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The Fruit Industry of Brazil

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THE FRUIT INDUSTRY OF BRAZIL*

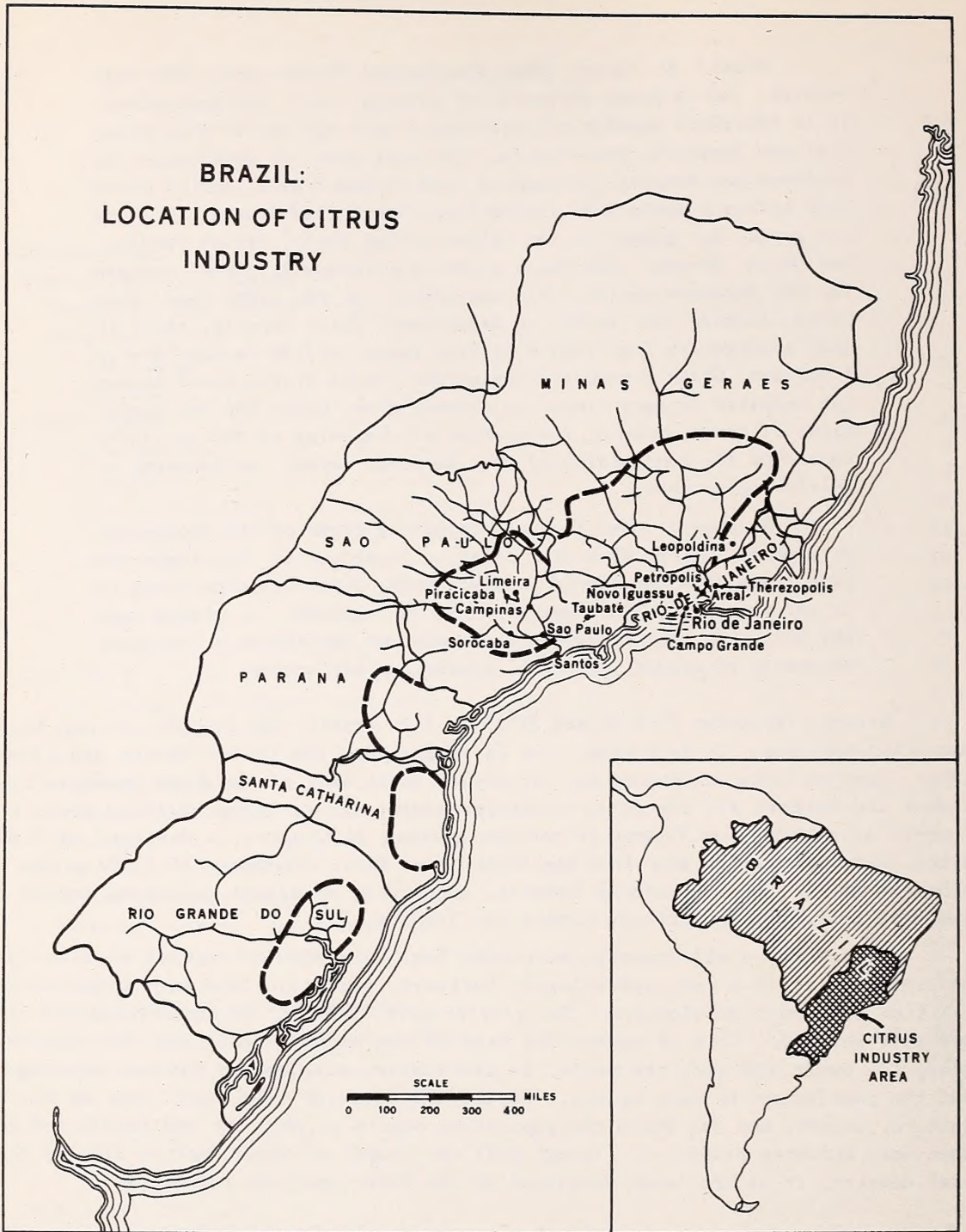
Brazil is larger than the United States and, like this country, has a great diversity of climate, soil, and population. It is therefore capable of producing a wide variety of both tropical and Temperate Zone fruits. The only ones of commercial importance are bananas, pineapples, and citrus fruits, and of these only citrus compete with fruits from the United States. Oranges are grown for export in the States of São Paulo, Rio de Janeiro, and Minas Geraes. São Paulo produces principally Navel oranges for the European market. Rio and Minas, on the other hand, grow Peras, largely for export to Argentina. Total exports, which in 1935 amounted to less than 3 million boxes, in 1939 reached nearly 6 million. Given a remunerative market, these States could expand the industry to many times its present size. Under the war conditions of today, however, the problem of disposing of the surpluses caused by the contraction of the European market is becoming of increasing concern.

Because of the lack of purchasing power of the population as a whole, Brazil does not offer a large outlet for Temperate Zone fruit from the United States. Under favorable conditions it is estimated that this market could be expanded to absorb some 250,000 boxes each of apples and pears and considerably increased shipments of grapes, cherries, plums, and nectarines.

Between latitudes 5°10' N. and 33°45' S. lies Brazil, the largest of the South American republics. In land area, it is larger than the United States and almost three times as large as Argentina. It covers about half of the South American Continent and borders all the other countries except Chile. From north to south the country stretches from Venezuela and the Guianas to Uruguay, a distance of 2,670 miles, and from east to west from the Atlantic to Peru, a distance of 2,690 miles. In other words, it is a tremendous country, containing an almost unlimited amount of land but lying almost entirely within the Tropics.

Brazil is an old country, with over four centuries of contact with Europe; nevertheless it is a new, undeveloped, backward, primitive land with great possibilities for future development. The greater part of Brazil is undeveloped and very sparsely settled. This is especially true of the northern part and the interior. Along the coast and near the ports, in particular, development has been more rapid and the population is much denser. Toward the interior from such towns as Rio de Janeiro, Santos, and São Paulo the population begins to thin out and conditions become more and more primitive. Though half the people of South America live in this vast country, it is the least developed of the South American republics.

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FIGURE 1.—Citrus-producing regions of Brazil.

The northern part of Brazil is low and tropical. Temperatures are high throughout the year, and rainfall is heavy. Parts of the country are covered with dense forests, inhabited by Indians, Negroes, and others who produce little and who contribute substantially nothing to the social and economic life of the country.

The east coast of Brazil is mountainous and extends for a distance of over a thousand miles. The mountains rise abruptly from the sea, culminating in a plateau from 2,000 to 3,000 feet high extending westward for many miles. The plateau is surrounded by mountain ranges, which rise to over 8,000 feet and have a tempering effect upon the climate. Contrasts of temperature within short distances are sharp as a result of these rapid rises in elevation. For example, Santos and Rio de Janeiro, which lie practically at sea level with high mountains at their backs, have the usual tropical climate, whereas São Paulo and Petropolis, which are but short distances inland, with elevations of about 2,500 feet, enjoy a temperate climate. During the summer months, those who can afford it have summer homes in the mountains some miles from the coast cities and commute to their offices.

Brazil as a farming country offers unlimited possibilities as far as the ability to produce is concerned. In the tropical zones many crops are found, which are raised without much effort on the part of the producer. While fruits and nuts are grown in abundance, they are grown largely under more or less natural conditions and do not enter the ordinary marketing channels. The staple crops, however, that constitute an important part of world commerce are cacao, cotton, tobacco, and sugar.

The central part of Brazil is more temperate and the most highly developed both agriculturally and industrially. This section includes the States of Rio de Janeiro, São Paulo, and Minas Geraes. The coast towns, such as Rio de Janeiro and Santos, and the high plateau country contain the bulk of the country's population.

The southern part of Brazil is still more temperate and has a climate similar to that of Uruguay and the northeastern part of Argentina. While only partially developed it is a country with a bright future. It is being settled by northern races who are thrifty and ambitious. The people living in the southern part of the country, or in the higher altitudes of the central part, are quite different from those living in the north or along the tropical coast. Climatic conditions permit of a rather wide selection of agricultural crops, both Temperate Zone and subtropical. The State of Rio Grande do Sul, with its livestock, general farm crops, and, to a lesser extent, Temperate Zone fruits, and the State of Paraná, with its forests and yerba maté, have great attractions for the prospective settler. This section is more attractive to the North European races than to the Negroes and South European or Latin races. While the Latin races are distributed pretty widely over all the South American countries, the Negroes are concentrated in the tropical zones. The northern part of Brazil, for instance, is very heavily populated with Negroes, but to the south the Negro population begins to thin out. In Chile and Argentina there are very few.

One of the most impressive facts about Brazil is its tremendous size and vast areas of undeveloped land. An estimated two-thirds of the country is unoccupied except for native tribes and an occasional settlement of a few whites. Large parts of the interior are still unexplored by white men.

Climate exerts a tremendous influence upon the habits, customs, and life of a race, striking examples of which are found in all parts of the world. Tropical

climates have many advantages, but so far as white people are concerned they are greatly outweighed by the disadvantages. The colonization and subsequent development of Brazil, and South America in general, offer interesting examples of the influence of climate. The origin of the settlers can easily be told by the nature of the country to which they have migrated. The Latin races have settled where the climate is mild and warm, similar to that of their native land, whereas the northern races have settled where the climate is temperate, invigorating, even severe, in keeping with that of the lands of their birth.

The Spanish influence dominates in Argentina and Chile, but Brazilians are descended from early Portuguese settlers. Portuguese is the language spoken and many of the customs and traditions of Portugal have been inherited by the people. Prior to the abolition of slavery in 1888, hundreds of thousands of Negroes were brought into the country to work the large coffee, sugar, cocoa, and other plantations. This accounts for the large percentage of Negroes in the northern part of the country. While the percentage of Negroes, Indians, and whites is unknown, it is clearly recognized that blacks, Indians, and people of mixed blood predominate over whites. From Rio de Janeiro south the white race predominates. In the interior where the country is sparsely settled and the people are widely scattered the population is mostly Indian.

In Brazil there is no color line, all races mixing freely in all walks of life. There is also much intermarriage among the races. Although the Negro is given the same opportunities as everyone else, the majority are uninterested in progress or in improving their social condition. As laborers, they are quite often lazy, indolent, illiterate, and unambitious. In the rural districts the sanitary conditions are almost unbelievably bad. Alcohol and disease take a heavy toll. Though some progress is now in evidence, it is slow. In Minas Geraes the Negro laborer indulges heavily in a potent alcoholic beverage made of sugarcane which breaks down his health and causes early death.

In the State of São Paulo and others of the south where the white race predominates, the country is more progressive and highly developed. German, Italian, Spanish, and Portuguese settlers are more numerous, as are the Japanese, and have contributed substantially to the development of the country.

Brazil, like the other South American republics, is a country of large land-owners. Large estates are owned by people living in the cities who operate them through farm managers. Fazendas containing thousands of acres are not at all uncommon, and the average size of most farms is about 500 or 600 acres. Only a small part, 20 percent, of the available land is used for agriculture, and but a small part of that is actually cultivated. About three-fourths of the farm land is in pasture or in forest.

Farming in Brazil is not on a highly scientific basis; in fact, most of the land is heavily exploited. The best lands are given over to coffee and cropped until they begin to wear out. The planter then sells and moves to virgin soil. The old farm is either planted to citrus, cane, or pasture. In many respects Brazil agriculturally is developing along the same lines that were followed in the United States. The one-crop system is pursued until the land begins to run down or is worn out. Since there is much good land available at low cost, this procedure is likely to continue for years to come. State and Government officials give demonstrations in soil conservation and soil management and are doing what they can toward educating the people in better farming methods. Results so far, however, have not been far reaching.

FRUITS OTHER THAN CITRUS

Because of its wide extremes of latitude and altitude, Brazil is capable of producing a wide variety of fruits. Outside of native tropical fruits, the greatest development from a commercial point of view has been in citrus fruits, principally oranges.

Temperate Zone Fruits

Temperate Zone fruits can be produced successfully in certain parts of the country, but they have not been developed to any great extent because the large consuming centers are more or less inaccessible to them. Such fruits as apples, pears, and grapes are to the inhabitants of a tropical country what bananas, pineapples, papayas, mangoes, and citrus fruits are to people living in the Temperate Zones. Certain localities in the high plateaus and mountain valleys of the States of Rio de Janeiro, Minas Geraes, and São Paulo are adapted to the cultivation of stone and pomaceous fruits. There are also places in the States of Santa Catharina, Rio Grande do Sul, and Paraná that are capable of producing Temperate Zone fruits.

Quinces are found growing wild in some of the more mountainous sections of southern Brazil and are used extensively in the manufacture of marmalades. Peaches, plums, and cherries, and in some places apples and pears, are found in gardens and small home orchards. In Rio Grande do Sul, the raising of apples and grapes has been attempted on a commercial scale. Though the commercial production of grapes has been successful to a certain extent, that of apples has never been. The cultivation of these and most fruits in Brazil receives scant attention. After the initial planting, the trees are left more or less to shift for themselves, which they do with varying degrees of success. The trees are mostly seedlings, nurseries being interested largely in growing citrus and other subtropical fruits.

The production of grapes in the cooler parts of the Rio Grande do Sul and São Paulo is confined to the labrusca group. The vinifera, or European type, proved to be unsuited to the moist climate of this region and was discontinued. Wine made from Labrusca grapes is consumed locally, for it cannot compete with the better wines imported from Portugal and other Mediterranean countries.

Tropical Fruits

Brazil produces a wide variety of tropical and subtropical fruits but only a few are exported or known outside of the country. Oranges, pineapples, and bananas need no introduction on world markets, but such fruits as mangoes, avocados, saposdillas, and guavas are consumed only locally.

Pineapples

The pineapple is indigenous to Brazil, and many important commercial varieties have been developed as a result of careful selection and breeding on the part of experiment-station workers. The largest collection of pineapple varieties, both wild and cultivated, is found at the experiment station at Campinas in the State of São Paulo. Dr. Felisberto Camargo, of the Agronomical Institute, is recognized as one of the world's leading authorities on pineapple breeding and cultivation.

From the standpoint of flavor, aroma, and texture, pineapples produced in the northeastern part of Brazil, in the States of Pernambuco and Parahyba, are claimed to have no superior. The fruit grown farther south, however, has a commercial preference, as it is more acid and of firmer texture. While a great many varieties are grown, the following are considered the most desirable: Red or purple types - Bico de Rosa and Caradura; white - Maranhão; yellow - Cayenne, Paulista, Ituano, and Fluminense. Varieties introduced from other countries are being tested, but so far those of Brazilian origin are preferred.

The planting season varies according to locality. In the Amazonas country, pineapples are planted any time during the year. In the northeast the usual time is from October to February. In the State of São Paulo, planting takes place from January to April, and in the State of Rio de Janeiro it is usually done from April to June.

The pineapple is produced over a wide territory, with plantations extending from Pernambuco to São Paulo. The most important centers of production are in the States of São Paulo, Pernambuco, Rio de Janeiro, Minas Geraes, and Parahyba, close to the ports or to large consuming centers. The location and extent of the industry is shown in table 1.

TABLE 1.—Production of Pineapples in Brazil, by States, 1934-38

| STATE | 1934 | 1935 | 1936 | 1937 | 1938 | AVERAGE 1934-38 |
|----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | : 1,000 | : 1,000 | : 1,000 | : 1,000 | : 1,000 | : 1,000 |
| | : pounds ¹ | : pounds ¹ | : pounds ¹ | : pounds ¹ | : pounds ¹ | : pounds ¹ |
| São Paulo | 40,846 | 49,118 | 43,562 | 50,000 | 48,000 | 46,306 |
| Pernambuco | 40,000 | 49,000 | 48,000 | 46,000 | 47,600 | 46,120 |
| Rio de Janeiro | 32,000 | 26,516 | 27,970 | 25,640 | 28,000 | 28,026 |
| Minas Geraes | 5,040 | 9,200 | 28,912 | 25,000 | 26,000 | 18,830 |
| Parahyba | 9,106 | 6,600 | 7,000 | 8,450 | 16,058 | 9,442 |
| Others | 27,108 | 25,902 | 25,950 | 26,672 | 26,252 | 26,376 |
| Total | 154,100 | 166,336 | 181,394 | 181,762 | 191,910 | 175,100 |
| | : | : | : | : | : | : |

¹Converted on the basis of 2 pounds per pineapple from official figures on the number produced.

The popularity of the pineapple on local markets can best be appreciated by comparing total production with export figures. While certain districts figure prominently in terms of production, they are relatively unimportant from the standpoint of exports. This indicates the quantity consumed within the country itself.

Production in São Paulo and Pernambuco is about equal, with 23 million pineapples produced, on an average, in each during the 5 years 1934-38. A large part of the production of Pernambuco, however, is consumed locally, whereas a good share of the output from São Paulo is exported. The State of Rio de Janeiro is third in importance, with an average of 14 million, followed by Minas Geraes with 9.4 million and Parahyba with 4.7 million. In the São Paulo area, pineapples are produced on the more gently rolling hillsides, in direct contrast to the steep mountain slopes on which they are planted in the vicinity of Rio de Janeiro.

The height of the pineapple season is in December and January, when they can be bought at very low prices.

TABLE 2.—Exports on pineapples from Brazil, by country of destination, 1934-38

| COUNTRY | 1935 | 1936 | 1937 | 1938 | 1939 |
|-----------------|----------------|----------------|----------------|----------------|----------------|
| | : 1,000 Pounds | : 1,000 Pounds | : 1,000 Pounds | : 1,000 Pounds | : 1,000 Pounds |
| Argentina | 6,584 | 6,552 | 9,448 | 7,173 | 7,238 |
| Uruguay | 228 | 144 | 885 | 562 | 680 |
| Germany | 16 | 57 | 104 | 157 | - |
| England | 239 | 220 | 58 | 54 | - |
| Belgium | - | 1 | 68 | 5 | - |
| Others | 3 | 3 | 34 | 2 | 1 |
| Total | 7,070 | 6,977 | 10,597 | 7,953 | 7,919 |
| | : | : | : | : | : |

Compiled from official sources.

Bananas

The banana, like the pineapple, is produced throughout the greater part of the country. Few homes, no matter how humble, are without a few banana trees. In the rural districts, tenant houses may be erected in the heart of an orange grove, but almost without exception a small planting of bananas is found around the houses.

Though total production of bananas for the country as a whole has averaged 73.8 million stems for the 5-year period 1934-38, commercial production, concentrated largely in the States of São Paulo, Rio de Janeiro, and Minas Geraes, has been about 51 million stems. In São Paulo the most intensive development has taken place in the hot lowlands around Santos. The city of Santos, the largest coffee port in the world, is also important as a port of export for bananas. The delta lands around Santos, when drained, prove excellent sites for the culture of bananas.

TABLE 3.—Production of bananas in Brazil, by States, 1934-38

| STATE | 1934 | 1935 | 1936 | 1937 | 1938 | AVERAGE 1934-38 |
|----------------------|---------|---------|---------|---------|---------|--------------------|
| | : 1,000 | : 1,000 | : 1,000 | : 1,000 | : 1,000 | : 1,000 |
| | : Stems | : Stems | : Stems | : Stems | : Stems | : Stems |
| São Paulo | 23,971 | 29,539 | 26,630 | 30,000 | 28,000 | 27,628 |
| Rio de Janeiro | 13,300 | 11,409 | 14,377 | 16,651 | 15,870 | 14,321 |
| Minas Geraes | 7,500 | 9,500 | 9,829 | 9,850 | 9,800 | 9,296 |
| Paraná | 4,680 | 4,800 | 4,400 | 4,500 | 4,600 | 4,596 |
| Pernambuco | 2,663 | 3,200 | 4,800 | 4,000 | 4,000 | 3,733 |
| Others | 13,833 | 14,041 | 13,533 | 14,993 | 14,694 | 14,219 |
| Total | 65,947 | 72,489 | 73,569 | 79,994 | 76,964 | 73,793 |
| | : | : | : | : | : | : |

Compiled from official sources.

Santos, which is practically at sea level, is at the base of the mountains that rise sharply some 2,000 feet to a high plateau. The rich alluvial deposits that have been formed around the city between the ocean and the mountains are ideal soil for bananas. The plantations, however, are not confined to the rich, flat delta lands but extend up the mountain valleys and onto the steep mountainsides as well.

Many varieties of bananas are grown in the country, but only a few enter export channels. Most of the Brazilian bananas are of the species *Musa sapientum*, and are short, fairly thick-skinned, and rather coarse in texture and flavor. The flavor is quite different from that of Central American varieties and has a tendency to be somewhat rubbery. Bananas are brought into Santos by both train and boat. The lowlands around the port are intersected by a number of navigable streams, which furnish cheap transportation by small boats and lighters from the plantations to the ship or docks.

Sixteen varieties are produced in the Santos area, of which six or seven are widely planted. The White banana (Bananeira Branca) and the Silver banana (Bananeira Brata) are grown extensively and used principally in connection with the sweetmeat industry. The Silver is the most widely used on the domestic market. The Maçã, or Apple banana, is well known and widely used locally. The São Thome, or St. Thomas, is only eaten cooked and is recommended for feeding to children. The Gold, or Pear, banana is a small, thin-skinned fruit and one of the most popular varieties on the Brazilian market. The three types produced for export are the dwarf, semidwarf, and Gros Michel. The last-named banana has a rather thick skin and stands handling and shipping well, which is a distinct advantage in export.

Production in the States of Rio de Janeiro and Minas Geraes is mostly in the mountain valleys and on the steep mountain slopes. These States are largely mountainous, with good soil and an abundance of rainfall.

During recent years an active export trade has been developed between Brazilian and European ports, in addition to the trade established with Uruguay and Argentina.

TABLE 4.—Exports of bananas from Brazil, by country of destination, 1935-39

| COUNTRY | 1935 | 1936 | 1937 | 1938 | 1939 |
|-----------------|----------------|----------------|----------------|----------------|----------------|
| | : 1,000 Stems: | : 1,000 Stems: | : 1,000 Stems: | : 1,000 Stems: | : 1,000 Stems: |
| Argentina | 8,186 | 8,422 | 8,363 | 8,108 | 9,379 |
| England | 2,009 | 1,954 | 1,896 | 1,739 | 1,084 |
| Uruguay | 349 | 688 | 788 | 840 | 954 |
| Germany | 6 | 66 | 171 | 288 | 305 |
| Belgium | 9 | 66 | 41 | 61 | 195 |
| Holland | 120 | 109 | 52 | 56 | 76 |
| Others | 4 | 21 | 0 | 0 | 14 |
| Total | 10,683 | 11,326 | 11,311 | 11,092 | 12,007 |
| | : | : | : | : | : |

Compiled from official sources.

CITRUS FRUITS

As far as American citrus producers are concerned, interest in the Brazilian fruit industry is centered around the production of citrus fruits and its significance

from a competitive standpoint, while producers of deciduous fruits are interested in Brazil as a market for their products.

Citrus Regions

São Paulo

São Paulo is one of the most progressive States of Brazil. In area it covers 91,310 square miles, or is approximately the size of Oregon, one and one-half times as large as Florida, and three-fifths the size of California.

São Paulo has a mountainous coast line. From the port of Santos, the land rises abruptly to a high plateau, extending westward for some 400 miles. The State is notable for many things - climate, type of people, diversity of agricultural products, development of industry, and excellence of transportation facilities.

The State of São Paulo supports a large part of the entire country, contributing 60 percent of the total Federal taxes. It has a population of 7 million people, compared with a total population of from 40 to 45 million. The city of São Paulo is the center of great activity. During recent years large manufacturing plants have been established in it and it has experienced a mushroomlike growth. From both an industrial and an agricultural point of view, São Paulo appears to be the most promising region in Brazil.

The topography of the State makes great expansion possible. A large part of it is a gentle rolling plain, similar in part to the Ohio River Valley and to eastern Oregon and Washington. Other districts are more rugged and broken up, and bear a closer resemblance to the New England States or the hill country of California. The country originally was heavily timbered but was cleared in order to make room for



FIGURE 2.—Countryside near Limeria, with orange nursery stock in the foreground.

coffee plantations. This clearing took place on a tremendous scale and opened up a countryside admirably suited to agriculture. The land is subject to a certain amount of erosion, but because of terracing and proper soil management there is less washing than in other parts of the country, particularly in the State of Rio de Janeiro.

The country around Limeira, the center of the principal orange-growing district, is a beautiful farming country, rolling but with wide expanses of fairly level land. Piracicaba, another potentially important orange district, has a similar topography, as do also Campinas and Araras, other important producing centers. Sorocaba, southwest of São Paulo across a rather rough mountain range, is the second most important orange district in the State. It differs considerably from the Limeira region in many respects. Topographically it is much more broken, some parts being very steep and hilly and covered with large rocks and boulders. Taubate, the third district in importance, is similar to the country around São Paulo, or gently rolling.

Each district claims to have certain advantages over the others. Fruit from the Sorocaba area, for example, is said to have a superior flavor and better shipping qualities than that produced around Limeira. The different districts, about 10 in number, are all within a comparatively short distance of the city of São Paulo, a railway journey of not more than 4 or 5 hours.

A large part of the orange plantings in the State have been made on land that was cleared and prepared for the growing of coffee, sugarcane, mandioca, cotton, and other crops common to Brazil.

While most of these crops are still produced, the coffee industry has shifted to other regions. Coffee planters having depleted the fertility of the soil as a result of years of continuous cropping or learning that areas farther inland were better suited for coffee growing, sold their holdings and shifted the industry farther into the interior. This left vast tracts of land to be turned into pasture, planted to other cultivated crops, or allowed to revert back to forests. Along with sugarcane, mandioca, cotton, and other crops came the commercial production of citrus.

The area planted to citrus in 1938, according to official figures, amounted to 103,572 acres. About 80 percent of the acreage is planted to Navel oranges; therefore in Brazil there are about 82,500 acres of Navels compared with 95,000 acres in California.

Production of Navel oranges in São Paulo has increased from 12 million boxes in 1931 to 15 million in 1938, and exports during the same period rose from 835,000 boxes



FIGURE 3.—Hillside Orange grove in the Sorocaba district.

to a little over 2 million boxes. In 1939 exports showed a further increase to about 2.5 million boxes. During the past 5 years it is estimated that plantings have increased by about 15 percent. These plantings are just coming into bearing and are expected to show further material gains in the production figures.

The size of holdings varies considerably with the district. Unlike the fruit industry in Argentina, that in Brazil is not controlled by a few large landowners living in distant cities. While holdings in the Limeira district range in size from 1,000 to 50,000 or 60,000 trees or more, there are very few operators who cultivate as many as 40,000 trees. The average orchard contains from 5,000 to 10,000 trees, or from 50 to 100 acres. The Fazenda Maute Dista, a farm of 1,600 acres owned by a Japanese syndicate just out of Campinas, has a citrus planting of 42,000 trees, consisting of 34,000 oranges, 5,000 lemons, and 3,000 grapefruit.

In the Sorocaba district, most of the oranges are raised by Spaniards who own their own places. These holdings average from 18 to 30 acres in size, but they often support from two to three times as many trees per acre as in Limeira, because of the thin soil and the close planting.

São Paulo, largely because of climatic conditions, has attracted immigrants who settle on and work their own land. While there are large estates supervised by farm managers, they are not as prevalent as in other parts of Brazil or in neighboring countries. The price of good orange land in the State varies according to location but can be purchased, on an average, for from \$25 to \$30 an acre. Sometimes desirable land close to a town or city is as high as \$50, but there is no difficulty in obtaining splendid property, already cleared and ready for planting, at the lower prices. In fact, suitable land, but some distance from a town, can be purchased for as low as \$5 or \$6 an acre.

São Paulo lies on the northern fringe of the Temperate Zone. Though not exactly a thermal belt, the orange districts rarely have frosts, and a freeze is experienced perhaps once in 30 years. In the higher elevations there are occasional frosts. The altitude, however, of São Paulo has a tempering effect upon the humidity and high temperature so characteristic of lowlands in the subtropics. Planters take care not to plant in valleys that may be visited by an occasional frost and keep to the tops of the hills and the higher elevations where air drainage is more or less assured.

Rainfall is sufficiently abundant in São Paulo to insure maturing of the crop. Annual precipitation averages from 50 to 60 inches, but during the winter months it is reduced to about an inch a month. The rains produce a luxuriant growth of weeds, grasses, and legumes, which assist in reducing erosion and supply the soil with humus.

The dark red loam soil, which characterizes a large part of Brazil, is common to the São Paulo area. Experienced coffee planters seek this particular soil type, rich in potash and iron. Since many of the present orange plantings are located upon abandoned coffee plantings, it is not surprising that this soil type predominates. Soils around Campinas, Limeira, and Piracicaba are especially red. North American tillers of the Porters red loam soil of the southern Piedmont would not feel strange in this land below the Equator. The soils around Sorocaba upon which the present citrus industry is established, however, are quite different from those of the Piedmont. In the district known as Brigadero Toblas, where the industry originally

started, the soils are very light, gravelly, and shotlike in character. Orchards are planted on steep hillsides and intercropped with onions, with serious erosion resulting. Many of the citrus plantings here are being abandoned, and the industry is gradually shifting to the east where the red soils occur.

The planting of late-maturing varieties of oranges in São Paulo is being discouraged, and the district is gradually discontinuing the production of Peras. This section is not suited for late oranges because of the heavy infestation of fruit-fly. The altitude, also, is said to produce too much acidity and an excess of water in late varieties. São Paulo Peras are too sour for the English market; consequently, most shipments go to Holland, Belgium, and the Scandinavian countries.



FIGURE 4.—Steep hillside citrus plantings not far from Sorocaba.

While São Paulo produces many different varieties of citrus fruit, it is distinguished from the Rio de Janeiro and other districts by its heavy proportion of Bahia Navel oranges. Some believe that when the industry was established some 10 to 15 years ago other varieties more suitable for export should have been planted instead of Navels.

One of São Paulo's greatest marketing problems is that of size. With a heavy percentage of the Navel crop running to large sizes, 126 and larger, much of the crop must be thrown out. An effort has been made to overcome this difficulty by using a larger box. This, however, has met with little success, as it has not disposed of the retail problem of selling this oversized fruit to the public. Furthermore, the importer, who finances exports to a large extent by advancing money against shipments, is placed at a distinct disadvantage. The expenses, such as freight, duty, and cartage, are approximately 25 cents a box more than the charges on a standard-sized box. Between 20 and 25 percent of the packed Navel crop is made up of size 126 and about 40 to 45 percent of the packed crop consists of larger sizes. The popular sizes, 176 to 288, represent only 30 to 35 percent of the total movement. These percentages vary somewhat from season to season, but on an average a far too heavy proportion of the total shipments consists of oversized fruit.

The question of variety presents a serious problem in São Paulo. The industry is so largely dependent upon export outlets that far more attention will have to be paid to market requirements than has been recognized or admitted heretofore. Production is increasing and markets are becoming more exacting and harder to find. São Paulo already has developed desirable strains of small Navels and through further

selection can produce varieties and sizes in keeping with present market requirements. This will be necessary if the industry is to remain on a profitable basis.

São Paulo is the only State that can boast of much in the way of transportation facilities. A large part of the total mileage in motor highways is located here; and, while most of the roads are graveled, they are wide, well-graded, all-weather roads. Road building in Brazil is expensive and maintenance is even more costly; consequently only the most highly developed sections can afford them. There is a good network of roads throughout the citrus areas. Feeder roads are bumpy and narrow, but they are passable and enable the grower to get his produce out without too much difficulty. No new construction was observed by the writer in the districts visited, but there was evidence all along of road maintenance.

In addition to highways, São Paulo has excellent railway facilities, leading not only to the ports but into the interior. Most of the roads do not extend very far into the country, 400 or 500 miles, but very good service is provided between those points served. The British-owned São Paulo Railway, which operates between São Paulo and Santos, a distance of about 30 miles, is not only one of the most profitable railways in existence but one of the most ingenious. A short distance out of Santos the trains are broken up into several cars each and begin a steep climb up the face of the Serra do Mar. In a distance of about 7 miles the train climbs 2,600 feet to the top of the plateau, which overlooks the Atlantic. The several railroads that operate in the State converge at São Paulo, and all sea-borne produce to be loaded at Santos must be transported over the São Paulo line. The São Paulo Railway thus transports about half the world's supply of coffee, to say nothing of the other industrial and agricultural products, including citrus, exported from the State. A large part of Brazil has no railway service, so badly needed if large areas in the interior are to be developed. São Paulo therefore has far more than its proportionate share.

Rio de Janeiro

Rio de Janeiro produces, on an average, 10 million boxes of oranges a year on an area of about 70,000 acres. From the standpoint of production of citrus fruit, Rio de Janeiro is second in importance, but in exports it is by far the most important district. This is largely accounted for by the fact that, whereas São Paulo produces mostly Navel oranges, Rio de Janeiro produces mostly Peras.

The Pera orange is not harvested until after the Navels have been shipped. The Navel season in São Paulo begins in April and ends in June. The Pera season does not begin until June and ends late in July or early August. In the State of Rio de Janeiro, in fact, the Pera season does not start until July and ends in November. Rio Peras find a sale in neighboring South American countries, to which a substantial share of its exports goes. On the other hand, while São Paulo is shipping Navels, markets of neighboring countries are well supplied with offerings from their own producing districts. In 1939, 3,202,102 boxes of oranges were shipped from the port of Rio de Janeiro, over 50 percent of which were exported to Argentina.

The city of Rio de Janeiro is stretched along miles of water front on a narrow strip of fairly level land between a high mountain range and the Atlantic ocean. The mountains rise abruptly from the sea to elevations of a thousand to almost three thousand feet. To get beyond this barrier requires a certain amount of winding and climbing, but once on the Western side of the range and just a few miles beyond the city one enters the famous Pera orange district.

Attempting to describe the Rio de Janeiro citrus district is like trying to paint a picture of the Grand Canyon of Arizona. It can't be done. Growers cultivating citrus under Florida or California conditions would have to see it for themselves to believe it possible to produce citrus in this region. Those familiar with the mountain orchards of the Appalachian region in the United States can better visualize the Pera orange groves. Planted on steep mountainsides, many of them almost perpendicular, and tucked away back in mountain coves and hollows are thousands upon thousands of orange trees in this district. Here the characteristic red soil of Brazil prevails, and the checkerboard pattern of the green trees against an almost blood-red background is exceedingly picturesque.

Numerous secondary ranges of mountains, or foothills, continue to the west and form a somewhat rugged and broken countryside. Between these hills are valleys varying in size and shape. Some are fairly flat; others are rolling with here and there hills resembling beehives or Brazilian anthills. Valleys, as well as hillsides, are cultivated and planted to orange trees. Frequently the entire hill, top and sides, is planted to trees. During the past 5 years many young groves have been established, a number of them on hillsides so steep that cultivation is rendered impossible and heavy erosion unpreventable.



FIGURE 5.—An orange planting in the Campo Grande district.

In this section two districts stand out in importance, the Campo Grande and the Novo Iguassú. Of the two, the latter is considered the better, although there seems to be little difference between them as far as topography and cultural practices are concerned. The Iguassú country, on the whole, is perhaps less rugged and there are larger areas of a more rolling country. Large farms and tracts of land, formerly planted to coffee, have been converted into orange groves.

Climatic conditions in the district of Rio de Janeiro are somewhat different from those of São Paulo, despite the fact that the two are fairly close together.

Much of Rio de Janeiro has a lower altitude and is consequently more tropical. The higher elevations are more or less similar to certain parts of São Paulo; but a large part of the plantings are in the valleys or low foothills where rain is more abundant and humidity and temperatures higher. In the northern part of the State the mountains rise to a considerable height; consequently the climate is influenced considerably by elevation. From Rio de Janeiro to Petropolis, a distance of approximately 40 miles, the elevation rises from sea level to 2,600 feet. Petropolis and neighboring towns are summer resorts for those who can afford to escape the summer heat of Rio, but there are extensive plantings of orange groves on the surrounding hillsides. Oranges from these higher altitudes ripen much later and account for the rather long harvesting season.



FIGURE 6.—Orange groves, palms, a few banana trees, and scattered bits of sugarcane are characteristic of the Novo Iguassú landscape.

The uncultivated areas are covered with dense forests, which are carpeted with ferns and other shade- and moisture-loving tropical plants. In the vicinity of Therezopolis, however, long stretches of steep mountainsides have been cleared and planted to oranges and other cultivated crops. Much of this country is very steep, rugged, and covered with huge boulders. In many ways it bears a close resemblance to the Swiss and Bavarian Alps. Oranges produced on these mountainsides at a high elevation mature late and have very good eating quality.

The State of Rio de Janeiro is pretty well served by both highway and rail transportation. The main highways, as in São Paulo, are graveled and well maintained, but the feeder roads are narrow, rough, and unimproved. During certain seasons they are impassable for motor cars and trucks, but oxen are able to pull and bump their way over them. There are ample rail facilities serving such districts as Iguassú, but the northern lines running to Petropolis and beyond to Minas Geraes are slow and travel is arduous.

Minas Geraes

The State of Minas Geraes (general mines) lies to the north and west of Rio de Janeiro. In addition to mineral resources, such as gold and iron, diamonds and other precious and semiprecious stones are mined. Minas Geraes is also an important agricultural State, although the greater part of it is still undeveloped.

Brazil is a country of contrasts. Without warning one passes from one extreme to the other. Leaving Rio de Janeiro, one of the most beautiful, modern, and up-to-date cities in the world, one is transported in a few minutes to an entirely different set of surroundings - in fact to a different world. There is no gradual tapering off from urban to suburban life. At the outskirts of Rio one leaves progressive city life and plunges immediately into the primitive way of the jungle. From Rio to Minas, with the exception of the summer-resort towns, such as Petropolis and Therezopolis, the country is very sparsely settled, with holdings becoming larger and life more primitive toward the interior.

Minas Geraes, like most of Brazil, is a region with a future. The southern part of the State bordering Rio de Janeiro was at one time an important coffee-producing section. It was, and still is, a country of large landowners. These tremendous expanses of rolling land, at times merging into steeply inclined hills, were at one time entirely covered with coffee trees. Hundreds of thousands of acres, stretching for miles and miles, are now largely in pasture and serve only as a reminder of what was once the home of a great industry. As the coffee industry is now shifting from São Paulo to Paraná, so it once moved from Minas to São Paulo.



FIGURE 7.—Typical native hut in southern Minas Geraes.

The huge holdings, formerly worked by slave labor, have been somewhat reduced in size, much land has been turned into pasture and grazed; cultivated areas have been given over to citrus fruits, sugarcane, mandioca, and bananas; but on the whole it still remains an open country of large estates and almost endless boundaries. In many respects, parts are similar in topography to eastern Washington and Oregon, with the extensive rolling hills of those States but with an abundance of rainfall and in some places covered by an almost impenetrable jungle.

The soil, as in the districts previously mentioned, is red. Its fertility is plainly indicated by the natural vegetation. Forest trees are large and the undergrowth dense. Cultivated crops and trees, although given little or no additional

food, make a good growth. Wild grasses, reeds, rushes, and brambles grow luxuriantly, in fact so luxuriantly that one of the problems is to keep them from encroaching upon the cultivated areas.

The native population in this part of the country is largely Negro, a primitive, superstitious people. They live in adobe houses, just four mud walls covered with a thatched roof, without windows or floors. Their wants, however, are few, and the climate is such that clothes and better housing are not essentials. Alcohol and disease are said to be their greatest curse. They consume large quantities of paratý, a potent beverage distilled from sugarcane. Paratý retails for 2 milreis a liter, approximately 10 cents a quart. Many of them are said to drink a pint of paratý every night before going to bed. They are an illiterate people and make little or no effort to protect themselves. The country abounds in poisonous snakes; and, although serum is available to the workers in most communities, a bite is generally not reported until it is too late. On one place visited by the writer, one of the laborers was bitten during the day. About an hour and a half passed before he mentioned it. He was then rushed to the nearest hospital for treatment, but it was too late to save his life.

Climatic conditions in Minas are favorable to the growth of a wide range of plants. Because of the altitude, heat is not oppressive and there are no great extremes of either heat or cold. Rainfall is more than abundant, especially during the summer months. However, it is not excessive as it is in the low country. The rolling, hilly country is excellently drained. Though erosion presents a problem on some of the cultivated hillsides, much of the land is in pastures and the cultivated areas are usually cropped or intercropped so as to reduce washing.

Transportation in Minas is fairly well developed. The Leopoldina Railway serves the southern part of the State and is considered one of the most important roads in the country. It passes through a large and potentially rich area. At present the journey is rather slow and tedious, but the railway serves the present needs of the territory.

Improved highways in Minas are not very numerous, but what they have are quite good. A splendid new highway is in construction between Areal and Leopoldina and when completed will provide an excellent artery for getting produce out of the country. The side roads in Minas, however, are narrow, winding, rough, and neglected. Ox carts manage to get over them, but motor transport is frequently difficult or impossible. Highway building in most parts of the country is very expensive and there is not sufficient revenue produced to do much in the way of new construction. Maintenance is frequently only sufficient to make the roads passable. The mountainous character of Minas, coupled with heavy rainfall and low revenues, discourages much highway development in the rural districts.

As a potential citrus-producing area, the State of Minas Geraes, like São Paulo, has almost limitless possibilities. Minas Geraes would find little difficulty in satisfying any market requirements that might arise.

In addition to citrus fruits, Minas Geraes produces large quantities of pineapples, bananas, and papayas. Oranges, however, rank first in quantity of production. The area devoted to citrus fruits, including some grapefruit and lemons, is estimated at about 22,000 acres. The Pera orange is the most important variety from a commercial point of view, but the small Navel, Bahianinha, is receiving increased attention.

The grapefruit varieties produced are Marsh Seedless, Duncan, and McCarty. Both Marsh and the seeded varieties have excellent quality. Some Fosters Pink are also produced, but this variety does not do so well.

Lemons are grown in most districts where oranges are produced, but the handling of the crop is quite different from that in California or Spain. Brazilians like sweet things, and lemons are allowed to ripen on the tree to develop more sugar. They find only a limited sale on the market. Grapefruit is not produced for the home market but for export. When export markets are lost or curtailed, grapefruit growers are unable to dispose of their fruit.

Citrus Varieties

Oranges

Brazil produces many types and varieties of oranges, but from a commercial standpoint the list is narrowed to two. In the Rio de Janeiro area the Pera, which resembles the Valencia, is the predominating variety, and in the State of São Paulo the Bahia or Navel is by far the most important. The Pera is better able to meet export requirements. The requirements of the European market with regard to size and the low productivity of the Bahia have been responsible for the downward trend of prices in the São Paulo area.

It is estimated that between 75 and 80 percent of the total production of oranges in São Paulo consists of Bahia Navels, whereas Peras account for about 15 percent. Such miscellaneous varieties as Valencia, Natal, Barão, Denia, Pineapple, Hamlin, and Murcia make up the other 5 or 10 percent. Exports of Navels average about 68 percent of the total as against 22 percent for Peras. In contrast to the Washington Navel of California, as we know it today, the Bahia Navel as produced in Brazil has undergone little or no change. While bud selection has been undertaken in Brazil and several small, smooth-skinned Navels are available, planters have not bothered to change over to the improved strains. A large part of the Navels produced in São Paulo are too large for the export trade. In some seasons it is necessary to cull out as high as 70 percent of the crop because of oversized fruit. The Washington Navel under São Paulo conditions has a biennial-bearing tendency. In full-crop years good fruit is produced, but in the off seasons the fruit is very poor and has little commercial value.

Several small-sized Navels have been introduced in recent years. Though they are of different strains and are found in different localities, they are all referred to as Bahianinhas (small Navels). Three new strains, known as the Piracicaba, Araras, and Bahianinha B B, are especially promising. They are good bearers, regular in shape, uniform in size, with invisible navel, and of good quality. The Bahianinha produces a uniform crop averaging about the 200 size. This is ideal for European marketing purposes. It is believed that if the present Navel production in the country, especially in São Paulo, were replaced by production of the new strains, their competitive position would be quite serious for California and South African oranges.

The Piracicaba produces, on an average, about 95 percent of exportable fruit as against 50 percent or less for the Bahia Navel. Furthermore, it ripens about 2 weeks earlier than the Washington Navel.



Figure 8.—The Bahianinha (small Navel).

The Pera is a good producer, ripens after the Navel, and corresponds to the Valencia. It has a thin skin and high juice content, but the juice is rather thin and watery. This variety is very sweet. It is well liked in Europe as well as in Argentina, to which country it is shipped in large quantities. It has a long shipping season, and for the country as a whole is considered to be the most valuable variety.

Among the varieties introduced from the United States, the Pineapple is considered the most valuable, followed by the Hamlin. The Pineapple variety has adapted itself to Brazilian conditions and has been well received on export markets. It bears heavily and produces fruit of medium size, averaging 200's. It ripens at the same time as the Navel and ships well. The fruit is firm, resistant to disease, thin-skinned, and well-colored. Its popularity is increasing, and it is predicted that plantings will show a considerable increase in the near future. The Hamlin matures from 10 to 15 days ahead of the Bahia. It should be shipped early, however, as its resistance is reduced if it is allowed to remain too long on the tree. It produces fruit somewhat larger than the Pineapple, averaging 176 in size. The Pineapple and Hamlin varieties do quite well in São Paulo, especially the former. They are annual bearers and produce an average of 5 boxes a tree on 5-year-old trees.

The Blood orange, a descendant of the Murcia Blood, was introduced into Brazil about 20 years ago, but because of climatic conditions the color has disappeared. The eating quality of the fruit, however, is said to be unimpaired. It produces heavy crops of good-quality fruit.

Other varieties grown and recommended for Brazil are listed below.

Early Ripening Oranges

Lima.—A popular variety preferred for children and invalids because of its lack of acidity. It can be harvested while the skin is still green.

Barão.—A good bearer, with a thin skin of good color. It also has very little acid.

Sabará.—A very productive variety. When fully ripe it has a flavor something like that of a peach. The fruit is small and rather flat and has a reddish pulp.

Bahia Cabúla.—Considered the most desirable type. The fruit is large with prominent navel, seedless, and of good quality. It bears irregularly.

Select Red (Selêta Vermelha).—A very good variety for this type of orange. It is very productive. The fruit is flat and has a reddish pulp. The juice is sweet and agreeable.

Midseason Ripening Oranges

Pineapple (Abacaxi).—One of the best varieties introduced from the United States. It bears good crops of uniform, medium-sized fruit. It is considered a good variety under Brazilian conditions and is highly recommended.

Pêla de Moca.—Bears irregularly and in bunches. The skin is smooth and thin. It is sweet, with little acid.

Country (Campista).—Vigorous and productive. The fruit is oblong in shape and of good flavor.

Imperial.—Productive and of good quality and flavor. The skin has a characteristic greenish-yellow stripe.

Coconut (Coco).—Quite a popular variety. The fruit is small and sweet, has little acid, and is noted for the length of time it remains on the tree.

Late Ripening Oranges

Select White (Selêta Branca).—Rather flat, thick-skinned, juicy, and very sweet. As indicated by the name, the juice is very light in color.

Serra d'Água.—Rather flat. The flavor is considered very good. The juice is very sweet.

Natal Pear (Pera Natal).—Similar to the Pera but remains on the tree longer.

Valencia Late.—The Valencia Late is of no commercial importance as yet; but the trees that have recently come into production indicate that the variety has considerable promise. The fruit is firm and of good quality and conforms to the size requirement of the export market. It holds well on the tree and bears good crops.

Cravo.—Well-known and in good demand on the domestic market. The fruit is large and has a thick, loose skin and good flavor. It is at its best during May and June.

Late Cravo.—Similar to the Cravo, but later.

Oranges are produced in all parts of Brazil, from the States of Pará and Maranhão in the north to Rio Grande do Sul in the south and from Amazonas and Mato Grosso in the west to Rio Grande do Norte, Pernambuco, Bahia, Rio de Janeiro, and São Paulo in the east. Commercial development, however, has been restricted to the States of Rio de Janeiro, São Paulo, Minas Geraes, and Bahia, with the heaviest production concentrated in Rio de Janeiro and São Paulo (table 5).

Production of oranges in Brazil shows a substantial increase during the past two decades, rising from 2,000,000 boxes in 1921 to over 35 million in 1939. For the 5-year period 1934-38 there was an average increase of more than 9 million boxes over the 3-year average of 1931-33. Practically all of this increase has taken place in São Paulo, Rio de Janeiro, and Minas Geraes. Production in other States has remained fairly constant.

TABLE 5.-Production of oranges in Brazil, by States, 1931-39¹

| STATE | AVERAGE 1931-33 | 1934 | 1935 | 1936 | 1937 | 1938 | 1939 | AVERAGE 1934-38 |
|-------------------------|--------------------|---------|---------|---------|---------|---------|---------------------|--------------------|
| | : 1,000 | : 1,000 | : 1,000 | : 1,000 | : 1,000 | : 1,000 | : 1,000 | : 1,000 |
| | : boxes | : boxes | : boxes | : boxes | : boxes | : boxes | : boxes | : boxes |
| São Paulo | 12,208 | 15,398 | 14,360 | 13,301 | 15,000 | 14,500 | (2) | 14,512 |
| Rio de Janeiro | 7,011 | 9,745 | 10,000 | 10,200 | 9,891 | 9,000 | 10,820 | 9,767 |
| Minas Geraes | 262 | 335 | 539 | 3,964 | 4,375 | 4,000 | 4,972 | 2,642 |
| Rio Grande do Sul | (3) | 2,026 | 3,326 | 2,369 | 2,171 | 2,300 | 2,955 | 2,439 |
| Santa Catharina | 1,420 | 2,077 | 2,123 | 2,000 | 2,100 | 2,100 | 1,875 | 2,080 |
| Others | 3,970 | 3,333 | 2,405 | 3,055 | 3,445 | 3,460 | ² 15,039 | 3,139 |
| Total | 24,871 | 32,914 | 32,753 | 34,889 | 36,982 | 35,360 | 35,661 | 34,578 |

¹ In boxes of 70 pounds.

² "Others" largely São Paulo.

³ Included in "others."

TABLE 6.-Exports of oranges from Brazil, by countries of destination, 1935-39¹

| COUNTRY | 1935 | 1936 | 1937 | 1938 | 1939 |
|-------------------|-----------|-----------|-----------|-----------|-----------|
| | : Boxes | : Boxes | : Boxes | : Boxes | : Boxes |
| England | 1,573,988 | 1,870,960 | 2,538,547 | 2,338,919 | 2,049,067 |
| Argentina | 444,919 | 611,062 | 1,154,403 | 1,204,919 | 2,006,377 |
| Netherlands | 125,047 | 322,534 | 375,599 | 528,489 | 575,795 |
| Belgium | 90,566 | 140,760 | 279,015 | 536,588 | 468,048 |
| Germany | 16,680 | 49,622 | 163,150 | 621,428 | 271,893 |
| Sweden | 71,414 | 18,354 | 79,645 | 49,451 | 88,267 |
| France | 302,340 | 200,330 | 260,923 | 126,915 | 74,646 |
| Canada | 3,248 | - | 93,113 | 25,301 | 47,959 |
| Finland | 255 | 447 | 6,258 | 900 | 11,179 |
| Denmark | 50 | - | - | 500 | 10,804 |
| Norway | - | - | 14,724 | 20,023 | 9,900 |
| Others | 11,915 | 2,643 | 5,481 | 31,612 | 18,008 |
| Total | 2,640,420 | 3,216,712 | 4,970,858 | 5,487,043 | 5,631,943 |

¹ In boxes of 70 pounds.

Official statistics.

TABLE 7.-Production and exports of oranges from Brazil, 1921-40¹

| YEAR | PRODUCTION ² | EXPORTS | YEAR | PRODUCTION ² | EXPORTS |
|------------|-------------------------|---------|------------|-------------------------|-----------|
| | : Boxes | : Boxes | | : Boxes | : Boxes |
| 1921 | 2,000,000 | 99,190 | 1931 | 20,000,000 | 2,054,302 |
| 1922 | 2,500,000 | 202,203 | 1932 | 25,000,000 | 1,930,138 |
| 1923 | 3,000,000 | 375,774 | 1933 | 29,612,910 | 2,554,258 |
| 1924 | 3,500,000 | 415,162 | 1934 | 32,913,600 | 2,631,827 |
| 1925 | 4,000,000 | 461,768 | 1935 | 32,753,100 | 2,640,420 |
| 1926 | 4,500,000 | 218,848 | 1936 | 34,888,650 | 3,216,712 |
| 1927 | 5,000,000 | 367,735 | 1937 | 36,982,170 | 4,970,858 |
| 1928 | 8,000,000 | 560,908 | 1938 | 35,359,600 | 5,487,043 |
| 1929 | 11,000,000 | 943,351 | 1939 | 35,660,570 | 5,631,943 |
| 1930 | 12,000,000 | 812,207 | 1940 | 35,000,000 | 2,857,791 |

¹ In boxes of 70 pounds.

² Production figures shown from 1921 to 1932 are estimates.

³ Estimated.

⁴ 2,000,000 to Argentina, 768,000 to Great Britain.

Brazilian Ministry of Agriculture, Department of Statistics.

Exports are confined almost entirely to the ports of Santos and Rio de Janeiro, which are close to the heavy producing centers. Rio de Janeiro is the most important port of export, with average shipments of more than 3 million boxes for the 3 years 1937, 1938, and 1939. Santos shipped more than 1¼ million boxes during 1937 and 1938

and over 2½ million in 1939. Of a total export movement of 5,631,943 boxes in 1939, Santos and Rio de Janeiro contributed 5,596,495 boxes. Though production in other States is substantial, the fruit is consumed locally.

European and Argentine markets are the principal outlets for Brazilian exports. Europe figures more heavily in Navels, whereas Argentina is more interested in Peras, which are shipped from Rio de Janeiro later than the São Paulo Navel crop. Exports to the Netherlands and Belgium showed consistent gains during the 5 years before the war.

Brazilian oranges have become increasingly important in European markets and are therefore of interest to American shippers, especially those of California, since they are sold in competition with California oranges during the summer months.

TABLE 8.—Exports of oranges from Brazil, by months, 1935-39¹

| MONTH | 1935 | 1936 | 1937 | 1938 | 1939 |
|-----------------|-----------|-----------|-----------|-----------|-----------|
| | Boxes | Boxes | Boxes | Boxes | Boxes |
| January | 4,496 | - | 5,228 | 67,631 | 11,906 |
| February | - | - | 10,276 | - | - |
| March | - | 5,467 | 484 | 13,150 | 97,291 |
| April | 112,263 | 245,570 | 226,865 | 544,857 | 888,706 |
| May | 374,593 | 529,549 | 726,931 | 812,584 | 1,001,094 |
| June | 418,369 | 281,057 | 700,423 | 551,491 | 208,435 |
| July | 378,141 | 235,463 | 474,239 | 389,283 | 395,679 |
| August | 303,863 | 393,622 | 536,464 | 365,047 | 566,256 |
| September | 319,339 | 457,369 | 528,169 | 680,599 | 618,577 |
| October | 403,813 | 612,875 | 738,857 | 1,030,297 | 798,393 |
| November | 252,616 | 316,529 | 660,529 | 804,125 | 764,682 |
| December | 72,927 | 139,211 | 362,613 | 227,979 | 280,924 |
| Total | 2,640,420 | 3,216,712 | 4,970,858 | 5,487,043 | 5,631,943 |

¹ In boxes of 70 pounds.

Brazilian Ministry of Agriculture, Department of Statistics.

Grapefruit

No separate statistics are available for the production of grapefruit, but the cultivation of this fruit has increased rapidly during recent years. Since the domestic demand is very limited and consumption negligible, nearly all of the production is for export, principally to Europe. The present European situation, however, has brought about a very serious condition for the grapefruit grower. Argentina is no better as a market for grapefruit than Brazil; consequently, with the European outlet eliminated, there is no place for the grower to turn. The 1940 crop for the most part was unharvested.

TABLE 9.—Exports of grapefruit from Brazil, by country of destination, 1932-38

| COUNTRY | 1932 | 1933 | 1934 | 1935 | 1936 | 1937 | 1938 |
|----------------------|--------|-------|--------|--------|--------|---------------------|---------|
| | Boxes | Boxes | Boxes | Boxes | Boxes | Boxes | Boxes |
| United Kingdom | 22,000 | 6,000 | 36,000 | 60,000 | 73,000 | 228,000 | 167,000 |
| Belgium | - | - | - | 1,000 | 2,000 | 11,000 | 10,000 |
| Netherlands | (1) | - | (1) | 1,000 | 1,000 | 3,000 | 6,000 |
| Others | - | - | - | - | - | ² 19,000 | 1,000 |
| Total | 22,000 | 6,000 | 36,000 | 62,000 | 76,000 | 259,000 | 184,000 |

¹ Less than 500 boxes.

² Canada 7,000, France 7,000.

Grapefruit varieties are much the same as those produced in the United States. Marsh Seedless is the only variety recommended for commercial planting. It is produced chiefly for the export trade. The tree is a vigorous grower and heavy producer. The fruit is of good size and has a smooth skin, but it is somewhat lighter in weight than the Florida Marsh. Triumph, Duncan, and McCarty are also planted to some extent, and all seem to do well, as far as production is concerned. Foster is being planted more extensively.

The grapefruit exporting season runs from early April to early July. Most of the Brazilian exports are shipped through the port of Santos.

Lemons

Brazil ranks fourth in the world production of lemons. Soil and climate are favorable to the cultivation of this crop, but no attempt has been made to standardize varieties or to develop an export trade. The decrease in the production of Verdelli lemons in Italy has stimulated a certain amount of interest in the production of lemons for the European market. Villa Franca, Eureka, and Lisbon have all been adapted to Brazilian conditions. They are productive and are recommended for commercial planting.

Lemon production in Brazil is still in its infancy, but it is believed that this fruit has great possibilities from an industrial standpoint.

The estimated total production approximates 1,740,473 boxes, but exports average only 9,575 boxes. About one-third of the total production is concentrated in the State of São Paulo.

TABLE 10.—Estimated production of lemons in principal countries, 1935-39

| COUNTRY | 1935 | 1936 | 1937 | 1938 | 1939 |
|---------------------|--------|--------|--------|--------|--------|
| | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| | boxes | boxes | boxes | boxes | boxes |
| United States | 10,747 | 7,787 | 7,579 | 9,380 | 11,106 |
| Italy | 11,155 | 10,253 | 8,248 | 8,663 | 11,328 |
| Spain | 1,582 | 1,481 | 1,474 | (1) | (1) |
| Brazil | 750 | 1,000 | 1,600 | 1,800 | (1) |
| Others | 1,507 | 2,394 | 1,630 | 3,000 | 4,943 |
| Total | 25,741 | 22,915 | 20,531 | 22,823 | 27,377 |

¹ Unavailable.

Compiled from official sources.

TABLE 11.—Exports of lemons from specified countries, 1937-40

| COUNTRY | YEAR ENDING OCTOBER 31 | | | |
|-----------------------|------------------------|-------|-------|-------|
| | 1937 | 1938 | 1939 | 1940 |
| | 1,000 | 1,000 | 1,000 | 1,000 |
| | boxes | boxes | boxes | boxes |
| United States | 256 | 720 | 831 | 470 |
| Italy | 5,986 | 6,023 | - | (3) |
| Spain | - | - | 455 | (3) |
| Syria | 233 | 270 | - | (3) |
| Palestine | 81 | 110 | 132 | (3) |
| Union of South Africa | 40 | 38 | 42 | (3) |
| Cyprus | 42 | 45 | 50 | (3) |

¹ Calendar year.

² April-December.

³ Not available.



FIGURE 9.—A characteristic planting consisting of a mixture of citrus and other subtropical plants.

CULTURAL PRACTICES OF THE CITRUS INDUSTRY

The cultural practices of the Brazilian Citrus industry can be summed up in a very few words. Brazil, as previously indicated, is blessed with many natural advantages. Soil and climate for the most part are favorable to the growing of crops. In fact, vegetation of all kinds makes a luxuriant growth without any special assistance. In reply to the question as to what cultural methods are employed, the usual answer is "God's methods." This statement is significant and covers the situation quite adequately. Citrus growing has not developed into the highly scientific business known in the United States. Its commercial value is readily recognized and its potential possibilities undisputed. The fact remains, however, that the fruit growing generally consists of planting the trees, keeping the upper hand on the ever-encroaching undergrowth, and harvesting and shipping the fruit. The cultural practices on many places visited by the writer compared favorably with those on some of the better cultivated California and Florida groves. In general, however, it can be accurately stated that the tendency of the growers is to produce the most possible with the least effort or expenditure.

Cultural practices in the State of São Paulo are the most advanced. In the region of Limeira many groves are well looked after and compare favorably in general appearance and productivity with good Florida groves. Since the average rainfall in the central district is from 50 to 60 inches a year, irrigation is not required. It is therefore difficult to compare Brazilian citrus growing with that in the United States Southwest, where production is largely impossible without irrigation.

Many citrus groves in the São Paulo area, particularly those around Campinas, Limeira, and Piracicaba, bear a closer resemblance to groves of similar size in the Orlando-Winter Haven districts of Florida. These groves are well maintained and present a neat, orderly appearance.



FIGURE 10.—An excellent Navel orange grove in the State of São Paulo, near Limeira.

Other groves, however, clearly indicate that a minimum of labor and money is expended in maintaining them. In the Sorocaba district most of the growers simply set out the trees and depend upon nature to do the rest. Heavy soil exploitation is evident throughout this region. Intensive intercropping of clean-cultivated crops is the general rule. The trees, in consequence, are stunted and undernourished. They bear young and have a short life. Production costs in this area are low, as little money is spent in the way of sprays, fertilizers, and cover crops. Laborers keep the brush down and cultivate the intercrops, such as onions and cotton, but otherwise the trees receive no consideration. A large percentage of the growers in the Sorocaba area are Spaniards, who are said to be very conservative in spending money or taking advice on cultural practices.

In the Rio de Janeiro and Minas Geraes districts advanced cultural practices are almost unknown. In the first place, a large part of the acreage planted is not suitable for cultivation. Much of it is so steep that cultivation is next to impossible. Clean tillage would certainly cause heavy washing. Where clean cultivation has been attempted under these conditions deep gullies have been formed and a large part of the surface soil has been removed. In a few isolated instances some terracing has been attempted, but this is by no means a general practice. Terracing is being recommended by experimental workers, but very few growers have either the will or the money to carry it out.



FIGURE 11.—Cultivation of steep hillsides results in serious erosion.
Note washing in the right-hand side of picture.



FIGURE 12.—Terracing in the Campinas district, São Paulo.

Where the land is less steep, some cultivation is attempted during the year. There is no uniform system of cultivation, however, much depending upon the financial condition and the will of the individual grower. A grower may practice clean cultivation during the winter months (the dry season) and during the summer months (the rainy season) cultivate once or twice. The summer rains produce a heavy crop of weeds and tall grasses, which are cut before harvest and disked under after the harvest is completed. Frequently little or nothing is done in the way of carrying out cultural practices of any kind. Sometimes it is difficult to recognize a grove at a distance because weeds and tall grasses have completely hidden the trees. A crew is then sent into the grove with scythes and tools that resemble corn knives or machetes to re-discover the trees and make ready for the harvest.

Insect-Pest and Disease Control

The insect pests most common to Brazil are scale insects, fruitflies, and rust mite. Many of the older groves visited were badly infested with scale, as was clearly indicated by the general health and vigor of the tree. The seriousness of scale is recognized, but no concerted efforts have been made to check or control it. Those who do spray are handicapped by those who do not.

Fruitflies, including the Mediterranean fruitfly in addition to several South American species, are the most serious pests of the country. They not only cause considerable loss of fruit but also curtail the market.

No producing area in Brazil is free of fruitflies. Some districts suffer more than others, but the pests present a problem to all growers. In the São Paulo area, the planting of late varieties has been rendered unprofitable because of fly infestation, which is the principal reason for growing Navels. The fruitfly prefers the coffee berry to citrus. The larvae feed on the inside of the hull that surrounds the coffee beans. As long as the coffee berries are about, the larvae feed on them, but when the coffee harvest is over the flies immediately attack citrus and other fruits. Nearby coffee plantations are therefore considered an asset, although they serve as a breeding ground for flies and a permanent source of infestation. Parasites, natural enemies of the fruitfly, have been introduced and are being distributed.

The rust mite, which accounts for considerable damage, largely by reducing the exportable volume of fruit, is easily controlled by spraying. However, since spraying is not usually practiced, the rust mite is a pest of economic importance.

Other insects, such as leafhoppers, ants, and beetles, are common throughout Brazil but are more or less controlled and are not regarded as economically important.

Among diseases, the various molds, scab, melanosis, leprosis, and stem-end rot are considered the most important. Root rot is also of importance but is pretty well taken care of through the use of proper rootstock.

Through a wider adoption of spraying and sanitary practices much of the present injury could be reduced, but growers are either satisfied with present returns or do not care to incur additional expense. The heaviest damage occurs in the older plantings, and many growers hold the view that it is cheaper to establish new groves than to adopt adequate control measures in an effort to preserve the old trees.

Some few growers follow a rather complete spray schedule, but most growers spray as little as possible. One large grower in a rather isolated district visited by the writer does not consider spraying essential. Though he has the proper equipment for spraying, he claims that the quality of his fruit was worse in the years when he sprayed than in those when he did not.

Fumigation is practiced by only a few growers. It is an expensive operation, and the great majority of growers are not inclined to go to the trouble and expense. Furthermore, fumigation would be extremely difficult if not impossible to carry out on a large part of the acreage planted.

Rootstock Selection

The need for the selection of suitable rootstock is clearly recognized by Brazilian growers, though their experience has not been as disastrous as that of the growers in the Corrientes-Misiones section of Argentina. The mistake of using the wrong stock was realized before it was too late and measures were adopted in time to forestall any major disaster.

Original Navel trees in the São Paulo region were budded on sweet orange; and, while the union appeared to be satisfactory, it was discovered that a short-lived tree was the result. Some 10 or 12 years ago Seville bitter orange seeds were imported from Spain and planted to serve as foundation stock upon which to propagate young trees. Navels budded on bitter orange live up to 30 years, whereas those budded on sweet orange are said to die out within 15 years because of being susceptible to root rot. Though some orange is being used exclusively by nurserymen in budding trees for average soil conditions, rough lemon is used when the trees are to be planted on sandy soil. In the Rio de Janeiro-Minas Geraes area, Peras are worked on lime and rough lemon root.

Nurseries

Brazil has sufficient nurseries to take care of all immediate future requirements. In São Paulo one of the largest and best-managed nurseries has a production capacity of about a million trees. This firm has introduced many plants and trees from the United States and other countries and propagated them as rapidly as the demand justified. Their growing, packing, and shipping facilities are as good as any to be found anywhere. This firm produces especially fine trees and strives for quality as well as quantity.

Many growers, however, sacrifice quality for price and set out second-grade trees, which they get at a much reduced price. These same growers are those who do not fertilize or spray but who practice intensive intercropping and exploit the soil to its fullest extent. The use of second-quality trees is especially in evidence in the Rio de Janeiro area. The best young planting stock was observed in the Limeira district. The price of orange trees varies according to size and quality, but the average is 3 milreis (roughly 17 cents).

Planting Distances

Close planting seems to be a South American practice, common to practically all areas visited. Actual planting distances vary considerably from recommended

distances. Trees in the older plantings are especially close together. In the orchards visited, the distance between trees ranged all the way from 13 to 30 feet. In São Paulo old plantings average 20 to 23 feet and newer plantings 26 or even 30 feet. In the Sorocaba district the average planting distance was about 20, but in a number of orchards trees were spaced but 13 feet apart. In the Rio de Janeiro area planting distances also vary considerably according to the location and the views of the individual; the average is 20 to 23 feet apart.

Close planting may be justified in some places, but on the whole growers have learned that wider spacing is essential under average conditions. The red soils are quite fertile and are capable of producing strong vigorous trees. When given half a chance the trees soon outgrow the space allotted them and create problems that are not easily solved. Sometimes growers want early production, which is encouraged by close planting. In many groves trees begin to bear some fruit in their third or fourth year. Production increases up to about the tenth year, when there is a decline and the trees begin to die out. Intensive cultivation of intercrops between closely spaced trees also hastens early bearing but results in a very short-lived grove.

Cover Crops, Intercrops, and Fertilizers

When cover crops, other than natural weeds and grass, are used, they usually consist of such legumes as cowpeas, soybeans, and velvetbeans. One of the best cover crops observed is a plant called mata matto (killweed). It makes a beautiful thick cover, is rather low growing, and gives the appearance of a thick-piled velvet carpet. Cover crops are usually planted in September and October and disked under the following May or June.



FIGURE 13.—A cover crop of mata matto (killweed) in the Campinas district, São Paulo.



FIGURE 14.—Cotton used as an intercrop between young orange trees, a practice of growing importance in São Paulo.



FIGURE 15.—Cotton interplanted with oranges in a grove of full-grown trees.

Where the topography of the land permits, what cultivating is done is carried out in connection with intercrops and not for the benefit of the trees. In São Paulo the nature of the intercrop produced depends considerably upon the district. In the

Limeira-Campinas area cotton is used extensively, especially in young groves. Growers claim that citrus groves can be brought into bearing at no cost by planting cotton as an intercrop. In addition to cotton, mandioca and corn are commonly used intercrops. In this area intercropping is practiced largely in connection with newly established groves; but in many places cotton and corn and sometimes mandioca are found growing in old producing groves.

In the Sorocaba district onions are used almost entirely as an intercrop, in both bearing and non-bearing orchards. The soil is loose and rather coarse in texture, resembling small shot, and is apparently well adapted to this crop. The growers, in fact, are more interested in producing onions than in producing citrus, as is clearly indicated by the appearance of the trees. In this particular location the citrus industry seems to be declining, and it is believed that the area now planted to trees will develop into an important onion-producing center.



FIGURE 16.—Turkeys are fed on the cover crop in this full-grown orange grove.

In the Rio de Janeiro-Minas Geraes area, intercropping is much the same as in the other districts; corn, cotton, and mandioca are the principal crops produced.

Commercial fertilizers are used rather sparingly, most growers depending upon green manure crops for what additional fertility is needed. The soil is deficient in phosphorous, and application is usually made on the basis of a kilogram (2.2 pounds) a tree. Most growers depend upon legumes as the chief source of nitrogen, but when they apply commercial fertilizer they rely largely upon bone meal. Some soils are deficient in potash. One large grower visited used a complete fertilizer at the rate of about 5 pounds a tree for large bearing trees. No two growers use the same formulas or the same treatment; in fact, the percentage of growers using fertilizers of any kind on a scientific basis is very small.

Application of fertilizer is usually made at the beginning of the rainy season, September or October.

Pruning

Very little attention is paid to pruning except to remove dead wood and make the trees appear a bit symmetrical. The questions of crotch formations, spacing of

branches, and the general mechanical aspects of pruning are ignored entirely. Some trees are headed very low, others about average. Some orchards are well trained; others are not trained at all. Pruning costs money, involves additional work, and is not considered essential as far as tree performance is concerned.

DISPOSAL OF CITRUS CROP

Yields and Harvesting

It is difficult to arrive at a representative average figure for per-tree or per-acre yield. Production varies considerably and depends largely upon the individual grower and the amount of care his grove receives. In well-kept groves production runs as high as 12 to 15 boxes a tree; in other groves trees of the same age produce an average of from 1 to 3 boxes. In a large majority of groves 5- and 6-year-old trees average from 1 to 2 boxes. In the eighth year production generally increases to about 3 boxes and in the tenth year begins to decline and the trees to die out. In well-kept groves trees in their seventh and eighth year produce, on an average, 3 to 4 boxes a tree, increasing up to 5 or 6 boxes at the age of 10 to 15 years.

Trees on steep hillsides or on thin gravelly soil will not average more than 1 box a tree. For the Sorocaba district, for instance, the average is less than one-half box a tree, tree run. Over 50 percent of the fruit is thrown out because it is oversized or of poor quality so that the average yield of export fruit is reduced to one-tenth to one-fifth box. Yields could generally be increased considerably by giving the trees just a little additional care, but apparently the need for greater productivity has not made itself felt.

The Brazilian harvesting season begins in April and ends in November. In the State of São Paulo a few early varieties, which are relatively unimportant in relation to the main crops, are ready in March. Navel oranges account for about 68 percent of the total São Paulo orange crop and Peras for 22 percent. The Pera harvest begins in July and ends in September. The export movement, which represents the commercial part of the crop, does not get under way until April and for all practical purposes is completed by July.

The Navel season for Rio de Janeiro, which in relation to the Pera season is comparatively unimportant, also begins in April and ends in June. The peak movement occurs during May. The harvest of Peras, which represent the bulk of the crop, extends from June through October. While shipments during June are quite heavy, the peak movement is in July and August.

For the country as a whole, heavy shipments are made during the months of April through November. On an average, considerably lighter shipments are made in July and August than in the other months. Some shipments occur throughout the year, but from December through March they are from storage stocks.

Harvesting methods are similar to those employed in other citrus-producing areas. The fruit is clipped from the stem and placed in field boxes and then transported to the packing house. Sometimes it is picked, piled under the trees, and later placed in boxes and delivered to the packing house. The fruit is so common and so cheap that no particular effort is made to handle it as carefully as it should be handled.

Packing, Storing, and Marketing

The part of the crop that is exported is packed in packing houses, conveniently located near the centers of production. In some localities there are as many as 25 or 30 houses operating. In others but 1 or 2 are necessary to serve the needs of the district. At Limeira, for instance, about 25 houses are at work in a normal shipping season. In the 1940 season, however, as a result of the loss of export markets, only 7 or 8 were operating.

Some of the packing houses in Brazil are run on a cooperative basis, others by private operators, and many by the firms that handle sales. Large exporting firms have a number of houses located in the various producing areas. There is a sufficient number of packing houses to take care of immediate needs. Should the curtailment of export markets continue, the industry will have far more houses than are required. The capacity of the houses varies considerably, ranging from an output of 300 or 400 boxes a day to 8,000 boxes. Many of them, however, average one or two carloads (500 boxes each) a day.

Packing houses, as a rule, are located along the railway where the fruit can be loaded direct from packing house to car. In some places, however, the houses are located some distance from the tracks and the packed fruit is carried by motor trucks from the packing house to the railway siding. For the most part the houses are well constructed and well equipped with modern packing machinery and accessories, which have been purchased in the United States.

The lack of precooling and cold-storage facilities is one of the outstanding problems confronting the Brazilian citrus industry, in view of the development of their export program. The need for such plants has been recognized for some years, and various plans and suggestions have been proposed from time to time, but with little result. The construction of a precooling plant at Santos has been especially recommended, and certain interests have been pressing for immediate action. The authorities, however, are cogitating over the matter and postponing actual construction.

Brazil has had an uphill battle in developing remunerative markets abroad. Though the volume exported has been increasing steadily from year to year, Brazilian oranges on European markets have suffered many heavy financial losses. A large part of these losses might have been prevented if cold-storage facilities had been available in Brazil.

There are no cold-storage or precooling plants at shipping points, and as the fruit is packed it is loaded into freight cars of various descriptions. During the height of the orange-shipping season there is usually a shortage of ventilated cars and fruit must be loaded into tight boxcars. The ventilated cars reduce the temperature of the fruit between shipping and loading points to a certain extent, but not sufficiently to have any significant effect upon the carrying quality of the fruit. Fruit shipped in tight cars arrives at the port of export showing excessive heat and already with much of its life gone before it is loaded.

The type of vessels used in carrying fruit is not always of the latest construction; in fact, many of the ships contain large refrigerated holds incapable of giving maximum refrigeration. Fruit that is loaded hot stands little chance of arriving at a distant port in prime condition; frequently it is fortunate if it lands in salable condition.

In the first place, ship refrigeration is not intended to reduce temperature but to maintain it. If fruit is loaded with the orchard and field heat previously removed, the average ship is capable of maintaining this reduced temperature with fair uniformity; but when a chamber is loaded with fruit having a temperature of 75° to 80° F., a period of as much as 2 weeks may elapse before the temperature has been reduced to a point where ripening has been arrested or the development of molds and rots slowed down.

Steamship companies operating out of Brazil require the shipper to have his fruit on the quay 24 hours prior to the arrival of the steamer. The fruit frequently arrives even earlier than the time specified, and the ship is often late in arriving. The result is that fruit often stands around in the hot sun for several days waiting to be loaded. Brazilian ports, especially Santos and Rio de Janeiro, are under no conditions good ports in which to handle perishables. The tropical climate greatly accelerates ripening and makes prompt handling and speedy dispatch primary requisites.

Brazilian ports are also characterized at times by infrequency and irregularity of sailings. Sometimes more than an adequate number of ships are available; at others there is a shortage. A precooling or cold-storage plant at the port of export would provide a more even and dependable flow of fruit and would eliminate the danger of dead freight. Much of the disaster that has been experienced in shipping fruit to Europe could have been avoided by providing the necessary facilities at the port of origin. Brazilian fruit is transported largely by English steamship lines, which operate a regular service between England and South American ports. This service is primarily for the meat trade, an important item of commerce between the two continents. These meat-carrying vessels have not proved satisfactory as fruit carriers, not only because of their construction, but because of their limited ports of call. Though some of the ships operating between South America and England discharge at Liverpool and occasionally at Southampton, approximately 70 percent discharge at London. This is a disadvantage to Brazilian shippers, as it does not offer them a very wide field of distribution.

Unlike those in Argentina, very few handlers of fruit in Brazil have a financial interest in the groves themselves. Occasionally they have an investment in the growing crop, but ordinarily they do not purchase until harvesttime or until the crop is packed. A large number of people engage in the handling of the crop. Most of them are local exporters, but some represent firms or overseas markets and others come over personally from Europe to make purchases and solicit consignments.

The financing of a large part of the crop that moves into export channels is done by importing firms located in the various overseas markets. Sometimes financing begins with the harvesting of the crop. Growers who are short of capital receive advances for packing material, labor for harvesting, packing, etc. Others are able to finance their operations up to the port of export but from there on are dependent upon outside financial assistance.

Very few growers in Brazil are in a position to finance their exports; consequently the marketing of the crop is badly disorganized and shippers are largely dependent upon the integrity of the receiver and the fortunes of the market. Those who consign outright are in a more advantageous position than those who receive cash advances, since there is a difference in the consolidated handling and selling charges.

These charges are the same as those on shipments originating from any other country under like conditions.

The packers, who are usually also shippers, generally buy the fruit from the growers at an agreed-upon price per box on the tree. In São Paulo practically all the fruit is sold on the tree, and in the State of Rio de Janeiro it is sold on the basis of the field box. Sometimes the buyer does the picking, but in general the fruit is picked and delivered to the packing house by the grower. The price paid varies according to variety, quality of crop, and season. The season has an important bearing upon price. The Navel under average conditions has a biennial-bearing habit. In full-crop years it produces good-quality fruit, but in the off season, or small-crop year, the fruit has little commercial value. When a small crop is produced, the fruit is very large and coarse and thus unfit for exportation. Under these conditions packers pay about 2 milreis a tree.

In purchasing unpacked fruit the buyer must take into consideration the percentage of oversized fruit, which usually packs out about 50 percent. After it has been through the washer and over the grading machine, this oversized fruit has a sales value of but 1 milreis (about 6 cents) a field box. When purchasing a crop on the tree, that is, estimating the yield and quality of the fruit and paying so much for the orchard, the buyer takes into account the percentage of oversized fruit, for which there is a limited sale. In a purchase of this kind the buyer pays all harvesting costs, such as picking, cartage, and packing.

In some instances a buyer is willing to pay more for fruit on the tree, provided he has the privilege of selecting the sizes; that is, he is not obligated to take anything larger than a specified size. Many buyers object to purchasing Navels because of their large sizes. The general specifications call for a maximum not to exceed 25 percent of 126's. Since most of the Navels are exported, buyers try to obtain the preferred sizes, which in the United Kingdom are 176's to 252's. Navels never run smaller than 288.

The Bahianinha strains are popular with buyers, especially those who export to Europe, because they average 90 to 95 percent of exportable sizes. Furthermore, they ripen about 2 weeks earlier than the ordinary Bahia (Washington Navel). The volume of Bahianinhas is small and consequently in great demand. These new strains so far have been averaging 10 milreis a field box as against 2 milreis for the ordinary Navel. In 1940, however, buyers were paying but 5 milreis as a result of the limited export demand.

Exporters buy both direct from the grower and from packers. Those exporters who reside permanently in the country make a practice of lining up their requirements in advance of the harvesting season, much the same as buyers do in the deciduous fruit-growing areas of the United States. Representatives of European firms who reside in the country only during the shipping season usually secure their requirements from the packing houses or through local shippers. A substantial part of export sales are made on an f.o.b. basis.

Brazilian fruit is sold and handled along pretty much the same lines as North American fruit. In the European market the same firms that handle fruit from other parts of the world receive fruit from Brazil. Upon arrival it is sold in many markets through the usual sales agencies, namely auction brokers and private-treaty firms or commission brokers.

The Brazilian shippers do not maintain an overseas representative but rely upon the integrity of selected firms to protect their interests. Brazilian shippers are wrestling with the long-disputed question of auction versus private-treaty selling. At the moment, auction firms handle the greater part of the sales but certain Brazilians feel that better results could be obtained if offerings were more equally divided between the auction and private firms.

Brazilian shipments are not controlled and not very well distributed. Furthermore, the quality and condition of Brazilian fruit up to the present has not been such as to command a preference on the market over competitive offerings. Brazilian oranges because of their appearance have not been handled by the higher class English fruit shops. A volume movement was effected, however, through the barrow markets, which are common throughout the poorer districts of large European cities, especially in the United Kingdom. In these barrow or pushcart markets it was not uncommon prior to the war to see a large pile of Brazilian oranges with a few California oranges mixed in and a sign over the display reading "California oranges."

In an effort to improve the appearance of the fruit and thus help in the solution of the marketing problem, experiments are under way in the addition of color. In 1940 the necessary equipment was purchased and installed at two or three points in São Paulo. A representative of the equipment company was sent to instruct those interested in the mixing of the dye and treatment of the fruit. The natural pale color of Brazilian fruit lends itself to the color-added process. The contrast between treated and untreated fruit was very striking, and all those who made the comparison were very enthusiastic over the possibilities of the treatment.

Production Costs and Marketing Charges

The cost of production varies considerably with the district and the individual grower. They are generally kept very low by avoiding all practices not essential to the life of the tree itself. The maintenance of trees or the continued productivity of a grove is frequently not even considered. When trees die, through natural or other causes, they are removed and new trees set in their place. Sometimes even this is not done. When trees decline or go out of production, new plantings are established. Growing costs, for cultivation, spraying, fertilization, etc., are reduced to a minimum.

On an average, the cost of production is figured at about 2 milreis a box. Some growers figure a bit more, and others claim to be able to produce a box for 1 milreis or less. In São Paulo growers estimate that growing costs range from 2 to 4 milreis, depending upon variety, productivity of grove, etc. Production costs in this area are perhaps somewhat higher because of the better cultural methods employed. In the State of Rio de Janeiro 2 milreis is considered the average growing cost. In Minas Geraes it may be even less. In one orchard visited in Minas Geraes a 6-year-old grove in 1939 produced, on an average, $9\frac{1}{2}$ boxes a tree at a cost of 570 reis a box, or about 3 cents. The grove is located 11 miles from a packing house, and the total cost of growing, picking, and hauling to the packing house was figured at between 2 and 3 milreis. The total cost of bringing a tree to bearing age is estimated at about 15 milreis.

Itemized costs of harvesting and packing operations are unavailable. Approximate costs, however, seem to be fairly uniform throughout the various fruit-growing sections. Total harvesting and packing costs are estimated at about 4 milreis a box (23 cents). This includes transportation to the packing house, labor in packing, labeling, etc., taxes, rent, power, and all other miscellaneous and overhead charges incident to packing-house operations. The total cost of packages and packaging material, such as containers, wraps, nails, wire, and labels, is estimated at 4 milreis.



FIGURE 17.—Orchard scene in southern Minas Geraes.

Packers work on a daily-wage-plus-bonus basis. Prior to the passage of the minimum wage law, which went into effect during the summer of 1940, packers were paid at the rate of 5 milreis a day plus a bonus for each box packed, or a total daily wage of about 7 milreis, the equivalent of 40 cents. Packing costs on this basis work out at about 15 reis a box. Most of the packers are women and girls. Although they do not work rapidly, they do put up a good pack. In the São Paulo district a large percentage of the Navels run to large sizes. In packing size 126 the workers pack up to 70 boxes a day. The average daily pack, however, is 35 boxes.

Ordinary farm laborers engaged in picking, hauling, and invoicing around the packing house receive from 3 to 4 milreis a day. The question of increased pay, however, has brought up some rather interesting and difficult problems. According to certain growers, attempts have previously been made to increase wages in the hope of creating more incentive to work and of providing better living conditions for the laborers. The results, however, have been just the opposite of those desired. Laborers who were raised from $2\frac{1}{2}$ to 4 milreis a day saw no necessity in working 6 days a week when they were earning as much as they were used to in 4, consequently they took 2 or 3 holidays a week instead of the customary 1.

Fruit that is unsuited for export is sold on the local market at a price averaging from 5 to 6 milreis a box. This returns to the grower 3 or 4 milreis, from which he must deduct picking, cartage, and other costs. If he sells on the tree, he gets $1\frac{1}{2}$ to 2 milreis a box. The freight or cartage, however, costs 1 or 2 milreis. Since it costs practically nothing to produce fruit, these prices are generally considered satisfactory.

Fruit produced in Minas Geraes costs the grower slightly more laid down at the port because of the greater distance and the additional handlings involved. There is

also a tax of 100 reis a box on every package entering the Federal District if intended for export and a tax of 450 reis if intended for local sale. The average selling price of Minas fruit, f.o.b. ship, is therefore about 16 milreis a box (90 cents).

Freight rates play an important part in the marketing of fruit. Growers living close to large consuming centers have a distinct advantage over those who are far removed. California shippers competing on the European market with Spain and Palestine, for example, clearly recognize this disadvantage. While Spain and Palestine are close enough to the large European markets to permit the use of ordinary storage, Brazil, South Africa, and the United States must resort to refrigeration. Of the several regions exporting oranges to Europe, California pays the highest freight rate and Brazil the second.

TABLE 12.—Freight rates on oranges to London from various exporting countries, 1939

| COUNTRY AND PORT | DISTANCE | RATES FOR- | |
|---------------------------------------|--------------|----------------------|----------------------|
| | | ORDINARY STOWAGE | REFRIGERATION |
| | <i>Miles</i> | <i>Cents per box</i> | <i>Cents per box</i> |
| Brazil (Santos) | 5,377 | (1) | 70 |
| Brazil (Rio de Janeiro) .. | 5,177 | (1) | 70 |
| United States (California): | 8,060 | (1) | 85 |
| United States (New York) : | 3,478 | ² 50 | 80 |
| South Africa (Capetown) .. | 6,121 | (1) | 54 |
| Palestine (Jaffa) ³: | 3,419 | 23-29 | 43-50 |
| Spain (Valencia) ⁴: | 1,799 | 19-25 | (1) |

¹ Not used.

² Used occasionally on fast ships.

³ Rates vary according to ship.

⁴ 25-cent rate is for the Spanish half case, which weighs 120 pounds. The 19-cent rate applies to the standard box, which weighs about 80 pounds.

The South African rate of 2s. 8d. (54 cents) per box includes discharging at Southampton and rail haul from Southampton to London.

The Brazil rate of 3s. 6d. (70 cents) includes a 6d. rebate, which goes back to the shipper at the end of the season provided he has complied with his contract. Since most Brazilian exports are carried in British bottoms, British steamship companies are able more or less to control the rates. If Brazilian shippers use competitive lines, the British companies can withhold the rebate as a reprisal.

Brazilian fruit on European markets is subject to the same treatment as that afforded the fruit of other countries. In England oranges are subject to a duty of 3s. per hundredweight duty and grapefruit a 3s. 6d. per hundredweight duty during the period from April 1 to November 30. During the rest of the season, December 1 to March 31, both oranges and grapefruit pay an ad valorem duty of 10 percent. Since the bulk of the Brazilian citrus enters the English market during the summer months, it is subject to the high-duty rate. In addition, it meets heavy competition from South African oranges, which come in free of duty.

South Africa enjoys a tremendous advantage over Brazil and the United States from the standpoint of both duty and freight rates. Freight and duty on Brazilian oranges amount to approximately \$1.07 a box as against 54 cents a box on South African oranges. Freight and duty, however, on a box of California oranges amount to \$1.47 to \$1.57. South Africa enjoys an advantage over Brazil, but Brazil likewise enjoys a distinct advantage over California.

At the 1940 rate of exchange the cost of delivering a box of Brazilian oranges to England is between 11 and 12 shillings (\$2.20 to \$2.40). These charges are approximately as follows:

Harvesting and packing costs
Materials (box, wraps, etc.)
Inland freight
Port charges

Brazilian currency

4\$200
4\$200
1\$000
1\$800
11\$200

The above converted at 80\$000 to £1 =
Ocean freight, less 6d. rebate
Import duty
Handling charges and selling commission

British currency

2s. 9½d.
3s.
2s. 4d.
2s. 2d.
10s. 3½d.

The above total converted at \$4.02 to £1 =

United States currency
\$2.06

Average cost of fruit to grower = 2\$000 = 6d. = 10 cents
Average cost of fruit to exporter = 4\$000 = 1s. = 20 cents

Total cost to grower of fruit laid down in England 10s. 9½d. = \$2.17
Total cost to exporter of fruit laid down in England 11s. 3½d. = \$2.27

Byproducts

As in other surplus-producing countries, in Brazil the war has introduced many additional difficulties to an already complicated marketing problem. With world citrus supplies increasing more rapidly than consumption, the question of waste utilization has been uppermost in the minds of most surplus-producing districts. The production of Brazilian oranges rose from 2,200,000 boxes in 1921 to 35,661,000 boxes in 1939. During the same period exports rose from 99,000 boxes to 5,632,000. The outbreak of war created a serious dislocation of Brazil's export program, especially in the State of São Paulo, which catered principally to the European market.

While some thought had been given to processing the surplus fruit, which was increasing each year, no definite action was taken until 1940, when two large machines were purchased. One machine was purchased by the Government to be operated at Limeira, the other by private interests located at Taubaté. The plant at Taubaté began to operate during the 1940 season, but the one at Limeira was not installed because suitable housing accommodations were not yet available.

The installation of a juice plant at Leopoldina, in the State of Minas Geraes, is under consideration. The machines will be used for manufacturing juice concentrates, oil, and feed for livestock. The machines are of American manufacture and have a capacity of 2½ tons of oranges an hour.

Grapefruit even more than oranges need to be processed. Since there is no demand for grapefruit within the country itself, some measures must be adopted to salvage the crop. Present exports amount to but 250,000 to 300,000 boxes, and it is estimated that in São Paulo alone the number of trees planted is just under a million.

Citric acid in the past has been imported, largely from Germany. As a result of the loss of the export market for fresh fruit, Brazil will in the future no doubt manufacture a supply of citric acid sufficient to satisfy home requirements.

Exports and Export Regulations

The total production of citrus fruit for the 5-year period, 1934 to 1938, averaged 34,500,000 boxes a year, whereas exports over the same period averaged 3,790,000 boxes. Domestic markets therefore absorbed about 89 percent of the total crop. Emphasis, however, has been placed upon export markets during recent years. Prior to 1928 Brazil exported practically nothing, but since that time each year has shown a steady and consistent increase in the volume entering export channels. From 1932 to 1939 exports increased from 1,952,000 boxes to 5,632,000 boxes, or approximately 200 percent.

Brazil, like many other citrus-producing countries, finds itself largely dependent upon the European market as an outlet for the surplus production. It also regards England as its best customer among the various European nations. The European market is of far greater importance, however, to the State of São Paulo than it is to the States of Rio de Janeiro and Minas Geraes, which produce late oranges that are in demand in other South American countries, principally Argentina. In 1936, São Paulo exported a total of 1,290,967 boxes, of which 1,001,157 boxes went to England. In 1939, this State exported a total of 2,540,055 boxes, of which 1,409,264 boxes went to England. In 1940 exports were reduced to 832,924 boxes, 569,594, or 68.4 percent, of which went to England.

In the event of a general improvement along certain lines, in the absence of which Brazil's marketing problems will continue to be difficult of solution, the Brazilian fruit industry could not only expand materially but offer some extremely keen competition for countries shipping oranges to the European market during the summer months. The improvements required are (1) the shift to the production of the Bahianinha orange, (2) the commercial use of the color-added process, and (3) the provision of adequate precooling and refrigeration facilities.

In line with Brazil's export policy and in an effort to meet competition on world markets, various regulations for the control of citrus-fruit exports have been adopted. For the State of São Paulo, which caters largely to the European market, regulations were adopted for the first time in 1940. Perhaps the most important of the many changes put into effect were the elimination of sizes 80, 96, 100, and 112 from the export trade, and the discontinuance of the oversized box. The attempt to dispose of large sizes in Europe has in most instances been unremunerative. Even in years when prices are good the returns on oversized fruit is insufficient to cover costs. Furthermore, this size competes with the more desirable sizes and results in lowering the general price level. Regulations permit the shipment of size 126, and the volume of this size is out of all proportion to that of the more popular or preferred market counts. Size 126 cannot be regarded as a profitable export size, especially when sold in London or the south of England. On an average, about 30 percent of the Navels exported from the State of São Paulo are of this size. Some of the more important regulations controlling São Paulo orange exports during 1940 are, in brief, as follows:

1. All exporters must register with the Bureau of Plant Production before they are permitted to export. Such registration must take place annually.
2. No grower is permitted to sell his fruit for export if his orchard does not meet the requirements of the bureau from the standpoint of sanitation. Exporters purchasing fruit from growers must report such transactions to the bureau.

3. Citrus fruit can be harvested only upon written authorization, contingent upon fulfillment of the following requirements:

- (1) A minimum of 50 percent orange or yellow color.
- (2) An acid-sugar ratio of the following minimum proportions:

| | | | |
|------------|---|-------|-------|
| Oranges | { | Navel | 1:7.0 |
| | | Pera | 1:6.5 |
| Grapefruit | | | 1:5.0 |

- (3) The following minimum percentage of juice by weight:

| | |
|------------|------------|
| Oranges | 40 percent |
| Grapefruit | 32 percent |

4. Use of scissors is compulsory. Picking fruit when wet is prohibited.

5. Picking boxes must be well-constructed, clean, and disinfected prior to picking. Picking boxes must be only level full.

6. Fruit being transported by road truck must be kept covered. When transported by rail the boxes must be stripped by laths. Transport by road for a distance of more than 16.6 miles is prohibited except upon written authorization. Oranges for export must be loaded in ventilated cars and moved during the night. Loading platforms must be under shelter. Exporters must give 15 days' notice of the districts from which they intend to ship fruit.

7. No packing plant is allowed to operate without authorization from the bureau. Authorization to operate is based upon the following:

(1) The house must be suitably situated and with a minimum of 200 square meters of paved floor space. The house must be covered and in conformity with the general principles of hygiene, ventilation, lighting, etc.

(2) The house must be equipped with mechanical washers, driers, polishers, sizers, and disinfectants. (Packing house machinery cannot be purchased until approved by the bureau.)

8. The packing house must supply the bureau or control officer such information as may be requested; maintain sanitary conditions in and about the packing house; furnish transportation for inspectors when requested; notify the control service daily where picking is being done; keep the flow of fruit within the maximum capacity of the machine; and avoid rough handling of the fruit.

9. Boxes for export must be of standard size, clean, well-constructed, and of good appearance. Outside measurements of boxes for oranges and grapefruit must be as follows: 26 inches by 12½ inches by 12½ inches. The use of the oversized box is prohibited. The dimensions of a standard lemon box, outside measurements, are 26-4/5 inches by 13-4/5 inches by 10-4/5 inches.

10. There must be an interval of 48 hours between picking and packing unless otherwise authorized by the control board. The following sizes are permitted for export:

Oranges - 126, 150, 176, 200, 216, 226, 252, 288, 324, 344, 360

Grapefruit - 36, 38, 46, 54, 64, 70, 80, 96, 112, 126, 150

The minimum gross weights permitted for boxes to be exported are as follows:

| | <i>Kilograms</i> | <i>Pounds</i> |
|-----------------------------|------------------|---------------|
| Oranges - | | |
| Sizes 96 to 126 | 32 | 70.4 |
| Sizes 150 to 200 | 33 | 72.0 |
| Sizes 216 and smaller | 36 | 79.2 |
| Grapefruit - | | |
| Sizes 36 to 54 | 29 | 63.8 |
| Sizes 64 to 72 | 30 | 66.0 |
| Sizes 96 and smaller | 31 | 68.2 |

11. Fruit to be artificially colored must meet the maturity requirements as stated under paragraph 3. Processes used must be those authorized by the bureau and must comply

with the requirements of the Public Food Policing Service. Artificial coloring is permitted only in rooms supplied with air-conditioning equipment and approved by the bureau.

12. Fruit for export must be well-graded, free of serious blemishes, diseases and insects, and have not less than 90 percent good orange or yellow color. The exportation of fruit produced on seedling trees is prohibited. Only fruit from grafted or budded trees and of known parentage is permitted.

13. Export fruit shipped by rail is permitted only upon presentation of a shipping certificate signed by the control service. The shipping certificate is issued only upon the presentation of a manifest showing a complete list of the type of fruit to be shipped.

Export certificates will be refused for any lot of fruit that fails to comply with the established regulations, which are based on the following points;

(1) A shipment must not exceed 10 percent rejects, which are classified and valued on the basis of individual fruits, as indicated below.

| <i>1 fruit with-</i> | <i>Equivalent to- Rejects</i> |
|---|-----------------------------------|
| Rot | 100 |
| Puncture or skin break | 20 |
| Leprosis | 10 |
| Bruising | 10 |
| Dry or green fruit | 3 |
| Defective conformation (i.e., navel projecting more than 1 cm., or more than 2 cm. in diameter) | 1 |
| Sun, wind, thrip, or contact spots (more than one-sixth of surface) | 1 |
| Hail or grasshopper spots or bee stings (a single spot more than 1 cm. in diameter or 3 spots with a smaller diameter) | 2 |
| Sooty mold, sooty blotch, melanosis, rust mite, scab, etc. (more than one-eighth of surface) | 2 |
| Spray or oleocellose spots (3 spots with a diameter of more than 1 cm. each) | 1 |
| A colony of Pinnaspis (A genus of scale insects) or 5 scale insects | 1 |

(2) A minimum of 1 percent of the boxes intended for export must be examined during the process of packing. If an inspector is absent when packing commences, he is at liberty to open and examine as many boxes as he considers necessary. Certificates will be refused if a car has been loaded without previous authorization. Packed fruit that has remained in the shed for more than 5 days must be reinspected before a shipping certificate may be obtained.

(3) Lots of fruit that show the presence of bruising must be allowed to stand for a period of 48 hours, after which they must be reexamined. Rejected lots must be repacked and reinspected. If a lot is rejected a second time, repacking is left to the discretion of the inspector. Condemned fruit must be repacked immediately.

Persons violating the above regulations are subject to fines and penalties of one kind or another. The fines range from \$5 to \$250, depending upon the nature of the offense. Penalties usually consist of refusal to issue export permits.

BRAZIL AS A MARKET FOR AMERICAN FRUITS

Exports of fresh fruit from the United States to Brazil during recent years have averaged 7,645 tons, with a declared value of about \$800,000.

Apples are exported in the largest quantity, followed by pears. For the period 1931-32 through 1939-40, apple exports averaged 131,000 bushels and pears 84,000 bushels. Apple exports during the past few years have showed considerable increase over those of earlier years.

Pear exports averaged 104,500 boxes for the period 1936-37 to 1939-40, as against an average of 63,800 boxes for the preceding period 1931-32 to 1935-36, or an increase of 64 percent.

TABLE 13.—Exports of United States fruits to Brazil, 1939-40 with comparisons

| FRUIT | AVERAGE 1931-32 TO 1935-36 | 1936-37 | 1937-38 | 1938-39 | 1939-40 |
|---|----------------------------------|-----------|-----------|-----------|---------|
| Applesbushels : | 124,000 : | 122,400 : | 139,700 : | 126,900 : | 146,600 |
| Applesboxes ¹ : | 120,900 : | 113,700 : | 132,800 : | 109,500 : | 129,200 |
| Applesbarrels ² : | 1,000 : | 2,900 : | 2,300 : | 5,800 : | 5,800 |
| Pearsboxes : | 63,800 : | 104,600 : | 91,900 : | 93,800 : | 127,600 |
| Grapesshort tons : | 75.0 : | 592.5 : | 921.6 : | 766.5 : | 991.6 |
| Cherries ³pounds : | - : | 16,265 : | 8,750 : | 43,915 : | 78,017 |
| Peaches ⁴pounds : | 50,855 : | 74,388 : | 60,096 : | 98,943 : | 31,881 |
| Plums and prunes ⁴pounds : | - : | 251,052 : | 379,888 : | 450,679 : | 365,761 |

¹ Approximately 1 bushel.

² Approximately 3 bushels.

³ Calendar years, 1931 to 1939.

⁴ Preliminary 1940 figures are, for cherries, 71,353 pounds; peaches 157,258; and plums and prunes, 578,630.

Though Brazil has an estimated population of between 40 and 45 million, a large percentage of the people fall within the low-income group. According to Brazilian trade sources, not more than 10 percent of the population are customers, or even potential customers, for American fruits.

The outlet for United States exports is confined to the large cities, where the wealth of the country and a large part of the foreign population are concentrated. Distribution, in fact, is confined to the coastal towns, as lack of transportation facilities precludes any possibility of developing a trade in perishable products in the interior.

American fruits are well received on markets such as Rio de Janeiro, São Paulo, and Santos, and it is believed that an increased volume of business could be done if the laid-down cost could be reduced and exporters would be willing to sell against documents instead of insisting upon f.a.s. terms. A few buyers are willing to arrange payment at the port of export, but the majority, largely as a matter of custom, are not disposed to make payment until after they are in receipt of the documents. Several importers expressed the opinion that, if certain costs and trade practices now in force could be modified, the Brazilian market could be expanded to absorb 230,000 bushels, or 200,000 boxes and 10,000 barrels, of American apples annually.

The Brazilian market has a strong preference for the Delicious; hence the bulk of sales consists of this variety. The market also absorbs a few Winesaps and a few King Davids, but the demand is limited and the prospects for stimulating a more active inquiry is not considered encouraging. Barreled-apple requirements are confined to the Gano, and the demand for this variety is limited. It is stated that the Gano is used largely for display purposes, for which it is particularly adapted.

The sizes of the Delicious required range from 80's to 113's. For Winesaps there is a wider range, from 100's to 216's, with preference going to sizes 150's to 216's. Smaller sizes of the Gano variety are also preferred.

Under like conditions it is believed that a market could be developed for about 250,000 boxes of pears. Varietal preference runs heavily to Anjous. The Hardy is not popular and the market is limited to only a few cars, possibly 5 or 6. There is a limited demand for a few Flemish Beauty, but no demand for Bartlett or Winter Nelis. Anjous make up 75 percent or more of the total.

It is believed that an increased business in soft fruits could be developed through direct shipments via the Panama Canal, which would result in lower transportation costs as well as better condition of the fruit on landing. Grape shipments in 1938-39, for instance, amounted to about 45,000 34-pound lugs, as compared with over 58,000 lugs in 1939-40. Imports from Argentina, on the other hand, amount to more than three times this volume. If the freight were reduced from 75 to 50 cents per cubic foot, importers are of the opinion that imports of grapes could be increased 100 percent. The varieties imported are principally Emperors and a few Red Malagas.

Importers are also of the opinion that quite a good market could be developed for United States cherries, plums, and nectarines, provided the laid-down price could be reduced. At the moment there is but a limited demand for such fruits, sales being restricted entirely to the luxury trade. This trade represents but a very small percentage of the consuming population.

To be able to move American apples and pears in volume, the cost in Brazil must not exceed \$2.50 to \$2.60, c.i.f. Wholesale values in order to permit a rather free movement must remain in the neighborhood of 50 to 60 milreis (\$2.80 to \$3.40) a box.

SUMMARY

Because of its wide extremes of latitude, longitude, and altitude, Brazil is capable of producing an almost unlimited variety of fruits; however, since the greater part of the country lies within the Tropics, the commercial development of fruit growing has been confined to those species indigenous to or best adapted to tropical or subtropical conditions.

From a strictly commercial point of view, pineapples, bananas, and oranges are the most important fruits produced, or are those that enter export channels. Many other fruits, however, such as the avocado, mango, cherimoya, jabotica, grenadilla, sapodilla, and papaya, are produced in large quantities and consumed within the country, where they are in great demand. Deciduous fruits, such as apples, pears, peaches, cherries, and grapes, can be and are to some extent produced in the higher elevations where climatic conditions are more temperate. The commercial development of deciduous fruits, however, has not been undertaken.

Oranges are produced in all parts of Brazil from Pará in the north to Rio Grande do Sul in the south, and from Amazonas in the west to Rio de Janeiro in the east. Where not produced commercially, they grow wild and thus provide an important item in the poor man's diet.

The commercial development of citrus fruit, especially oranges, has taken place rapidly and on a large scale during recent years. Heaviest plantings have been made in the Federal District and in the States of Rio de Janeiro, São Paulo, Minas Geraes and Bahia. Total orange production for the past 5 years shows an average of 34½ million boxes against 24½ million for the previous 5 years, or an increase of 41 percent. A large part of this increase has taken place in Rio de Janeiro and São Paulo, where commercial plantings and export supplies are heaviest. Exports from these two districts have risen sharply during recent years. Shipments in 1932 amounted to 1,930,000 boxes and in 1939 to 5,632,000, or an increase of almost 200 percent.

Excellent land, well adapted for the growing of oranges and other citrus fruits, can be purchased for as low as \$5 or \$6 an acre. Land that has been cleared and improved and is close to town can be purchased for from \$25 to \$30 an acre. This land is in the best commercial producing regions. Production costs in Brazil are low, ranging from the equivalent of 3 to 10 cents a box in the grove. Handling, packing, and other charges are correspondingly low. Oranges can be produced, picked, packed, transported, and loaded on board ship for a total cost of from 55 to 75 cents a box, according to locality and variety.

Production methods for the most part are spoken of as "Gods methods." This description is no misstatement of fact. A large part of the acreage receives the minimum of care and has the appearance of neglect, and in some instances of complete abandonment. There are individual groves, however, that are scientifically cared for and a credit to their owners. These well-kept groves compare favorably in appearance and in production with a well-cared-for grove in California or Florida.

The European war is having a serious effect upon the citrus industry, similar to that experienced in Palestine and other countries that rely largely upon the export market. The State of São Paulo, which produces principally Navels for the European market, has suffered greatly through trade dislocation. The Pera orange-producing regions, however, namely Rio de Janeiro and Minas Geraes, have not fared quite so badly, since a substantial part of their exports go to Argentina.

The development of the byproducts industry is regarded largely in the light of an emergency measure. While it may be a partial solution to the present marketing problem, it is by no means the answer to all the difficulties that have arisen in São Paulo. It is believed that the real solution is an increased domestic market. According to the president of the Citrus Association of São Paulo, the direct cost of delivering a box of oranges to the consumer is about 18 cents, under existing conditions. The average wholesale price for oranges in São Paulo is from 17½ to 20 cents a box, which allows little or no profit for the grower. In view of the increasing purchasing power in Brazil, it is believed that the domestic market could be developed to absorb the 5½ million boxes of surplus oranges at a remunerative price for the grower. This would be an increase in the wholesale price of 2 or 2½ milreis (10 to 15 cents) per box, or an average of about 30 cents instead of the 17½ to 20 cents now being paid.

Expansion in citrus production could go on almost indefinitely. Without a great deal of effort Brazil could produce more than the world's requirements of summer oranges - in fact, could almost supply world markets with their year-round requirements. Certain improvements and additional facilities, to be sure, would be necessary, but these could easily be provided if conditions warranted. While the European catastrophe has temporarily interrupted the development of the citrus industry, the potential possibilities of the country should not be underrated.

The possibility of developing an important market in Brazil for American fruit is very doubtful. Apple exports to Brazil under normal trading conditions in the pre-war years 1936-37 to 1938-39 averaged about 1.5 percent of the total United States export business, and pears averaged about 3.3 percent. While it is believed that exports to Brazil could be increased slightly, provided certain conditions were met, the volume moved could in no way replace or even approach the shipments made to certain European countries.

