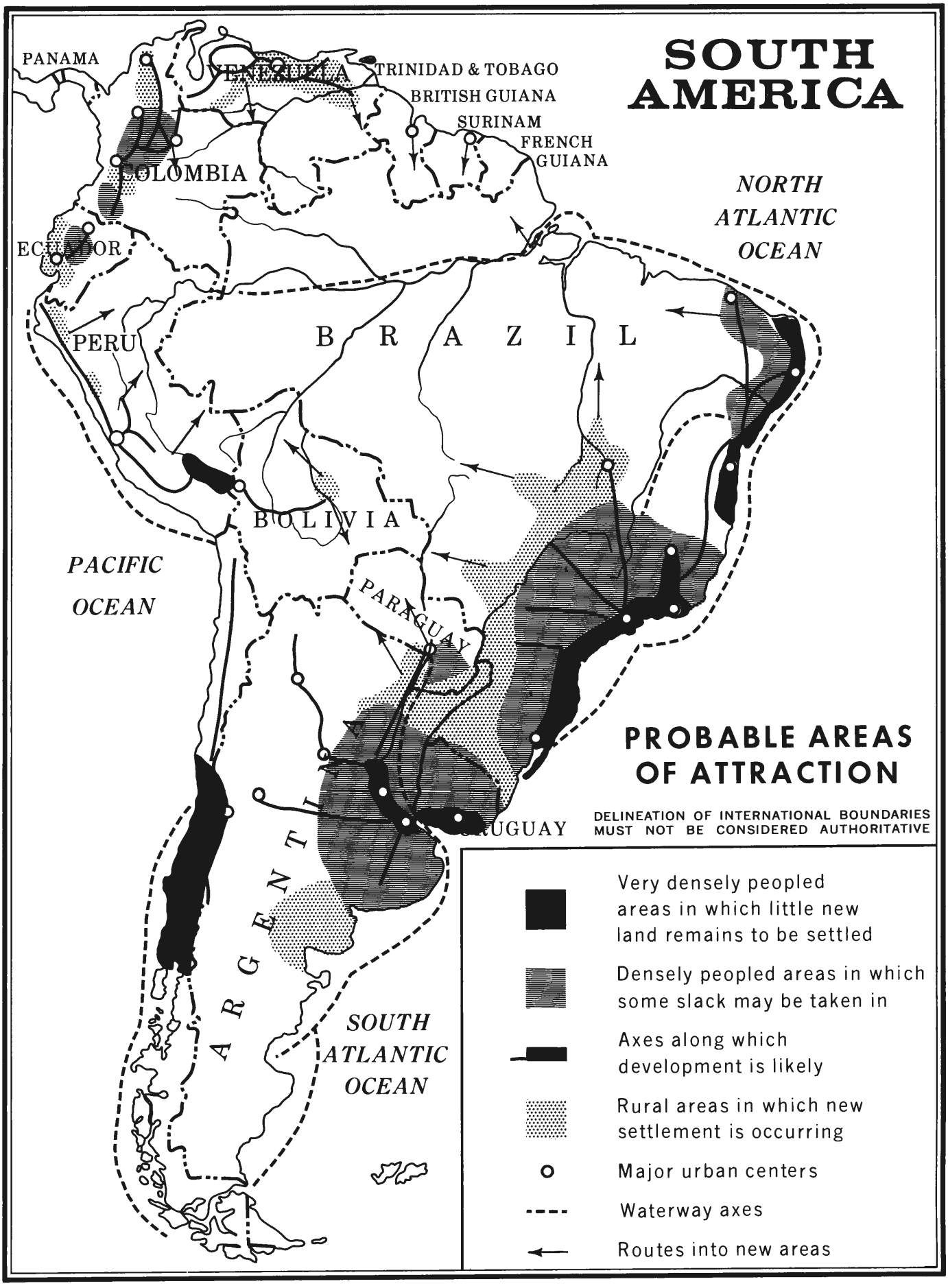
GROSS NATIONAL PRODUCT AND POPULATION
ANNUAL PERCENTAGE OF INCREASE/DECREASE
(1950-51 to 1963-64)*



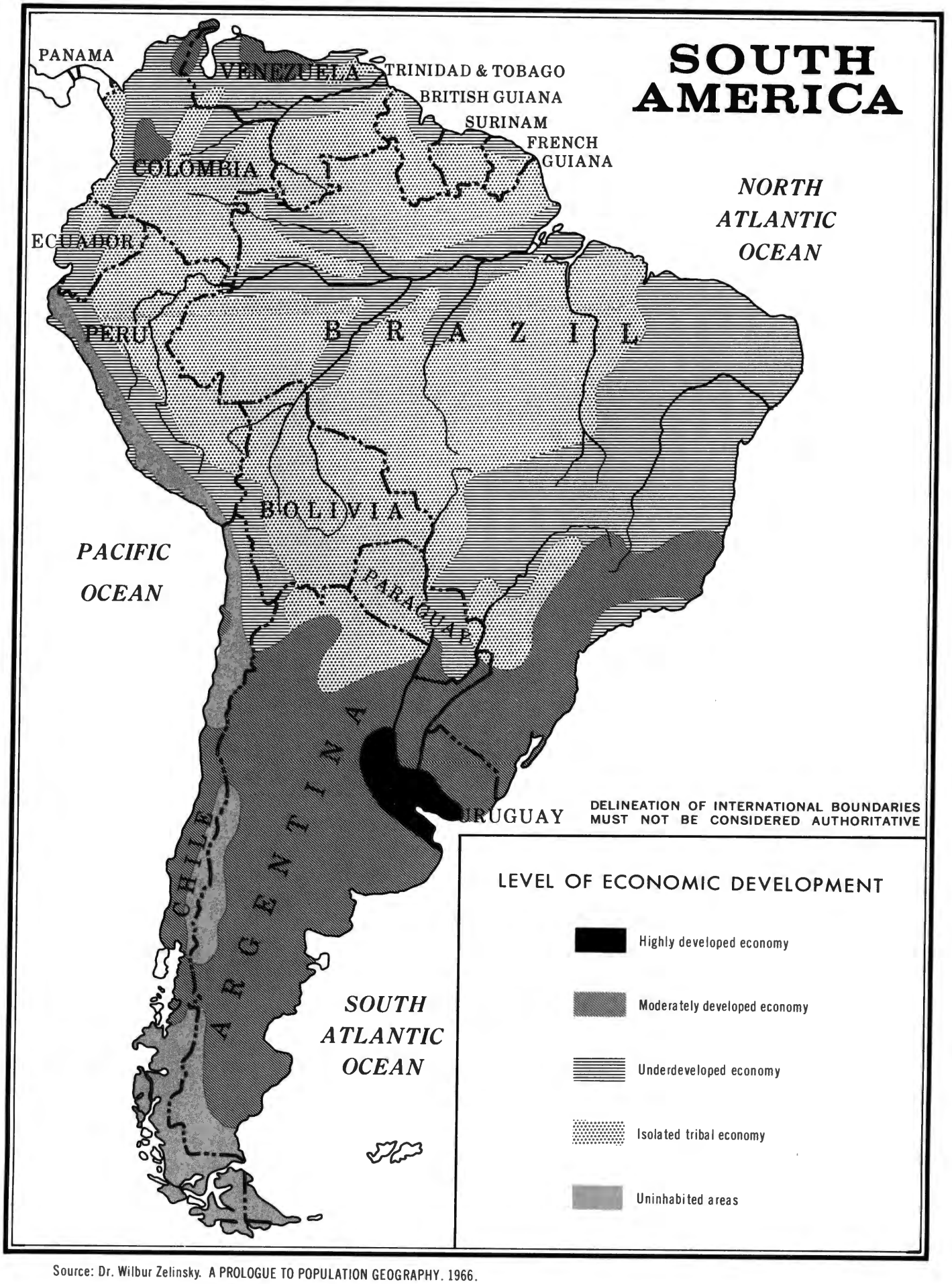
*Compound average annual rate

SOURCE

Latin America: Agency for International Development, Statistics and Reports Division, June, 1965.



SOURCE:
Latin America: An Economic and Social Geography by J. P. Cole



Source: Dr. Wilbur Zelinsky. A PROLOGUE TO POPULATION GEOGRAPHY. 1966.

GENERALIZED POPULATION/RESOURCE REGIONS[1/]

(See map following next page)

1. Technology source: low population/resource ratio.

Representative types: United States, Canada, Australia and New Zealand. The inclusion of parts of Argentina, Brazil and Uruguay in this category is to a degree subjective, since the region has attained only the transitional zone between categories 1 and 2. Thus, this region in South America should be considered within the lower limits of category 1, or the upper limits of category 2.

Characteristics: Advanced or rapidly expanding technology; skilled personnel; small to moderate population; significant known or probable resources; social means for maximizing national and individual affluence.

2. Technology source: high population/resource ratio.

Representative types: Referred to as the European type. The region in Chile is only barely within this category; its technological level may be too low for it to advance solidly into this category for some time in the future.

Characteristics: Relationship still quite favorable between the size and technological virtuosity of the population and the capacity of resources to support the population. However, due to the greater limitations on space and resources, there is a more intensive local economy and a more conservative attitude toward renewable resources.

3. Technology deficient: low population/resource ratio.

Representative types: Referred to as the Brazilian type.

Characteristics: The Brazilian type is the more fortunate among technologically deficient regions in terms of prospects, if not necessarily in the current ratio, between population and developed resources. These are the areas where a combination of historical or cultural factors has resulted in a present population significantly below the level that could be supported satisfactorily with known resources. Larger populations could be attained with a higher phase of socio-economic development. In general, areas within this category are considered to be in a transient status at the present time.

4. Technology deficient: high population/resource ratio.

Representative types: Referred to as the Egyptian type. In South America it is oriented primarily to the coastal areas of the continent; it is specially applicable to much of the Andean highland from Ecuador to Bolivia and northeast Brazil.

Characteristics: Excessive pressure of population upon immediately available physical and social resources. The ratio of inhabitants to accessible means of subsistence or employment close to critical stage in many instances.

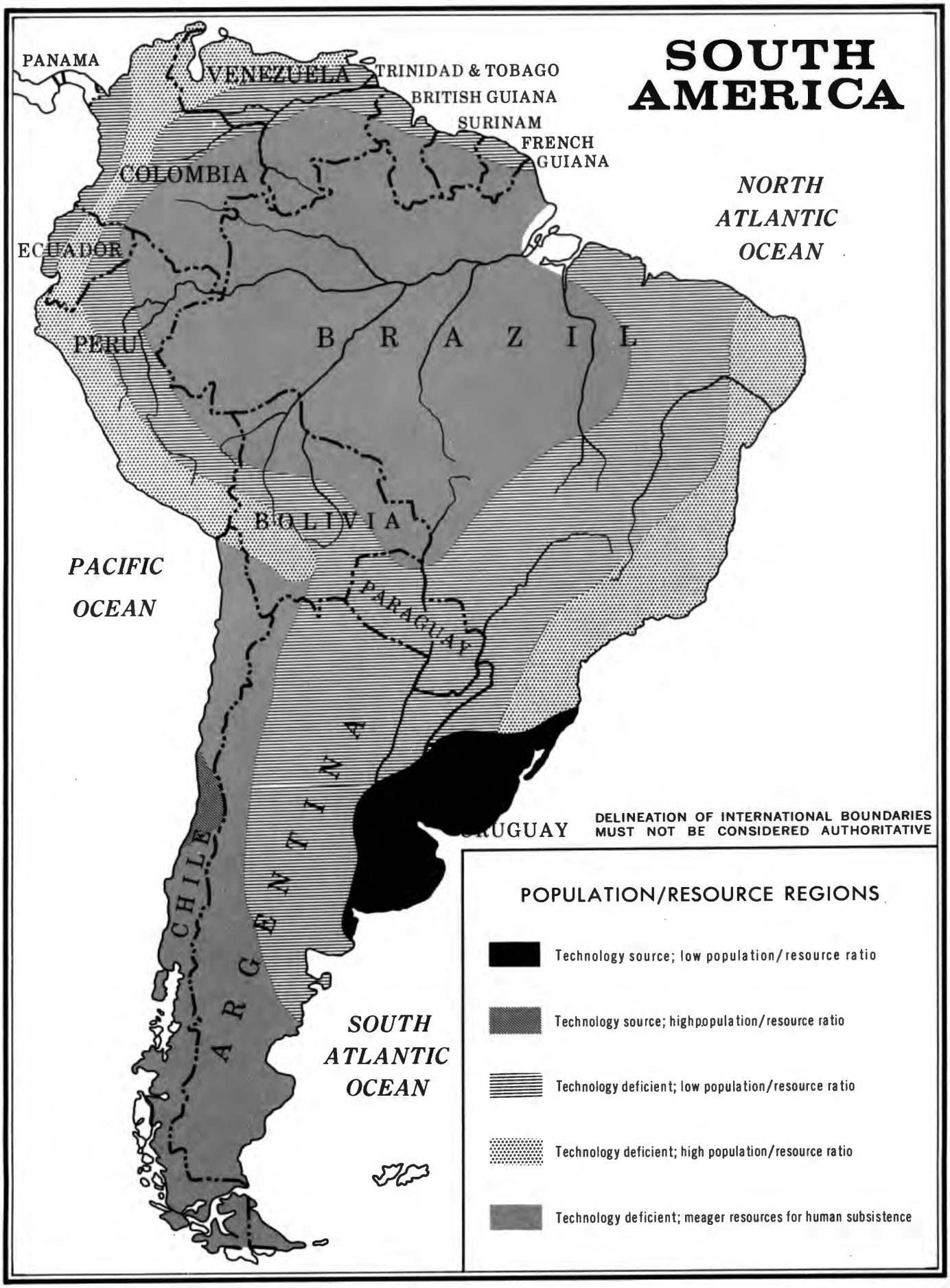
5. Technology deficient: meager resources for human subsistence.

Representative types: In South America this type includes most of Amazonia and Patagonia and a small area comprising the coastal desert of Peru and north Chile.

Characteristics: Entirely unsettled, intermittently occupied, or inhabited by small marginal groups. The present value of this region lies in the possible exploitation of some raw materials. Future technological developments to overcome physical impediments to settlement may make some areas within this region tenable for a permanent population, probably in a cluster pattern.

1/ The population/resource regions presented on the accompanying map are based upon the proposal by Dr. Edward A. Ackerman for a system to define and measure the population and resource factors of a region. This approach is in the initial conceptual stage, and is, therefore, not yet an ultimate tool for analyzing population/resource relationships. Rather, it must be considered as one of the few serious efforts to develop such a system.

This Agency considers the proposal by Dr. Ackerman to be a valid approach to an important aspect of developmental planning, and for this reason it is included in this presentation.



Sources: Philip M. Hauser and Otis D. Duncan (Editors). THE STUDY OF POPULATION: AN INVENTORY AND APPRAISAL. University of Chicago Press, 1959, and Dr. Wilbur Zelinsky. A PROLOGUE TO POPULATION GEOGRAPHY. 1966.

AGRICULTURE

A. General

In the late 1950's agriculture employed some 24 million people in South America, nearly half of the total employed population of the region, but was only accounting for about one quarter of the combined gross domestic product. The remaining activities therefore accounted for three quarters, while employing half of the productive population. An approximate employment in agriculture was shared out as follows: Andean countries 6 million, the Islands and Guianas 3.5 million, Brazil 10 million, Southern South America 3 million. In contrast, the figure for the U.S.A. during the same decade was 7,331,000. The U.S. figure has subsequently diminished, in spite of a rise in production.

The importance of agriculture to the economy varies greatly from country to country, as is shown by the following figures.

	Agriculture as % of total employment (1950s)	Percentage contribution of agric. to GDP, 1960 or nearest year
Bolivia	72	(45)
Brazil	58	27
Colombia	54	34
Paraguay	54	38
Ecuador	53	37
Perú	(50)	25
British Guiana	46	25
Venezuela	41	6
Chile	30	14
Argentina	25	20
U.S.A.	12	4
U.K.	4	4

( ) Estimated.

The contribution of agriculture to total gross domestic product varied from 53% in Ecuador to about 20% in Argentina and only 6% in Venezuela.

One reason for the backwardness of agriculture in South America has been the failure to modernize in the way that mining, manufacturing, and many service activities have been modernized. In most South American countries agriculture only receives a small share of total public investment, much less even than the share of its contribution to gross domestic product.

Only about 5 percent of the total area is used for the cultivation of field and tree crops, while another 17.5 percent is classified as grazing. Some 47.5 percent of the total area is forest covered.

B. Physical Conditions Affecting Agriculture

Very little of South America has a growing season that is too short to permit cultivation of some sort. Only in the extreme south of the continent and in the highest parts of the mountain regions is arable farming impossible on account of low temperatures.

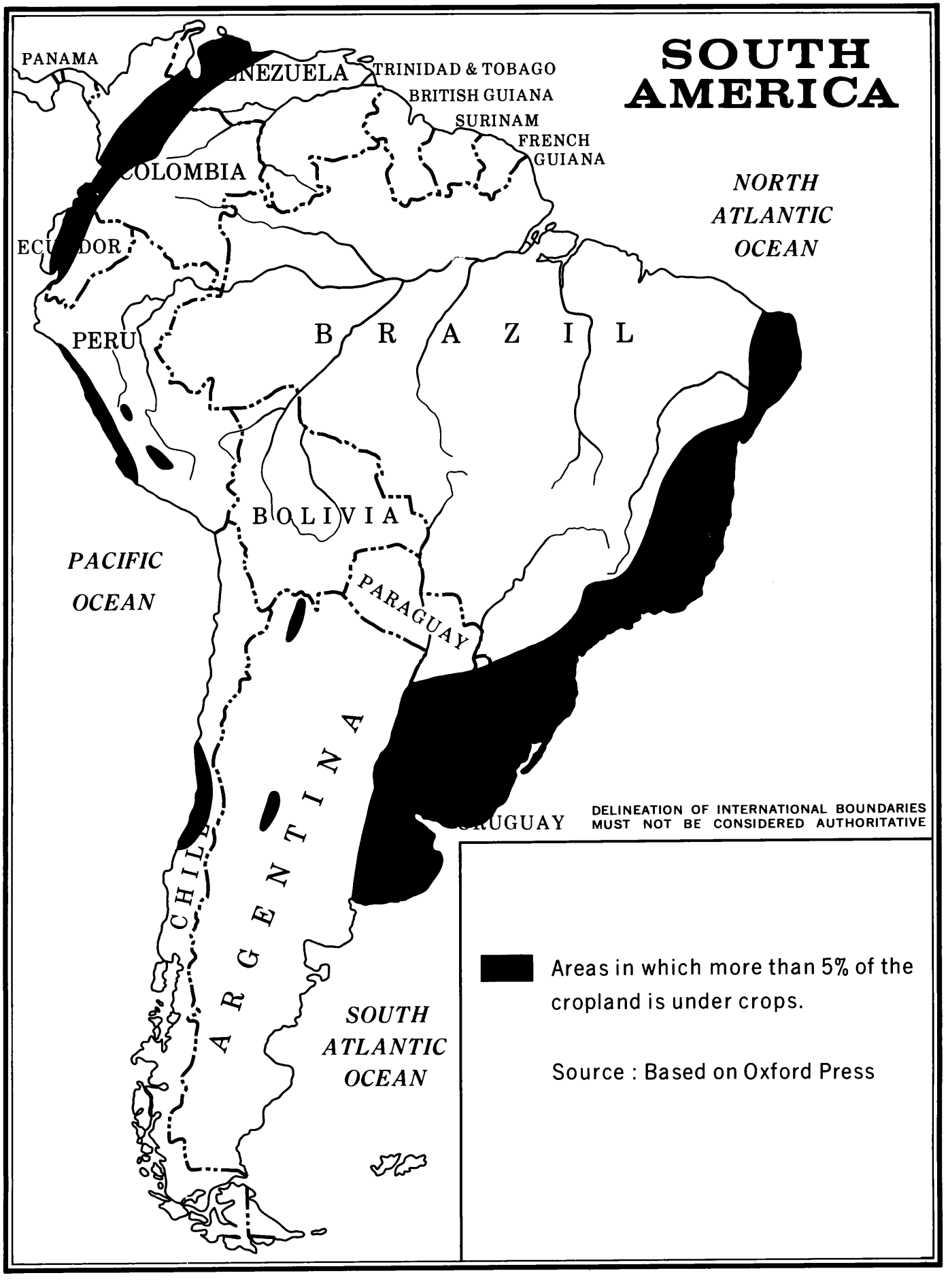
Precipitation exerts a much wider influence on agriculture than features of temperature. Irrigation is required in a belt of country extending along coastal Perú and northern Chile and crossing the Andes into western and southern Argentina. Much of northeast Brazil has cronically low and unreliable rainfall, while many smaller areas such as the northern part of the Maracaibo Lowlands in Venezuela and deep valleys in the Andes are dry. Excessive precipitation is one reason for the failure to extend cultivation in many of the forest areas of tropical South America.

Relief features, or rather slopes, make cultivation impossible, difficult or undesirable in many areas. These include much of the Andean countries and considerable areas in southeast Brazil. Lack of slope also hinders cultivation, for large areas in the interior of South America in both the Amazon and Paraná basins are almost flat and at the present, ill-drained. These areas include wide flood plains with potentially fertile land on which cultivation is impossible without regulation of the rivers themselves.

In the mountain areas, good soils occur over limited areas, notably on the floors of basins and valleys. The belt of chernozem and associated soils in Argentina is very fertile. Soils of moderate fertility are found in southern Brazil, in the interior of Argentina and in parts of Paraguay and Bolivia. The various oases, fertile flood plains, valley floors, volcanic soils and so on in total, form an appreciable area.

Cultivated area has been greatly extended by the introduction of irrigation, and the possibilities of further expansion in this direction are great.

Virtually every crop and every type of livestock can be found somewhere in South America but a surprisingly large number of crops, some of which would seem to be suited to the South American environment at present play a very small part in the farming economy.


SOUTH AMERICA
PANAMA
VENEZUELA
TRINIDAD & TOBAGO
BRITISH GUIANA
SURINAM
FRENCH GUIANA
COLOMBIA
ECUADOR
NORTH ATLANTIC OCEAN
PERU
BRAZIL
BOLIVIA
PACIFIC OCEAN
PARAGUAY
URUGUAY
CHILE
ARGENTINA
SOUTH ATLANTIC OCEAN
DELINEATION OF INTERNATIONAL BOUNDARIES MUST NOT BE CONSIDERED AUTHORITATIVE
Areas in which more than 5% of the cropland is under crops.
Source : Based on Oxford Press

C. Crops and Livestock

E = export surplus B = own needs satisfied D = deficit O = little or none grown	Venezuela Colombia Ecuador	Peru Bolivia	Brazil Paraguay	Argentina Uruguay	Chile
New World origin					
Maize	B	B	B	E	B
Cassava	B	O	B	O	O
Potatoes	B	B	O	B	B
Cacao	E	B	E	D	D
Tobacco	B	B	B	B	B
Sisal	O	O	O	O	O
Groundnut	O	O	B	B	O
Complex origin					
Cotton	B	E	E	B	D
Old World origin					
Sugarcane	B	E	E	E	D
Coffee	E	B	E	D	D
Wheat	D	D	D	E	B
Bananas	B	B	B	D	D
Rice	B	B	B	E	B
Livestock (all Old World)					
Cattle	B	B	B	E	B
Hogs	B	B	B	B	B
Sheep (wool)	D	E	D	E	E
Meat	B	B	B	E	B

More limited (a) New World: other tubers (Andes), other roots (forests) coconut palm (coasts), rubber tree in plantation, coca (Peru, Bolivia), yerba mate (South Brazil and Paraguay), sunflower (Argentina).

(b) Old World: linseed, oats, barley, rye (Argentina), millet and sorghum (Brazil), the vine (Chile, Argentina), olive trees, canary seed (Argentina), tea (Peru, Argentina), citrus fruits (Brazil), apples (Argentina).

Plants recently acquiring importance: oil palm (Colombia, Venezuela) pyrethrum, jute, soy beans (Brazil).

D. Farming Economy and Marketing

Agriculture in South America is characterized by virtually every major kind of farming economy. In forest lowlands of Amazonia and in a few small areas elsewhere, rural communities depend more on hunting, fishing and the gathering of wild plant products than on cultivation at all. Usually, however, a few crops are grown in these areas: cassava, maize, bananas, root crops (in addition to cassava) and fruits, all of which can be

counted on to yield some food even when they receive little serious attention. Although goods from outside do penetrate these areas, most settlements are sufficiently isolated and independent to be considered as having subsistence economies. In this way, several million people live virtually beyond the economic life of the countries they inhabit, for the perishable goods they could produce cannot be moved quickly by the inadequate river vessels and rafts in use.

On the next level of rural economy, the agriculturalists are slightly above the subsistence level. Perhaps half of the agricultural population of South America falls in this category. Communities grow nearly all the food they consume and provide most of their own clothing and building material, but achieve a surplus that can hardly be spared, to exchange for products from other regions. Local and regional markets and fairs held at regular intervals are characteristic. Total turnover is small but the range of commodities can be very large. This kind of economy might be called a regional subsistence level. An example of this is the interior of northeast Brazil.

The third kind of rural economy is also widespread in South America; it is a commercial agriculture based on a market economy. In this kind of economy, a large part of the farm production, whatever the size of unit of land tenure, is sold off the farm. The special crops are grown either for consumption in large urban centers in the same country or for export. Commercial farms usually supply most of their own needs of food, whether by consuming part of their own commercial products or by devoting some space to food crops.

The more agriculture in South America moves away from a subsistence level, the more it becomes essential to have efficient facilities for marketing, i.e., good means of transport, places for storage, adequate management and a satisfactory financial system.

E. Summary

The general impression of agriculture in Latin America is that crop-farming is not well balanced, while livestock farming is generally inefficient and wasteful. With regard to crop-farming, there still seems to be a hangover from colonial times. Often the best land is devoted to the cultivation of coffee, sugar, bananas or whatever other crop a particular region finds itself well suited to produce, while food crops occupy less fertile land and have less thorough and regular attention. With regard to livestock, large herds are kept but there has been little attempt to improve meat or milk yields by breeding and by improving the supply of fodder crops.

Since only about 5 percent of the total area of Latin America is under field and tree crops it would seem that there must also be scope for developing completely new areas. On the other hand, not much is known about physical conditions in many areas, and given the generally poor quality of soils in the tropics, intelligently directed research is required to determine the best approach to development within each and every area.

AGRICULTURAL SOILS
(For use with accompanying 1:7,000,000 scale map of South America)

1. Chernozems and Brunizems

Chernozems and Brunizems occupying large acreages of the undulating to rolling plains in Argentina and Uruguay are generally well known for their high natural fertility. These soils like their counterparts in the U.S. and the U.S.S.R. are deep, black, friable, and have a high base saturation; given adequate moisture and proper management, they produce excellent yields of corn, wheat, forage and truck crops.

2. Rubrozems and Red Brown Mediterranean Soils

Rubrozems and Red Brown Mediterranean soils occurring in southern Brazil, eastern Paraguay, and as unmapped local inclusions with various other soils in Chile, Ecuador, and Bolivia, have good potential under proper management for upland crop production.

3. Alluvial, Organic, Podzolized, and Gleyed Soils

Alluvial, Organic, and Gleyed soils comprise a group whose agricultural potential may vary greatly, not only between the components, but even within areas of individual components. Alluvial and Gleyed soils, much of which are fertile and suitable for agriculture, are mostly forested. The Organic soils, situated on coastal lowlands and locally on inland stream flood plains, are generally fertile but too wet for most crops other than rice; also along the coasts, these organic soils are commonly salty. With proper management (irrigation and/or drainage, fertilization, etc.,) these soils have good agricultural potential.

4. Ando Soils

Ando soils comprise a group, (black or dark brown in color and relatively high in organic matter) that has developed from volcanic ash in Colombia, Ecuador, and Chile. These soils are friable, permeable, and respond well to fertilization, but are very susceptible to erosion; most of Colombia's coffee is produced on Ando soils.

5. Reddish Chestnut, Reddish Prairie, and Semi-Desert Soils

Reddish Chestnut, Reddish Prairie, and Semi-Desert soils mantle parts of southeastern Bolivia, northwestern Paraguay, and western Argentina. These soils generally have a high base saturation and are potentially productive but in many places lack sufficient soil moisture for agriculture; with proper management, including irrigation, they would be very productive.

6. Humic Gley Soils and Grumusol (include coastal Lowlands)

Humic Gley soils and Grumusol most commonly occupying flat to undulating basin-like, poorly drained areas, occur in many of the countries of South America; some of the larger areas are in southern Brazil, eastern and southern Paraguay, northeastern Argentina, and southern and northwestern Uruguay. Humic Gley soils generally are situated on broad flat low interstream areas subject to occasional flooding. Grumusol, chiefly plastic, sticky clay is found on the slightly higher flat to undulating slopes; it swells and shrinks perceptibly with fluctuations in soil moisture and is very difficult to cultivate. Under proper management, these soils have a good potential for crop production.

7. Brown Forest - Red Yellow Podzolic, and Noncalcic Brown - Red Yellow Podzolic Soils

Brown Forest - Red Yellow Podzolic soils and Noncalcic Brown - Red Yellow Podzolic soils occur as associations in northwestern South America. The Brown Forest - Red Yellow Podzolic association occupies hills and dissected plateaus in the dry western part of Ecuador; weathered from shale, this soil association produces fairly good yields of coffee, cacao, and bananas even without irrigation; many areas are forested, some are used for grazing. Noncalcic Brown - Red Yellow Podzolic association is found in northwestern Colombia; although predominantly fertile these soils have a low crop yield potential unless irrigated, limed and fertilized.

8. Latosols and Low Humic Gley Soils

Latosols and Low Humic Gley soils, prevalent in the Amazon Lowlands generally are not used, but under proper management should produce fair crop yields.

9. Latosols and Red Yellow Podzolic Soil on Plains

Latosols and Red Yellow Podzolic soil probably make up the most extensive soil association in South America; they are widespread east of the Andes and south of the Amazon Lowlands on upland plains, and have fair to low potential for agriculture.

10. Latosols on Hills and Plains

Latosols on hills and plains are widespread on the eastern Andes footslopes of Bolivia, Peru, Ecuador, and Colombia, and along the Brazilian border north of the lower Amazon Lowlands. Chiefly red, but ranging to brown and yellow, Latosols are deeply weathered, highly leached, acid in reaction and low in available plant nutrients; they have the peculiar capability of rendering phosphates unavailable to

plants. Latosols are friable and easy to cultivate, allowing easy penetration of water and plant roots. Because of the low natural fertility of these soils, proper management, encompassing crop rotation, use of improved plant varieties, use of appropriate fertilizers, and cessation of annual burning of vegetation, is a necessity for satisfactory crop yields.

12. Lithosols, Latosols, Red Yellow Podzolic Soils on Plains and Hills

Lithosols, Latosols, Red Yellow Podzolic soils of hills and mountains are fairly well restricted to the eastern lower slopes of the Andes, mostly in Bolivia and Peru. Unlike the deeply weathered Latosols of the tropic lowlands, these relatively shallow soils are used extensively for certain crops such as bananas, citrus fruits, avocados, coca leaves, and coffee; where slopes are mild, these soils are used for sugarcane and fiber crops.

13. Solonetz and Saline Soils, Desert Soils

Solonetz, Desert, and Saline soils occur chiefly in southwest Bolivia, northern Chile, northwestern Argentina, and western Ecuador. These soils generally have a high base saturation; the Desert soils are commonly shallow. The Saline soils usually will not produce crops prior to reclamation (leaching or removal of excess salts). These soils have poor agricultural potential; under proper management which would require irrigation and in some case - drainage- some areas would produce good yields.

14. Lithosols

Lithosols encompass the massive areas covering most of the Andes with wide variety of mostly shallow unconsolidated material ranging in textures from silty clay through the regosolic sands and gravels to large boulder fields. The tree limit ranges from about 3, 350 meters in Colombia to less than 1,000 meters elevation in southern Chile. At lower elevations, Lithosols in tropical areas can be used for a wide variety of tree crops from coffee, citrus crops, to lumbering or timber; grassland areas can be grazed with sheep and goats. Lithosols generally have poor agricultural potential except for forestry.

Attention is directed to the fact that the soils map at a scale of 1:7,603,200 is of necessity, highly generalized. Consequently, prior to any detailed planning, additional research, preferably thorough field investigation, is recommended.

LAND USE
(For use with accompanying 1:7,000,000 scale map of South America)

1. Commercial agriculture with relatively large labor requirement includes production of such crops as coffee, cotton, rice, tobacco, and sugarcane.

2. Sedentary subsistence agriculture indicates settled areas that produce agricultural products for home and community consumption.

3. Livestock ranching without forage crops is the system of uncontrolled grazing of open rangeland.

4. Shifting cultivation is a primitive agricultural practice that entails clearing and planting an area, and after 1 to 3 years of cultivation, abandoning it, moving to another location and restarting this cycle.

4b. Shifting cultivation with scattered forest enterprises is the land-use term used to describe an area that has been subjected to the process of clearing-subsistence cultivating-abandoning or relocating in 1 to 3 year cycles while the inhabitants are engaged, as a sideline or part-time job, in logging or some other forest industy.

5. Forest products with some primitive shifting agriculture where the inhabitants are engaged primarily in logging, lumbering or some other forest industry while practicing primitive, shifting, subsistence, garden type agriculture near their temporary settlements.

6. Specialized farming and dairying indicate areas that are used for producing dairy products or for growing citrus fruit, apples, pears and grapes.

7. Commercial crop and livestock agriculture with relatively small labor requirement reflects the production of wheat, corn, and cattle.

8. Undifferentiated highlands with some minor seasonal grazing by sheep and goats also contains sizeable areas of rockland, boulder fields, and permanent snow and ice fields.

9. Desert areas contain nitrates and other mining activities.

The following symbols are used in addition to the above land use legend to indicate specific mineral or crop activity within the general land use area:

○	Coal	F	Fruit
△	Oil	R	Rice
X	Other Minerals	RU	Rubber
B	Bananas	S	Sugarcane
CA	Cacao	T	Tobacco
COF	Coffee	V	Vineyards
COT	Cotton	W	Wheat

SURFACE WATER RESOURCES OF SOUTH AMERICA

(For use with accompanying 1:7,000,000 scale map of South America)

INTRODUCTION AND SCOPE

Water, as a resource, is limited in relation to quantity, quality, time and geographical distribution. Thus, the resource is not always naturally available for most advantageous use when needed. The materials presented here, in graphical and textual form, are intended to show the availability (as limited by time and geographical distribution) of the water resources of South America on a broad scope in relation to the overall regional development of the continent. Because of this broad scope, generalized areas have been developed and many details and shades of refinement have been omitted in characterizing the areas. The limiting constraints of quantity and quality of the water resource are very important factors in development programs. In South America the lack of reliable, systematic statistical data on these two aspects of water resources preculuded their being utilized in this study. Measurement and collection of hydrologic data therefore, must be the starting point in all South American water development programs.

The factors to be considered and the steps to be taken in planning a water resource development program are discussed in other sections of the study. It is necessary here, however, to emphasize the importance of early recognition of the gaps and deficiencies in the basic data available for the investigation and to take measures to correct the deficiencies at the beginning of the investigation program. In all developing countries there is a lack of reliable, statistical hydrologic data upon which to base sound judgements for the program. The initial step, in these instances, then is to establish a hydrologic measuring network--streamflow and precipitation measuring gages--which will give representative coverage for the area involved in the investigation.

DESCRIPTION

Water is an essential element in the development of civilizations, but it is also a destroyer of life. The general presentation of materials in this study delineates, along broad outlines, these two factors in the potential regional development of South America. On one hand, areas are shown where the development of water resources enhances and complements the economic development of regions. Water, to be used for power production, irrigation supply, navigation, domestic or industrial water supply, fishing, etc., requires only the application of technical skills and financing before a positive growth can be felt in the region. These areas have been assigned a symbol (+) on the graphic. On the other hand,

areas are shown where the lack of water and/or the excess of water can kill the development of a region or require technical regulatory measures and financing to be applied before growth can occur. Floods must be controlled, confined, or diverted - quality must be improved - quantities must be regulated for better seasonal distribution and - lands must be reclaimed by drainage. Various combinations of these regulatory measures must be carried out before the other elements of development can bring a positive growth to these regions. These areas have been assigned the symbol (-).

The Water Resources of South America can be described most conveniently in relation to the following drainage basins: 1. Caribbean Drainage, 2. Orinoco River, 3. Amazon River, 4. Atlantic Coast Drainage, 5. Pacific Coast Drainage, 6. Río de la Plata, 7. The Great Central Basin, 8. Patagonian Plateau. These are described below:

1. The Caribbean Drainage spreads over major portions of Colombia, Venezuela, and the Guianas. The areas has favorable water resources development potential over the majority of the region. However, the lower regions of the Atrato and Magdalena rivers in Colombia will require flood control and drainage programs for extensive areas before development advances. Coastal areas adjacent to the Golfo de Venezuela in both Colombia and Venezuela are lacking in both rainfall and suitable sources of water within the areas. Other coastal areas of Venezuela suffer from lack of fresh water with limited sources of supply.

2. The Orinoco Basin covers about 30 percent of Colombia and 80 percent of Venezuela. The development of its water resources is the controlling factor in the continued expansion of Venezuela's industrial economy. At present, the navigational potential is its greatest component, but continued hydro power and irrigation developments in the Venezuelan tributaries have a strong influence on the economy. The annual flooding of large areas of the plains in the vicinity of Puerto Paez restricts development and expansion in this region. Economic restraints at present preclude the development of the natural navigation course between the Upper Orinoco in Venezuela and the Negro river system in the Brazilian Amazon. The vast plains of eastern Colombia will be accessible as the tributaries of the Orinoco are developed.

3. The Amazon River Basin has the largest developmental potential of any area in the world. In addition to extending over 60 percent of Brazil, the Amazon basin includes 30 percent of Colombia, 50 percent of Ecuador, about 80 percent of Peru, and 75 percent of Bolivia. The development of its water resources can only have a large positive effect on

the economic progress of each of these countries. The present utilization is naturally directed toward navigation on the main stem and the western tributaries, and improvement of navigability in selected areas of potential development appears to be the primary step in regional development. The town of Manaus at the juncture of several navigable streams has an advantageous location on the waterway system, but because it is also at the point of concentration of flood flows from about one-half of the total drainage of the Amazon, it has an annual flood problem for three or four months each year.

The Madeira river is navigable to near the Bolivian-Brazilian border where it is impeded by rapids. Transshipment of goods is necessary via railroad. On the Bolivian territory, in the vicinity of the upstream terminal of the railroad, a large area is seasonally inundated near the mouth of the Mamoré River. The headwaters of the Mamoré River, which cover almost the entire eastern territory of Bolivia, have a three month rainy season which inundates large areas of poorly drained land. These three factors restrain the expansion of a potentially high Bolivian agricultural economy in the Santa Cruz area of the Mamoré River basin.

4. The Atlantic Coast Drainage Area affords a good potential for surface water resource development, except in the extreme northeast, where periods of extended drought place severe restrictions on the agricultural development of the area. Electric power and irrigation developments in this area can provide a base upon which the agricultural potential can be realized.

5. The Pacific Coast of South America presents a difficult and expensive problem for surface water resource development. Extreme dry conditions exist for about 2,000 miles of this coastal region -- from the northern limits of Perú to the town of Caldera in Chile. For an additional 400 miles south of Caldera, a transition zone into a more humid area exhibits strong arid characteristics. In Perú, the arid zone averages 30 miles wide inland, and the commercial farming in the area is entirely dependent upon the surface water of the approximately 40 small rivers which cross the area. The desert areas of the Chilean Pacific Coast have a lesser development potential than those of Perú because of restricted water diversion possibilities.

6. The Río de la Plata Drainage Area encompasses portions of Argentina, Bolivia, Brazil, Uruguay, and all of Paraguay. The eastern portions of its drainage (the Paraná basin), and the Andean highlands in the west from Tucumán, Argentina, to Sucre, Bolivia, are areas in which surface water resources complement the economic development of the regions. The central portion of the area - in the basin of the Paraguai - has characteristicly poor drainage of the lowlands, and annually has large areas under water for six continuous months.

7. The Great Central Basin is a continuation of the Pacific Coast arid zone, and extends from the region of Lake Titicaca in Peru, through parts of Bolivia and Chile, across the center of Argentina to near the Atlantic Coast at Bahía Blanca. With the exception of the Lake Titicaca area and small portions of the Andes in Chile and Argentina, the basin is characterized by extreme deficiencies in surface water over a greater part of the year.

8. The Patagonian Plateau covers about 1,000 miles south of the Río Colorado in Argentina. Except for the snow melt in the Andes along the western border of the region, the entire area has a deficiency of surface water annually.

TRANSPORTATION

(For use with accompanying 1:7,000,000 scale map of South America)

Improved transportation in South America is an important key to expanding national markets and developing the hinterland.

Many of the Republics have some good road systems, and travel by steamer and airplane is often as comfortable as it is anywhere else in the world. But in all of South America, transportation facilities are limited, although susbstantial advances have been made in the last decade.

The entire area has only about 66,000 miles of railroads--less than one-third the mileage in the United States. Argentina and Brazil have the most railway mileage in South America, but much of it needs improvement and renewal. Both countries in recent years have obtained large credits to rehabilitate their railway systems. In other South American countries, much of the railway system has long winding trackage, steep grades, and sharp curves as a result of the rough terrain of the area. Differences in gages makes integrated transportation difficult. Colombia, Ecuador and Bolivia use narrow gage while Peru and Uruguay use the US standard gage. Chile and Argentina use both standard and narrow gage. Most railroads in Brazil are narrow, one meter gage.

The highways of South America are getting much more attention than the railroads. The belief is widespread that further development of land transportation should stress the building of highways rather than the extension of railroads. The Pan-American highway system has given road building a tremendous stimulus. During the past decade, much effort has been made to connect the principal cities and farming areas by an adequate road system. South America now has about 594,000 miles of highways-but this is still less than a fifth of the mileage in the United States. More than 70 percent of the highways are unsurfaced; only about 35,000 miles are paved with cement or some type of bituminous material.

Air transportation was hailed hopefully in South America in the early 1940's as being suited to the area's requirements; it could avoid the forbidding geographical obstacles--the jungles, deserts, and high mountain ranges--that balked surface facilities. Air transport quickly became a boon to passengers, but it was slower in helping to solve the problem of moving bulk freight. Since 1950, however, bulk freight movement by air has been steadily improving. Many small operators are engaged in short-haul common-carrier services. These feeder services reach virtually all regions of the area.

Still, most of the heavy cargoes of South America move either by truck or by coastal steamer or river boat. In some countries, particularly Chile and Brazil, coastal shipping is vitally important. In fact, it is Brazil's only truly national transportation system.

In its rivers, South America has four of the world's greatest water systems--the Amazon, Río de la Plata, Magdalena, and Orinoco. Only on the Amazon, which is in effect an estuary, can the oceangoing ships make their way far into the interior.

More than 25,000 miles of South America's rivers are navigable--15,000 miles of them are in Brazil. Most of Brazil's hundreds of rivers are laced with rapids and shoals, so that freight carried along them frequently has to be portaged. Even with these drawbacks, which add to the cost of transportation, considerable tonnage is moved annually over these rivers, not only in Brazil but elsewhere in South America. Argentina and Uruguay have important agricultural region in South America that are readily accessible by water highways. Potentially arable lands in the Amazon Basin are favorably situated to utilize water transportation.

The accompanying map on transportation at a scale of 1:7,000,000 is designed to show the relative density of the existing transportation system within South America. While accurate in general, it has many defects of detail. Navigable waterways shown on the map are subject to definition. In the short period of time devoted to this presentation no attempt was made to differentiate among those streams and sections of streams navigable for oceangoing vessels, river steamers, light river boats, rafts, and canoes.

The information is available and it is recommended that such additional delineation be made for the Latin American Office of Development Planning.

The roads shown as "Existing Roads" do not by any means meet the criteria of an "All Weather" road within the United States. Within the Andes barrier, they are slow, crooked, torturous, often one lane, and at times require four-wheel drive vehicles.

In those relatively level areas subject to perennial or seasonal high rainfall, the roads are often impassable even to four-wheel drive in the wet season.

Nevertheless, in all parts of the continent the roads constitute a plus factor, and are being used by the local inhabitants in order to improve the overall productive capacity of the continent.

A high priority should be given to the construction of penetration routes, linking one area of higher development potential with another, and, even more important, the centers of development potential to the urban areas which will utilize their food and livestock products, and in turn, supply the manufacturing and industrial needs of the newly developing regions.

Natural conditions seem to favor the construction of roads within much of the interior portion of South America; inadequate drainage combined with forests in some areas being the major obstacle to construction. A more detailed examination of existing construction materials should be made by the Latin American Bureau of AID in order to determine the accuracy of the above impression as to suitability for road construction.

North and west of Brasilia an extensive area exists where road construction problems will be relatively minor. The terrain is rolling, drainage is good and construction materials are available. The Belém-Brasilia road penetrates this area. In the west of Brazil, the new Route 28 to Peru has encountered only moderate difficulties: the major obstacles being transportation of things and bridge construction.

ROADS AND RAILROADS IN SOUTH AMERICA (Miles)

	Railroads	Roads	Paved	
Argentina	26 614	84 008	14 156	
Bolivia	2 661	15 094	382	
Brazil	22 720	334 740	9 000	
British Guiana	81	880		
Chile	5 500	36 425		
Colombia	2 191	23 988		
Ecuador	725	10 393	919	
Paraguay	808	7 786	188	
Peru	2 262	25 276	2 554	
Surinam	91	1 590	300	
Uruguay	1 860	23 488	5 488	"improved"
Venezuela	433	29 949	8 215	
TOTAL	65 946	593 637	34 714	+ 5 488 improved

CONSTRUCTION MATERIALS

(For use with accompanying 1:7,000,000 scale map of South America)

The entire area* contains no known manufacturing plants producing construction materials, such as brick, tiles, glass products or gypsum, all of which are imported from foreign or domestic plants in more developed regions. Five cement manufacturing plants are known to exist in the region.

Three major types of rocks are important as a source of construction materials:

1. Limestone, in addition to providing the raw materials for cement manufacture, is suitable for road building and structures. Quarries shown are mostly for cement manufacture.

2. Gneiss and granite rocks provide sources of road building materials, rip-rap, crushed stone, concrete aggregate, and dimensionstone for masonry structures.

3. Basalt, a group of hard igneous rocks, is usually used as a source of crushed rock for road building and other construction purposes.

*Central portion of South America

Sources: Mapa Geológico do Brasil, 1960. Departamento Nacional da Producao Mineral.

Anuairo Estatistico, 1960, Rio de Janeiro.

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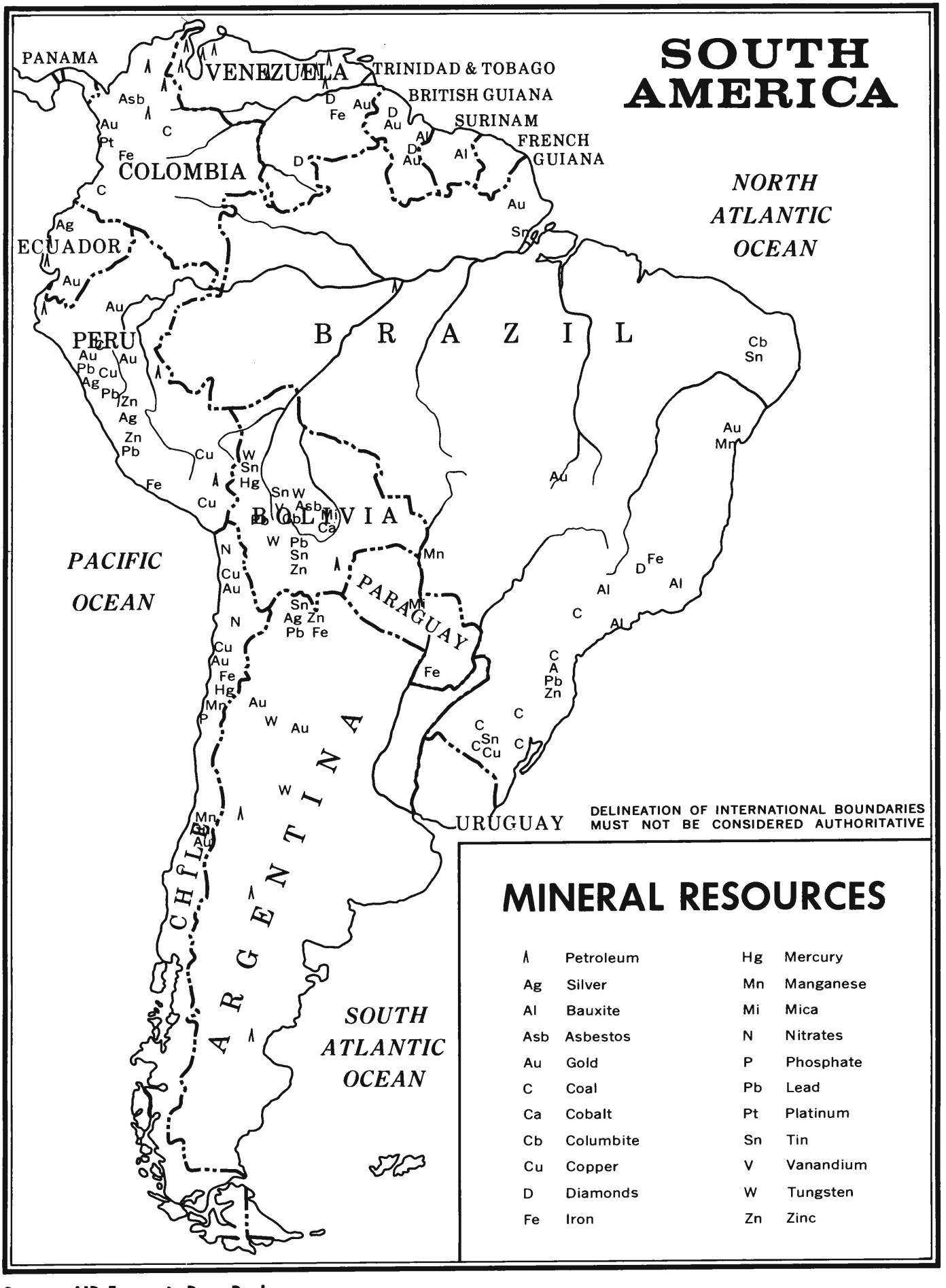
Handbook of South American Geology, Baltimore, 1956.



Source: AID Economic Data Book

ELECTRIC POWER

(For use with accompanying 1:7,000,000 scale map of South America)

The consumption of electrical energy in South America is well below the world average on a per capita basis, but the demand for energy and the rate of growth of generation facilities is improving the electrical power capacities of the region.

Several significant facts are evident from 1959 data, with few exceptions. The principal systems provided about one-half of the total energy consumed in the various countries, and privately-owned generating companies have the highest consumption of energy per capita. The main source of energy for the principal systems is hydropower. The exceptions are Argentina, Ecuador and Venezuela. The principal systems deliver their energy in about equal amounts between Industrial and Domestic customers.

The rate of annual growth is greatest in Venezuela,† and least in Bolivia,†† averaging about 10 percent in the remaining countries. On a per capita basis, Chile and Venezuela have the greatest generation capacity, and Paraguay and Ecuador the least. Although Venezuela has the highest potential for hydropower generation in one river basin, Brazil has the largest potential for any one country. Excess potential power generation capacity is possibly available for export in Bolivia, Ecuador, British Guiana and Surinam.

The following table illustrates the potential for hydroelectric power generation in South America:

Country	(1 000 Kw)[1/]	[2/] Total (1 000 Kw)	[2/] Per Km² (Kw)	[2/] Per Capita (Kw)
Argentina	3 974	29 440	10.60	1.45
Bolivia	2 650	22 080	20.10	6.72
Brazil	14 720	176 640	20.70	2.81
Colombia	3 974	73 600	64.65	5.44
Chile	5 152	18 400	24.80	2.52
Ecuador	1 472	25 760	97.90	6.44
Paraguay	2 061	7 360	18.10	4.42
Peru	4 710	40 480	31.50	3.96
Uruguay	294	2 208	11.80	0.82
Venezuela	3 165	36 800	40.30	5.82
Br. Guiana	2 650	14 720	68.50	27.36
Surinam	800	7 400	51.80	30.60

1/ Based upon minimum daily discharge (1 000 Kw).
2/ Based upon average discharge.

† Rate 16.9 (1950-1959)
†† Rate 3.6 (1950-1959)

EDUCATION
(See 1:7,000,000 map for Statistics)

A. Some Problems of South American Education

1. Quantitative factors. Within South America there are great quantitative differences in the educational situation of individual countries, and even within the urban-rural areas of the same country.

a. Illiteracy. The illiteracy rate of a country may be regarded as a rough indication of a minimum educational achievement. Although the percentage of illiteracy on this basis is apparently decreasing, the actual numbers of illiterates are probably increasing because of the rapid rise in the population. Countries with a large proportion of rural population generally have a higher percentage of illiteracy than do those with larger urban populations, sometimes in almost direct ratio to the percentage of rural inhabitants in the total population.

b. Educational Level of Adult Population. Adult illiteracy is due to the low educational level achieved by the South American population 15 years of age and over. The average number of years completed by those who have attended school is 4.4. Perhaps 10 percent of the 15-year-and-over age group in South America has completed primary school; 6 percent, some secondary-level education; 2 percent, a full secondary program; and 1 percent, some form of higher education, with only a fraction of this group completing a full program of studies.

c. School Enrollment. The first step toward preventing adult illiteracy and providing a basic education is through regular school programs. The problem of expanding school enrollments in South America is compounded by the rapid increase in the school-age population. Primary school enrollment was estimated in 1960 at 26 million, or about 60 percent of the population of primary school age (6 to 14 years of age). Secondary enrollment in 1960 was approximately 11 percent of primary enrollment. In higher education, total enrollment in 1960 was about 500,000, which represented about 17 percent of secondary school and 2 percent of primary school enrollments.

d. Absenteeism and School Dropouts. Absenteeism and school dropouts at all levels constitute a serious problem in most of South America. The factors behind this situation are a combination of socio-economic and educational conditions. Often the limited facilities cannot meet enrollment requirements, especially in the first year or two. Poor economic conditions, lack of adequate food and clothing, malnutrition, disease, and poor health conditions are contributing problems.

Particularly in rural areas, the advantages of education not related to needs and local environment are not always apparent to either parents or children. Parents demand that children work in the home or the field, and they often live great distances from the schools. In urban areas, parental unwillingness to continue to support a child after he attains an age at which he can contribute to his own support is a factor. Even in the most advanced South American countries, approximately 75 percent of pupils beginning primary school and 68 percent of those going on to a secondary school failed to complete their respective programs, and only 5 percent of those who began primary education completed secondary. Again, there is a marked difference between the situation in urban and rural areas. In Colombia, for example, it was indicated over a recent period that the urban retention rate was more than 30 percent, while in the rural zones it dropped to 1 percent.

e. Physical Shortages. Physical shortages of buildings, supplies, textbooks, other instructional materials, and teaching aids are among the deficiencies in South America. While there are some good school buildings, well equipped with teaching materials, libraries, and laboratories, these are the exceptions. Initial expenditures for school construction are often not followed up with budgetary provision for the necessary maintenance. Shortages of buildings, especially in rural areas, lead to several teaching shifts a day, sometimes as many as three or four, so that the time spent in the classroom, already at a minimum in a 2- or 3-year program, is still further reduced to a fraction of the minimum for an acceptable education. The shortage of texts and teaching materials is a factor in the teaching technique that results in the teacher's dictation of a lesson, or writing text material on the blackboard, which pupils then copy.

f. Teacher Shortages and Deficiencies. The shortage of trained teachers throughout South America is one of the most serious problems to educational advancement. If school buildings were available for all primary age children, there would be an immediate shortage of about 500,000 teachers. Approximately 45 percent of the elementary teachers throughout the area have not been prepared through the normal school programs, and, therefore, are not regularly certificated. Rural areas suffer by comparison with urban areas, and teachers trained in urban areas are reluctant to accept rural assignment. Other problems are low salaries, heavy pupil-teacher load, insecurity of tenure, and low social and occupational status.

At the secondary level there are similar problems. While the secondary-level teachers usually are better prepared academically than elementary teachers, the proportions of untrained secondary teachers is higher than in elementary

schools, since only a few countries have a sufficient number of special institutions for professional preparation of secondary-level teachers. Part-time employment among many secondary teachers is common because the limited demand for full-time teaching services makes it necessary for teachers to hold other positions often unrelated to teaching. Teachers may also instruct in more than one school.

2. Qualitative Factors

The principal problem is that of reorienting the traditional philosophy, content, and methods of education at all levels to meet the needs of present-day life. Characteristics of the system underlying the necessity for such reorientation are: overemphasis on academic curriculum, lack of practical instruction and applied science, and the predominance in universities of education in the traditional professions unrelated to technical and scientific needs. In other words, educational methods still appear to be geared to the socio-intellectual objectives of an earlier day, and not to providing a means for the individual to achieve his potential in society.

Although new instructional programs are being introduced, the academic and theoretical subjects are still emphasized. As previously noted, educational programs are generally inflexible throughout most of the South American countries, with little adaptation to local environment and needs, exemplified particularly by programs in rural areas. Terminal education designed to fit pupils for a useful role in urban areas is also a great need of South American schooling.

Methods of teaching and learning still emphasize memorizing encyclopedic detail emanating from the teacher, whether it be at elementary, secondary, or higher education levels. Shortages and the expense of texts and other learning materials have contributed to this practice. General lack of laboratory and scientific equipment, and lack of interest in scientific method, observation, and analysis lead to teaching of science subjects theoretically. Teachers are usually trained in rote memorization, and reflect in their teaching the methods and techniques by which they learned.

3. Higher Education

Most of the quantitative and qualitative problems apply to higher education. However, there are certain factors of special significance for higher education.

The nature of the student bodies of the public universities in most South American countries has been drastically transformed over the past 40 years. They are no longer drawn largely from

the economic and social elite; those from the middle class and the less privileged social groups now generally form the majority.

This change has increased the role of the students in matters of university administration. The modern university student movement began in 1918 at the University of Córdoba in Argentina, and has spread throughout South America. It has concerned itself with the recognition of university autonomy, reforms in administration and programs of study, and a prominent role for students in university administration. One result of the change in the composition of the university student body is that many have become part-time students because they must work to support themselves. This is one reason why students are often unable to complete their studies in the required length of time.

South American universities have the general problem of shortage of physical facilities and equipment. The national universities in some countries have been able to build campuses, called "university cities", others have not been so fortunate. Lack of funds is a major factor in the difficulties encountered in building up full-time teaching staffs. Many part-time professors are professional men devoting a few hours a week to teaching.

In social and economic development, one of the most obvious needs is a program of higher education and training in related areas, such as technological education, business and public administration, advanced agricultural studies, and professional education. Some South American universities are adding these studies or modernizing existing programs. In new universities the emphasis is frequently in these fields, and often it is easier to start new institutions than to modernize programs in those already established.

One problem in connection with new studies is persuading students to enter them. In most instances, the professions of medicine, law, and theoretical engineering remain the major attractions for students, while interest in such fields as agriculture and animal husbandry is limited, even in countries where they are the major sectors of the economy. Other almost ignored university activities are research, community service and extension functions. Inadequate budgets contribute to the limitations in research, but the system of part-time professors and the lack of scholars oriented to and trained for advanced study and research are principal factors.

B. Organization and Structure of South American Education

1. Administration. South American countries in general have centralized (national) systems of educational administration and control through the secondary level. National ministries of education set the curriculums and plans of study, and, in most countries, have authority in matters of supervision, inspection, selection of teaching materials, teacher appointments, and certification of diplomas. In Brazil, Argentina, Colombia, and Venezuela there is some decentralization of administration to state or provincial authorities.

There is a shortage of trained administrators, curriculum specialists, and school inspectors. Only a few institutions offer programs of training in various fields of educational administration. Recently there has developed an interest in systematic planning of education and its coordination with general plans of national development. Educational planning offices have been established in the education ministries in a number of countries.

South American universities, public or private, generally are self-administering, and are not subject to direct ministerial or government control. Brazil is an exception, for the Ministry of Education has general administrative control. Other public institutions of higher learning offer various kinds of specialized education, and are subject to the appropriate ministry.

2. Finance. Public financing of education in South America is principally the responsibility of the central governments. Public funds for the universities in some countries are included in the educational budget and dispersed through the Ministries of Education, while in others they are appropriated separately. U.S. Government funds have been made available to a number of the South American republics for education under programs of technical cooperation and educational and cultural exchange, as have funds from international organizations (UNESCO, Organization of American States, and others). Private funds are available only on a limited scale.

Lack of sufficient funds for education is a chronic problem in South America. Reliable and comparable figures for the different countries on the percentage of the gross national income or product devoted to education are inconclusive or lacking. Some progress is being made in both percentage and absolute increases in national education budgets--though a good part of this increase is brought about by inflation.

Brazil, Chile, Colombia, Peru, and Uruguay allot a fixed percentage of national government revenues to education.

Colombia now provides in its constitution that not less than 10 percent of the total budget shall be for education. Some countries have tended to spend a relatively large share of the available funds on central educational administration rather than on educational facilities, program and instruction.

3. Elementary Education. In South American countries this level is referred to as primary education. In most of the countries it is free and legally compulsory for children from 7 to 14 years of age. However, the compulsory provision is inoperative in many localities because of the lack of schools and teachers, great distances from school in rural areas, and lack of transportation. The primary program is 6 years in most countries. In rural areas the primary program is seldom more than 4 years.

4. Secondary Education. In South America, this term traditionally has been applied to academic, university preparatory education. Vocational education has usually been termed "technical", "industrial", "commercial", or "agricultural". Another type of secondary-level education is given in normal schools for the preparation of teachers. The university preparatory program covers 5 or 6 years in most countries. The bachelor's diploma (bachillerato) in the majority of the Latin American republics is awarded by the Ministry of Education, frequently after a common final examination, and qualifies a student for university entrance.

Both vocational and agricultural education at the secondary level are in great need of expansion. Enrollment in vocational schools represents, at the most, only 25 percent of the student body in secondary schools. These schools usually provide a general or prevocational cycle similar to the first cycle of academic education, plus some vocationally oriented subjects. Programs vary from 2 to 5 years, and on completion provide a certificate or title in the particular field, and in some cases serve as a basis for further vocational and technical training.

The Agency for International Development (AID) has been working with the South American governments in these programs for a number of years. UNESCO, the Organization of American States, and the Rockefeller Foundation, among other groups, have also been active in the field of agricultural and rural education.

5. Teacher Education. Formal preparation of teachers for the elementary schools generally takes place in secondary-level normal schools, which offer a combined program of general education and teacher training. In urban normal schools, programs are generally comparable in length to those in academic secondary schools. Rural normal school programs are usually shorter and may consist of 2 to 4 years of training

beyond an abbreviated program of primary education. Many teachers, particularly in rural areas, receive no special preparation, but commence teaching with only a primary school education. In-service programs of training have been instituted for such teachers.

Formal programs for the preparation of secondary and normal school teachers are offered in higher normal schools, pedagogic institutes, and university schools (faculties) of education, humanities, or philosophy and letters. Facilities for preparation of vocational teachers are being developed, but are extremely limited in most countries.

6. Higher Education. National, state, or private universities provide higher education, and institutes and independent faculties offer specialized or professional programs. Universities are generally loose unions of practically independent faculties (schools) with few relationships among them. Programs of study are largely professional or specialized with fixed curriculums and few, if any, electives. Students generally enter directly from secondary school into the professional faculty of their choice. Graduate work, as organized and understood in the United States, is virtually nonexistent in South America, though programs of 5 years or longer and programs of special research institutes may have some resemblances. For this reason, those desiring advanced education and training for research, university teaching, and various highly specialized positions are usually compelled to undertake graduate work abroad. Some countries have specially organized programs to this end; for example, in Colombia the Colombian Institute for Advanced Study Abroad (Instituto Colombiano de Especialización Técnica en el Exterior - ICETEX).

7. Adult and Community Education. Adult and community education exists in all South American countries, but information is generally lacking on their scope and nature. They include literacy programs for adults and community development and education projects in rural areas, such as the literacy and community education programs of Radio Sutatenza in Colombia (the so-called "radiophonic" schools), and the rural núcleo school programs in several Andean countries. Night school programs in continuing and vocational education are conducted in urban areas, and some countries have well-developed apprenticeship and on-the-job training programs and facilities similar to the National Service of Industrial Apprenticeship in Brazil and Colombia, financed mainly by taxes on private industry payrolls.

HEALTH

The 7 maps prepared for this subject show the distributional patterns for the following diseases:

Maleria eradication

Ankylostomiasis (hookworm)

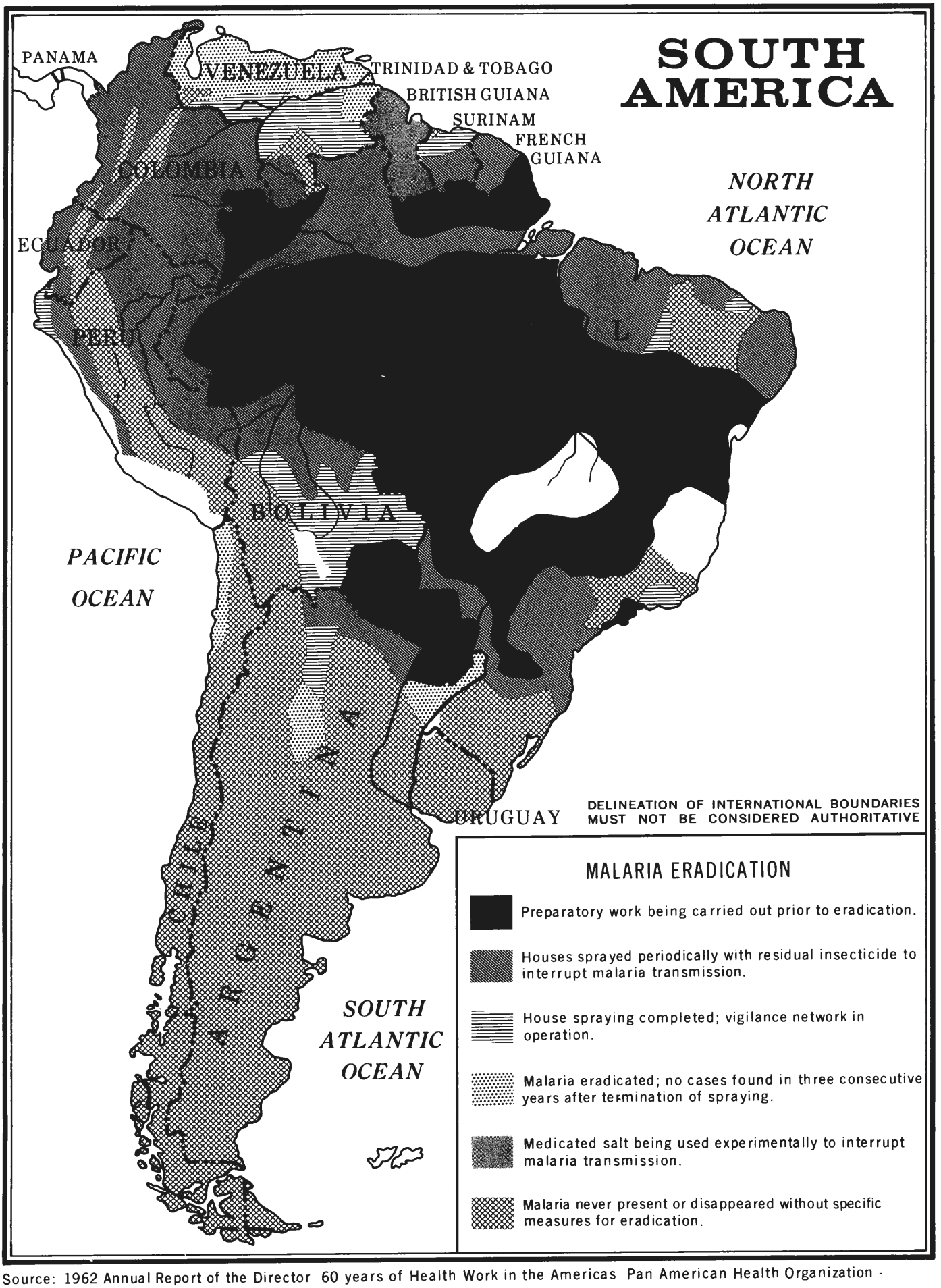
Leprosy

Chagas' disease

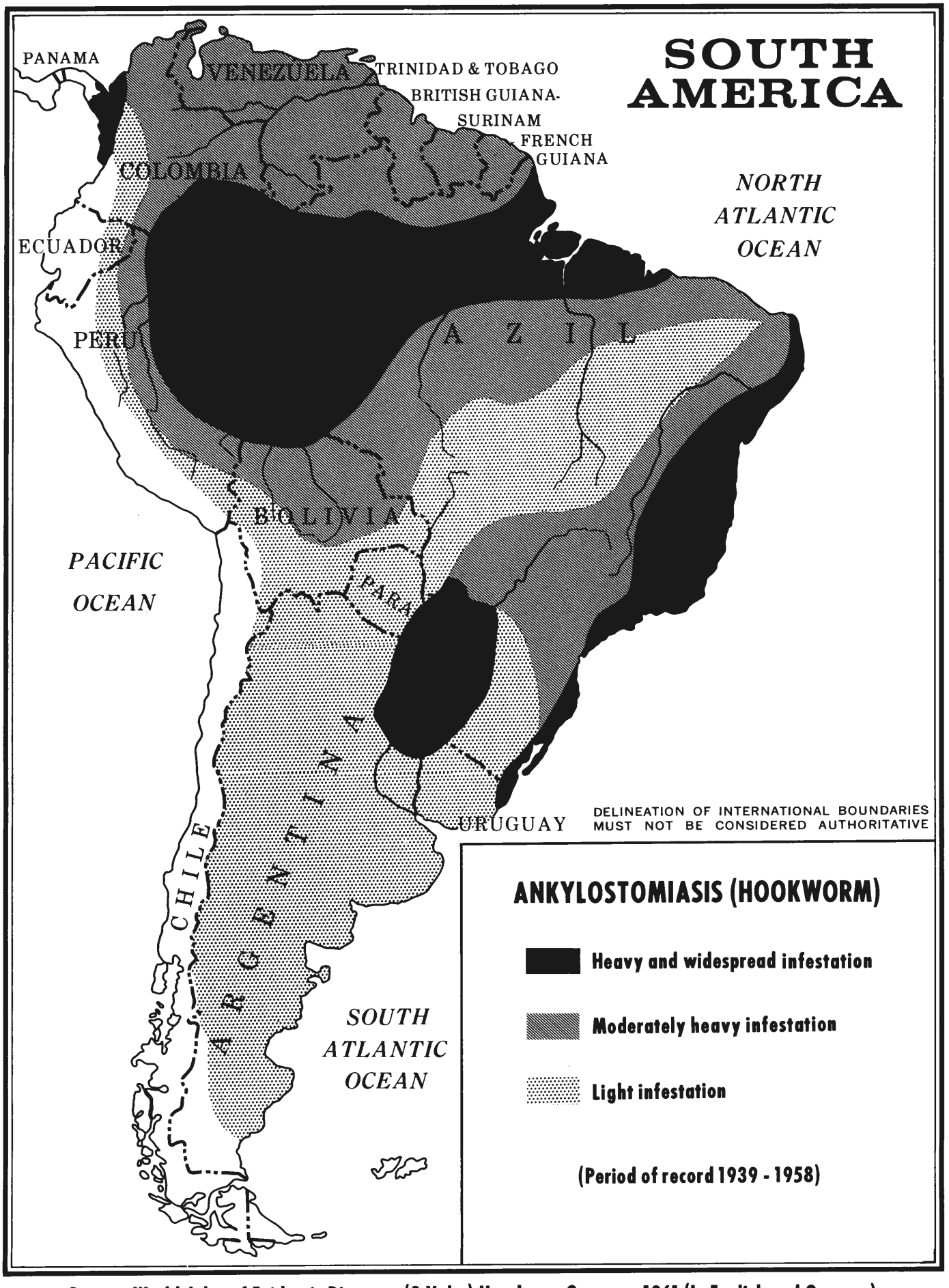
Trachoma

Plague

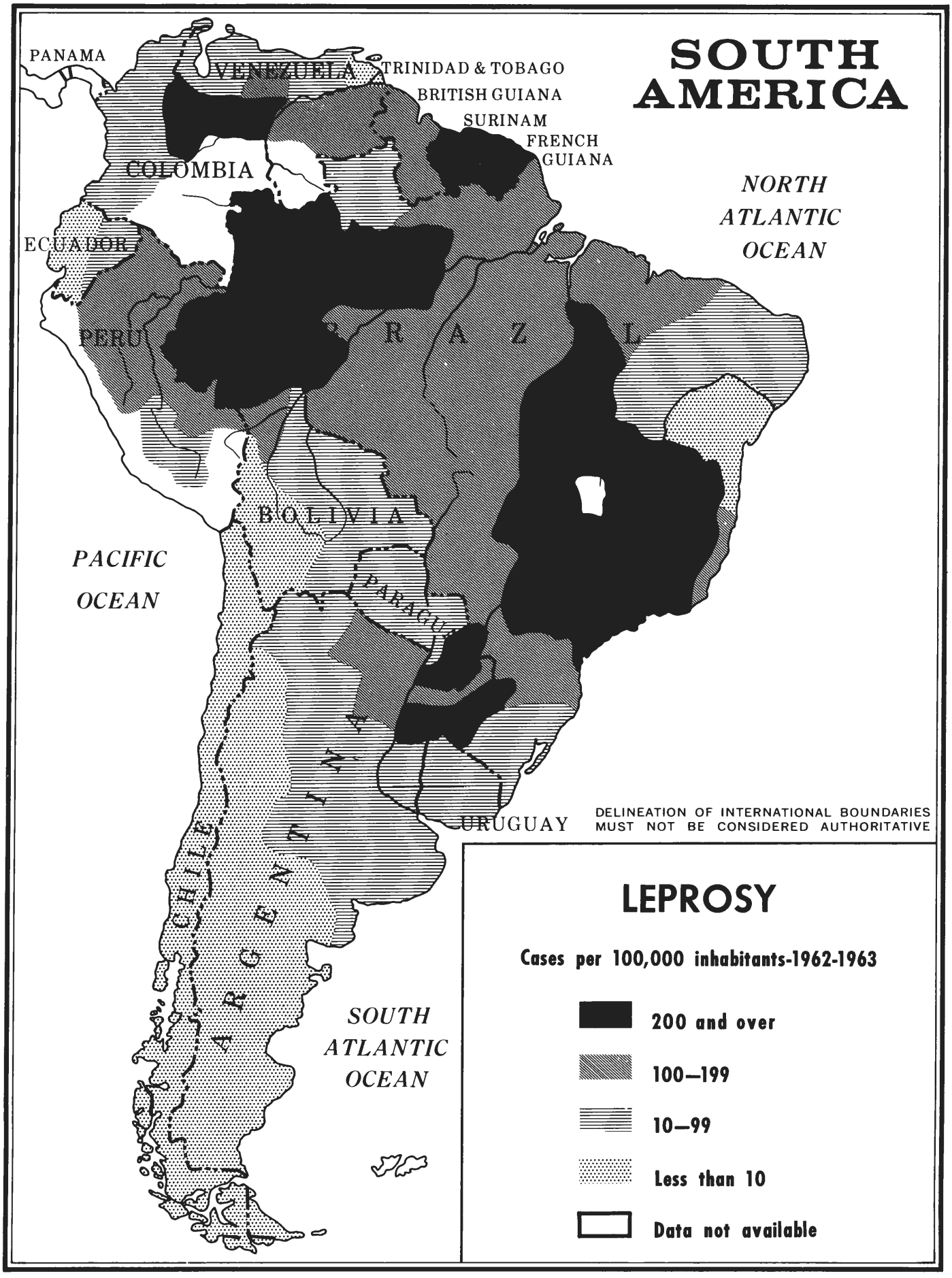
Amoebic dysentery



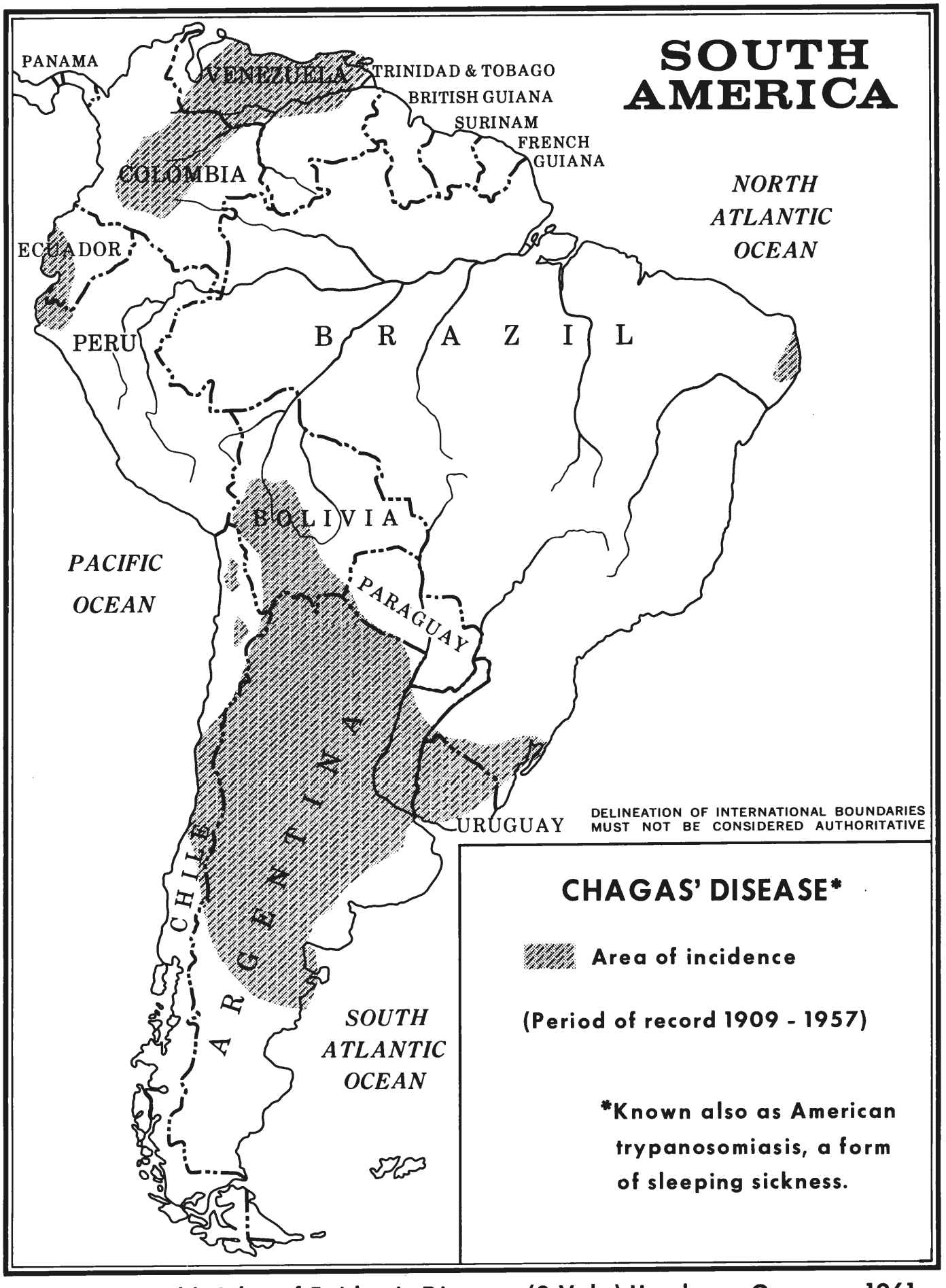
Source: 1962 Annual Report of the Director 60 years of Health Work in the Americas Pan American Health Organization - World Health Organization Sept.1963.



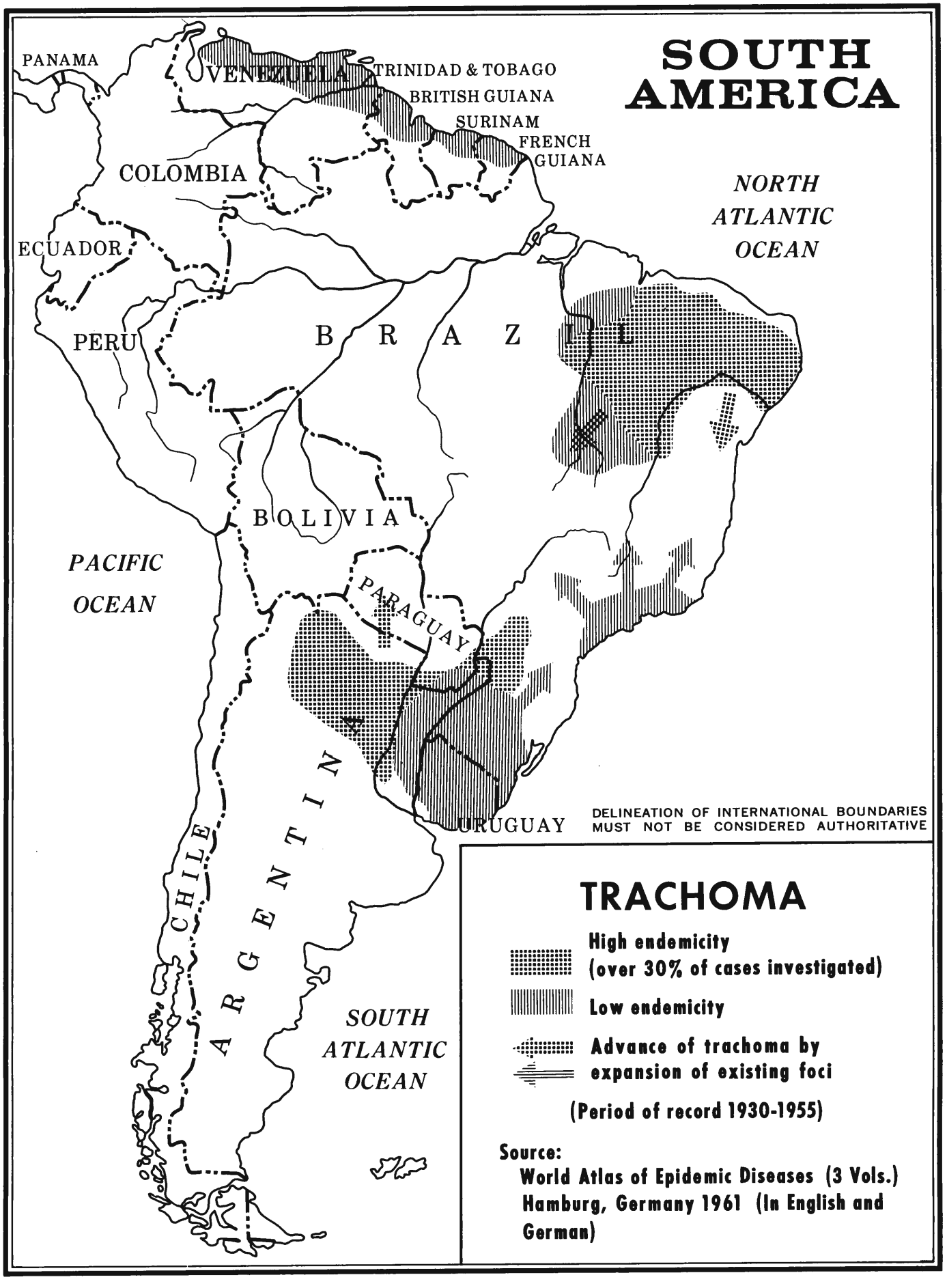
Source: World Atlas of Epidemic Diseases (3 Vols.) Hamburg, Germany 1961 (In English and German)

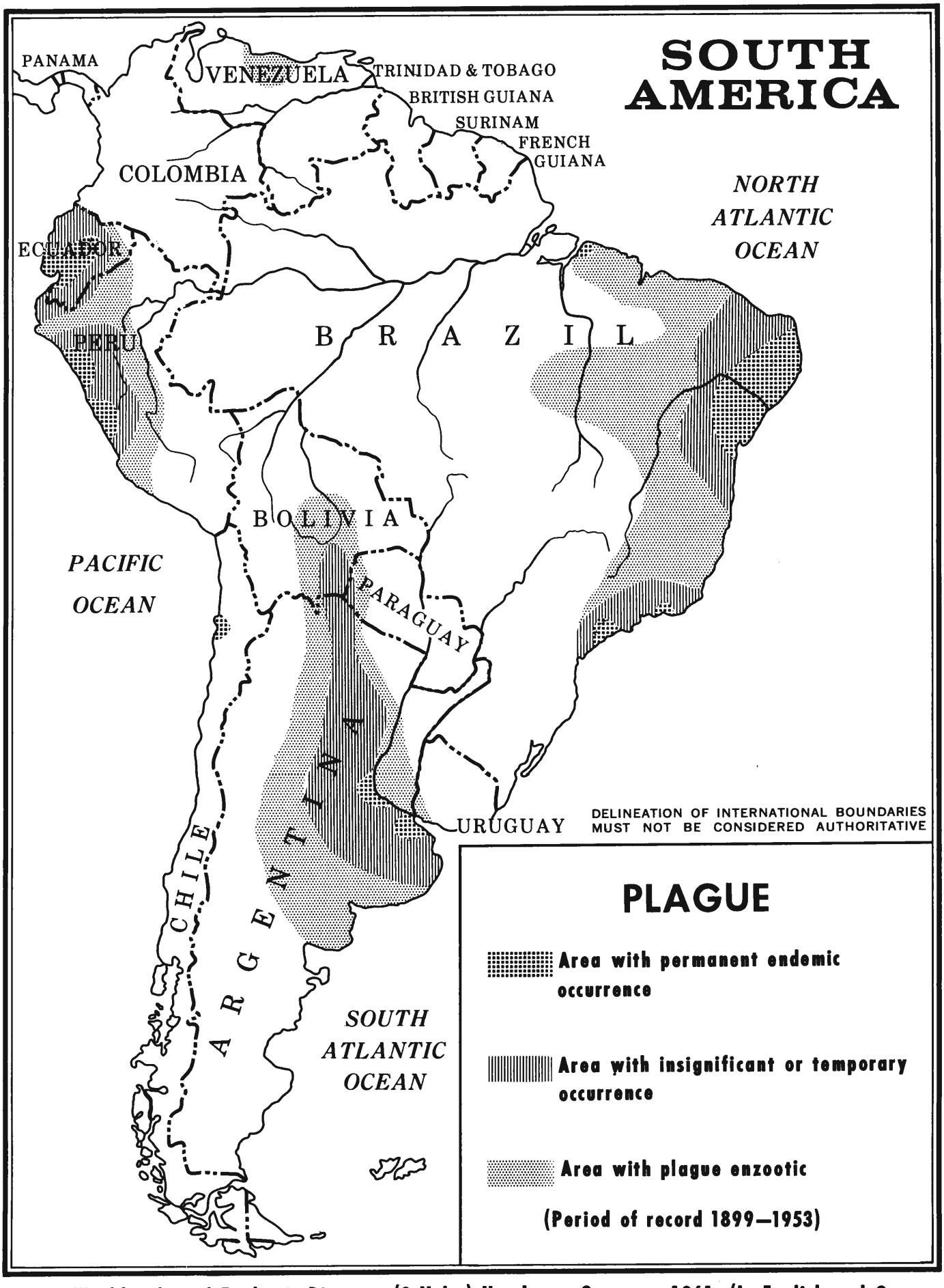


Source: Reported cases of Notifiable Diseases in the Americas Scientific Publication No.114 June 1965
Pan American Health Organization / World Health Organization

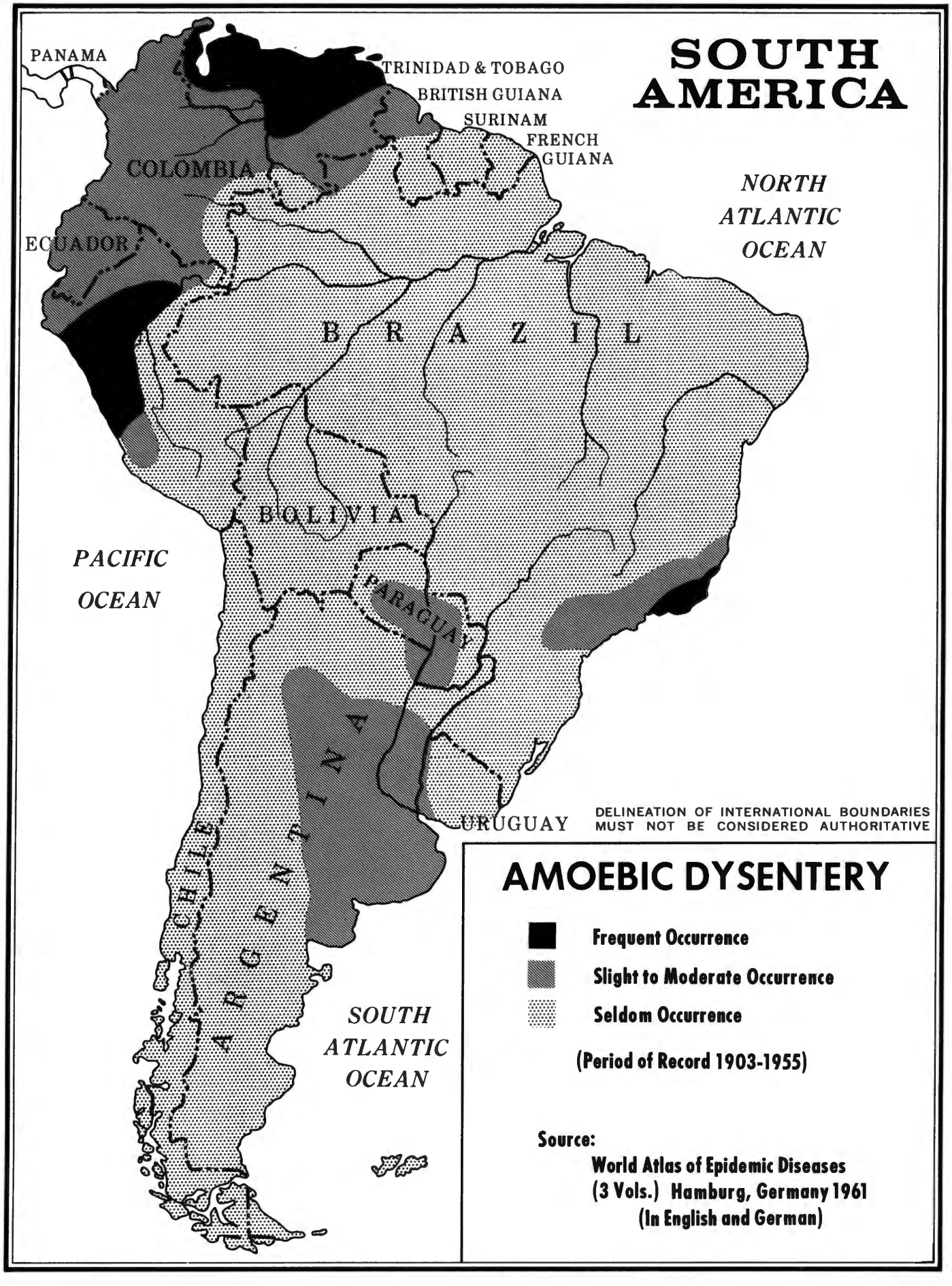


Source: World Atlas of Epidemic Diseases (3 Vols.) Hamburg, Germany 1961 (In English and German)


SOUTH AMERICA
PANAMA
VENEZUELA
TRINIDAD & TOBAGO
BRITISH GUIANA
SURINAM
FRENCH GUIANA
COLOMBIA
NORTH ATLANTIC OCEAN
ECUADOR
PERU
B R A Z I L
BOLIVIA
PACIFIC OCEAN
PARAGUAY
URUGUAY
CHILE
ARGENTINA
SOUTH ATLANTIC OCEAN
DELINEATION OF INTERNATIONAL BOUNDARIES MUST NOT BE CONSIDERED AUTHORITATIVE
TRACHOMA
High endemicity (over 30% of cases investigated)
Low endemicity
Advance of trachoma by expansion of existing foci
(Period of record 1930-1955)
Source:
World Atlas of Epidemic Diseases (3 Vols.) Hamburg, Germany 1961 (In English and German)



Source: World Atlas of Epidemic Diseases (3 Vols.) Hamburg, Germany 1961 (In English and German)


SOUTH AMERICA
PANAMA
TRINIDAD & TOBAGO
BRITISH GUIANA
SURINAM
FRENCH GUIANA
COLOMBIA
ECUADOR
NORTH ATLANTIC OCEAN
B R A Z I L
BOLIVIA
PACIFIC OCEAN
PARAGUAY
CHILE
A R G E N T I N A
URUGUAY
SOUTH ATLANTIC OCEAN
DELINEATION OF INTERNATIONAL BOUNDARIES MUST NOT BE CONSIDERED AUTHORITATIVE
AMOEBIC DYSENTERY
Frequent Occurrence
Slight to Moderate Occurrence
Seldom Occurrence
(Period of Record 1903-1955)
Source:
World Atlas of Epidemic Diseases
(3 Vols.) Hamburg, Germany 1961
(In English and German)

GROSS NATIONAL PRODUCT

	GNP (MILLION U.S.$) 1960	1964	GNP PER CAPITA 1960	1964
Argentina				
Current prices	$7,264	-		
1962 prices	$10,382	$10,835*	$521	$508
Bolivia				
Current prices	$495	$720*		
1962 prices	$558	$660*	$147	$159
Brazil				
Current prices	$6,060	$15,160		
1962 prices	$12,213	$14,033	$173	$178
British Guiana				
Current prices	-	$158**		
1962 prices	-	$158**	-	$260**
Chile				
Current prices	$2,720	$3,930		
1962 prices	$3,330	$3,800*	$439	$457
Colombia				
Current prices	$3,584	$4,700		
1962 prices	$4,134	$4,835	$280	$293
Ecuador				
Current prices	$750	$1,000*		
1962 prices	$811	$950*	$189	$198
Paraguay				
Current prices	$273	$374*		
1962 prices	$322	$356*	$185	$188
Peru				
Current prices	$2,009	$3,180		
1962 prices	$2,157	$2,780	$213	$245
Surinam				
Current prices	$97	$101**		
1962 prices	$101	$101	$328	$300**
Paraguay				
Current prices	-	$1,420*		
1962 prices	-	$1,382	-	$522**
Venezuela				
Current prices	$5,216	$6,405	$714	$724
1962 prices	$5,252	$6,146		

* Estimated
** 1962

GROSS NATIONAL PRODUCT

DISTRIBUTION GNP BY PERCENTAGE (1962)

	%	
Argentina	32	Manufacturing
	25	Trade, transportation and communications
	16	Agriculture
	27	Services and other
Bolvia	34	Agriculture
	20	Transportation and commerce
	13	Mining, including petroleum
	12	Manufacturing
	21	Services and other
Brazil	29	Agriculture
	27	Manufacturing, mining and construction
	12	Commerce
	11	Services
	21	Other
British Guiana	26	Agriculture, forestry and fishing
	20	Transportation, storage and communications
	14	Manufacturing
	13	Mining
	12	Government
	5	Services
	10	Other
Chili	23	Commerce
	18	Manufacturing
	11	Transportation, commerce and construction
	10	Agriculture, forestry and fishing
	10	Services
	9	Government
	6	Mining
	13	Other
Colombia	23	Agriculture
	20	Manufacturing and mining
	19	Transportation, commerce and communications
	8	Services
	21	Other
Ecuador	37	Agriculture, forestry and fishing
	16	Manufacturing
	12	Commerce
	9	Services
	8	Transportation and construction
	2	Mining
	16	Other

GROSS NATIONAL PRODUCT

DISTRIBUTION GNP BY PERCENTAGE (1962) con't.

	%	
Paraguay	37	Agriculture, forestry and fishing
	20	Commerce
	19	Manufacturing, mining and construction
	10	Services
	4	Transportation and communications
	10	Other
Peru	22	Agriculture and stock raising
	17	Commerce and construction
	10	Government
	9	Mining
	20	Other
Surinam	30	Mining
	16	Agriculture, forestry and fishing
	15	Transportation and commerce
	15	Manufacturing and construction
	15	Government
	9	Services
Uruguay	22	Manufacturing
	17	Agriculture, forestry and fishing
	15	Government and banking
	14	Commerce
	10	Services
	22	Other
Venezuela	30	Petroleum and mining
	14	Commerce
	13	Manufacturing
	10	Services
	7	Agriculture
	3	Government
	23	Other

Source: AID Economic Data Book, Latin America

AGRICULTURE AND LIVESTOCK PRODUCTS

(Base Year: 1952-53 - 1956/57=100)

Country	1955/56	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63
Argentina	97	109	112	105	102	110	108
Brazil	106	114	124	142	135	144	133
Colombia	101	109	112	118	118	118	119
Chile	102	112	108	110	114	115	119
Paraguay	-	-	-	-	-	-	-
Peru	103	100	107	113	116	121	125
Uruguay	97	91	86	78	91	93	99
Venezuela	105	109	113	115	127	133	145

PRODUCTION/FOOD STUFFS

Argentina	98	108	113	105	101	109	108
Brazil	103	115	122	127	132	136	138
Colombia	104	103	107	109	111	110	112
Chile	102	113	108	109	114	115	120
Paraguay	-	-	-	-	-	-	-
Peru	102	100	106	113	112	118	119
Uruguay	99	89	83	78	90	90	96
Venezuela	108	110	112	116	129	138	150

Source: Boletín de Economía y Estadísticas Agrícolas, abril 1964; FAO

LAND UNDER CULTIVATION
(in hectares)

Country	Total	In Production	Fallow
Argentina	18 297 687	12 270 840	6 026 847
Bolivia	3 045 201	608 035	2 437 166
Brazil	14 692 631	14 692 631	-
Colombia	3 531 960	1 952 988	1 578 972
Chile	2 453 521	1 788 081	665 440
Ecuador	1 244 900	896 600	348 300
Paraguay	No data		
Peru	2 840 818	-	-
Uruguay	1 585 252	1 187 117	398 135
Venezuela	1 818 537	1 025 245	793 292

Source: PAU, America En Cifras, 1963.

LAND IN PASTURE

(in hectares)

Country	Pastures			Land	
	Total	Cultivated	Natural	Mountain & forest	Other* unused
Argentina	124 353 206	13 947 040	110 406 166	21 838 975	9 447 521
Bolivia	11 322 525	-	-	10 972 646	7 363 254
Brazil	107 633 043	14 973 060	92 659 983	55 999 081	49 483 925
Colombia	14 605 953	-	-	6 387 025	1 297 759
Chile	10 331 200	2 909 887	7 421 313	8 672 367	6 075 248
Ecuador	1 775 300	520 800	1 254 500	1 136 400	1 527 800
Paraguay	-	-	-	-	-
Peru	10 502 102	-	10 502 102	2 342 335	4 627 875
Uruguay	14 456 955	609 638	13 847 317	592 638	296 744
Venezuela	16 706 026	2 747 851	13 958 175	6 129 599	907 689

* Swamp, marsh, desert, etc.

Source: PAU, América en Cifras, 1963.

PER CAPITA LEVELS OF CONSUMPTION OF AGRICULTURAL PRODUCTS FOR HUMAN USE
(kilograms per year)

Products	Argentina (1959)	Brazil (1957)	Chile (1957)	Colombia (1956/58)	Ecuador (1957/59)	Paraguay (1957-59)	Peru (1959)	Uruguay (1954-56)	Venezuela (1959)
Food Products									
Grains	120	106	129	61	74	84	87	99	82
Roots & Tubers	67	118	92	84	90	229	151	61	92
Sugar	31	31	37	51	22	15	26	33	37
Leguminous vegetables & nuts	3	27	8	9	13	15	9	2	16
Vegetables	44	21	77	13	30	36	78	37	16
Meat	91	29	31	41	15	48	18	109	25
Eggs	7	3	4	3	5	1	1	7	4
Milk (protein content)	3	2	3	2	3	2	1	6	4
Fats	20	10	10	8	7	7	9	23	13
Natural Fibers									
Cotton	5	4	2	3			2	3	3
Wool	1.0	0.3	1.0	0.3			0.4	1.2	0.3

Source: FAO, State of Food and Agriculture, 1962.

UNIT YIELDS OF SOME IMPORTANT CROPS IN SELECTED COUNTRIES

(Quintals per hectare)

Country	Beans			Tobacco			Cotton		
	1934/38	1948/52	1958/60	1934/38	1948/52	1958/60	1934/38	1948/52	1958/60
Argentina	10.5	9.5	9.9	10.9	10.4	10.3	1.9	2.4	2.3
Brazil	8.7	6.8	6.9	9.0	7.6	7.9	1.8	1.5	1.6
Chile	8.5	9.3	8.2	20.8	20.3	20.6	-	-	-
Colombia	5.0	-	-	11.0	10.4	16.9	1.7	2.2	4.1
Paraguay	-	8.3	8.0	8.5	11.1	10.0	2.1	2.6	1.6
Perú	-	9.2	9.7	-	10.2	12.9	5.0	5.0	5.1
Uruguay	4.2	-	-	9.2	-	-	-	-	-
Venezuela	-	-	7.8	4.3	8.5	15.1	1.2	2.8	2.3

Source: ECLA, Agriculture in Latin America, 1963.

UNIT YIELDS OF SOME IMPORTANT CROPS IN SELECTED COUNTRIES

(Quintals per hectare)

Country	Wheat			Maize			Rice			Potatoes		
	1934/8	1948/52	1958/60	1934/8	1948/52	1958/60	1934/8	1948/52	1958/60	1934/8	1948/52	1958/60
Argentina	9.8	11.5	12.4	18.1	14.8	18.5	28.5	30.5	32.5	58.0	64.0	87.0
Brazil	9.0	7.4	5.1	13.9	12.4	12.9	14.3	15.7	16.3	67.0	48.0	55.0
Chile	10.6	11.9	12.6	13.8	13.8	20.0	38.4	29.0	24.6	85.0	88.0	81.0
Colombia	8.0	7.2	8.7	9.0	10.7	11.6	-	20.4	20.4	46.0	-	-
Paraguay	-	7.8	7.2	10.3	12.0	12.6	20.4	19.1	22.1	-	63.0	36.0
Perú	7.0	9.3	10.1	16.1	14.3	12.7	19.9	38.5	40.4	29.0	57.0	52.0
Uruguay	7.5	9.1	6.4	6.3	6.9	5.2	35.7	32.7	33.0	41.0	38.0	37.0
Venezuela	4.9	4.7	6.4	13.8	11.4	11.7	12.0	11.7	15.8	16.0	26.0	63.0

Source: ECLA, Agriculture in Latin America, 1963.

PROJECTIONS OF PRODUCTION, YIELD AND AREA FOR FOUR AGRICULTURAL PRODUCTS IN 1980

	Maize	Rice[a]	Beans	Wheat
Average 1958-60				
Area (millions of hectares)	18.3	4.2	4.5	8.8
Yield (metric quintals per hectare)	11.4	17.5	5.9	11.6
Production (millions of tons)	21.0	7.3	2.6	10.1
Net foreign trade (millions of tons)[b]	-0.4	0.2	-	1.3
Total apparent consumption (millions of tons)[c]	20.6	7.5	2.6	11.4
Per capita apparent consumption (kilograms)	102.7	37.4	13.0	56.9
1980				
Per capita apparent consumption (kilograms)	149.1[d]	50.4[e]	17.7[e]	68.6[f]
Total apparent consumption and production (millions of tons)[g]	53.5	18.1	5.3	24.6
Yield per hectare (quintals per hectare)[h]	14.3	18.7	6.4	14.4
Area required (millions of hectares)	37.4	9.7	8.3	17.1

a/ Rice in the husk.
b/ Net imports (+); net exports (-).
c/ Production plus imports minus exports.
d/ An elasticity coefficient of 0.5 was assumed, or an annual rate of 1.5%, in view of the higher growth rate estimated for animal consumption.
e/ The 1948-52 trend was extrapolated to 1958-60, giving an annual rate of 1.4% for rice and 0.4% for beans.
f/ The per capita consumption for Argentina, Chile and Uruguay was maintained at the same level, and for the remaining countries the same annual rate as for the last 20 years was assumed, i.e. 1.66%.
g/ It was assumed that there would be no net foreign trade balances.
h/ The trend between 1948-52 and 1958-60 was extrapolated, giving the following annual rates of increase: maize and wheat 1%; rice, 0.15% and beans, 0.4%.

Source: FAO, Production and Foreign Trade Yearbooks, 1958-60.

YEARLY RATE OF INCREASE IN AGRICULTURAL PRODUCTION AND POPULATION IN SOME SOUTH AMERICAN COUNTRIES, 1945-47 TO 1958-60

Country	Population	Agricultural Production
Argentina	1.0	2.1
Bolivia	1.3	2.0
Brazil	3.9	2.9
Chile	1.8	2.2
Colombia	2.5	2.8
Ecuador	7.2	3.0
Paraguay	1.5	2.4
Peru	2.9	2.3
Uruguay	1.4	1.6
Venezuela	4.6	3.7

Source: ECLA, Agriculture in Latin America, 1963.

PROJECTIONS OF TOTAL INTERNAL DEMAND AND PRODUCTION FOR FIVE AGRICULTURAL PRODUCTS IN 1980

(Millions of tons)

Product	Total internal demand		Production		Yield			Area (Millions of hectares)		
	1958-60	1980	1958-60	1980	1958-60	1980		1958-60	1980	
						I[a]	II[b]		Ia	II
Wheat	11.4	24.6	10.1	24.6[c]	11.6	14.4	18.2	8.8	17.1	13.5
Maize	20.6	53.5	21.0	53.5[c]	11.4	14.3	19.8	18.3	37.4	27.0
Rice[d]	7.5	18.1	7.3	18.1[c]	17.5	18.7	45.3	4.2	9.7	4.0
Beans	2.6	5.3	2.6	5.3[c]	5.9	6.4	6.4	4.5	8.3	8.3
								35.8	72.5	52.8

a/ By extrapolation of the trend for the period 1948/52 - 1958/60.

b/ Average yield for Europe in 1957-59, except for beans, for which the level was lower than in Latin America.

c/ It is assumed than there will be no net foreign trade balance.

d/ Rice in the husk.

Source: ECLA, Agriculture in Latin America, 1963.

ANNUAL RATE OF EXPANSION OF THE VOLUME OF NET IMPORTS OF TROPICAL AND SEMI-TROPICAL AGRICULTURAL COMMODITIES BETWEEN 1957/59 AND 1970, ON THE ASSUMPTION OF CONSTANT PRICES
(Percentages)

Commodity	North America	Western Europe	Japan	USSR & People's Republic of China
Sugar	0.5	-	2.3	a/
Coffee	1.4	1.6	8.8	8.8
Cacao	1.6	1.6	5.2	6.5
Fibers a/	0.2	0.9	1.6	1.0

Source: Agricultural Commodities: Projections for 1970, FAO. Data based only on the indices corresponding to the most optimistic hypothesis of income growth.

a/ It is estimated that from net exporters these countries will become net importers, by a volume of about 3 million tons.

b/ Cotton, wool and jute.

NET IMPORTS OF BEEF, 1957/59 AND 1970
(Thousands of tons, carcass weight)

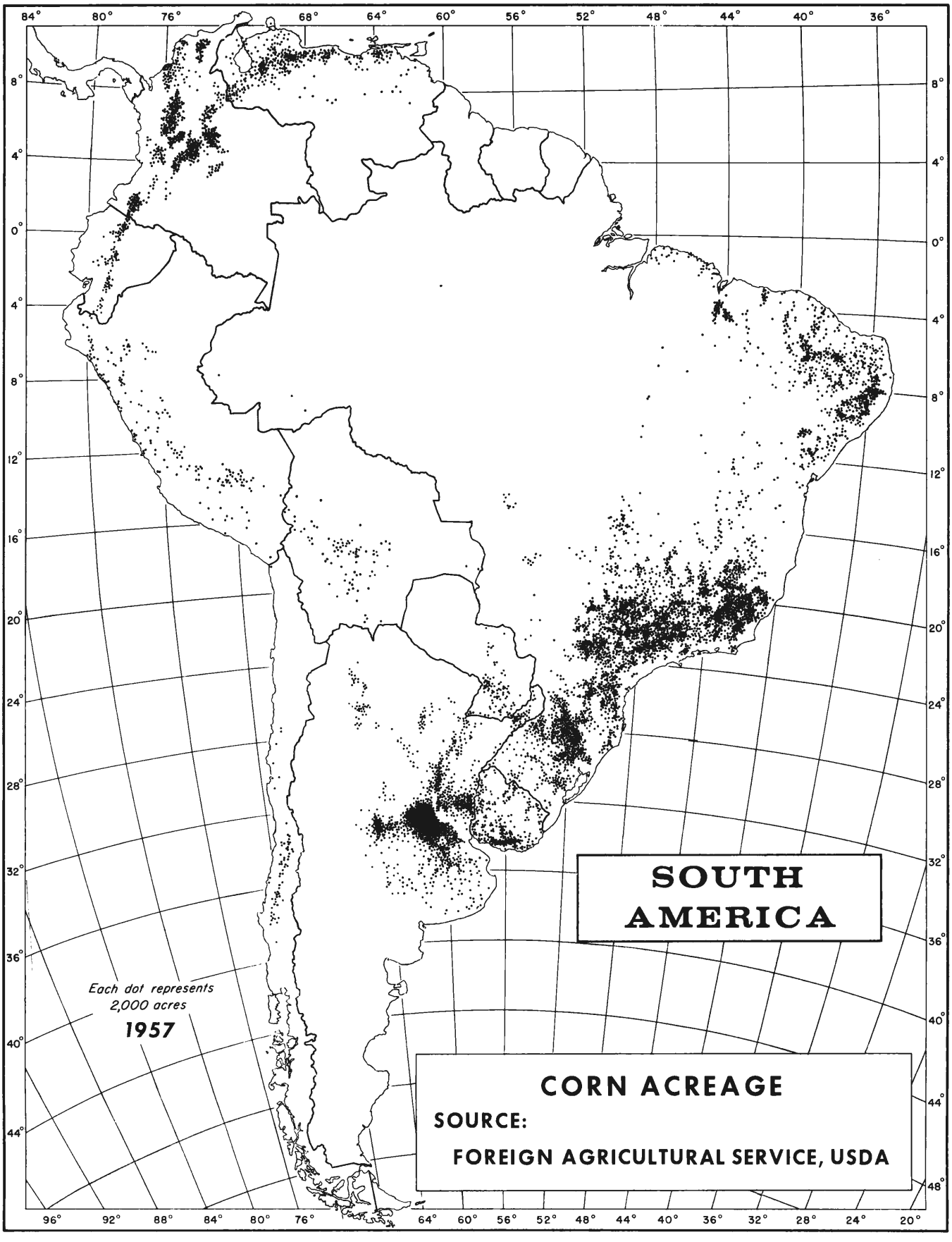
Country or Region	1957/59	1970	Index	Annual Percentage
North America	316	385	122	0.9
United Kingdom	629	736	117	0.7
European Economic Community	258	340	132	1.3
Japan	10	30	300	5.2
Total for Countries Listed	1 213	1 491	123	1.0

Source: FAO, op. cit.

CONSUMPTION OF FERTILIZERS IN SELECTED COUNTRIES IN SOUTH AMERICA AND OTHER REGIONS

Country	Nitrates (thousands of tons of N)		Phosphates (thousands of tons of P_2O_5)		Potassium fertilizers (thousands of tons of K_2O)		Arable area (millions of hectares)
	1948-52	1958-59	1948-52	1958-59	1948-52	1958-59	
Brazil	11.0	44.3	31.0	81.3	11.6	65.7	19.1
Chile	9.5	47.7	20.9	29.6	3.5	6.5	5.5
Ecuador	0.2	3.7	0.3	2.3	0.1	1.8	1.1
Peru	34.3	55.3	23.6	7.3	4.9	3.2	1.7
Venezuela	1.3	5.5	0.5	6.8	0.8	4.0	2.9
France	251.7	480.8	454.2	764.4	362.1	705.4	21.5
Western Germany	191.1	226.2	405.5	607.9	660.3	1 003.8	8.6
Egypt	98.2	177.1	16.7	27.7	0.6	2.3	2.6
Japan	368.0	681.7	224.5	389.4	145.3	437.4	6.1

Source: FAO, Production Yearbook, 1960


SOUTH AMERICA
Each dot represents 2,000 acres
1957
CORN ACREAGE
SOURCE:
FOREIGN AGRICULTURAL SERVICE, USDA

CORN
(1955-1964)

Country	1955/56	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64
			AREA				
			(1 000 hectares)				
Argentina[1/]	2 240	2 361	2 415	2 744	2 757	2 645	-
Bolivia	-	89	-	-	-	-	-
Brazil[2/]	5 998	6 189	6 681	6 886	7 343	-	-
Colombia	812	705	650	715	710	696	732
Chile[2/]	73	77	75	74	74	73	75
Ecuador	-	191	203	209	228	212	-
Paraguay[2/]	92	98	110	92	95	96	-
Perú[2/]	234	262	253	246	266	253	272
Uruguay[2/]	308	310	259	277	265	238	-
Venezuela[1/]	257	297	280	398	389	483	-
			PRODUCTION				
			(1 000 tons)				
Argentina	3 870	4 932	4 108	4 850	5 220	4 360	5 715
Bolivia	-	100	200	205	-	-	-
Brazil	6 999	7 787	8 672	9 036	9 580	-	-
Colombia	940	851	701	864	737	754	782
Chile	138	159	146	145	159	151	157
Ecuador	-	155	157	160	153	138	-
Paraguay	120	125	143	110	124	120	-
Perú	265	333	339	380	348	351	365
Uruguay	209	133	78	220	155	204	-
Venezuela	317	358	336	439	420	540	394
			YIELD				
			(100 kilograms/hectare)				
Argentina	17.3	20.9	17.0	17.7	18.9	16.5	-
Bolivia	-	11.2	-	-	-	-	-
Brazil	11.7	12.6	13.0	13.1	13.1	-	-
Colombia	11.6	12.1	10.8	12.1	10.4	11.0	10.7
Chile	18.9	20.7	19.5	19.6	21.4	20.8	21.2
Ecuador	-	8.1	7.7	7.7	6.7	6.5	-
Paraguay	13.0	13.0	13.0	12.0	13.0	12.5	-
Perú	11.3	12.7	13.4	15.4	13.1	13.9	13.4
Uruguay	6.8	4.3	3.0	8.0	5.8	8.6	-
Venezuela	12.3	12.0	12.0	11.0	10.8	11.2	-

1/ Areas seeded.
2/ Areas cultivated.

Source: PAU, America en Cifras, 1963.


SOUTH AMERICA
Each dot represents 2,000 acres
1957
WHEAT ACREAGE
SOURCE:
FOREIGN AGRICULTURAL SERVICE, USDA

WHEAT
(1955-1964)

AREA
(1 000 hectares)

Country	1955/56	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64
Argentina[1]	4 062	5 243	4 378	3 599	4 198	3 438	5 044
Bolivia	-	20	-	-	-	-	-
Brazil[2]	1 196	1 446	1 186	1 141	1 022	743	-
Colombia	195	178	160	166	160	165	140
Chile[2]	783	891	889	838	849	843	854
Ecuador	65	59	55	79	79	85	-
Paraguay[2]	4	20	15	12	8	10	-
Peru[2]	159	135	158	154	153	158	149
Uruguay[2]	819	691	293	523	436	400	353
Venezuela[1]	3	4	2	2	2	2	-

PRODUCTION
(1 000 tons)

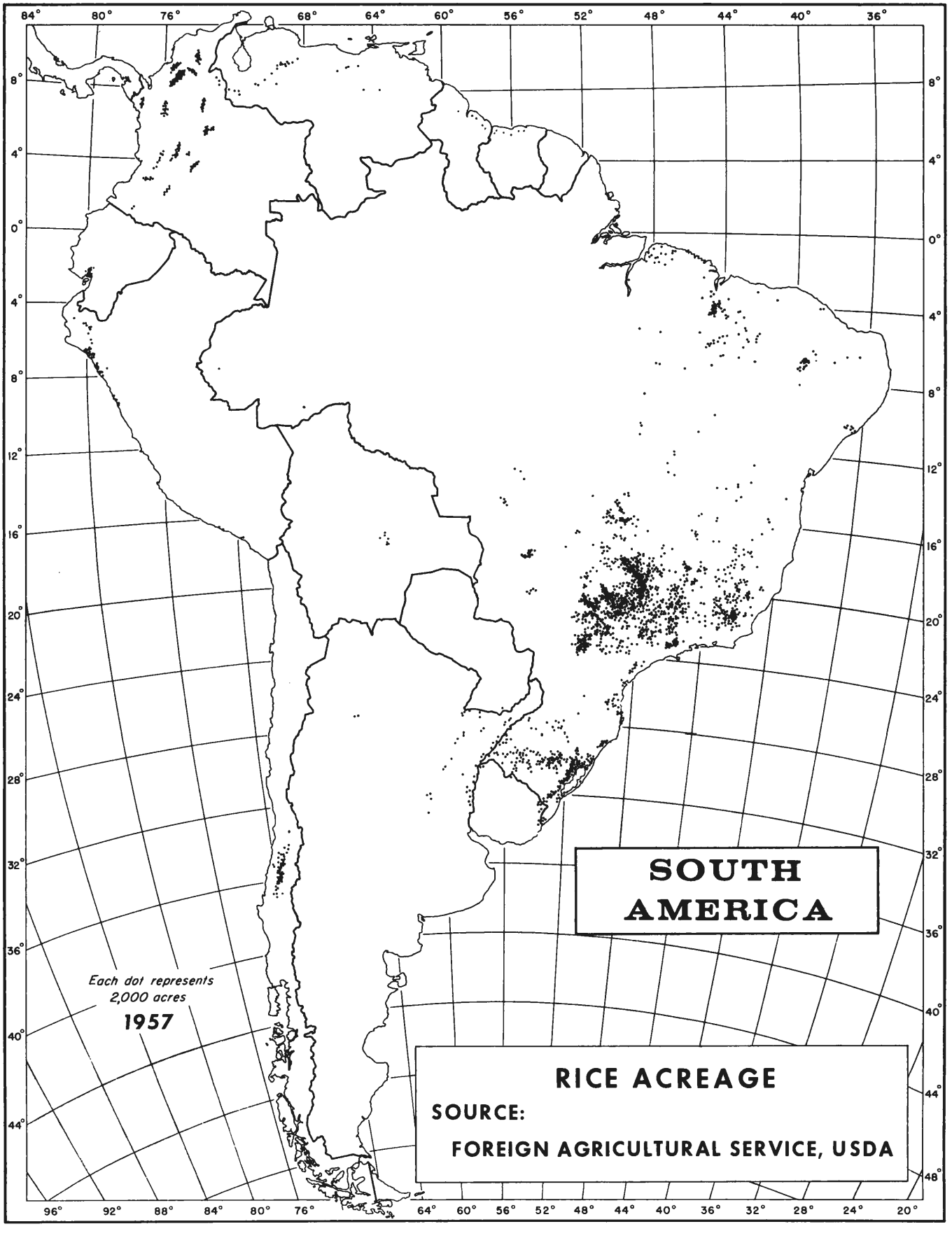
Argentina	5 250	6 720	5 837	3 960	5 100	5 020	7 100
Bolivia	-	11	44	43	44	45	-
Brazil	1 101	589	611	713	545	680	-
Colombia	166	155	140	145	142	162	125
Chile	1 085	1 169	1 116	1 123	1 072	1 274	-
Ecuador	42	39	47	58	78	78	-
Paraguay	3	14	11	9	7	7	-
Peru	152	127	161	153	154	157	150
Uruguay	876	360	183	413	372	452	-
Venezuela	2	3	1	1	1	2	-

YIELD
(100 kilograms/hectare)

Argentina	12.9	12.8	13.3	11.0	12.1	14.6	14.1
Bolivia	-	5.4	-	-	-	-	-
Brazil	9.2	4.1	5.2	6.3	5.3	9.2	-
Colombia	8.5	8.7	8.8	8.7	8.9	9.8	8.9
Chile	13.8	13.1	12.5	13.4	12.6	15.1	-
Ecuador	6.4	6.6	8.5	9.9	9.9	9.0	-
Paraguay	7.1	7.0	7.0	7.5	9.0	7.0	-
Peru	9.5	9.4	10.2	10.0	10.1	9.9	10.1
Uruguay	10.7	5.2	6.2	7.9	8.5	11.3	-
Venezuela	5.6	6.8	7.3	5.1	5.4	7.7	-

1/ Area seeded.
2/ Area cultivated.

Source: PAU, America en Cifras, 1963.


SOUTH AMERICA
Each dot represents 2,000 acres
1957
RICE ACREAGE
SOURCE:
FOREIGN AGRICULTURAL SERVICE, USDA

PADDY RICE
(1955-1964)

AREA
(1 000 hectares)

Country	1955/56	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64
Argentina[1/]	54	52	56	46	53	52	53
Bolivia	19	13	16	-	-	-	-
Brazil[2/]	2 555	2 683	2 966	3 174	3 350	3 368	3 298
Colombia	188	195	206	227	237	257	278
Chile[2/]	30	40	40	40	29	33	33
Ecuador	59	84	88	95	112	113	110
Paraguay[2/]	9	7	7	7	7	7	7
Peru[2/]	67	70	87	79	91	55	81
Uruguay[2/]	19	18	14	16	18	19	19
Venezuela[1/]	62	12	28	42	58	69	75

PRODUCTION
(1 000 tons)

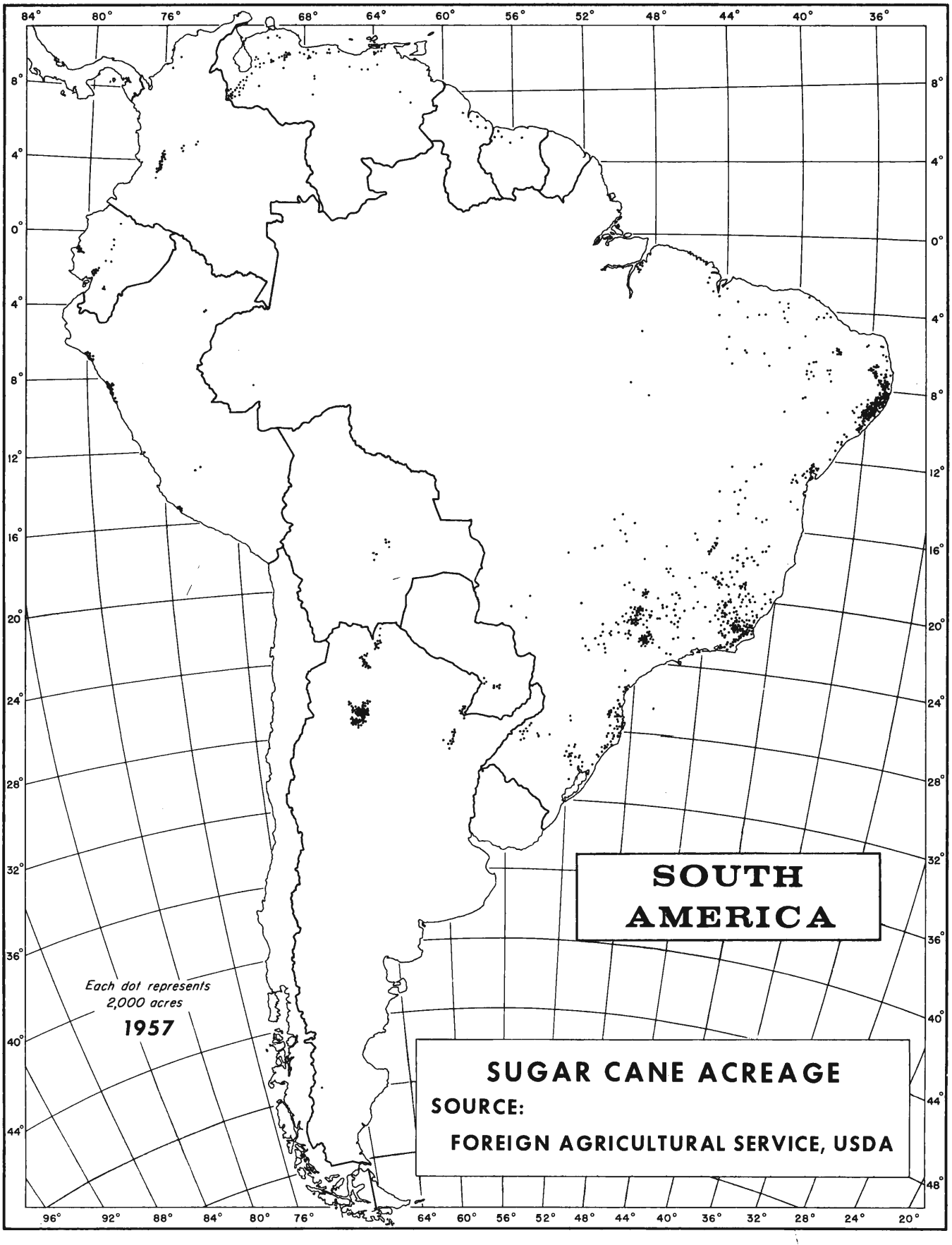
Argentina	164	162	190	149	182	178	190
Bolivia	32	21	23	23	23	-	-
Brazil	3 489	4 101	4 795	5 392	5 557	5 980	5 400
Colombia	324	410	422	450	407	555	560
Chile	58	94	111	109	83	84	72
Ecuador	131	175	186	163	187	191	200
Paraguay	19	16	15	16	17	16	17
Peru	243	249	358	328	394	185	325
Uruguay	64	49	53	54	61	72	58
Venezuela	60	19	39	72	81	103	112

YIELD
(100 kilograms/hectare)

Argentina	30.9	31.3	34.0	32.4	34.3	34.1	36.1
Bolivia	16.4	16.6	14.6	-	-	-	-
Brazil	13.7	15.3	16.2	17.0	16.6	17.8	16.4
Colombia	17.2	21.0	20.5	19.8	17.2	21.6	20.1
Chile	19.6	23.6	27.7	27.2	28.4	24.4	21.9
Ecuador	22.3	20.8	21.3	17.2	16.7	16.9	18.2
Paraguay	21.1	23.0	22.0	22.0	24.0	23.0	23.3
Peru	36.3	35.5	41.3	41.8	43.3	33.6	40.2
Uruguay	33.5	27.7	36.8	34.5	34.1	38.0	29.9
Venezuela	9.7	16.6	13.6	17.2	13.8	15.0	15.0

1/ Area seeded.
2/ Area cultivated.

Source: PAU, America en Cifras, 1963

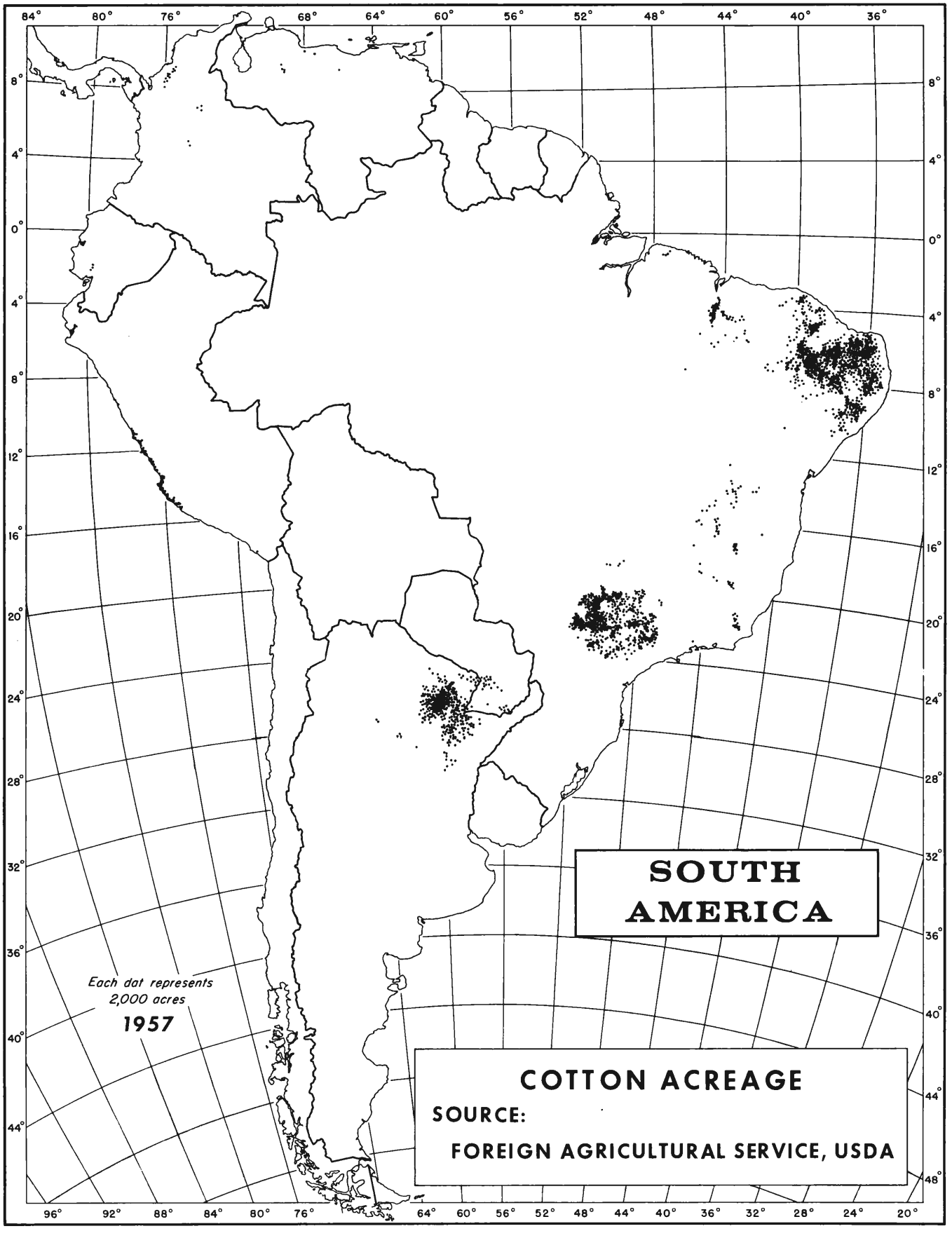

SOUTH AMERICA
Each dot represents 2,000 acres
1957
SUGAR CANE ACREAGE
SOURCE:
FOREIGN AGRICULTURAL SERVICE, USDA

SUGARCANE
(1955-1963)

Country	1955/56	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63
			AREA (1 000 hectares)				
Argentina[1/]	303	281	275	242	223	207	223
Bolivia[1/]	-	13	16	-	-	-	-
Brazil[2/]	1 073	1 172	1 208	1 291	1 340	1 367	1 467
Colombia[2/]	-	310	339	329	-	-	-
Ecuador[2/]	45	59	59	61	-	63	65
Paraguay[2/]	14	19	21	21	22	22	23
Peru[3/]	81	82	87	92	72	-	-
Uruguay[2/]	4	-	4	4	-	-	-
Venezuela	52	-	-	-	52	-	-
			PRODUCTION (1 000 tons)				
Argentina	9 324	12 860	11 522	10 089	9 650	9 778	11 800
Bolivia[4/]	-	470	550	-	-	-	-
Brazil[4/]	40 946	47 703	50 020	53 512	56 927	59 377	62 535
Colombia[4/]	-	14 480	15 889	15 419	-	-	-
Ecuador[4/]	-	-	3 976	4 748	-	5 614	5 917
Paraguay[4/]	380	550	584	609	647	672	700
Peru[3/]	6 826	7 840	7 544	8 734	8 663	-	-
Uruguay	81	-	161	133	-	-	-
Venezuela	3 056	1 719	1 924	2 134	3 242	3 436	3 550
			YIELD (100 kilograms/hectare)				
Argentina	308	458	419	416	433	471	530
Bolivia	-	361	344	-	-	-	-
Brazil	382	407	414	414	425	434	426
Colombia	-	467	469	469	-	-	-
Ecuador	-	-	674	778	-	891	917
Paraguay	272	289	285	290	290	300	300
Peru	848	959	870	951	1 202	-	-
Uruguay	-	-	-	-	-	-	-
Venezuela	584	-	-	-	625	-	-

1/ Areas seeded.
2/ Areas cultivated.
3/ Total of sugarcane ground for the production of sugar, alcohol, beverage and molasses.
4/ Production refers to the total of cut sugarcane.

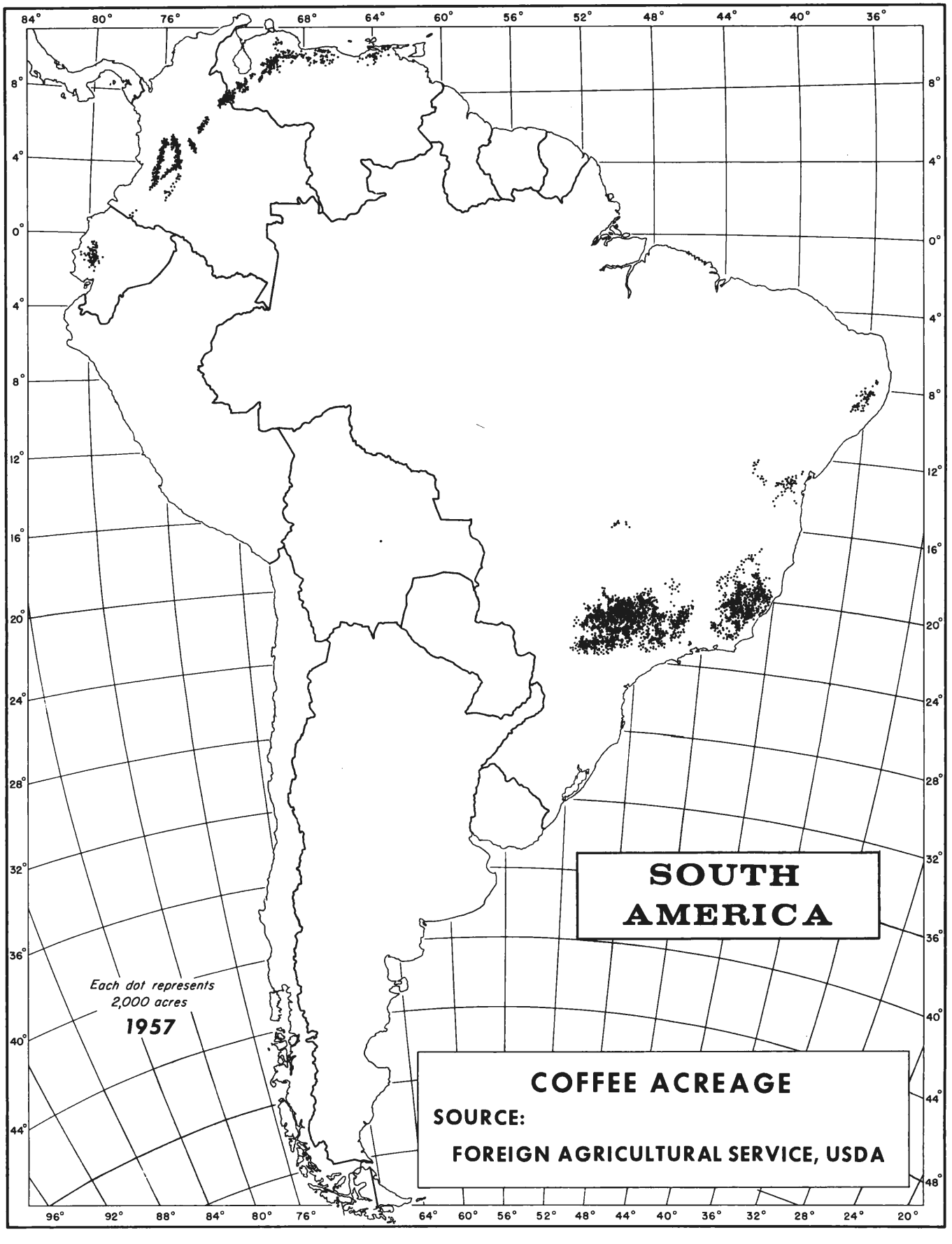
Source: PAU, America En Cifras, 1963.


SOUTH AMERICA
Each dot represents 2,000 acres
1957
COTTON ACREAGE
SOURCE:
FOREIGN AGRICULTURAL SERVICE, USDA

COTTON
(1955-1964)

Nation	1955/56	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64
Plant	AREA (1 000 hectares)						
Argentina	533	496	461	499	537	519	546
Brazil	2 617	2 707	2 746	2 930	3 224	3 458	-
Colombia	69	95	151	149	166	182	162
Ecuador	18	22	18	20	24	21	18
Paraguay	48	66	40	35	50	63	-
Perú	217	238	236	252	255	275	275
Uruguay	-	1	1	1	1	-	-
Venezuela	17	33	47	46	50	38	40
Fiber	PRODUCTION (1 000 tons)						
Argentina	123	100	89	124	108	133	131
Brazil	428	381	466	536	609	640	-
Colombia	23	33	67	68	78	82	73
Ecuador	3	3	3	2	2	2	3
Paraguay	12	9	5	8	11	13	-
Perú	105	115	116	130	131	146	138
Uruguay	-	0	0	0	0	-	-
Venezuela	4	8	8	8	8	8	8
Fiber	YIELD (100 kilograms/hectare)						
Argentina	2.3	2.0	1.9	2.5	2.0	2.6	2.4
Brazil	1.6	1.4	1.7	1.8	1.9	-	-
Colombia	3.3	3.4	4.5	4.4	4.7	4.5	4.5
Ecuador	1.5	1.4	1.5	1.2	0.9	1.5	1.7
Paraguay	2.5	1.3	1.2	2.3	2.2	2.1	-
Perú	4.8	4.8	4.9	5.2	5.1	5.3	5.0
Uruguay	-	3.0	3.3	2.4	2.7	-	-
Venezuela	2.6	2.3	1.8	1.8	1.7	2.1	2.0
Cotton Seed	PRODUCTION (1 000 tons)						
Argentina	222	181	165	229	200	257	240
Brazil	813	751	886	1 019	1 158	1 216	1 045
Colombia	41	65	134	134	156	164	152
Ecuador	66	7	6	6	7	6	-
Paraguay	21	18	9	16	22	27	-
Perú	167	190	189	203	216	243	-
Uruguay	-	1	1	0	0	-	-
Venezuela	9	14	17	17	14	19	-
Cotton Seed	YIELD (100 kilograms/hectare)						
Argentina	4.2	3.7	3.6	4.6	3.7	5.0	4.5
Brazil	3.1	2.8	3.2	3.5	3.6	3.5	-
Colombia	5.9	6.8	8.9	8.9	9.4	9.0	9.4
Ecuador	3.1	3.0	3.2	2.8	2.8	2.9	-
Paraguay	4.4	2.7	2.3	4.7	4.4	4.3	-
Perú	7.7	8.0	8.2	8.1	8.5	8.8	-
Uruguay	-	6.0	6.6	4.5	5.5	-	-
Venezuela	5.2	4.1	3.5	3.6	2.7	5.0	-

Source: PAU, América en Cifras, 1963.


SOUTH AMERICA
Each dot represents 2,000 acres
1957
COFFEE ACREAGE
SOURCE:
FOREIGN AGRICULTURAL SERVICE, USDA

COFFEE
(1955-1964)

AREA
(1 000 hectares)

Country	1955/56	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64
Bolivia	-	-	-	-	-	-	-
Brazil	3 266	4 078	4 297	4 420	4 384	4 463	-
Colombia	1 022	-	-	-	-	-	-
Ecuador	-	-	-	-	-	152	-
Paraguay	-	-	-	-	-	-	-
Peru	22	36	39	76	80	-	-
Venezuela	340	-	-	340	340	340	-

PRODUCTION
(1 000 tons)

Bolivia	-	-	3	2	3	-	-
Brazil	1 370	1 696	2 629	1 797	2 085	1 620	1 560
Colombia	335	462	480	462	468	450	468
Ecuador	22	31	17	26	33	53	48
Paraguay	0	1	2	1	1	-	-
Peru	12	21	22	32	38	46	47
Venezuela	53	60	55	53	54	49	-

Source: PAU, America en Cifras, 1963.

CACAO
(1955-1964)

AREA
(1 000 hectares)

Country	1955/56	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64
Bolivia	-	-	-	-	-	-	-
Brazil	368	461	466	471	474	465	0
Colombia	67	-	-	-	-	-	-
Ecuador	165	205	205	165	-	164	-
Peru	14	15	16	16	16	-	-
Venezuela	109	-	-	70	70	70	-

PRODUCTION
(1 000 tons)

Bolivia	2	2	2	2	2	2	2
Brazil	158	164	178	163	156	140	-
Colombia	14	13	13	14	17	14	16
Ecuador	27	34	33	44	42	44	43
Peru	4	5	5	6	7	-	-
Venezuela	17	16	13	15	13	15	15

Source: PAU, America en Cifras, 1963

BANANAS
(1955-1963)

AREA
(1 000 hectares)

Country	1955/56	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63
Argentina	-	-	-	-	-	-	-
Brazil 1/	156	164	166	175	185	194	209
Colombia	-	-	-	-	40	40	-
Ecuador	-	-	-	102	114	111	111
Paraguay	-	-	-	-	-	-	-
Venezuela 2/	-	-	-	-	54	47	40

PRODUCTION
(1 000 tons)

Argentina	11	3	3	9	12	47	36
Brazil	4 086	4 665	4 595	4 885	5 127	5 429	6 013
Colombia	-	-	-	-	508	508	-
Ecuador	1 873	1 669	1 755	1 898	2 075	2 050	2 115
Paraguay	155	157	161	161	141	145	141
Venezuela	435	417	359	371	453	341	297

1/ Area seeded.
2/ Area cultivated.

Source: PAU, America en Cifras, 1963.

PEANUTS
(1955-1964)

AREA
(1 000 hectares)

Country	1955/56	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64
Argentina[1/]	196	260	190	189	280	266	-
Bolivia	-	2	-	-	-	-	-
Brazil[2/]	163	255	291	436	476	412	-
Ecuador	-	9	9	7	7	-	-
Paraguay[2/]	11	11	10	11	11	10	-
Peru[2/]	1	1	1	2	2	-	-
Uruguay[2/]	8	8	8	9	10	10	-
Venezuela	1	1	1	1	1	2	-

PRODUCTION
(1 000 tons)

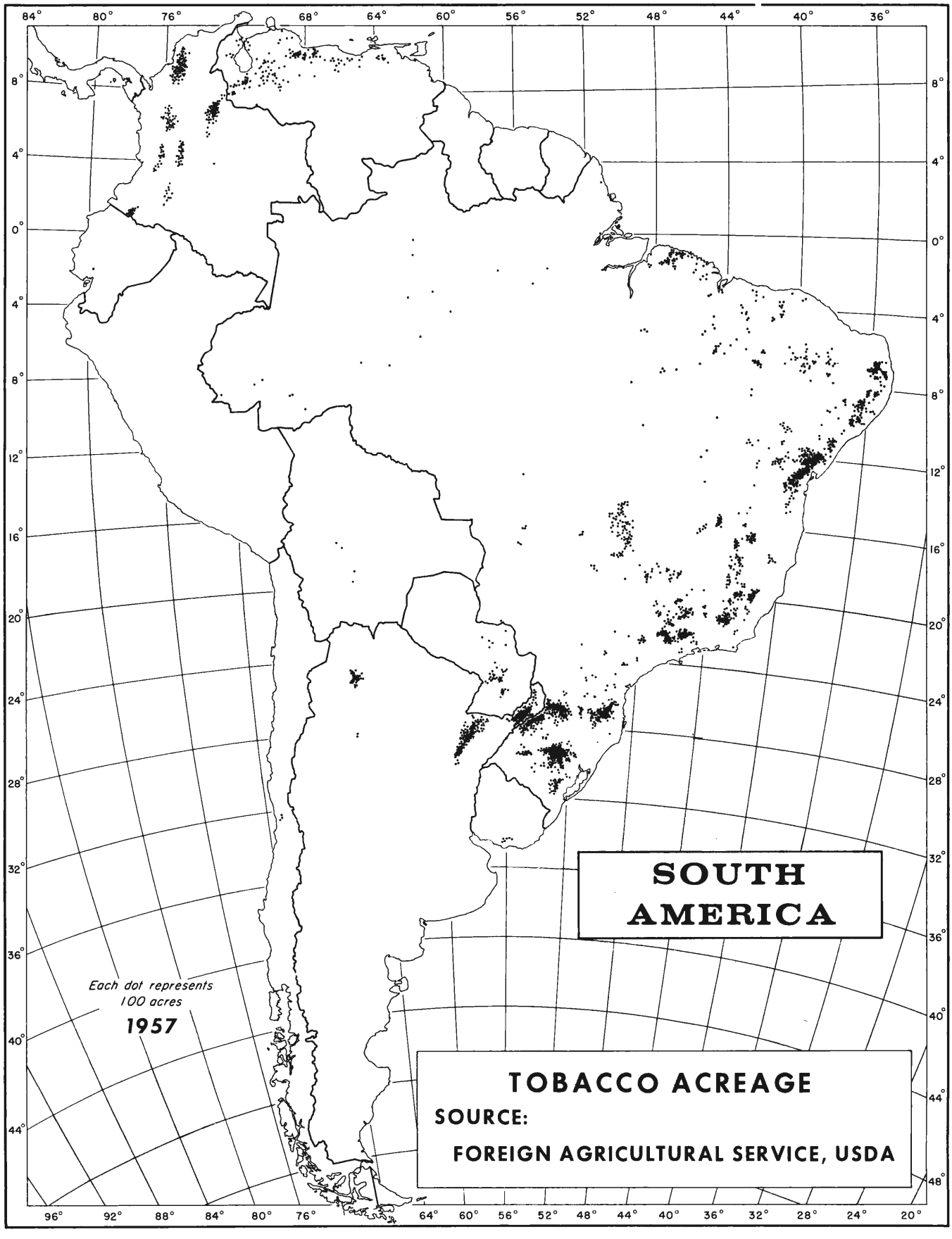
Argentina	216	241	209	266	433	312	-
Bolivia	-	2	-	-	-	-	-
Brazil	181	357	408	584	648	510	-
Ecuador	-	9	9	11	8	-	-
Paraguay	10	9	8	9	9	9	-
Peru	1	1	1	2	3	-	-
Uruguay	6	3	5	7	8	7	-
Venezuela	2	1	1	1	1	2	-

YIELD
(100 kilograms/hectare)

Argentina	11.1	9.3	11.0	14.1	15.5	11.7	-
Bolivia	-	10.0	-	-	-	-	-
Brazil	11.1	14.0	14.0	13.4	13.6	12.4	-
Ecuador	-	9.6	10.4	15.4	11.5	-	-
Paraguay	9.0	8.5	8.8	8.5	8.5	8.5	-
Peru	9.1	9.6	8.2	15.5	18.4	-	-
Uruguay	8.0	3.7	6.3	7.6	7.7	7.1	-
Venezuela	15.6	9.1	10.4	9.9	10.7	9.4	-

1/ Area seeded.
2/ Area cultivated.

Source: PAU, America en Cifras, 1963.


SOUTH AMERICA
Each dot represents 100 acres
1957
TOBACCO ACREAGE
SOURCE:
FOREIGN AGRICULTURAL SERVICE, USDA

TOBACCO

(1955-1964)

AREA

(1 000 hectares)

Country	1955/56	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64
Argentina[1/]	35	30	36	46	38	42	53
Bolivia[1/]	1	1	1	1	1	1	1
Brazil[2/]	196	181	191	213	228	232	218
Colombia	22	23	23	15	14	19	22
Chile	3	4	3	3	3	3	3
Ecuador	1	1	1	1	1	1	-
Paraguay[2/]	6	7	10	9	12	20	18
Peru[2/]	3	2	2	2	2	3	3
Venezuela[1/]	7	6	5	7	8	6	6

PRODUCTION

(1 000 tons)

Argentina	41	28	41	48	46	40	49
Bolivia	1	1	1	1	1	1	1
Brazil	148	144	151	161	168	187	163
Colombia	39	38	39	25	28	38	43
Chile	-	7	7	8	7	7	6
Ecuador	1	1	-	1	1	1	-
Paraguay	6	7	10	9	15	25	23
Peru	4	2	2	2	2	3	3
Venezuela	7	5	6	9	10	8	8

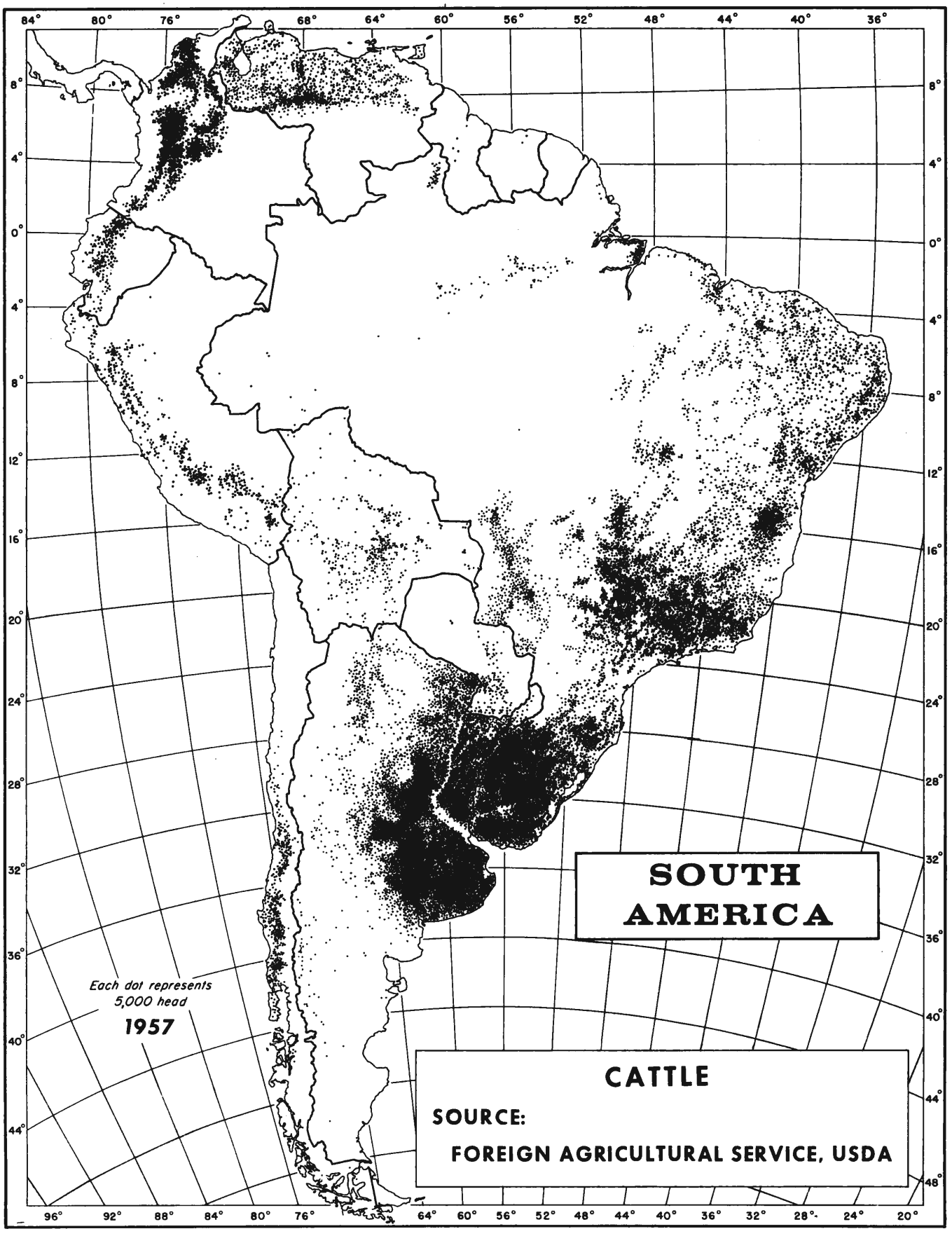
YIELD

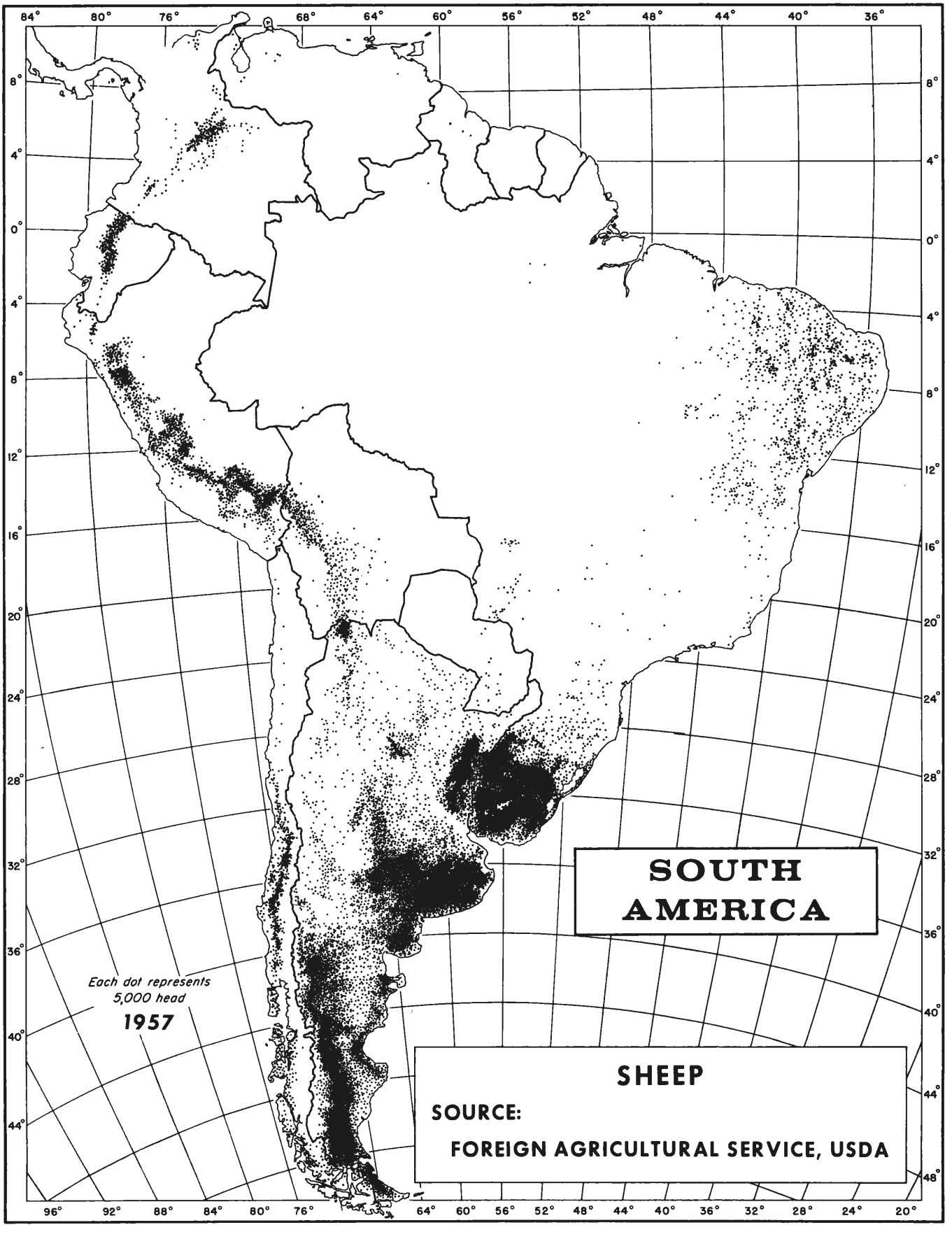
(100 kilograms/hectare)

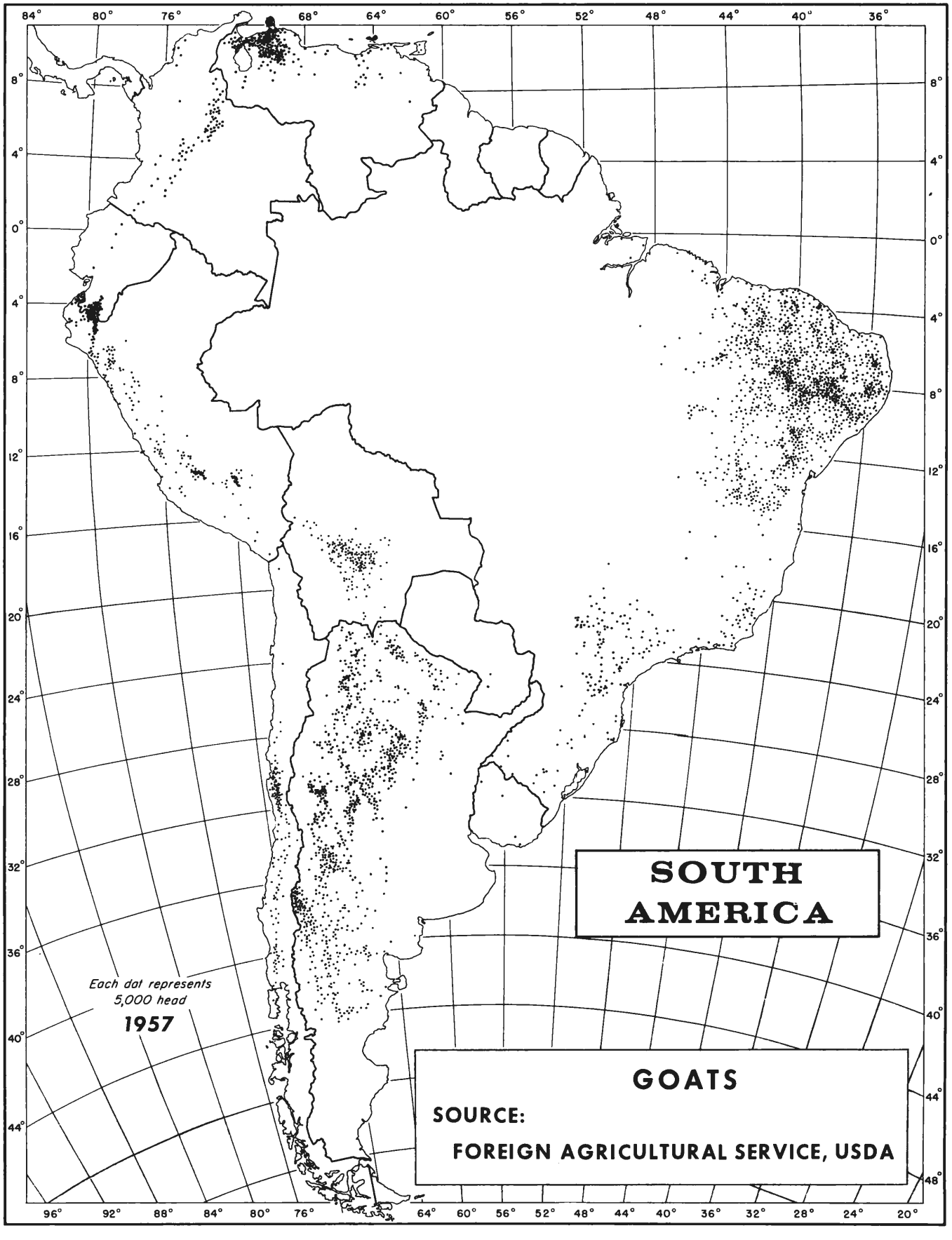
Argentina	11.6	9.2	11.6	10.5	12.0	9.3	9.3
Bolivia	-	7.9	6.6	7.9	7.9	7.8	7.8
Brazil	7.6	7.9	7.9	7.6	7.4	8.1	7.5
Colombia	-	16.5	17.1	16.6	20.0	19.8	19.6
Chile	-	19.6	21.6	22.9	22.2	23.1	23.0
Ecuador	15.0	14.3	-	11.0	9.6	9.6	-
Paraguay	10.0	10.0	10.0	10.0	12.0	12.5	12.7
Peru	12.6	10.0	10.0	10.0	12.0	12.5	10.6
Venezuela	10.6	9.0	13.0	13.1	13.8	14.2	13.8

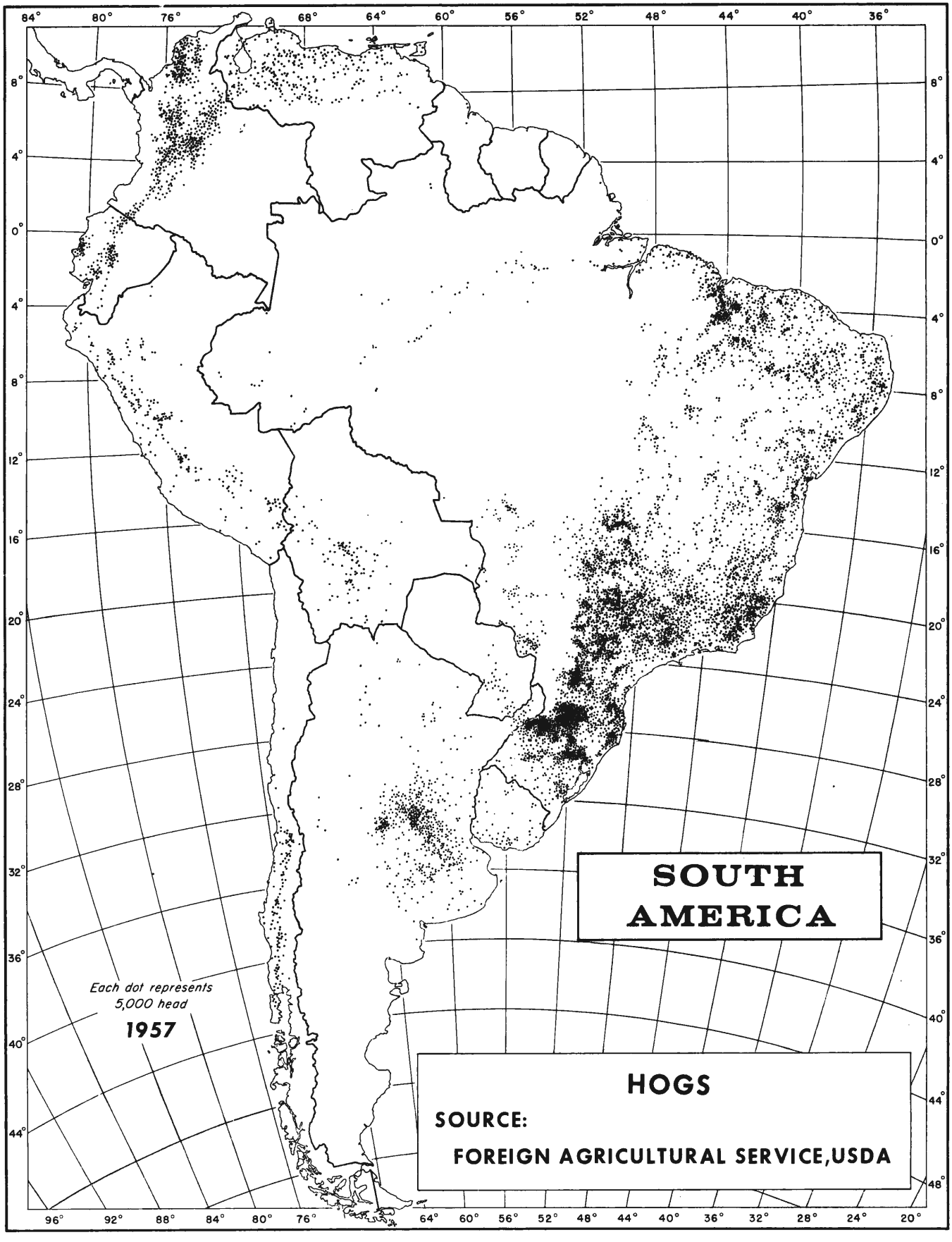
1/ Area seeded.
2/ Area cultivated.

Source: PAU, América en Cifras, 1963.


SOUTH AMERICA
Each dot represents 5,000 head
1957
CATTLE
SOURCE:
FOREIGN AGRICULTURAL SERVICE, USDA


SOUTH AMERICA
Each dot represents 5,000 head
1957
SHEEP
SOURCE:
FOREIGN AGRICULTURAL SERVICE, USDA


SOUTH AMERICA
Each dot represents 5,000 head
1957
GOATS
SOURCE:
FOREIGN AGRICULTURAL SERVICE, USDA


SOUTH AMERICA
Each dot represents 5,000 head
1957
HOGS
SOURCE:
FOREIGN AGRICULTURAL SERVICE, USDA

LIVESTOCK
(1956-1963)

NUMBER OF HEAD
(1 000)

Country, Month & Type	1956	1957	1958	1959	1960	1961	1962	1963
Argentina (Jun)								
Cattle	46 940	43 980	40 736	41 206	44 550	43 200	43 300	41 000
Hogs	4 011	3 489	3 142	3 501	3 800	3 400	3 075	3 100
Sheep	45 166	45 931	47 010	48 847	50 200	49 000	48 000	47 000
Bolivia (Jan)								
Cattle	-	-	-	-	2 449	-	2 100	2 000
Hogs	-	-	-	-	-	-	-	-
Sheep	-	-	-	-	-	-	5 650	5 700
Brazil (Dec)								
Cattle	66 695	69 548	71 420	72 829	73 962	76 176	79 078	-
Hogs	41 416	44 190	45 262	46 823	47 944	50 051	52 941	-
Sheep	18 867	20 164	19 921	18 995	18 162	19 168	19 718	-
Colombia (Dec)								
Cattle	13 390	14 400	14 840	15 100	15 400	15 600	15 600	15 800
Hogs	1 455	1 770	1 800	1 870	1 950	2 150	2 300	2 400
Sheep	1 126	1 081	1 081	1 190	1 305	1 400	1 450	1 500
Chile (Jan)								
Cattle	2 885	2 900	2 912	2 809	2 913	2 990	2 935	2 900
Hogs	946	1 013	974	931	964	958	975	980
Sheep	5 922	5 947	6 067	6 136	6 298	6 343	7 520	7 530
Ecuador (Aug)								
Cattle	1 274	1 363	1 385	1 410	1 490	1 550	1 720	1 909
Hogs	994	1 081	1 150	1 201	1 270	1 340	1 434	1 530
Sheep	1 242	1 501	1 551	1 603	1 657	1 703	1 749	2 200
Paraguay								
Cattle	4 095	3 929	3 703	3 666	4 004	4 695	4 500	-
Hogs	439	456	461	476	523	575	633	-
Sheep	213	172	165	160	160	-	-	-
Perú (Dec)								
Cattle	3 380	3 224	3 372	3 590	3 820	3 824	3 927	-
Hogs	1 281	1 364	1 432	1 464	1 625	1 540	1 620	-
Sheep	15 204	14 130	14 760	15 136	16 009	16 300	15 937	-
Uruguay (May)								
Cattle	7 433	7 200	7 430	7 502	7 505	8 792	8 835	-
Hogs	381	387	395	400	405	383	406	-
Sheep	25 303	24 500	22 560	21 351	21 700	21 738	22 300	-
Venezuela (Jul-Dec)								
Cattle	6 380	7 162	-	-	-	6 441	6 459	6 614
Hogs	-	2 362	-	-	-	1 781	-	-
Sheep	-	176	-	-	-	99	-	-

Source: PAU, America en Cifras, 1963.

FORESTS

Country	Area (1 000 ha)	Forest Area (1 000 ha)	Forest Area As % of Land Areas	Accessible Forests (1 000 hectares)	Forests In Use (1 000 hectares)	Coniferous Forests (1 000 hectares)	Coniferous Forests In Use (1 000 hectares)	Forest Area Per Capita (hectares)	Area of Accessible Forest Per Capita (hectares)	Population (1958) (1 000)
Argentina	274 821	70 000	25	60 000	10 250	250	250	3.5	3.0	20 250
Bolivia	109 858	47 000	43	6 000	-			17.9	2.3	3 311
Brazil	846 988	561 656	66	140 000	40 000	9 000	6 000	8.9	2.2	62 725
Chile	73 377	20 443	28	10 077	4 641	400	300	2.9	1.4	7 298
Colombia	112 036	69 000	62	62 000	411			5.7	5.1	13 522
Ecuador	27 179	14 845	55	4 500	300			3.7	1.1	4 007
Paraguay	40 675	20 906	51	6 272	5 017			14.3	4.3	1 677
Peru	124 457	70 000	56	15 000	1 000			6.8	1.5	10 213
Uruguay	16 760	554	3	554	538		10	0.2	0.2	2 679
Venezuela	91 205	45 000	49	7 600	1 100			6.3	1.2	6 320
Br. Honduras	2 253	1 813	80	1 378	1 378	250	178	21.6	16.4	70
Br. Guiana	21 497	18 130	84	3 626	260			35.2	7.0	533
Fr. Guiana	8 800	7 000	80	1 509	50			233.3	50.0	30
Surinam	13 882	11 721	84	1 000	10			51.4	4.4	233

Source: FAO, Pulp and Paper Prospects in Latin America, 1963.

EXTRACTION OF LOGS
(1957-1962)
(in cubic meters)

Country & Year	TOTAL			CONIFERS			NONCONIFERS		
	Total	Industrial	Firewood	Total	Industrial	Firewood	Total	Industrial	Firewood
Argentina									
1957	-	-	-	-	-	-	-	-	-
1958	11 652	2 277	9 375	104	104	-	11 548	2 173	9 375
1959	-	-	-	-	-	-	-	-	-
1960	12 111	2 002	10 109	196	180	16	11 915	1 822	10 093
1961	11 840	2 025	9 815	200	185	15	11 640	1 840	9 800
1962	-	-	-	-	-	-	-	-	-
Bolivia									
1957	-	-	-	-	-	-	-	-	-
1958	-	-	-	-	-	-	-	-	-
1959	-	-	-	-	-	-	-	-	-
1960	4 218	68	4 150	1	1	-	4 217	67	4 150
1961	4 293	83	4 210	2	2	-	4 291	81	4 210
1962	4 337	87	4 250	1	1	-	4 336	86	4 250
Brazil									
1957	101 860	11 860	90 000	27 420	7 420	20 000	74 440	4 440	70 000
1958	102 090	12 090	90 000	27 520	7 520	20 000	74 570	4 570	70 000
1959	-	-	-	-	-	-	-	-	-
1960	106 450	16 450	90 000	27 650	7 650	20 000	78 800	8 800	70 000
1961	-	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-	-
Colombia									
1957	12 662	3 443	9 219	56	56	-	12 606	3 387	9 219
1958	-	-	-	-	-	-	-	-	-
1959	-	-	-	-	-	-	-	-	-
1960	-	-	-	-	-	-	-	-	-
1961	25 330	3 130	22 200	20	20	-	25 310	3 310	22 200
1962	-	-	-	-	-	-	-	-	-
Chile									
1957	5 400	2 500	2 900	710	510	200	4 690	1 990	2 700
1958	4 895	2 095	2 800	841	661	180	4 054	1 434	2 620
1959	4 541	2 071	2 470	1 538	1 258	280	3 003	813	2 190
1960	5 583	2 971	2 612	1 710	1 490	220	3 873	1 481	2 392
1961	5 819	3 019	2 800	1 726	1 526	200	4 093	1 493	2 600
1962	6 901	3 514	3 387	1 970	1 700	270	4 931	1 814	3 117

EXTRACTION OF LOGS
(continued)

Country & Year	TOTAL			CONIFERS			NONCONIFERS		
	Total	Industrial	Firewood	Total	Industrial	Firewood	Total	Industrial	Firewood
Ecuador									
1957	-	-	-	-	-	-	-	-	-
1958	2 200	140	2 060	-	-	-	2 200	140	2 060
1959	-	-	-	-	-	-	2 200	140	2 060
1960	3 350	1 050	2 300	-	-	-	3 350	1 050	2 300
1961	2 550	732	1 818	2	2	-	2 548	730	1 818
1962	2 835	805	2 030	2	2	-	2 833	803	2 030
Paraguay									
1957	-	-	-	-	-	-	-	-	-
1958	-	-	-	-	-	-	-	-	-
1959	1 734	455	1 279	-	-	-	1 734	455	1 279
1960	-	-	-	-	-	-	-	-	-
1961	1 720	395	1 325	-	-	-	1 720	395	1 325
1962	-	-	-	-	-	-	-	-	-
Peru									
1957	4 348	348	4 000	20	20	-	4 328	328	4 000
1958	5 314	314	5 000	12	12	-	5 302	302	5 000
1959	4 440	558	3 882	10	10	-	4 430	548	3 882
1960	4 649	689	3 960	7	7	-	4 642	682	3 960
1961	4 549	510	4 039	9	9	-	4 540	501	4 039
1962	4 610	490	4 120	15	15	-	4 595	475	4 120
Uruguay									
1957	-	-	-	-	-	-	-	-	-
1958	413	85	328	48	48	-	365	37	328
1959	-	-	-	-	-	-	-	-	-
1960	-	-	-	-	-	-	-	-	-
1961	1 265	215	1 050	130	130	-	1 135	85	1 050
1962	-	-	-	-	-	-	-	-	-
Venezuela									
1957	4 384	384	4 000	-	-	-	4 384	384	4 000
1958	4 818	318	4 500	147	147	-	4 582	182	4 400
1959	4 766	266	4 500	-	-	-	4 766	266	4 500
1960	4 876	276	4 600	-	-	-	4 876	276	4 600
1961	4 968	318	4 650	-	-	-	4 968	318	4 650
1962	4 982	332	4 650	-	-	-	4 982	332	4 650

Source: PAU, America En Cifras, 1963.

PA_ _ _ Pl_ _

(Production, Imports, Apparent Consumption)

Country	1959 Mechanical pulp	1959 Chemical wood-pulp	1959 Other Chemical pulp	1959 Total	1960 Mechanical pulp	1960 Chemical wood-pulp	1960 Other Chemical pulp	1960 Total
Argentina								
P	16 699	33 000	36 595	86 294	18 396	28 000	28 865	73 261
I	25 000	87 685	-	112 685	20 000	66 222	-	86 222
C	41 699	120 685	36 595	198 970	38 396	94 222	26 865	159 483
Brazil								
P	90 800	145 652	34 000	270 452	91 700	198 000	40 000	329 700
I	-	88 109	-	88 109	-	81 131	-	81 131
C	90 800	233 761	34 000	358 561	91 700	279 131	40 000	410 831
Chile								
P	49 322	8 912	2 000	60 234	51 790	50 354	2 700	104 844
I	-	40 799	-	40 799	-	7 265[a]	-	7 265[a]
C	49 322	49 711	2 000	101 033	51 790	57 619	2 700	112 109
Colombia								
P	-	-	2 800	2 800	-	6 153	2 698	8 851
I	-	32 683	-	32 683	-	31 095	-	31 095
C	-	32 683	2 800	35 483	-	37 248	2 698	39 946
Paraguay								
No data								
Peru								
P	-	-	25 782	25 782	-	-	25 700	25 700
I	500	7 000	-	7 500	394	10 691	-	11 085
C	500	7 000	25 782	33 282	394	10 691	25 700	36 785
Uruguay								
P	1 800	-	3 000	4 800	2 000	-	3 000	5 000
I	-	19 485	-	19 485	644	25 083	-	25 727
C	1 800	19 485	3 000	24 285	2 644	25 083	3 000	30 727
Venezuela								
I & C	-	31 704	-	31 704	-	31 041	-	31 041
TOTAL: P	158 621	187 564	103 177	450 362	163 886	282 507	102 963	547 356
I	25 500	307 465	-	332 965	21 038	252 528	-	273 566
C	184 121	495 029	103 177	783 318	185 924	535 035	102 963	820 922

P (Production)
I (Imports)
C (Apparent Consumption)

a/ Net imports (imports 20 962 minus export 13 697 equals 7 265)

Source: FAO, Pulp and Paper Prospects in Latin America, 1963.

PULP & PAPER MILLS (1958)
(tons)

Country	Newsprint		Other Paper and Paperboard										Total	
			Up to 5 000 tons/year		5 000-10 000 tons		10 001-20 000 tons		20 000-40 000 tons		Over 40 000 tons			
	No.	Capacity	No.	Capacity	No.	Capacity	No.	Capacity	No.	Capacity	No.	Capacity	No.	Capacity
Argentina	1	20 000	48	112 400	16	123 700	4	52 500	-	-	2	109 000	71	417 600
Brazil	8	66 000	38	108 100	14	118 600	11	155 700	3	71 000	-	-	74	519 400
Chile	2	52 000	8	7 700	1	8 000	-	-	1	28 000	-	-	12	95 700
Colombia	-	-	6	10 300	-	-	-	-	-	-	1	45 000	7	55 300
Paraguay	-	-	7	9 900									7	9 900
Peru	-	-	2	6 500	1	7 000	-	-	1	40 000	-	-	4	53 500
Uruguay	-	-	3	2 200	3	27 000	1	12 000	-	-	-	-	7	41 200
Venezuela	-	-	2	6 500	2	13 000	-	-	1	35 000	-	-	5	54 500

Source: FAO

ESTIMATED INVESTMENT REQUIRED FOR THE PROPOSED DEVELOPMENT OF THE PULP AND PAPER INDUSTRY, 1959-65

(Millions of dollars)

	Paper and Paperboard				Pulp				
Country	Newsprint	Printing and Writing Paper	Other Paper and Board	TOTAL	Mechanical	Long Fiber Chemical	Short Fiber Chemical and semi-Chemical	Total	TOTAL
Argentina	1	17	44	62	4	-	31	35	97
Brazil	15	27	50	92	12	48	64	124	216
Chile	15	3	12	30	11	49	-	60	90
Colombia	-	11	19	30	-	-	19	19	49
Paraguay	No data								
Peru	-	2	15	17	2	-	2	4	21
Uruguay	-	1	2	3	2	-	1	3	6
Venezuela	-	-	33	33	-	-	3	3	36
TOTAL	31	61	175	267	31	97	120	248	515

Source: FAO

ESTIMATED BALANCE-SHEET OF SUPPLY AND DEMAND IN RESPECT OF PULP, PAPER AND PAPERBOARD, (1965)

(Thousands of tons annually)

Country	Pulp				Paper and board			
	Mechanical	Long-fiber chemical	Short-fiber chemical and semi-chemical	Total	Newsprint	Printing and writing paper	Other paper and board	Total
Argentina								
Capacity-1958	20	10	86	116	20	99	299	418
Additions-1959-65	17	--	92	109	6	59	116	181
Capacity-1965	37	10	178	225	26	158	415	599
Estimated production-1965	33	9	160	202	22	130	334	486
Projected demand	46	145	160	351	175	134	340	649
Deficit (-) or surplus for export	-13	-136	-	-149	-153	-4	-6	-163
Brazil								
Capacity-1958	75	72	138	285	66	134	319	519
Additions-1959-65	75	166	149	390	95	74	133	302
Capacity-1965	190[a]	238	287	715[a]	161	248[a]	412[a]	821[a]
Estimated production-1965	171	218	257	646	153	225	375	753
Projected demand	171	218	207	596	334	235	386	455
Deficit (-) or surplus for export	-	-	+50	+50	-181	-10	-11	-202
Chile								
Capacity-1958	53	-	3	56	52	14	30	96
Additions-1959-65	75	235	-3	307	90	12	34	136
Capacity-1965	128	235	-	363	142	26	64	232
Estimated production-1965	122	223	-	345	135	25	60	220
Projected demand	122	81	-	203	40	28	64	132
Deficit (-) or surplus for export	-	+142	-	+142	+95	-3	-4	+88
Colombia								
Capacity-1958	-	-	3	3	-	3	52	55
Additions-1959-65	-	-	76	76	-	44	59	103
Capacity-1965			79	79		47	111	158
Estimated production-1965	-	-	71	71	-	43	100	143
Projected demand	9	34	71	114	44	46	102	192
Deficit (-) or surplus for export	-9	-34	-	-43	-44	-3	-2	-49

ESTIMATED LATIN-SIDE SUPPLY AND DEMAND IN RESPECT OF PULP, PAPER AND PAPERBOARD, (1965)
(Thousands of tons annually) con't.

Country	Pulp				Paper and board			
	Mechanical	Long-fiber chemical	Short-fiber chemical and semi-chemical	Total	News-print	Printing and writing paper	Other paper and board	Total
Paraguay No Data								
Peru								
Capacity-1958	-	-	28	28	-	5	49	54
Additions-1959-65	6	-	15	21	-	10	30	40
Capacity-1965	6	-	43	49	-	15	79	94
Estimated production-1965	5	-	39	44	-	13	60	73
Projected demand	5	16	39	60	30	14	62	106
Deficit (-) or surplus for export	-	-16	-	-16	-30	-1	-2	-33
Uruguay								
Capacity-1958	3	-	5	8	-	13	28	41
Additions-1959-65	3	-	4	7	-	-	-	-
Capacity-1965	6	-	9	15	-	15[a]	33[a]	48[a]
Estimated production-1965	5	-	8	13	-	13	30	43
Projected demand	5	13	11	29	35	15	32	82
Deficit (-) or surplus for export	-	-13	-3	-16	-35	-2	-2	-39
Venezuela								
Capacity-1958	-	-	-	-	-	-	55	55
Additions-1959-65	-	-	25	25	-	-	112	112
Capacity-1965	-	-	25	25	-	-	167	167
Estimated production-1965	-	-	23	23	-	-	150	150
Projected demand	7	67	23	97	44	49	162	255
Deficit (-) or surplus for export	-7	-67	-	-74	-44	-49	-12	-105

Source: FAO

AREAS FOR DEVELOPMENT

NORTHEASTERN PERU

For more than a decade the Peruvian government has been talking about the development potential of northeastern Peru, meaning an area of montaña extending from Jaen/Bagua on the Marañon River in the northwest to Yurimaguas at the junction of the Marañon and Hualaga Rivers in the northeast, southward and westward until the montaña gives way to the hostile slopes of the Sierras.

Small settlements of Europeans appeared here 300 years ago, but total isolation restricted growth. With the advent of air transportation the situation began to change, and now Tarapoto in the center of the area is the busiest domestic airport in Peru. Tarapoto airfreights cotton, produced by Clayton-Anderson, to the coast for competitive entry in the world market. Occasional beef carcasses are also shipped to the coast. The construction of a road from Olmas on the Peruvian coast eastward past the Marañon River is already opening new areas for cotton and livestock production in the Jaen/Bagua region. Upon completion, the road promises to do the same for the population centers of Moyobamba, Tarapoto and Yurimaguas. Further road construction is envisioned from Tarapoto to Tingo Maria further south in the headwaters of the Hualaga River.

This portion of northeast Peru is an area of latosols, which are thought of as having a low productivity. Their long-term profitable utilization will require careful management. The streams and rivers of the area run red, showing the erosional effects of man's activity upon the area today.

Yet, this is an area which is showing great progress. People are migrating into it and tilling the soil. If the physical and human resources of the area, or which are available to the area, are properly employed, the agriculturally productive land of Peru may well increase by 50 percent, if not double.

The area is shown on the map of Population Resource Region as one of having a high population/resource ratio, but technologically deficient. It is significant that the region is separated from the Peruvian coast by the lowest pass in the Andes (8,500 feet), that the inhabitants of the coast have a high percentage of European-Indian mixture, as do the inhabitants of the northeast region. The Peruvian coast is overpopulated, and the northeast underpopulated. It is reasonable to expect success in transporting the technological skills available on the coast to the northeast region where the skills can be employed to the greater benefit of both the individual and the nation.

It is suggested that the Latin American Bureau of AID take a broad view of the development of this virgin area which is currently unsurveyed and unmapped. This broad view should, as the first step, take an inexpensive inventory of those resources which are available within northeastern Peru. This inventory should then be used as a primary document in assisting the government of Peru to bring about the intelligent and orderly long-term development of the region.

THE RUPUNUNI OF BRITISH GUIANA

Much has been written on the Rupununi, but mostly by the British novelist who writes to thrill his countrymen who must stay at home. The U.S. national's knowledge of the Rupununi is limited to tales heard in Georgetown. For the rare American this may be supplemented by a quick flight to Latham on the Brazilian border for a return to Georgetown the same day.

The Rupununi deserves a more careful consideration.

It is not an Eldorado (as it was once thought), but it does constitute an under-developed and under-utilized area in a country where a major political and economic objective is to get the people off of the coast and into the interior. The accompanying map shows a trail from Georgetown to Latham. In 1961 four engineers attached to the USAID Mission in Georgetown flew a seven-year-old jeep to Latham, and in a period of ten days drove back overland, utilizing the trail shown on the map. This was done without taking any advance actions to prepare the trail for use.

The Rupununi savannas appear to be an area in which nature is attempting to modify the savannas into forest cover. It is true that geologically the region is old, which mitigates against it; but the soils are of recent depositional origin, and this fact appears to outweigh the disadvantages of age within the Guiana shield.

Water constitutes a problem. The rainfall regime places too much upon the land, and then follows the inundation with a drought cycle. However, no organized hydrologic investigations of the savanna area have, to our knowledge, been carried out.

Even without water control the region is used for ranching. Corn and garden crops not available along the coast (including tomatoes) grow in the Rupununi, and are airfreighted to Georgetown. Beef is airfreighted to Georgetown on a continuing basis.

The Rupununi savannas of British Guiana extend to Boa Vista on the upper reaches of the Rio Blanco in Brazil, and any conclusions reached as a result of the studies within

the Guiana shield should be valid for the contiguous savanna areas in Brazil also.

It is suggested that the Latin American Bureau of AID may take the initiative in exploring the overall natural and human resource potential of this extensive area within southern British Guiana and northern Brazil with an eye to opening the currently isolated area to future productive employment by man.

Aerial photography at a scale of 1:40,000 covers almost the entire country, and will greatly facilitate a resource analysis. Flown by Hunting Surveys, utilizing funds available under the Commonwealth Development Acts, copies of the photographs are available in Georgetown; the negatives are available in London. (See map following pg. 78)

THE TOCANTINAS RIVER OF BRAZIL

A group of specialists from the Bureau of Reclamation are currently carrying out investigations of the Tocantinas River basin of Brazil. This action is well warranted. The report of these technicians should be looked at from the long view, and if it is positive, systematic thought should be given to the adoption of a systematic long-range river basin approach to the development of this great Brazilian river.

CENTRAL PARAGUAY-NORTHERN ARGENTINA

In the central Paraguay-northern Argentina area, soils are generally productive for agriculture, but during the wet season the area is subject to saturation due to poor drainage. Conversely, in many places the soil lacks sufficient moisture during the dry season. The area warrants a serious review of the drainage and/or irrigation activities required to bring the soil into more productive use.

Additionally, a site near Posadas on the boundary between Paraguay and Argentina, demonstrates a high potential for the development of power within the area if carried out on an international basis.

NORTHERN BOLIVIA

In northern Bolivia, north of Cochabamba and Santa Cruz, there is an area of humic gley soils which appears to have a favorable water potential, and is near potential power sites. The area appears to warrant further investigation.

THE AMAZON

Sizeable but isolated areas of alluvial organic and gleyed soils of good agricultural potential are known to exist along the Amazon. With proper management, these soils have a good agricultural potential. The major problem in their development appears to be the lack of transportation, communication and an enlightened agricultural population.

CENTRAL BRAZIL

The area of central Brazil, roughly associated with the Banana Island region, carrying a natural vegetation of forest in an area surrounded by savanna, is shown as an area of alluvial soil which, with proper management, has good agricultural potential. It is suggested that attention be directed toward this area.

More attention can be given to the area of latosols and red-yellow podzolic soils that occupy the heart of Brazil in the savanna between 5° and 15° latitude. These soils are widespread south of the Amazon basin, and, while poorer than those of southern Brazil and eastern Paraguay, nevertheless may be usable for growing cassava, corn, and keeping hogs and poultry if cultivation is confined to the lower elevations.

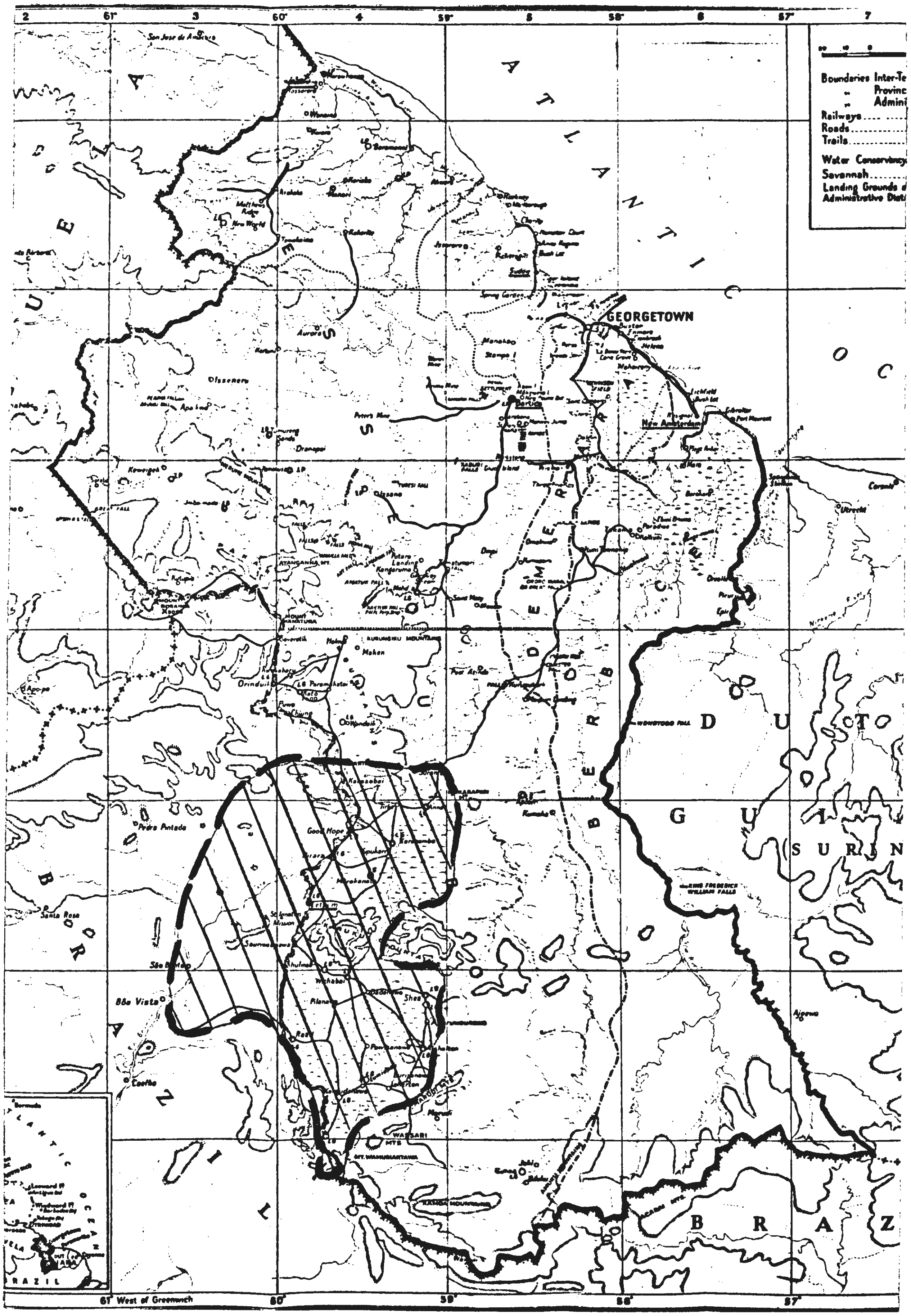
The rivers and streams in this area have a strong wet season flow which lasts more than half the year. Hydrologic studies are necessary to coordinate the planning and production of exploitable crops.

GENERAL - POPULATION TRENDS

Recent studies of population movement indicate that migration is occurring from areas of low income to areas of relatively higher income, irregardless of whether or not the higher income area is urban or rural. In each of the agricultural areas mentioned above there is a promise of increased agricultural earnings for currently low income and largely landless farm workers.

CAUTION

None of the areas mentioned above are recommended for project investment - rather, this paper suggests that they warrant further reconnaissance in the way of preliminary resource investigations.



GEORGETOWN
New Amsterdam
Bartica
Boundaries Inter-Te
Railways
Roads
Trails
Water Conservancy
Savannah
Landing Grounds
Administrative Distr
A T L A N T I C
O C
D U T
G U I
S U R I N
B R A Z
Good Hope
Pedro Pintado
Santa Rosa
Bôa Vista
61° West of Greenwich
60°
59°
58°
57°

SUGGESTED APPROACH TO RESOURCE ANALYSIS

A major requirement of the South American continent is the proper and balanced development of the water resource so as to meet the needs for domestic uses, irrigated agriculture, industrial water supply, hydropower production, and other purposes. The countries, of South America will require assistance from the Agency for International Development on a growing scale and in various forms if the water development requirements are to be met.

The first step must consist of preliminary country surveys of water needs and resources. Such surveys provide guidelines for comprehensive government action in the field of water resources development, and include an indication of immediate development possibilities and recommendations of steps for long-term development.

The first line of investigation should take place on an area basis; that is, a geographic area, sub-area, or single river basin within the country concerned. In this approach it is necessary to divide a country into a number of easily and rationally defined areas for which water requirements can be reasonably forecast. In certain cases, the drainage basin of rivers may be the best choice, where in other situations the demographic distribution would make it unrealistic to take watershed as the method of approach. By pinpointing water requirements, either through the geographical area or the demographic approach, the requirements of industrial, agricultural and related uses can be critically appraised. The first step in any approach is to collect existing information and to evaluate the data within the framework of water resources development. This will determine where serious gaps exist in the physical resources data. A determination of the gaps themselves is an important accomplishment, and plans can be made to close the gaps.

No country in South America is free from the problems associated with the development of international rivers. Therefore, in the case of South America, a matter of high priority is the conduct of preliminary surveys of international river basins of interest to the riparian countries. These surveys must take into account existing local facilities and local development programs, while at the same time outlining possible programs of international river basin development. This should lead to the formulation of concrete projects which, in turn, will necessitate further action and assistance.

Equally important are the pre-development investigations of ground water basins which may or may not correspond to the river basins spoken of above. These investigations should take into account the increasing share of water supply which must come from the development of ground water sources; both in the more developed and in the undeveloped regions of South America.

It must be recognized that the total quantity of fresh water is limited, and that supplies of this vital commodity must be obtained where and when they occur, either on the surface or in the ground water sources. It rests upon the ingenuity of man to overcome the handicaps of nature in properly utilizing these water sources. As population pressure increases, greater efforts will have to go into harnessing, controlling, and developing water resources. Nowhere is this more true than on the currently under-utilized, under-populated, currently marginal lands in the interior of the South American continent. Large investments will be required in the determination of the water resources and in their subsequent development where such is deemed economically feasible. Technical assistance will be required in the conduct of a basic inventory, the building of basic services in the developing country, for pilot projects, and pre-investment studies.

The Corps of Engineers, U. S. Army, deals with broad problems of water resources development, including integrated river basin development; carries out economic studies and assistance projects; and is responsible for broad water resources surveys and ground water exploration, hydropower problems, and navigation. It stands ready to lend assistance in South America, along the lines that it employed in the development of the United States.

PLANNING FOR WATER RESOURCES DEVELOPMENT

Water resource planning has been defined as "the orderly consideration of a project from the original statement of purpose through the evaluation of alternatives to a final decision on a course of action. It includes all work associated with the design of a project, except detailed engineering of the structures."1/ The investigation of the development of water resources, whether for a single unit of development, such as a reservoir, or of an entire river basin, is a complex planning effort made up of interrelationship between the physical aspects of the availability of the water, the economics of development and overall objectives of the institution directing the development.

Investigations of water resource development projects which are initiated with a clear statement of objectives accompanied by a plan of investigation are more easily directed toward sound, mutually agreeable final decisions than those investigations which are developed according to "day by day" methods.

The various elements comprising the factors which should be considered in developing a "plan of investigation" are

1/ "Water Resources Engineering", p. 605, Linsley and Franzini, McGraw-Hill, 1964.

listed under Factors to be Considered in Water Resource Development.[2]

There are several checkpoints in the course of investigations of water resource development which are needed to appraise the potential of development and to make decisions on the advisability and direction of continued investigations.

The first checkpoint is usually a reconnaissance study. "The purpose of reconnaissance investigations is to discover possible developments worthy of further consideration."[3] Reconnaissance investigations are based upon the readily available data concerning the project, and a minimum of field investigation and supplemental computations. Reconnaissance procedures are usually "hand-book" estimates and "short cut" methods which rely heavily upon "professional judgment".

The second checkpoint is the consideration of the data developed in the course of Feasibility Investigations. "The Feasibility Investigation comprises a detailed and comprehensive study and analysis of the contemplated project or program, directed towards its ultimate authorization, financing, design, construction and development."[4] The feasibility investigation should provide firm, detailed and reliable information upon which the institution initiating the investigation can base its recommendations for authorization of the program for development, and upon which the financing institution can determine the relative risk of the monies involved in construction.

The third checkpoint is the Definite Project Plan, which provides, after the appropriation of construction funds, final engineering designs and specifications upon which contractors can submit bids for construction, and construction contracts can be awarded.

The steps in planning a water resource development project are listed in Steps in Planning Water Resource Development.[5] A review of the subjects will clearly illustrate the complexity of the problem of Water Resource Development, and the need for the integration of the skills and knowledges of a large variety of specialized disciplines in arriving at a final decision which will best implement the objectives of the institutions initiating the program.

2/ "Manual of Standards and Criteria for Planning Water Resource Projects", United Nations, Water Resources Series No. 26, 1964, p. 1.

3/ Ibid, p. 3.

4/ Ibid, p. 8.

5/ "Water Resources Engineering", p. 608-609, Linsley and Franzini, McGraw-Hill, 1964.

FACTORS TO BE CONSIDERED IN WATER RESOURCE DEVELOPMENT

A. Purposes of a multiple-purpose project:

1. Irrigation
2. Drainage
3. Domestic or industrial water supply
4. Flood control
5. Hydro-power generation
6. Navigation
7. Fish and wild life conservation
8. Recreation
9. Water quality control
10. Salinity control
11. Watershed management
12. National defense
13. International relation

B. Land resources:

1. Land classification
2. Land use and capabilities
3. Development
4. Settlement
5. Drainage

C. Water resources:

1. Water supply, surface and groundwater and salvage
2. Water quality and treatment
3. Water requirements, all purposes
4. Water rights including international treaties
5. Flood studies
6. Sediment, including transport, erosion and aggradation
7. Project operation studies
8. Forecasting for operation
9. Hydraulic design requirements

D. Engineering and geology:

1. Aerial photography, surveying and mapping
2. Geology, foundation and materials
3. Anticipated construction problems
4. Plans and cost estimates, physical plan formulation
5. Anticipated operation, maintenance and replacement problems and estimates of cost

E. Economics:

1. Existing economy and resource use
2. Future economy without the project
3. Future economy with the project, and regional and national impact
4. Economic criteria for plan formulation
5. Economic justification

F. Financial considerations:

1. Cost allocation to various purposes
2. Repayment of capital investment
3. Payment of annual operation, maintenance and replacement costs

G. Legal considerations:

1. Rights to use of water
2. International agreements and treaties
3. Land acquisition and rights-of-way

H. Public relations:

1. Determination of public interest in contemplated development
2. Dissemination of factual information on progress and objectives of investigation
3. Establishment of government policy and enabling legislation

I. Reports:

1. Reconnaissance reports
   (a) Basin plan
   (b) Preliminary project report
2. Special interim or progress reports
3. Feasibility
4. Definite plan

J. Administration:

1. Organizational requirements for supervision of construction and operation of proposed projects
2. Program and budget requirements and control

STEPS IN PLANNING WATER RESOURCE DEVELOPMENT

1. Statement of objective
2. Collection of data
    - A. General
        - a. Water resources
            - (1) Hydrology-precipitation, streamflow, evapotranspiration, water quality, sediment
            - (2) Geology-groundwater, soil survey, erosion
            - (3) Cartographic-maps
        - b. Other basic resources
            - (1) Geologic-minerals
            - (2) Ecologic-vegetation, fish and wildlife
            - (3) Demographic-people and institutions
            - (4) Economic-industry, transportation, markets, tourism, recreation, land, taxes
        - c. Constraints
            - (1) Law-water rights, pollution control, land zoning, land ownership, administrative patterns, Indian lands, interstate compacts, treaties
            - (2) Public opinion
            - (3) Existing projects
    - B. Special data
        - a. Agriculture
            - (1) Land classification
            - (2) Crop water requirements-quantity and quality
            - (3) Climatic limitations
        - b. Municipal uses
            - (1) Industrial water needs-quantity and quality
            - (2) Population water needs
        - c. Hydro power
            - (1) Projected needs
            - (2) Alternate sources
        - d. Flood control
            - (1) Extent of past flooding and damages
            - (2) Local storm drainage requirements
        - e. Navigation
            - (1) Present water traffic patterns
            - (2) Alternatives-roads, railroads, airways
        - f. Recreation
            - (1) Natural attractions
            - (2) Present recreation patterns-types, place, time
        - g. Pollution control
            - (1) Existing waste discharges-location, time, character of waste
            - (2) Water pollution regulations or quality standards

3. Projections
   A. General
      (1) Population-place and time
      (2) Land use-place and time
      (3) Economic-markets, tourism, etc.
   B. Specific
      (1) Agriculture
         (a) Markets
         (b) Crops
         (c) Technological development
         (d) Water demand
      (2) Municipal
         (a) Domestic water demand
         (b) Industrial water demand
         (c) Technological changes
      (3) Power
         (a) Market and demand
         (b) Growth of alternate sources
         (c) Technological improvements
      (4) Flood control
         (a) Zoning possibilities
         (b) Projected flood damage-place and frequency
         (c) Possibilities of flood warning
      (5) Navigation
         (a) Growth of demand
         (b) Growth of competing facilities
         (c) Transportation patterns-point to point
         (d) Technological advance-navigation and competing facilities
      (6) Recreation
         (a) Growth of demand
         (b) Changes in recreation preferences
      (7) Pollution
         (a) Anticipated quantities and characteristics of waste
         (b) Technological advances

4. Project formulation
   A. Defining boundary conditions
   B. Listing all possible land use plans and their water requirements
   C. Listing all possible projects* which could meet the needs as projected under 3 and 4B
   D. Preparing preliminary designs and cost estimates for projects listed under 4C
   E. Estimating benefits for all projects
   F. Rejecting all projects which do not appear to be individually economic. †
   G. Forming of all combinations of projects which are not mutually exclusive †† and totaling the costs and benefits of all combinations

H. Selecting the two or three cominations which offer prospect of maximum return for detailed consideration and reanalyzing costs and benefits-selecting the "final alternative plans."
I. Preparing reports on final alternatives showing costs, benefits, staging, financing, and intangible factors for review by appropriate authority

5. Project authorization
   A. Reviewing results of step 4 by appropriate authority
   B. Selecting one of the plans for authorization

*Project is used here as any operation which will help to meet estimated needs including reservoirs, levees, diversion works, water-treatment plants, forecasting services, etc. In many cases there will be mutually exclusive alternatives, i.e., dams of different heights at a given site. Each such alternative is considered to be a "project."

†In some cases the benefits of a project are dependent on other projects, i.e., a single reservoir and power plant may not be economic but in combination with other storage is economic. Such interrelations should be considered here.

††Consider that some projects may be mutually exclusive in place but not in time; e.g., where two heights of dam are considered, the low dam may be built now and subsequently raised.