1952

Cotton production in the state of São Paulo, Brazil: a survey of recent trends and problems.

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Boston University

http://hdl.handle.net/2144/10656

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COTTON PRODUCTION IN THE STATE OF
SÃO PAULO, BRAZIL:
A SURVEY OF RECENT TRENDS AND
PROBLEMS

by

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(A. B., SYRACUSE UNIVERSITY, 1951)

Submitted in partial fulfilment of
the requirements for the degree of
Master of Arts
1952
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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>v</td>
</tr>
<tr>
<td>Chapter I Historical Background</td>
<td>1</td>
</tr>
<tr>
<td>Various stages of development</td>
<td></td>
</tr>
<tr>
<td>Present status of São Paulo within Brazil</td>
<td></td>
</tr>
<tr>
<td>Chapter II Agriculture in São Paulo</td>
<td>8</td>
</tr>
<tr>
<td>Topography, climate, and soils</td>
<td></td>
</tr>
<tr>
<td>Major land uses</td>
<td></td>
</tr>
<tr>
<td>Systems of farming</td>
<td></td>
</tr>
<tr>
<td>Farm tenancy and nationality of operators</td>
<td></td>
</tr>
<tr>
<td>Agricultural labor</td>
<td></td>
</tr>
<tr>
<td>Chapter III History of Cotton in Brazil and São Paulo</td>
<td>17</td>
</tr>
<tr>
<td>American Civil War period</td>
<td></td>
</tr>
<tr>
<td>World War I developments</td>
<td></td>
</tr>
<tr>
<td>Depression and post-depression developments</td>
<td></td>
</tr>
<tr>
<td>Major sources of labor</td>
<td></td>
</tr>
<tr>
<td>Principal areas of production in State of São Paulo, 1930-40</td>
<td></td>
</tr>
<tr>
<td>Chapter IV São Paulo Cotton Production, 1940-50</td>
<td>33</td>
</tr>
<tr>
<td>Present zones of cotton production in São Paulo</td>
<td></td>
</tr>
<tr>
<td>Reasons for the decline in production after 1944</td>
<td></td>
</tr>
<tr>
<td>The use of fertilizers</td>
<td></td>
</tr>
<tr>
<td>Insect control</td>
<td></td>
</tr>
<tr>
<td>Chapter V São Paulo's Cotton Improvement Program</td>
<td>47</td>
</tr>
<tr>
<td>Breeding and selecting</td>
<td></td>
</tr>
<tr>
<td>Production and multiplication of planting seed</td>
<td></td>
</tr>
<tr>
<td>Supervision and inspection of ginning</td>
<td></td>
</tr>
<tr>
<td>Cotton classification service</td>
<td></td>
</tr>
<tr>
<td>Transportation facilities for cotton</td>
<td></td>
</tr>
<tr>
<td>Future work program of the Special Cotton Commission</td>
<td></td>
</tr>
<tr>
<td>Chapter VI Conclusion</td>
<td>58</td>
</tr>
<tr>
<td>Footnotes</td>
<td>61</td>
</tr>
<tr>
<td>Bibliography</td>
<td>64</td>
</tr>
<tr>
<td>Abstract</td>
<td>66</td>
</tr>
</tbody>
</table>
LIST OF MAPS, TABLES AND GRAPHS

MAPS

Map I  South-American Primary Settlement Centers .......................... 3
Map II  Past and Present Area of São Paulo .................................. 5
Map III Average Rainfall Distribution of São Paulo State .................. 11
Map IV  Cotton Areas, 1930-40 .................................................... 30
Map V  Cotton Movements in São Paulo, 1940-50 ............................. 36

TABLES

Table I  Immigrants to São Paulo State 1827-1936 .............................. 6
Table II Production of Principal Crops for 1939 and 1948 .................... 8
Table III Value of Principal Crops, 1920-24 averages and 1948 ............ 9
Table IV Percentage of Farms and Area by Nationalities in 1939-40 .... 15
Table V Comparison of Cotton Exported through the Port of Santos with total Brazilian Exports, 1920-39 .......................... 19
Table VI Cotton Acreage and Production in the State of São Paulo and in all Brazil, 1921-22 to 1938-39 .......................... 25
Table VII Cotton Exports by Countries of Destination, 1939 and 1949 ... 26
Table VIII State of São Paulo Cotton Production, Acreage, and seeds distributed, 1940-52 .............................................. 34
Table IX Inhabitants per sq. Kilometer (Rural Population) 1934,1950 ... 38
Table X Consumption of Fertilizers for Various Countries, 1948-49,42

GRAPH

Graph I  Importation and Production of Mineral Fertilizers in the State of São Paulo, 1940-50 .............................................. 41
Introduction

Agriculture has always been a very important factor in Brazil's economy, but unfortunately it was for many years essentially dominated by a single crop—first sugar, then coffee, with a brief rubber boom interspersed. The last twenty years however have witnessed a considerable modification of Brazilian agriculture. Special attention has been placed on an attempt at diversifying agricultural production and improving the technology of agricultural methods.

The development of cotton production in the State of São Paulo is an excellent example of this new trend in agriculture. Early attempts at expanding cotton production resulted mostly in failure. What cotton São Paulo did produce before 1932 was so mixed in staple and so badly ginned that foreign markets took it reluctantly and at great discounts. Beginning about 1930, the trend of cotton production in Brazil was upward, the State of São Paulo accounting for most of the increase. Production increased steadily until 1944, when the total Brazilian production reached a peak figure of 2.7 million bales, of which 2.1 million bales were grown in São Paulo. Starting in 1945, however, an abrupt decline in production occurred, largely in São Paulo, and total Brazilian production in 1947 fell to less than half the 1944 figure.

Owing to the expansion in cotton production in the State of São Paulo, cotton has become Brazil's second largest export crop and presents a serious challenge to coffee's supremacy. Certain demographic changes have also resulted from the expansion of cotton farming, particularly in São Paulo, changes which have both social and economic significance.

Cotton has thus become a very vital part of the São Paulo scene and
of the Brazilian economy in general. The expanding textiles industry, of major importance in the development of Brazil's economy, will require an increasing amount of cotton in the future. If São Paulo's production cannot supply this cotton, the Brazilian textile industry and total economy will be severely affected. The effects of cotton's rising and then dwindling production on the welfare of both São Paulo and Brazil as a whole, justifies this attempt to describe the development of cotton agriculture in São Paulo and to analyze the various factors that contributed to shape this development.

The organization of this study combines both a chronological and topical arrangement of materials. A general historical background of Brazil and the State of São Paulo is provided as well as a more detailed history of cotton development in both Brazil and São Paulo. In addition, a chapter is devoted to a broad discussion of agriculture in São Paulo including such matters as geographic factors, land use and tenure, and agricultural labor.

Two chapters are devoted to trends and problems of cotton production in São Paulo during the past decade. One of these chapters is devoted primarily to questions relating to actual cotton production; the other chapter deals with a comprehensive cotton improvement program currently being implemented in the State of São Paulo.

A concluding chapter attempts to generalize concerning short term and long term prospects for future development of cotton growing in São Paulo.

Since cotton is of comparatively recent importance in São Paulo, interest in analyzing its development has arisen only in the last decade
or so. As yet no comprehensive treatment of the subject, in any language, has appeared, to the best of the writer's knowledge. The task of assembling sufficient data, therefore, was made more difficult due to the relatively small amount of material published concerning the subject. For material on the general historical, geographical and agricultural patterns of Brazil and São Paulo, the standard Brazilian reference sources have been used. With respect to the main topic, i.e., cotton production in the State of São Paulo, source materials were obtained from specialized periodical journals published by the various agricultural departments of the São Paulo state government. These publications have been made available through the recently created São Paulo Research and Reference Collection at Boston University.

The United States Government Division of Public Documents has also been most helpful in furnishing me with government publications containing considerable material pertaining to the subject.

I am greatly indebted to Professor Maurice Halperin, Chairman of the Department of Latin-American Regional Studies and my principal thesis adviser, and to my second reader Dr. Walter Beveraggi-Allende of the Department of Latin-American Regional Studies at Boston University, for their guidance and valuable suggestions in the preparation of this work.
Chapter I

Historical Background

Before considering the recent trends in the cultivation of cotton in São Paulo, it would be appropriate to sketch briefly the history of the settlement of Brazil, the founding of São Paulo, and the rise of São Paulo as a cornerstone in the economy of Brazil.

The first recorded settlement of Brazil was established in 1502 at Salvador, in the present state of Bahia. At first, since the Portuguese found no source of gold or gems comparable to those of India, and no rich native civilization in existence to pillage, Brazil was neglected. But when French and Spanish encroachments threatened this territory, Portugal had to establish colonies on the coast of South America or relinquish her claims. The subsequent division of the coast into capitanias, each under the direction of a person selected by the Portuguese king, led to uneven settlement since some capitanias flourished while others failed.

The second successful colony was founded at São Vicente on January 20, 1532. There is no certain knowledge of when the very first Europeans came to this island of São Vicente. As early as 1507 maps marked a port called São Vicente, and there are records of other settlers or settlements noted; but not until 1532 did Martim Afonso de Sousa and his brother colonize this island, located in the southern part of Brazil near the present city of Santos, the main port of São Paulo State. One group of Afonso's men settled in São Vicente, while another settled nine leagues away in the highlands of the mainland, near a river called Piratininga from which the colony first took its name. This colony was the nucleus from which the present city of São Paulo was formed in 1554 by
the Jesuit priests José de Anchieta and Manuel da Nobrega.

Another successful colony was founded at Recife, in the present state of Pernambuco, in 1561. Thus the three chief primary settlement centers from which the Portuguese carried forward their conquest of Brazil were São Paulo, Salvador, and Recife. (See Map I page 3 for primary settlement centers of South America.)

While sugar production was bringing great wealth to the people of the Northeast of Brazil, the settlers in São Paulo were relatively poor since they had discovered no source of wealth. Therefore, from São Paulo a series of military-like expeditions went forth into the interior of Brazil. These expeditions were called bandeiras and their members were called bandeirantes. The main objectives of these groups were to find gold and capture Indian slaves, and in quest of these, they extended themselves as far south as the shores of the Plata opposite Buenos Aires, westward to the Paraguay Asunción, and even roamed into the scrub-forest country of northeast Brazil. (Map II illustrates the one-time expansion of São Paulo and also notes its present size.)

Various stages of development

The history and development of São Paulo may be summarized into three general stages. The first stage begins in the early 1500's with the founding of Brazil and later the three primary settlement centers of São Paulo, Salvador, and Recife. In general, this stage is characterized by development of the sugar fields in the Northeast and small, scattered, poor agricultural settlements in the South. The next period dating from about 1650, is marked by the collapse of the sugar market and the discovery of gold in Minas Gerais by the roaming bandeirantes of São Paulo. This
MAP I

South-American Primary Settlement Centers

- Spanish Primary Settlement Centers
- Portuguese Primary Settlement Centers
- Main Currents of Penetration and Settlement

Source: Preston E. James, *Brazil*, p. 33.
stage brought a rush of peoples from other regions to settle around the gold area.

Little of economic interest went on in the capitancias during the 18th century. The last and most important stage occurred around 1850 and lasted until almost 1930. This was characterized by the wildfire spread of coffee through the Paraíba Valley and into the new lands which were opening up in Brazil. By 1886 no less than sixty percent of the coffee production was found in São Paulo. The tale of coffee, and in a general sense, as will be seen in the later story of cotton, lies in the search for virgin lands to be exploited, exhausted, and left behind.

Although the present area of São Paulo, comprising 247,239 square kilometers or a little less than the size of Arizona, is small compared to some other states of Brazil, the overwhelming importance of São Paulo in the present day economy of Brazil will soon be noted.

Present status of São Paulo within Brazil

A little over two-hundred miles southwest of Rio de Janeiro is a city of more than two million inhabitants - São Paulo, possibly the world's fastest growing city.

The population of the State of São Paulo was 2,800,000 in 1910, 4,400,000 in 1920, and 9,242,000 in 1950 - almost one-fifth of Brazil's total population of approximately 52,500,000. While the actual settlement of São Paulo took place over four hundred years ago, the tremendous increase in population is of recent origin and only since the end of the last century has it wielded a predominant influence in Brazilian economic affairs.

The relative importance of the State of São Paulo in the present
MAP II

Past and Present Area of São Paulo

--- Present Frontiers of Brazil

--- Present Area of São Paulo

--- Greatest Expansion of São Paulo

economy of Brazil can be seen by the following figures:

In trade and economy São Paulo contributes:
- 50% of Brazil's total exports
- 50% of national income
- 48% of total banking business
- 50% of textile production
- 49% of electric power consumption

In agriculture São Paulo accounts for:
- 70% of coffee production
- 60% of the export value of coffee
- 48% of Brazil's coffee trees
- 70% of cotton production
- 50% of the volume of rice
- 35% of the volume of corn
- 45% of the export value of fruit
- 47% of the metric tonnage of potatoes

What was the cause of the great surge of importance of this small area of Brazil? The years 1885 to 1900 witnessed the sudden transformation of the São Paulo region from an outlying part of the Southeast, to a new and independent region focusing on the city of São Paulo and the port of Santos. In the historical background of this transformation is the quest for and development of wealth-bringing products. The three main developments however which caused this surge in importance were the increase of European and North-American markets for coffee; the spread of coffee over the São Paulo State; and the rapid immigration of Brazilians and Europeans into São Paulo. The latter phenomenon is revealed in the following table:

<table>
<thead>
<tr>
<th>Nationality</th>
<th>Number of Immigrants</th>
<th>Percentage of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italians</td>
<td>982,903</td>
<td>32.50</td>
</tr>
<tr>
<td>Brazilians</td>
<td>494,834</td>
<td>17.06</td>
</tr>
<tr>
<td>Portuguese</td>
<td>413,161</td>
<td>14.24</td>
</tr>
<tr>
<td>Spaniards</td>
<td>386,613</td>
<td>13.33</td>
</tr>
<tr>
<td>Japanese</td>
<td>177,551</td>
<td>6.12</td>
</tr>
<tr>
<td>Others</td>
<td>486,124</td>
<td>16.75</td>
</tr>
<tr>
<td>Total</td>
<td>2,901,186</td>
<td>100.00</td>
</tr>
</tbody>
</table>
The next chapter will discuss the natural features of the State of São Paulo on which this development took place, and the patterns of agriculture that were adopted by these early farmers.
Chapter II

Agriculture in São Paulo

São Paulo, although by far the greatest industrial state in Brazil, is one of the country's largest agricultural producers. São Paulo agriculture today is characterized, despite the predominance of coffee, by its great diversity. More than one-hundred and ten different crops and twenty types of livestock products are produced on a commercial basis in the State. These include a wide range of tropical and sub-tropical fruits, vegetables, grains and fibers.

São Paulo is Brazil's leading state in the production of coffee, cotton, rice, and sugarcane, and the second largest producer of oranges, bananas, and castorbeans. (See Table III, page 9 for production of principal crops, 1939 and 1948.) The progress in diversification of agricultural production in this area is indicated by the trends seen in the production of various crops. (See Table II, page 8 for the value of production of the principal crops.

Table II

Value of Principal Crops, 1920-24 averages and 1948
(In million cruzeiros)*

<table>
<thead>
<tr>
<th>Crop</th>
<th>1920-24 averages</th>
<th>1948</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coffee</td>
<td>1,504</td>
<td>6,451</td>
</tr>
<tr>
<td>Corn</td>
<td>1,025</td>
<td>5,249</td>
</tr>
<tr>
<td>Rice</td>
<td>266</td>
<td>4,131</td>
</tr>
<tr>
<td>Cotton</td>
<td>336</td>
<td>3,484</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>208</td>
<td>2,426</td>
</tr>
<tr>
<td>Manioc</td>
<td>87</td>
<td>2,358</td>
</tr>
<tr>
<td>Beans</td>
<td>232</td>
<td>2,719</td>
</tr>
<tr>
<td>Potatoes</td>
<td>58</td>
<td>1,069</td>
</tr>
<tr>
<td>Wheat</td>
<td>36</td>
<td>1,033</td>
</tr>
<tr>
<td>Others</td>
<td>356</td>
<td>3,535</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,110</strong></td>
<td><strong>32,445</strong></td>
</tr>
</tbody>
</table>

* One cruzeiro equals about 5.45 cents U.S. currency

## Table III

### Production of Principal Crops for 1939 and 1948

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Regions</th>
<th>1939</th>
<th>1948</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coffee</td>
<td>São Paulo</td>
<td>11,463</td>
<td>10,786</td>
</tr>
<tr>
<td></td>
<td>Other Brazil</td>
<td>6,255</td>
<td>5,354</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>17,718</td>
<td>16,130</td>
</tr>
<tr>
<td>Cotton</td>
<td>São Paulo</td>
<td>308</td>
<td>222</td>
</tr>
<tr>
<td></td>
<td>Other Brazil</td>
<td>156</td>
<td>105</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>464</td>
<td>327</td>
</tr>
<tr>
<td>Rice</td>
<td>São Paulo</td>
<td>468</td>
<td>833</td>
</tr>
<tr>
<td></td>
<td>Minas Gerais</td>
<td>331</td>
<td>532</td>
</tr>
<tr>
<td></td>
<td>Rio Grande do Sul</td>
<td>357</td>
<td>516</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>329</td>
<td>673</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1,485</td>
<td>2,554</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>São Paulo</td>
<td>2,708</td>
<td>6,046</td>
</tr>
<tr>
<td></td>
<td>Pernambuco</td>
<td>4,204</td>
<td>5,616</td>
</tr>
<tr>
<td></td>
<td>Minas Gerais</td>
<td>3,506</td>
<td>5,128</td>
</tr>
<tr>
<td></td>
<td>Rio de Janeiro</td>
<td>3,000</td>
<td>3,562</td>
</tr>
<tr>
<td></td>
<td>Others (10)</td>
<td>6,451</td>
<td>10,541</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>19,869</td>
<td>30,893</td>
</tr>
<tr>
<td>Oranges</td>
<td>Rio de Janeiro</td>
<td>10,820</td>
<td>9,639</td>
</tr>
<tr>
<td></td>
<td>São Paulo</td>
<td>12,000</td>
<td>6,214</td>
</tr>
<tr>
<td></td>
<td>Minas Gerais</td>
<td>4,286</td>
<td>5,678</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>2,450</td>
<td>13,294</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>34,256</td>
<td>34,825</td>
</tr>
<tr>
<td>Bananas</td>
<td>Minas Gerais</td>
<td>12</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>São Paulo</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Rio de Janeiro</td>
<td>16</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Others (10)</td>
<td>30</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>88</td>
<td>136</td>
</tr>
<tr>
<td>Castor beans</td>
<td>Bahia</td>
<td>18</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>São Paulo</td>
<td>12</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>Pernambuco</td>
<td>24</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Ceará</td>
<td>25</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>32</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>118</td>
<td>231</td>
</tr>
</tbody>
</table>

In 1925, the value of coffee production accounted for 68.9 percent of the total value of agricultural production but by 1938 this proportion had decreased to only 37.5 percent, the value of cotton production increasing during the same period from only 5.3 percent to 28.5 percent of the total. By 1948, the production values showed over six crops challenging the supremacy of coffee.

**Topography, climate and soils**

The altitude of the State of São Paulo varies from sea level to over 6,000 feet. The narrow coastal plain is generally hot and humid, but only a short distance inland the range of the Serra do Mar rises with its cool, humid climate, and beyond the Paraíba Valley, in the northeast, the Serra do Mantiqueira rises even higher than the Serra do Mar.

West of these two mountain ranges is an interior plateau called the **antiplano** which comprises most of the State. This plateau gently slopes to the west towards the Paraná River. This entire antiplano region is rolling country with only a few small areas of level land. It is interspersed with hills rising from 2,400 feet to 3,000 feet in the central part of the State.

Two-thirds of São Paulo lies within the torrid zone, but because of the high altitude of much of the State, a subtropical climate prevails. In the interior, the climate varies greatly from winter to summer. During the summer months the days are hot and the nights are cool; during the winter, the nights are cold but on sunny days the weather is warm. The rainfall distribution is similar to that of the United States as far as the calendar goes - that is, heavy rainfall during December, January, February, and March, and light during June, July, and August. The principal difference is that the rains in São Paulo come during the summer.
months (seasons being reversed) and the drought during the non-growing winter months.

In spite of the subtropical climate, there is a definite growing season. Most crops are planted from the latter part of August through mid-November and are harvested from February through June. The growing season is not limited by killing frosts since in most years such frosts do not occur, although it is quite common to have temperatures between 40 and 45 Fahrenheit during June July, and August. Frequently the temperature drops several degrees lower.

The small amount of moisture received from May to mid-September restricts plant growth during that period. The average rainfall for the State is 58.4 inches. In the altiplano it varies from 40 to 60 inches which is more than adequate for most crops.

Map III

Average Rainfall Distribution of Sao Paulo State

![Map of Average Rainfall Distribution](image)

Four soil types, constituting twenty-six percent of the State's area, support its agricultural economy. On these soils practically all the coffee, cotton, sugarcane, and a large part of the rice, beans, and corn are grown. The famous red soils, including the reddish clay soil called massapé and the deep purplish-brown clay soil called terra roxa, were used primarily for coffee cultivation. Unfortunately, they have been planted for fifty to eighty years now, which is about the maximum length of time that clay soils can be used to grow coffee. During the last twenty years or so, growers have been planting their old terra roxa soils to cotton and pasture, and in some cases mainly to corn.

The deep sandy and shallow sandy soils found in the newly developed western third of the State, were originally covered with dense forests under which a thick blanket of organic material had accumulated. As these forests were leveled and the land planted to cotton, this organic material rapidly disappeared since the heavy rainfall and long periods of hot weather were ideal for the development of the organisms which destroyed it. These soils are exceedingly productive for ten to twenty-five years, depending mainly on the treatment they receive. If planted to a clean-culture, row crop such as cotton, the soil fertility is depleted within ten years; if planted to coffee, the soil fertility will last from twenty to twenty-five years.

The one important point to remember regarding many of the soils of São Paulo is their tendency to erode rapidly, especially when they are used without fertilizers for the production of cotton. When the terra roxa is allowed, through bad agricultural practices, to dry out at the surface, it is especially liable to erode badly during the next heavy
rain. Erosion control, which will be discussed in a later chapter, is probably São Paulo's most serious problem from the standpoint of future agricultural production.

**Major land uses**

Approximately sixty percent of São Paulo's land is in farms and ranches. In 1945, of this sixty percent, 28% was cultivated, 43% was in pasture, and 29% was in forest and woodland. Only a small part of the State's area is irrigated. In some areas small tracts of vegetables and citrus fruits are irrigated but no irrigation is used for such crops as cotton, corn, beans, and coffee.

There has been a general shift in agricultural production in São Paulo from the east to the west. Coffee production entered the State through the Paraíba Valley after 1850, and as the land became worn out, production moved farther west into virgin-forest areas. When the newer clay soils were reached, areas of agricultural production remained stationary for a period of years before moving further west.

As a result of this exploitative type of agriculture, large areas have been left economically suitable only for grass growing. In the agricultural belt in the east, the increasing importance of fertilizers will be shown in a later chapter.

**Systems of farming**

The São Paulo region has played an important part in the program for the expansion of agricultural production in Brazil. The western third of the State has been opened to agricultural development during the last twenty-five years.

There is a common pattern of farming systems in this western region; the land is cleared and planted to rice and corn for one or two years and
then is planted to cotton for five to ten years after which time it is seeded to pasture. A common agricultural operation in São Paulo that is rather uncommon in the United States is the inter-planting of crops. Most of the coffee in the State is interplanted with a summer crop of beans, and often corn, cotton, or castor-beans are grown between rows of coffee trees. Cottonfields are frequently planted to four rows of cotton and one row of corn and sometimes peanuts are planted between rows of cotton.

Unfortunately farming in both the eastern region and to a lesser extent in the western region has been generally characterized by an extreme form of exploiting the soil. The land of São Paulo has been worked hard as long as it produced large crops profitably, after which it was planted to pasture or more often abandoned, and the growers moved on to new, more fertile areas. Modern agricultural practices of fertilization, crop rotation, etc. are almost unknown in the São Paulo agricultural scene.

Farm tenancy and nationality of operators

In the 1939-40 season, over forty-five percent of all the farms in the State were operated by tenant farmers. Over half of these tenants paid cash rent and the others paid one-third or one-half of their crop. Cash tenants paid from $1.30 to $16.67 per acre as rent, the majority however paying less than $1.70 per acre. However land rentals have increased considerably since that season.

The cash renter furnishes his own equipment and some of his operating capital, while the sharecroppers are usually without funds and equipment. For the latter, the land owner plows the land, furnishes
the necessary tools, and gives a cash allowance. Although the cash renter also frequently receives cash advances from the owner, the major difference is that the owner frequently exercises little control over the crops produced by the cash renter but he dictates the crop program to the sharecropper.

In 1939-40, Brazilian citizens operated 72% of São Paulo's farms comprising 71% of the land. Foreign growers operated 28% of the farms constituting 29% of the area. Although the Japanese in 1939-40 operated less than five percent of the farms of São Paulo and only two percent of the total area (See Table IV below), they have played an important role in influencing agricultural practices, particularly in respect to cotton by increasing the volume of production and improving the quality of the fibers.

Table IV

Percentages of Farms and Area by Nationalities in 1939-40 *

<table>
<thead>
<tr>
<th>Nationality</th>
<th>Percentage of total</th>
<th>Area Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazilian</td>
<td>71.6</td>
<td>71.3</td>
</tr>
<tr>
<td>Italian</td>
<td>10.9</td>
<td>9.3</td>
</tr>
<tr>
<td>Spanish</td>
<td>5.3</td>
<td>3.1</td>
</tr>
<tr>
<td>Japanese</td>
<td>4.6</td>
<td>2.1</td>
</tr>
<tr>
<td>Portuguese</td>
<td>4.0</td>
<td>3.1</td>
</tr>
<tr>
<td>German</td>
<td>-</td>
<td>1.1</td>
</tr>
<tr>
<td>English</td>
<td>-</td>
<td>1.0</td>
</tr>
<tr>
<td>Others</td>
<td>3.6</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

* These are the latest figures available until the results of the 1950 census are released. These figures retain their significance due to the immigration restrictions adopted by the Brazilian government in the 1940's.

Agricultural labor

In 1939, there were 205,000 families of colonos, 136,000 individual
camaradas, and 621,000 individual enxadas working on São Paulo farms. A colono is a rural worker under contract for a relatively long period of time, generally a year or more. He is in charge of cultivating a given area and receives not only a contract price but also a percentage of what he produces. Generally, he is also given a plot of land on which to raise rice and beans, for his family. His entire family helps him with the work. A camarada is an individual rural worker who is paid by the day, the month, or the job. An enxada is a hoe hand and is generally a member of a colono family.

Systems of labor in São Paulo may be divided into two general classifications - those in the old or eastern zones and those in the new or western zones. In both regions the men do most of the work that requires the use of animals or machinery, while in the old zones a larger proportion of the hand labor is done by women and children than in the new zones. They do by hand the planting, hoeing, thinning, and a large part of the harvesting.

Day-labor wages vary considerably depending on the competition of other products and industries, and the possibility of laborers acquiring farms of their own in the newer sections of the State. During the 1943-44 season, day wages varied from $0.50 to $1.25 a day without food, and from $0.30 to $0.80 with food.
Chapter III

History of Cotton in Brazil and São Paulo

It will be recalled that three major stages of development in the history of São Paulo were outlined in Chapter I. A fourth stage must now be distinguished in this development, a stage which also brought a rush of pioneer settlement into São Paulo as did the preceding stages. This stage, like the others, can also be characterized by the development of a wealth-bringing product—this product is cotton.

European explorers of the early sixteenth century reported finding cotton growing along the coast of Brazil in both the north and south. Early historians mentioned that the Indians used cotton to make cloth, cordage, and fishing nets.

The cultivation of cotton by settlers took place early in the colonial period not only in the northern districts about Maranhão, Ceará, Pernambuco, and Maceió, but also in the south around the territory of São Paulo. By as early as the middle of the 1700's cotton had become a considerably important export crop in the north, and in 1751, a cotton inspectorate (Inspeção do Algodão) to examine and classify the cotton intended for export, was established in Pernambuco.

Increasing attention was paid to cotton in the next fifty years and it is reported that during the first decade of the next century, 1801-1810, an average of 44,324 bags of cotton (equivalent to approximately 12,000 bales of 475 pounds each) was exported yearly through Recife, the port of Pernambuco.

The first mills for the spinning of yarn and weaving of cotton cloth began operating in Minas Gerais about 1775 employing the aid of
skilled workmen brought over from India. However the domestic mills soon encountered strong opposition from the Portuguese crown which desired to retain the colonial textile market as an outlet for the mills in Portugal, and numerous prohibitions and restrictions were placed on the Brazilian industry which were not relaxed until the 1840's.

The decline in world cotton prices about 1820 and the rapid development of cotton production in the United States, coupled with the lack of an established textile industry in Brazil, adversely affected Brazilian cotton growing. Brazilian export figures indicate that interest in cotton still remained, annual exports in the 1840's and 1850's averaging about 57,000 bales. During this period, coffee production rapidly increased and by 1840, coffee was established as Brazil's major export product.

American Civil War period

The Civil War in the U.S. revived an active interest on the part of European spinners towards Brazilian cotton which reflected itself in increased Brazilian production and exports, during the last years of the war and the years immediately following the conflict.

Complete figures for this period are not available, but the peak of cotton production in Brazil resulting from the cutting off of U.S. cotton from world markets was reached in 1870 or 1871. Exports, which from 1849-50 to 1853-54 had averaged 65,988 bales, averaged 247,618 bales during the period from 1869-70 to 1873-74, and in 1871-72 a high of 362,130 bales were exported, a figure which was not equaled until 1934 when 583,654 bales were exported. (See Table V, page 19 for a comparison of Cotton Exported through the Port of Santos with total Brazilian Exports, 1920-39).
Table V

Comparison of Cotton Exported through the Port of Santos
with Total Brazilian Exports, 1920-39

<table>
<thead>
<tr>
<th>Year</th>
<th>Port of Santos (478 pound bales)</th>
<th>Total Brazil (478 pound bales)</th>
<th>Percentage Santos is of total Brazil (percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1920</td>
<td>51,923</td>
<td>113,000</td>
<td>45.9</td>
</tr>
<tr>
<td>1921</td>
<td>21,837</td>
<td>90,424</td>
<td>24.1</td>
</tr>
<tr>
<td>1922</td>
<td>39,438</td>
<td>156,570</td>
<td>25.2</td>
</tr>
<tr>
<td>1923</td>
<td>22,819</td>
<td>88,413</td>
<td>25.8</td>
</tr>
<tr>
<td>1924</td>
<td>2,743</td>
<td>29,815</td>
<td>9.2</td>
</tr>
<tr>
<td>1925</td>
<td>43,644</td>
<td>141,294</td>
<td>30.9</td>
</tr>
<tr>
<td>1926</td>
<td>1,587</td>
<td>76,963</td>
<td>2.1</td>
</tr>
<tr>
<td>1927</td>
<td>2,938</td>
<td>54,961</td>
<td>5.3</td>
</tr>
<tr>
<td>1928</td>
<td>5</td>
<td>46,167</td>
<td>---</td>
</tr>
<tr>
<td>1929</td>
<td>17,088</td>
<td>224,739</td>
<td>7.6</td>
</tr>
<tr>
<td>1930</td>
<td>260</td>
<td>140,282</td>
<td>2.2</td>
</tr>
<tr>
<td>1931</td>
<td>297</td>
<td>95,835</td>
<td>.3</td>
</tr>
<tr>
<td>1932</td>
<td>---</td>
<td>2,377</td>
<td>---</td>
</tr>
<tr>
<td>1933</td>
<td>2,892</td>
<td>53,928</td>
<td>5.4</td>
</tr>
<tr>
<td>1934</td>
<td>288,968</td>
<td>583,654</td>
<td>49.5</td>
</tr>
<tr>
<td>1935</td>
<td>262,412</td>
<td>639,379</td>
<td>41.0</td>
</tr>
<tr>
<td>1936</td>
<td>610,594</td>
<td>923,873</td>
<td>66.1</td>
</tr>
<tr>
<td>1937</td>
<td>702,347</td>
<td>1,089,298</td>
<td>64.4</td>
</tr>
<tr>
<td>1938</td>
<td>921,778</td>
<td>1,239,368</td>
<td>74.4</td>
</tr>
<tr>
<td>1939</td>
<td>1,175,774</td>
<td>1,482,000</td>
<td>78.3</td>
</tr>
</tbody>
</table>

Source: Omer W. Herrmann, South Brazil, New Land of Cotton, Farm Credit Administration Circular C-117, May, 1940, p. 11.

The major part of this period's cotton was grown in the northeastern states of Maranhão, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, and Sergipe, the traditional cotton-growing region of Brazil. However, a considerable quantity was produced in São Paulo, the leading agricultural state of southern Brazil. Shipments of cotton through Santos, the port of São Paulo, averaged 37,258 bales from 1869-70 to 1873-74 or roughly fifteen percent of the annual average of 247,818 bales for the whole country.

With the return of American cotton to world markets and the downward trend in cotton prices in the 1870's and early 1880's, interest in Brazil
turned to other products — in the southern states to coffee, and in the north to sugar and rubber. Cotton production thus declined sharply. Exports during the years 1879-80 to 1883-84 averaged 103,535 bales, a decline of fifty-eight percent from the 1870-74 averages, although still well in advance of averages for the years preceding the American Civil War.

Brazilian cotton production in both the northeastern and southern states was still further retarded by the abolition of slavery in 1888, and in the northeastern states in particular by the rapid development of the rubber industry in the Amazon basin which during the last decades of the century drew increasingly on the northeastern cotton states for both labor and capital.

In the southern states, the history of cotton over the last thirty years of the 19th century was affected in the same manner as the northeastern states, with coffee instead of rubber drawing labor and capital away from cotton. Exports of cotton through the port of Santos which averaged 25,588 bales during the five year period from 1865-66 to 1869-70 fell to an average of only 8,034 bales during the period from 1875-76 to 1879-80. The 1880's and 1890's constitute a stagnant period in the cotton-growing industry of São Paulo. The wave of immigration chiefly from Italy, Spain and Portugal which followed soon after the abolition of slavery in 1888 appears to have been absorbed to a considerable extent by the rapid expansion of coffee production.

In the early 1900's, however, cotton production in São Paulo began to show a slow upward trend, averaging 9,692 bales over the five year period from 1900-01 to 1904-05 and 19,422 bales during the following five
years to 1910. There were a number of factors contributing to shape this general trend, some of which were:

1. The rapid development of the cotton textile industry in São Paulo and Rio de Janeiro, the lint requirements for which far surpassed São Paulo's production;

2. A decline in cotton production in the northeastern states, from whence Southern mills had drawn most of their lint supplies, because of rubber boom which lasted until 1910;

3. The low price of coffee which prevailed in world markets during the first eight or ten years of the new century, tending to revive interest in alternative crops.

The decline in Brazilian rubber prices around 1910 due to the entry of Dutch and British rubber plantations of the Far East into world markets, resulted in a return of both capital and labor to cotton farms and ranches in the northeastern states of Brazil. This is reflected in the increase in cotton production during the years immediately preceding World War I.

World War I developments

Despite the increased domestic consumption by the growing textile industry, Brazilian cotton exports which had averaged 100,991 bales per year from 1901-1905 and had fallen to an average of 77,850 bales annually from 1906-1910, averaged 114,472 bales yearly from 1911-1914 and in 1913 reached a figure of 172,605 bales. This cotton was almost entirely of northeast Brazilian origin, since production in São Paulo was still insufficient to meet the needs of the southern textile industry.

A protective tariff policy, established in the early 1900's gave further impetus to cotton production since this policy aided the domestic textile industry. In 1905, Brazil reportedly had 110 mills, with 26,420 looms and 743,928 spindles, and employing 39,000 workers. Within a short
space of ten years, by 1915, there were 240 mills, with 51,134 looms, and 1,512,626 spindles, giving employ to 82,000 workers.

During World War I, cotton exports declined sharply, although production for the country as a whole was maintained at about an average of 387,000 bales. The decrease in exports was due to the increased consumption of domestic textile manufacturers and the difficulties in shipping abroad arising from war-time restrictions.

In 1918, the coffee districts of São Paulo suffered a severe frost which damaged millions of trees and resulted the following year in the smallest coffee crop since the early 1880's. This failure of the coffee crop coincided with a period of extremely high cotton prices, and in an attempt to offset their losses from coffee, many farmers planted cotton. As a result, the 1918-19 cotton crop in São Paulo totaled 228,840 bales or more than six times the average for the preceding five years (30,090 bales) and a figure never before attained. For the first time since the beginning of the century, cotton exports of appreciable quantities took place through the port of Santos, totaling 27,685 bales in 1919 and 51,923 bales in 1920.

However, cotton had evidently been intended as only an emergency crop by the São Paulo planters and the following year the São Paulo coffee crop recovered to a more or less normal figure and prices for coffee were favorable as a result of the short crop the preceding year. Thus with the decline in cotton prices in 1919-20, cotton production for that year dropped to 95,288 bales, less than half the preceding year's crop and by 1921-22 cotton production in São Paulo had fallen to 60,827 bales.

This decline in São Paulo's production following the record 1918-19 crop was more than offset by increased production in the northeastern states.
so the country as a whole showed an upward trend in production during the early 1920's reaching its peak with a total crop of 738,800 bales in 1924-25.

Since cotton prices rose more rapidly than those of coffee between 1921-24, São Paulo cotton production increased from 62,722 bales in 1922-23 to 117,014 bales in 1923-24 and to 124,047 bales in 1924-25.

Following the high of 738,800 bales total Brazilian production of cotton in 1924-25, production dropped considerably with declining world cotton prices, and over the eight year period from 1925-26 to 1932-33 averaged about 513,500 bales per year of which an average of 86,906 bales was exported during the calendar years 1926-33. The decline was much more pronounced in São Paulo, where coffee was the principal crop, than in the northeastern states, as coffee prices were high in relation to cotton prices from 1925 to 1930 and thus farmers devoted more attention to coffee than to cotton. Over the six year period from 1925-26 to 1930-31, cotton production in São Paulo averaged only 41,000 bales per year and in 1928-29 and 1929-30 fell to the low figures of 20,500 and 18,100 bales respectively as compared with the peaks of 228,840 bales in 1918-19 and 124,047 bales in 1924-25.

**Depression and post-depression developments**

With the break in commodity prices which occurred in 1929 to 1931, the export price of Brazilian coffee showed a considerably sharper decline than did the export price of cotton. The effect of the rise in world cotton prices beginning in 1932 was accentuated by the devaluation of Brazilian currency and by a short cotton crop in 1932-33 resulting from a drought in the northeastern states. This brought the domestic price of cotton to
abnormally high levels during the last half of 1932 and the early part of 1933. In response to these and other factors, one of which was the low world price of coffee, cotton production in Brazil in 1933–34 rocketed to 1,014,000 bales of which the State of São Paulo alone accounted for almost half or 471,803 bales. (See Table VI, page 25, for cotton acreage and production in São Paulo and Brazil, 1921–22 to 1938–39.)

Brazil's cotton exports for 1934 reached a high of 583,654 bales. The spread between coffee and cotton prices increased in 1934 and the 1934–35 cotton crop for Brazil was 1,328,00 bales of which São Paulo contributed 453,000 bales while production in the northeastern states reached a new high of 747,200 bales.

The following five year period from 1935–1940 resulted in a continuation of the favorable relationship of cotton prices over those of coffee and the opening up of Japanese and Chinese markets for cotton. The annual average of cotton production for this period was 1,956,000 bales with São Paulo contributing a larger and larger share each year. In 1938–39, the total Brazilian crop stood at 1,990,000 bales, of which south Brazil produced 1,329,000 bales or 66.8 percent. São Paulo's share amounted to 1,260,000 bales or well over ninety percent of southern cotton.

The principal markets for Brazilian cotton during the 1930's were the United Kingdom, France, and later in the thirties principally Germany, Japan, and China. (See Table VII, page 26 for cotton exports by countries of destination, 1939 and 1949). Exports from São Paulo had increased from about 260 bales in 1930, or only two percent of Brazilian cotton exports, to over a million bales in 1940, or eighty percent of Brazil's cotton exports. (See Table V, page 19)
<table>
<thead>
<tr>
<th>Season</th>
<th>São Paulo Area</th>
<th>São Paulo Production</th>
<th>All Brazil Area</th>
<th>All Brazil Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1921-22</td>
<td>247 1,000 acres</td>
<td>61 1,000 bales</td>
<td>1,257</td>
<td>459</td>
</tr>
<tr>
<td>1922-23</td>
<td>352 1,000 acres</td>
<td>63 1,000 bales</td>
<td>1,511</td>
<td>484</td>
</tr>
<tr>
<td>1923-24</td>
<td>378 1,000 acres</td>
<td>117 1,000 bales</td>
<td>1,550</td>
<td>552</td>
</tr>
<tr>
<td>1924-25</td>
<td>338 1,000 acres</td>
<td>124 1,000 bales</td>
<td>1,912</td>
<td>739</td>
</tr>
<tr>
<td>1925-26</td>
<td>236 1,000 acres</td>
<td>76 1,000 bales</td>
<td>1,542</td>
<td>561</td>
</tr>
<tr>
<td>1926-27</td>
<td>130 1,000 acres</td>
<td>40 1,000 bales</td>
<td>1,422</td>
<td>493</td>
</tr>
<tr>
<td>1927-28</td>
<td>105 1,000 acres</td>
<td>46 1,000 bales</td>
<td>1,376</td>
<td>464</td>
</tr>
<tr>
<td>1928-29</td>
<td>93   1,000 acres</td>
<td>21 1,000 bales</td>
<td>1,393</td>
<td>430</td>
</tr>
<tr>
<td>1929-30</td>
<td>52   1,000 acres</td>
<td>18 1,000 bales</td>
<td>1,726</td>
<td>571</td>
</tr>
<tr>
<td>1930-31</td>
<td>148 1,000 acres</td>
<td>48 1,000 bales</td>
<td>1,694</td>
<td>483</td>
</tr>
<tr>
<td>1931-32</td>
<td>228 1,000 acres</td>
<td>99 1,000 bales</td>
<td>2,000</td>
<td>555</td>
</tr>
<tr>
<td>1932-33</td>
<td>299 1,000 acres</td>
<td>160 1,000 bales</td>
<td>1,703</td>
<td>481</td>
</tr>
<tr>
<td>1933-34</td>
<td>972 1,000 acres</td>
<td>472 1,000 bales</td>
<td>2,851</td>
<td>1,014</td>
</tr>
<tr>
<td>1934-35</td>
<td>1,355 1,000 acres</td>
<td>453 1,000 bales</td>
<td>3,981</td>
<td>1,328</td>
</tr>
<tr>
<td>1935-36</td>
<td>2,224 1,000 acres</td>
<td>815 1,000 bales</td>
<td>5,054</td>
<td>1,757</td>
</tr>
<tr>
<td>1936-37</td>
<td>2,578 1,000 acres</td>
<td>935 1,000 bales</td>
<td>5,220</td>
<td>1,824</td>
</tr>
<tr>
<td>1937-38</td>
<td>2,596 1,000 acres</td>
<td>1,115 1,000 bales</td>
<td>6,010</td>
<td>2,075</td>
</tr>
<tr>
<td>1938-39</td>
<td>2,230 1,000 acres</td>
<td>1,260 1,000 bales</td>
<td>5,666</td>
<td>1,990</td>
</tr>
</tbody>
</table>

**Sources:**

**Expansion of cotton acreage in São Paulo**

The rapid expansion of cotton production in the State of São Paulo is probably the outstanding development in Brazilian agriculture since 1932. At the beginning of the expansion of cotton acreage and production in 1930-31, it was estimated that there were available for new cultivation in São Paulo some ten million acres. A part of this was in the older areas where agriculture had been established for many years, but much of it was in the newer or less-developed western and northern sections of the State.
Table VII

Cotton Exports by Countries of Destination, 1939 and 1949

<table>
<thead>
<tr>
<th>Country</th>
<th>1939</th>
<th>1949</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Kingdom</td>
<td>221</td>
<td>270</td>
</tr>
<tr>
<td>Spain</td>
<td>12</td>
<td>95</td>
</tr>
<tr>
<td>Italy</td>
<td>62</td>
<td>1</td>
</tr>
<tr>
<td>Benelux</td>
<td>33</td>
<td>2</td>
</tr>
<tr>
<td>France</td>
<td>154</td>
<td>30</td>
</tr>
<tr>
<td>Poland</td>
<td>19</td>
<td>64</td>
</tr>
<tr>
<td>Netherlands</td>
<td>54</td>
<td>6</td>
</tr>
<tr>
<td>Sweden</td>
<td>10</td>
<td>76</td>
</tr>
<tr>
<td>China</td>
<td>222</td>
<td>-</td>
</tr>
<tr>
<td>Colombia</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Canada</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Australia</td>
<td>-</td>
<td>32</td>
</tr>
<tr>
<td>Japan</td>
<td>-</td>
<td>359</td>
</tr>
<tr>
<td>Germany</td>
<td>-</td>
<td>301</td>
</tr>
<tr>
<td>Others</td>
<td>45</td>
<td>642</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,492</td>
<td>642</td>
</tr>
</tbody>
</table>


It is on this undeveloped area of reasonably fertile land that much of the cotton has been produced. The new areas planted to cotton since 1932 may be divided into four groups according to the former use or condition of the land. In order of importance these were:

1. Timberland and brushland
2. Pasture land
3. Land formerly used for other crops (corn, rice, beans)
4. Land from which coffee trees have been removed or on which cotton is planted between the rows of coffee trees.

In the west, along the timber frontier of the State, the cotton lands consisted almost entirely of virgin timber land. In the districts to the east, where pasture acreage has always been large, burnt-over land or old pastures which had grown to brush or small timber were used as cotton lands. In the
general farming districts and in the coffee areas, the land used formerly for corn and other crops was converted to cotton.

It is estimated that more than half, possibly three-quarters of the cotton acreage in 1937, was in timberland and brushland cleared expressly to grow cotton. The methods of clearing the land, of growing the cotton, and of colonizing these lands represented the most distinctive features of cotton expansion in the State of São Paulo.

The clearing process was comparatively simple. The trees and brush were cut down in the autumn months of March and April. They dried out during the winter months and the land was usually burnt-over in September. It was then turned over to tenants, and after some further clearing and working with a hoe, cotton was planted by hand between the stumps with one man making a hole and a second man following who dropped the seed and covered them over with his foot. Generally the rows were about five to seven feet apart and the plants from 30 to 40 inches apart within the rows. Throughout the zone, stump-pulling or blasting was unknown.

Some lands were more thoroughly burned than others, and in addition, the old cotton plants were used in burning the land after each harvest. By piling and burning the old cotton plants around the bigger stumps the land was often fairly clear in three or four years, at least sufficiently to make good pasture land. The amount of stumps and logs on the new lands devoted to cotton were one of the distinctive conditions under which cotton was grown. On small timber or brushland plots, the land was turned over to colonists on a three year contract. It is interesting to note that cotton growing had become a part of the operations of livestock ranches. Formerly the land was planted to corn for the first
year or two after burning and then sown to grass. Now, however, lands intended eventually for pasture were turned over to cash tenants to use for growing cotton for three years or more before converting it to pasture. The minimum cash rental for these lands was around $1.50 per acre in addition to the obligation of clearing them and later returning them as pasture.

**Major sources of labor**

Relatively favorable returns from cotton drew labor away from the other enterprises in São Paulo as well as in other Brazilian states. Although statistical information in respect to the sources of labor supply for cotton growing is slim, the following appear to be the principal ones:

- a. Former laborers on coffee plantations
- b. Small farmers formerly growing corn, rice and beans
- c. Japanese and other immigrants
- d. Native laborers who migrated from other states of Brazil

Most Japanese colonists who entered the country during 1932-37 had been contracted for the coffee plantations prior to their departure from Japan. One of the conditions of immigration under the contract was employment on coffee plantations for a minimum of two years. After the two years more and more migrated to cotton growing districts and in the mid-1930's it was estimated that 40 percent of the cotton was produced by Japanese who cleared the land, grew two or three crops and then moved on to new land and repeated the operation.

There is a pronounced migratory tendency among the laborers in São Paulo due apparently to the one and two year contracts system of hiring coffee workers and to the continuous shifting from one coffee plantation to another. This tendency made possible relatively prompt
adjustments of the labor supply to varying wages and undoubtedly accounted in part for the rapid shift to cotton. Gin-owners pointed out that the 1935-36 cotton crop of 815,000 bales, the largest (up to that time) in the history of the State, was picked and marketed in a shorter period of time than were the previous crops and usually no difficulty was encountered in finding new colonists to work the increasing São Paulo production.

Principal areas of production in the State of São Paulo, 1930-40

The principal cotton-producing municipalities were Campinas-Santa Barbara, Ribeirão Preto, Narília, and Jaboticabal. (See Map IV of São Paulo, page 30).

Cotton in the Campinas-Santa Barbara section was grown on land that had been in use for many years and therefore required fertilizers to obtain satisfactory yields. In 1940 only 10 percent of the cotton grown in São Paulo was grown with fertilizers and the bulk of this was grown in the Campinas-Santa Barbara section. Very little crop rotation was practised, some farmers planting cotton on the same land for eight years using about 550 pounds of bone-meal to the acre (at a cost of $1.25 per 100 pounds). Low labor costs enabled the farmers to continue growing cotton on these old areas at little expense, the usual wage rate being 20 to 30 cents a day, in addition to living quarters and a plot of land on which to raise food. Production in the Campinas-Santa Barbara area increased from 17,443 bales in 1932-33 to 69,419 bales in 1938-39.

In the Ribeirão Preto area, cotton was planted on old coffee lands, and yields of 300 to 350 pounds of lint cotton per acre could be realized without the use of fertilizers. Production of cotton in this area
Map IV

Cotton Areas 1930-40
increased from 4,687 bales in 1932-33 to 20,774 bales in 1938-39. This shift from coffee to cotton caused the breaking up of the large estates into smaller parcels of about 120 acres. Most of the purchasers of these small parcels were the former tenants who grew cotton on a cash-rent or share-crop basis.

One of the fastest-growing cotton areas in 1939-40 was in the vicinity of Jaboticabal, west of Ribeirão Preto. Here production had increased from 1,109 bales in 1932-33 to 32,218 bales in 1938-39. Much of the cotton in this area was produced on former pasture lands but cotton was also grown on land formerly devoted to other crops and on woodland cleared since the beginning of the cotton boom.

Temporary cotton land was found around Olimpia and Nova Granada, west of Barretos, where owners of pasture land rented to cotton farmers for three or four years in order to obtain cash income and have their pastures cleaned. Rental of these lands ranged from $1.50 to than $2.50 per acre. Olimpia production of cotton increased from only 97 bales in 1934-35 to 17,710 in 1938-39, and production in Nova Granada increased from 800 bales in 1932-33 to 25,263 bales in 1938-39.

The area about Marilia was one of the newer cotton-growing districts, and had developed remarkably since the beginning of the cotton boom in 1932. Production in this area including Marilia, Vera Cruz, Pompeia, and Tupã increased from 2,006 bales in 1933-34 to 129,444 bales in 1938-39. In this area cotton was grown almost exclusively on former brush and timber land which had been cleared expressly for planting cotton. Japanese colonists constituted an important factor in cotton production in these new western areas around Marilia. Official statistics relating to cotton seed
distribution by nationalities show that 67 percent of the seed sold for planting in Marilia for the 1939-40 crop was purchased by Japanese.

Prices received by farmers in 1940 for seed cotton at gins in São Paulo averaged 2.23 cents per pound while in 1941, offers by ginners did not exceed much over 1.58 cents per pound.

There were many factors contributing to the amazing expansion of cotton production that took place in the State of São Paulo from 1930 to 1940. Some of these are:

1. The relatively stable world cotton price situation since the 1932 depression.
2. Favorable climate, soil, and abundance of virgin land, ideally suited for cotton production.
3. Currency devaluation, exchange controls, and barter agreements.
4. Relatively dense population and large domestic textile industry.
5. Desire of other countries to develop alternative sources of supply independent of those in the United States.
6. Efforts by the Brazilian government to diversify the economy resulting in encouragement and benefits to cotton growers.

In 1930, a total of 148,260 acres of land in the State of São Paulo were devoted to the production of cotton while the total area of Brazil cultivated to cotton was 1,694,000 acres. By 1940 the number of acres devoted to cotton in Brazil had risen to 5,889,000 acres of which the State of São Paulo accounted for 2,656,194 acres.
Chapter IV

São Paulo Cotton Production 1940-50

The crisis of coffee experienced by Brazil growers in the 1930's extended into the early 40's and as a result, a greater number of acres were converted to the cultivation of cotton each year. The number of acres devoted to cotton in São Paulo rose from 2,751,390 acres in 1941 to 3,222,648 in 1942, reaching a high of 3,693,666 acres in 1944. The five year period from 1939-40 to 1943-44 recorded the highest average yields yet obtained, 257 pounds per acre, despite the large increase in planted area.

From 1939 to 1944, cotton replaced coffee as Brazil's most valuable crop, production in São Paulo rising from 1,417,760 bales* in 1940 or 65.5% of total Brazilian cotton production to the peak of 2,161,567 bales in 1944, almost 80% of Brazil's production.

A sharp decline in cotton production occurred in 1945 when yields fell to only 137 pounds per acre, the lowest yield since the initial expansion of cotton production in São Paulo, while acreage planted to cotton declined to 2,919,300 acres. Cotton production in São Paulo dropped to fourth place in value of production, following coffee Brazil's, most valuable crop, corn, and rice.

This decline, initiated in 1945, continued during the last half decade of the 1940's, cotton production in São Paulo falling to as low as 695,977 bales in 1948, with barely two million acres planted to cotton that year. Last year, 1951, cotton production recovered somewhat reaching a figure of 1,075,988 bales, the highest figure since the 1945 decline. (See Table VIII, page 34).

* All bales referred to in this chapter are 480 pounds in weight
Table VIII
The State of São Paulo Cotton Production, Acreage, and Seeds Distributed, 1940-1952

<table>
<thead>
<tr>
<th>Year</th>
<th>Seeds distributed</th>
<th>Acreage</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sacks of 66 pounds</td>
<td></td>
<td>Bales of 480 pounds</td>
</tr>
<tr>
<td>1940</td>
<td>688,319</td>
<td>2,656,194</td>
<td>1,417,760</td>
</tr>
<tr>
<td>1941</td>
<td>718,079</td>
<td>2,751,390</td>
<td>1,776,891</td>
</tr>
<tr>
<td>1942</td>
<td>687,260</td>
<td>3,222,846</td>
<td>1,319,120</td>
</tr>
<tr>
<td>1943</td>
<td>781,117</td>
<td>3,642,588</td>
<td>1,750,457</td>
</tr>
<tr>
<td>1944</td>
<td>887,293</td>
<td>3,693,666</td>
<td>2,161,567</td>
</tr>
<tr>
<td>1945</td>
<td>900,830</td>
<td>2,919,300</td>
<td>1,085,812</td>
</tr>
<tr>
<td>1946</td>
<td>596,108</td>
<td>2,229,984</td>
<td>808,753</td>
</tr>
<tr>
<td>1947</td>
<td>607,642</td>
<td>3,000,504</td>
<td>817,856</td>
</tr>
<tr>
<td>1948</td>
<td>487,042</td>
<td>2,072,760</td>
<td>695,977</td>
</tr>
<tr>
<td>1949</td>
<td>626,138</td>
<td>2,202,804</td>
<td>1,034,418</td>
</tr>
<tr>
<td>1950</td>
<td>907,554</td>
<td>2,925,606</td>
<td>770,691</td>
</tr>
<tr>
<td>1951</td>
<td>978,169</td>
<td>2,831,812</td>
<td>1,075,988</td>
</tr>
<tr>
<td>1952 *</td>
<td>1,250,000</td>
<td>3,420,000</td>
<td>1,170,000</td>
</tr>
</tbody>
</table>

* estimate

1951 and estimate figures from A Agricultura em São Paulo, Ano 1 No. 9, Dezembro 1951, p. 5.

São Paulo played an increasingly important role in Brazilian cotton exports, contributing in 1945 ninety-nine percent of total Brazilian exports of cotton. Brazilian cotton exports rose to 1,627,000 bales in 1946 and then slowly decreased to only 642,000 bales in 1949. São Paulo has contributed over 90% of Brazil's total cotton exports since 1942.

Most of São Paulo's 1950 cotton exports of approximately 620,000 bales went to the United Kingdom which has been Brazil's principal cotton market over the last decade. Other countries of destination for São Paulo cotton exports in the last year or two have been France, Germany, Spain, and Sweden. Due to the dollar shortage, these purchasers are willing to pay higher prices in soft currencies for cotton obtainable outside the
the U.S. Moreover, United States cotton has been placed under export license regulations, therefore current Brazilian cotton prices are considerably above the North American cotton quotations. The average price per ton of cotton shipped from São Paulo in 1939 was Cr. $3,630 which equals approximately $197.84 in U.S. currency (one cruzeiro being equal to about 5.45 cents in U.S. currency), and in 1948 the average price per ton had risen to $708.50.

The cotton export business is largely in the hands of firms of international character, organized under Brazilian law. The U.S. firm of Anderson, Clayton and Co. entered the Brazilian field as early as 1926 and in 1950 handled 28.4% of Brazil's cotton exports.

Present zones of production in São Paulo

The march of cotton cultivation in São Paulo continued its westward trend extending itself to the western-most borders of the State. (See Map V, page 36.) There are roughly three cotton-producing zones in the State: 1. the old central zones comprise the Campinas-Piracicaba-Limeira-Sorocaba region, 2. the cotton-coffee area of the northeast consisting of the Ribeirão Preto-Jaboticabal-Mateus region; 3. and the new western region comprises the Alta Paulista, Noroeste, Alta Sorocabana, and Alta Araripense. These zones are formed by the sectors of Marilia, Presidente Prudente, Araçatuba, and Rio Preto. These sectors presently represent seventy percent of the total area cultivated to cotton in the State and contributed approximately seventy percent of last year's cotton production in the State.

Reasons for the decline in production after 1944.

Diverse causes have been presented as responsible for the decline in cotton production in São Paulo. Among these can be cited the following:
Map V

Cotton Movements in São Paulo, 1940-1950

Old zones

Cotton-Coffee zones

New Cotton zones
degeneration of the varieties; disorganization of official services after the extinction of the *Serviço Científico do Algodão*, a technical organization directed by Dr. Raimundo Cruz Martins which had divided the State into different cotton zones, established seed selection posts in each zone under the care of trained technicians, and contributed pure, disease-free seeds for distribution; bad meteorological conditions; attacks of insect plagues; pronounced erosion in several regions of the State; lack of financing capital; lack of crop rotation; lack of fertilization; as well as other reasons of lesser importance.

The trend towards urbanization in the State of São Paulo has also contributed in part to the decline in cotton production suffered after 1944. The publications of the first results of the 1950 census makes possible an analysis of the demographic changes undergone in the different regions of the State. The general trend revealed by this data is that there has been a larger increase in urban population than rural; there has been a rural exodus in certain central regions; and there has been a "march to the west".

Of the general increase of 43.67% of total population in the State since 1934, the rural population has grown only 6.57% while urban increase amounted to 37.10%. Urban population has increased in all sectors while rural population has fallen in the central sectors of Araraquara, Avare, Bauru, Bebedouro, Campinas, Jau, Piracicaba, Piraputanga, Ribeirão Preto, and Taubaté.

In order better to evaluate the importance of depopulation of certain sectors, the following Table showing inhabitants per square kilometer of rural population is included:
Table IX

Inhabitants per square Kilometer

(Rural Population), 1934-1950

<table>
<thead>
<tr>
<th>Sectors</th>
<th>Sq. Kilometers</th>
<th>1934</th>
<th>1950</th>
</tr>
</thead>
<tbody>
<tr>
<td>Araçatuba</td>
<td>16,635</td>
<td>8.9</td>
<td>17.6</td>
</tr>
<tr>
<td>Araraquara</td>
<td>11,150</td>
<td>25.6</td>
<td>17.2</td>
</tr>
<tr>
<td>Avaré</td>
<td>18,150</td>
<td>15.8</td>
<td>12.9</td>
</tr>
<tr>
<td>Baurú</td>
<td>10,855</td>
<td>24.3</td>
<td>20.8</td>
</tr>
<tr>
<td>Bebedouro</td>
<td>10,884</td>
<td>22.2</td>
<td>17.7</td>
</tr>
<tr>
<td>Campinas</td>
<td>10,610</td>
<td>31.9</td>
<td>25.9</td>
</tr>
<tr>
<td>Itapetininga</td>
<td>20,636</td>
<td>8.2</td>
<td>9.6</td>
</tr>
<tr>
<td>Jau</td>
<td>5,177</td>
<td>26.5</td>
<td>21.1</td>
</tr>
<tr>
<td>Marilia</td>
<td>13,350</td>
<td>8.7</td>
<td>28.5</td>
</tr>
<tr>
<td>Piracicaba</td>
<td>7,588</td>
<td>26.5</td>
<td>22.0</td>
</tr>
<tr>
<td>Piraçuñúnga</td>
<td>9,781</td>
<td>25.2</td>
<td>22.4</td>
</tr>
<tr>
<td>Presidente Prudente</td>
<td>22,806</td>
<td>8.3</td>
<td>16.9</td>
</tr>
<tr>
<td>Ribeirão Preto</td>
<td>17,589</td>
<td>20.3</td>
<td>17.7</td>
</tr>
<tr>
<td>S. José do Rio Preto</td>
<td>24,887</td>
<td>14.2</td>
<td>18.2</td>
</tr>
<tr>
<td>São Paulo</td>
<td>29,698</td>
<td>18.6</td>
<td>23.0</td>
</tr>
<tr>
<td>Taubaté</td>
<td>16,253</td>
<td>17.7</td>
<td>17.0</td>
</tr>
<tr>
<td>State</td>
<td>247,049</td>
<td>16.9</td>
<td>18.6</td>
</tr>
</tbody>
</table>

The diminution of the number of inhabitants in several zones was compensated by an increase in other western zones such as that of Marilia which from 8.7 inhabitants per square kilometer has increased to 28.5; Presidente Prudente from 8.3 to 16.9 inhabitants; Araçatuba from 8.9 to 17.6; and São José do Rio Preto whose rural population was not small, had an increase of four percent. Interestingly enough, these four sectors presently comprise the most important cotton producing regions of the State.

However, not withstanding the migration of the population to newer zones, there has not been a proportionate increase in "per capita" production since the volume of production of the fifteen principal products has remained practically the same over the last seventeen years. Thus, although the State of São Paulo is probably one of the most advanced federal entities from the point of view of mechanization of agriculture, it is
obvious that this practice, which is still in its infancy, will have to be developed to a much greater degree. For an increase of 2,387,027 inhabitants since 1934 in the urban zones there has been an increase of only 422,256 inhabitants in rural zones. The indefinite growth of cities will bring about either a progressive increase in the cost of subsistence and an alimentary crisis which even now is threatening Brazil's economy, or the necessity of increasing the productivity of the man in the field, an objective which can be realized for the present principally with the aid of machines and equipment of foreign origin.

Some groups of municipalities in zones that have lost rural population have shown an increase in productivity where the use of machines have augmented the productivity of the man in the field and the soils are still relatively fertile. This has taken place in the group of municipalities of the Sectors of Ribeirão Preto and Bebedouro situated on good lands of the planalto which offer favorable conditions for mechanized cultivation. In this region there has been an increase in the production of both coffee and cotton.

The diminution of cotton production in the older central zone has probably been caused more by the dislocation and diminution of its population than to other factors. The dislocation of production to the western sectors of Presidente Prudente, Marilia, Arapuã and Rio Preto depict the migration of the population in search of newer, more fertile soils. From the 29,262 sacks of cotton seeds sown in these sectors in 1934-35, the figure has risen to 712,000 sacks presently cultivated.

The westward expansion of cotton and population produced a tremendous instability of labor. The rural worker today does not remain on the
same property for more than one or two years. Aside from the social and economic inconveniences of this instability such as lack of education of the workers, lack of better housing, ignorance of agricultural practices that conserve the soil, etc., it also diminishes the possibilities of ameliorating technical knowledge since the fazendeiros or land owners, knowing that their employees will be working on another property in a year or two are not interested in bettering the working capacity and knowledge of these workers.

The use of fertilizers

The trend away from the country and to the cities is creating a crisis in agricultural production in Brazil. One way of combating this is to increase the efficiency and capacity of the remaining laborers by the increased use of agricultural machinery. Another way is to increase the efficiency and capacity of agricultural production by the augmented practices of fertilization and insect control.

The consumption of fertilizers in São Paulo has been increasing over the last twenty years. The first movement towards the wider use of fertilizers was felt in the decade 1920-29 and since then consumption has increased in 1940 to five times the amount consumed in 1930, in 1950 to thirty times the amount consumed in 1930, and in 1951 to forty-five times the 1930 figure. Import of fertilizers have steadily risen also. (See Graph I, page 41). Imports made through the port of Santos until 1940 represented around 90 to 95% of the chemical fertilizers that entered Brazil. During the five year period from 1940-45 that percentage fell to 85-90% and in the last five years has fallen even further to the present level of around 65-70%. Although São Paulo uses more fertilization than
Graph I

Importation and Production of Mineral Fertilizers in the State of São Paulo, 1940-50

the rest of the country, it is still on a very small scale. If one considers that the 152,000 tons of fertilizers imported by the State in 1950 had been applied to the 1,890,000 alquiere (one alquiere equaling approximately six acres) presently cultivated to the principal crops, an average of only 80 kilograms per alquiere would be the result. In comparison with other countries in the world possessing similar agricultural conditions to those of São Paulo, the small use of fertilizers by Brazilian farmers is evident. (See Table X, p.42 for consumption of fertilizer in various countries).

Table X

Consumption of Fertilizers
for Various Countries, 1948-49

<table>
<thead>
<tr>
<th>Countries</th>
<th>N-1,000 tons</th>
<th>P2O5-1,000 tons</th>
<th>K2O-1,000 tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>7.0</td>
<td>22.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Formosa</td>
<td>20.7</td>
<td>10.4</td>
<td>27.0</td>
</tr>
<tr>
<td>Korea</td>
<td>110.0</td>
<td>63.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Australia</td>
<td>13.3</td>
<td>301.8</td>
<td>4.9</td>
</tr>
<tr>
<td>India</td>
<td>49.2</td>
<td>9.0</td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>8.1</td>
<td>29.6</td>
<td></td>
</tr>
</tbody>
</table>

1. São Paulo consumption represented 70% of Brazil's total consumption that year.


The increased use of fertilizers in São Paulo has been due principally to the following causes: (a) the rise of prices of agricultural products has been relatively greater than prices of fertilizers, (b) official technological assistance to farmers, (c) propaganda campaigns by firms selling fertilizers. Of the above the main cause has been that of the relation between the prices of agricultural products and those of fertilizers, as follows:
Nevertheless, fertilizer prices in São Paulo are relatively high. Factors contributing to this are high maritime freight rates, commercialization of fertilizers, lack of adequate farm credit for the acquisition of fertilizers, higher railroad rates, and the 8% federal exchange tax that affects fertilizer prices.

The cultivation of cotton rapidly depletes the fertility of the soil. Poor agricultural practices such as extended use of the land and lack of crop rotation has virtually exhausted the soils of the central regions and the fertility of the western soils is also being depleted. Cotton cultivation presently covers some 3,000,000 acres in São Paulo. An average annual production extracts from the soil per acre 160 pounds of potassium chlorate, 150 pounds of sodium nitrate and 100 pounds of superphosphates, using terms of most used commercial fertilizers. It is easy to calculate how depletion of soils is progressing harvest by harvest. Since production has extended itself to the very borders of the State, the following possibilities seem to be present:

(a) that cotton will extend itself into the States surrounding São Paulo.

(b) that São Paulo cotton production will diminish as soils are used up.

(c) that more efficient use of the land will be adopted by increasing the production and use of fertilizers.
Insect control

Insect damage is an important factor in the wide fluctuations of annual yields. This damage has afflicted São Paulo’s cotton for many years and since the production has spread over most of the States, the loss from insects has increased. Although definite data are not available, it is estimated that insects cut yields by ten to fifty percent. This loss is caused by a number of destructive insects, the most important ones being the pink bollworm, the cotton root borer, and the cotton leaf caterpillar.

While the pink bollworm caused a great deal of damage, it is probably not as destructive now as it was a few years ago, due to the control measures that have been adopted. All seed is fumigated and much precaution is used in destroying the plants in the field after the harvest. This fumigation is done in the State Department of Agriculture planting seed warehouses and since growers can purchase seed only from this department, the control of fumigation presents no administrative problem.

At present the cotton root borer seems to be a very destructive cotton insect in São Paulo. It has been known for many years, but no effective method of control has been developed. Although the department of agriculture recognizes the possible loss in fertility through the burning of organic matter, it has passed decrees which require that stalks in infected fields be burned to destroy root borers as a necessary precaution to control damage from these insects. Keeping the fields clean and rotation of crops also minimize damage from this insect which afflict fifty to seventy percent of the cotton plants.

The cotton leaf caterpillar is probably the most widespread of the
of the major insects. Some estimates place the damage of crops by this insect at from ten to twenty-five percent annually. The form of control followed is to spray the crop two or three times a year with calcium arsenate, lead arsenate, or other poisons.

There are several other insects, such as cotton stainers, cutworms, grasshoppers, ants, and aphids that cause some damage from year to year.

Actually, probably no other agricultural practice has evolved as rapidly in the last few years as the utilization of modern insecticides in cultivating cotton. In 1948-49 around three thousand tons of insecticides were consumed; in 1949-50 the figure rose to five thousand tons; in 1950-51 their use surpassed eleven thousand tons; and estimates for the 1951-52 consumption were placed at approximately twenty-five thousand tons.

The two sources of the various types of insecticides are importation and national production. Imports consist mainly of chlorated products such as DDT, BHC and sulphur used in the composition of mixtures. National production furnishes a small quantity of BHC and practically all the phosphate product most widely utilized, which is thiophosphate.

The two main raw materials used to make chlorated insecticides are benzol and chlorine. Despite the increased availability of these products, their consumption has surpassed their production owing to three factors.

1. the steady increase in the consumption of insecticides in many countries of the world.
2. The enlarged utilization of these raw materials in various industries.
3. the American desire to "stockpile" these materials for strategic purposes.

Since the use of insecticides is one of the most decisive factors
in attempts at increasing yields and thereby the efficiency and capacity of the farm laborer, there will be an increasing trend in the future towards a wider consumption of insecticides in cotton growing. With a cotton area of some 3,000,000 acres, there is a capacity for consumption of at least fifty thousand tons of insecticides.
Chapter V

São Paulo's Cotton Improvement Program

The State government of São Paulo has been very active in supporting agricultural production. Because of its desire to diversify the economy, cotton production was stimulated by governmental encouragement to the farmers. The government has striven to maintain this interest in cotton production by initiating a series of programs to improve the quality of the cotton and thereby increase the benefits to cotton growers.

The organization of these programs are divided into special bureaus, divisions, and sections, each having a specific function in the cotton program and all coordinated in the Secretaria da Agricultura, or Department of Agriculture, of São Paulo.

The State's work in cotton breeding and seed control and distribution is carried on by the Instituto Agronômico, or São Paulo Institute of Agronomy at Campinas. This institute was founded in 1887, before the organization of the Secretaria da Agricultura, but its work with cotton started in 1924, when Dr. Raimundo Cruz Martins became the director of the Secção de Algodão created a year before. During the first years, the principle objective of the Secção de Algodão consisted in selecting the most productive of the seventy known varieties of cotton and choosing the best qualities of fibers. However, in 1935, the Instituto Agronômico was reorganized and a Serviço Científico do Algodão was created. This bureau contained three sections: the Secção de Experimentação to carry on the work of the Secção de Agronomia which had replaced the Secção de Algodão in 1927; the Secção de Controle de Sementes to carry on the production, selection, and distribution of cotton seeds; and the Secção de Tecnologia
de Fibras to study the differing characteristics of the cotton fibers.

The Servicio Cientifico operated until 1942 when its was discontinued and its work taken over by two different divisions, one the Seccao de Algodo do Instituto Agronomico created that year and headed by Dr. Ismar Ramos and the other the Divisao de Fomento Agricola under the directorship of Dr. Cruz Martins.

The latest organization to promote cotton production in Sao Paulo is the Comissao Especial do Algodao created in May 1950, which now incorporates all divisions and persons interested in cotton into one central body. Before discussing the various elements in this new program to revive cotton production in Sao Paulo, it will be well to review some of the past achievements of Sao Paulo's cotton program.

Breeding and selecting

In its cotton-breeding and selection, and adaptation work, the Institute of Agronomy (Campinas) of the Department of Agriculture assembled cottonseed samples of all the leading varieties of North-American cotton. With these samples as the initial basis for experimentation and with other stocks available in the State's agricultural experiment stations, the Institute in 1924 began to develop varieties that would be adapted to natural conditions in the State. Analyses and experimentation showed that the short-staple Texas and Express varieties of cotton were best adapted to growing conditions in Sao Paulo, whereas in northeast Brazil, the long-staple tree cotton thrived more successfully. The characteristics of these large-boll types of American cotton have undergone basic changes in their new environment; staple lengths have been improved and fiber lengths now approach a fairly high degree of uniformity.
In the 1930's, certain strains of three selected varieties* were isolated and their seeds were multiplied in the experiment stations and furnished to the Divisão de Fomento Agrícola to renovate cotton cultivated in São Paulo. In 1942, seeds of a variety, isolated in the Secção de Genética were received by the Secção de Algodão. After long experimental work with this variety, called I. A. Campinas 817, it was recommended for use throughout the entire territory of the State. This variety presently occupies almost eighty percent of the area cultivated to cotton and was an important factor in the revival of cotton production after the decline suffered in 1945.

Production and multiplication of planting seed

In March 1932, the State government took measures to control the distribution of seeds. It issued decree number 5437 that stated that cotton growers should use only seed recommended by the Secretary of Agriculture. In the beginning, the see-distribution work was done largely through commercial dealers under the supervision of the Divisão de Fomento Agrícola. On July 5, 1935, decree number 7312 gave the seed control and distribution work to the Institute of Agronomy. The Divisão de Fomento Agrícola had divided the State into eight seed distribution zones with stations in the following cities: Campinas (zone 1), Itapetininga (zone 2), Avaré (zone 3), Presidente Prudente (zone 4), Bauru (zone 5), Araraquara (zone 6), Jaboticabal (zone 7), and Ribeirão Preto (zone 8).

For the expurgation of the seeds produced on farms cooperating with the State government, fourteen seed-concentration warehouses (postos de expurgo) were constructed by the Institute from which the seeds were also sold. Contracts were made with leading cotton farmers in these zones to

* Varieties named I. A. 7387, I.A. 7111-028 and I. A. 21077.
produce and multiply the stocks of planting seeds for distribution in their respective zones. As production of cotton increased, the number of cooperating farms also increased. The distribution program now provides for the planting seed requirements for the some 200,000 cotton farmers in the State. The cooperating farmer agrees in his contract not only to plant the varieties recommended by the Institute but also to follow its agricultural practices suggestions. His farm is also available for tests and demonstrations related to planting data, row and in-the-row spacing of plants, use of fertilizers, and methods of insect control. Because of the coordinated system of cooperating farms and experiment stations when a new variety develops such as Campinas 817, the entire State's production can be converted to the new strain in a relatively short time.

Cotton produced by each of the cooperators is also subjected to yearly routine tests to ascertain differences between cotton-producing areas of the State and adaptability of different varieties to each area. These routine tests include examination of:

1. Fiber length - Practical classification by hand is followed by use of mechanical sorters
2. Weight of 50 bolls
3. Percentage of lint outturn
4. Weight of 100 seeds
5. Fineness of fiber
6. Weight of the fiber from 100 seeds

The staple of São Paulo cotton is remarkably uniform, practically all of it being 1 inch staple and falling within a range of 1/16 inch above or below. Cooperators may deliver their cotton to any gin on the Institute's approved list. There the seed cotton is stored in bins until it can be
ginned under the supervision of the **fiscal** who is a representative of the Department of Agriculture. All cotton is then ginned and each bale is numbered and branded for identification purposes. The fiscal also supervises the sacking of planting seed and its shipment to one of the fourteen concentration warehouses.

**Storage and distribution of planting seed.**

The concentration warehouses are located on railway sidings in towns with satisfactory highway connections and transportation facilities. Each has considerable seed storage capacity and also fumigating, cleaning, and mechanical delinting equipment. All warehouses also have laboratory facilities for testing the seeds.

On receipt of the sacked seed from the gins, it is placed in an isolated storage section of the warehouse set aside for unfumigated seed. Germination tests are then performed and if satisfactory, the seed is immediately fumigated for the control of pink bollworm. After fumigation the seed is cleaned, delinted, and resacked. If the seed meets all required specifications, a certificate of quality is inserted in each sack bearing the Institute's stamp and the lot-identification number. It is then sealed with a lead seal and is ready for sale and distribution. The law requires that all farmers purchase their cotton seed from the Institute of Agronomy, but included in the purchase price of the seed is a premium on a hail-insurance policy. In this way, all the cotton acreage of São Paulo is covered by hail insurance.

**Supervision and inspection of Ginning.**

Another phase of São Paulo's cotton improvement program has been to see that the cotton is properly ginned and handled in order to preserve
the good qualities developed by the variety and seed program. The mecha-
nical equipment of each gin plant (machina de beneficiar algodão) is
inspected prior to the operating season and while in actual operation. The
annual license to operate is issued only if the inspector’s report is
satisfactory. In addition to a force of inspectors, each gin is visited
by a fiscal or representative of the Department of Agriculture to see that
the cotton is properly ginned. The fiscal draws a sample of cotton from
each bale, places it in a paper bag that has the bale number and weight
marked on it, and places these paper bags in a large canvass bag sealing
it with wire and lead. Each canvass bag contains from 40 to 50 four-
ounce samples and an invoice giving:

1. Name of ginner
2. Trade-mark of the gin
3. Bale numbers represented by enclosed samples
4. Weight of each bale
5. A blank space for the insertion of grade
   and staple information

The bags are shipped each night to the Fomento division of the Department
of Agriculture and after substitution of a blank form containing only a
code number for the invoice, the cotton is then turned over to the São
Paulo Bolsa de Mercadorias (Merchandise Exchange) for classification.

Increasingly stricter regulations are being placed on gin plants
in São Paulo, and the standardization of operations, use of adequate and
modern machinery, and integrity of operation are strongly enforced.

**Cotton Classification Service**

While Dr. Cruz Martins was initiating the system of pure disease-
free seed distribution, Dr. José Garabaldi Dantas organized in 1935 a
classification service and since 1938, every bale of cotton produced in the State of São Paulo has been classed under a national cooperative classing arrangement that includes the State and Federal Departments of Agriculture and the cotton section of the São Paulo Bolsa de Mercadorias.

Classifiers employed by the Bolsa classify each day the receipts of the previous day. These classifiers review the samples that have been drawn from each bale of cotton produced in the State. Each bale is classified for grade according to the nine white types of the official cotton standards of Brazil, staple classification being in millimeters. The U.S. middling classification lies between São Paulo types 4 and 5 while price quotations for São Paulo's cotton reported in the U.S. are based on São Paulo type 5.

The following are some of the advantages gained by the State Government classification service:

1. It assists in protecting the independent ginner and cotton merchant in Brazil from unscrupulous dealings of foreign exporters and vice versa.

2. It establishes the approximate value of the cotton for tax purposes.

3. It gives the Federal and State Departments of Agriculture information on the quantity and quality of cotton produced, exported, stocks on hand, and the destination of foreign shipments.

4. It provides a good basis for adequate direction of cotton improvement program.

5. It forms the basis for an accurate statistical service for cotton.

Mainly thru this classification service the Bolsa de Mercadorias de São Paulo, and the Federal and State Department of Agriculture are able
to furnish statistics on:

1. Annual production of cotton in States and the Nation in number of bales, tonnage, and value of the crop.

2. Estimates of intentions to plants and acreage thru the sale of seed.

3. Acreage planted according to State, municipalities, or county and zone.

4. Number of bales and weight of cotton classified fortnightly, monthly and cumulatively.

5. Monthly and seasonal exports of cotton of each State by exporter and country of destination.

6. Cotton consumption by States


8. Number, ownership, size, volume, and details of equipment of each gin plant.

Transportation facilities for cotton.

Most of the railroads were originally built to accommodate the vast coffee traffic but cotton production has followed the railroad lines fairly closely and most of the gins are located along the railroad railroads which proceed mostly in a westerly and northwesterly direction from the city of São Paulo. Although the agricultural areas are fairly well served by railroad facilities, the type of equipment used is a handicap. Ancient equipment of English, American, and German manufacture is still used and there are two gages of track used in south Brazil. Therefore in many instances, cotton or other products must be transferred from the cars of one road to the cars of the other. This involves considerable time, labor, and expense.

However railroad rates, which are Government controlled, are considerably lower than traffic rates in the United States. Some railroads
are electrified but most of the steam locomotives, because of shortage of coal in Brazil, burn wood for fuel. So far as exportation of cotton is concerned, the location of railroads in the State is an advantage since many lines funnel into the city of São Paulo and from there the 2,500 feet descent down the escarpment into the port of Santos is managed by means of an amazing English cable railroad. Recently, the Government built another rail line down the escarpment to Santos. This line, which carries freight from the Sorocabana railroad, does not go through São Paulo.

There is a marked lack of good highways in the interior of the State, many of the roads being little more than trails. Very little of the baled cotton or cottonseed is handled by trucks, probably because rail rates are low, good truck-highways are lacking, and prices of gasoline are high.

Large landowners are not enthusiastic about improvement or development of highways since they have been using the railroads for travel between their farms and the cities for years and highway construction might increase their taxes. There is also the feeling on the part of some landowners that with improved highway facilities it would be more difficult to keep labor on the land since the plantation would become less isolated and workers might move from farm to farm in search of the highest wages. However, there is a growing awareness of the inadequacy of the highways and an increasing demand for improvement.

Future work program of the Special Cotton Commission

The Special Cotton Commission is made up of representatives of official organization and of cotton producers, all interested in maintaining a full program of recuperation of the Paulista cotton cultivation which
has undergone a period of crisis. The Commission has studied the diverse causes contributing to this decline in production such as lack of crop rotation, severe soil erosion, negligence in use of insecticides and fertilizers, adverse weather conditions, degeneration of the varieties of cotton, attacks of plagues, lack of adequate financing, etc. The following are some of the basic points of the Commission’s "Campanha de reerguimento da produção de algodão":

Cotton seeds - continue producing high quality disease-free seed making sure that sufficient seed is produced; closer supervision of the cooperative fields; make seeds available early so that the first rains can be used in cultivation.

Sanitary defense and insecticides - make absolutely obligatory the burning of all remnants of the cotton after each harvest, revising the law to include rigorous penalties for those who do not comply; increased stocks of insecticides to supply the real needs of the farmers; study the amount of insecticides needed to be imported and send the data to the offices in charge of importation; an intensive campaign by means of the press and radio and other methods, alerting the farmers against plagues and providing instructions on the best ways of combating them.

Regional Committees - install regional committees in the principal cotton zones of the State; ask all farmers to cooperate with these committees or to form sub-committees of their own; use the efforts of all these for an efficient campaign to stimulate renewed cotton production.

Fields of Cooperation - form new fields of cooperation to supply the need for an increased seed production; suggest higher prices for cotton seeds be paid the cooperators to stimulate further production.

Instructions to farmers - by use of press, radio, pamphlets, and demonstrations, instruct the farmers in preparation of the land, planting of seed, time to plant, treatment of plants against insects, necessity of fertilization, etc.

Financial aid - study means of obtaining better system of farm credit and ways of reducing prices of items such as fertilizers for the farmers; devise a plan of general contribution from all agricultural, commercial, or industrial segments of the economy linked in some manner to cotton production.
Commerce and exportation - adaptation of a practical system of specialized cotton credit on a wider basis and more in accord with present costs; revival of immigration policy to augment rural labor; adoption of methods to encourage and extend the fertilization of lands, defense against erosion, and other practices capable of increasing production; expansion and perfecting of official technical services responsible for the obtaining and multiplying of good seed to insure better production and larger yields per acre; adoption of methods to stimulate the use of modern agricultural machinery especially adapted for the production, transportation, and ginning of cotton; promotion of a program to mobilize forces to combat plagues of cotton including aid of the farmers, ginners, exporters, and government.

Much of the blame for the decline in cotton production after 1945 must be placed on the diminution of governmental interest and encouragement of cotton cultivation in the State. The astonishing decrease in production in 1950 quickly renewed governmental interest in cotton and presently great attention is being provided by all parties interested in cotton in the attempt to revive the production of this important product of the State's, and of, Brazilian economy. For this reason and in view of the amazing expansion in cotton production which took place in the thirties by means of a program similar to the one now in operation, there is a strong probability that São Paulo's and Brazil's cotton production will regain its share in the economy in the near future.
Chapter VI

Conclusion

Cotton production in the State of São Paulo has passed through many changes in the last twenty years. Its progress has been marked by an amazing expansion of the quantities produced and also by continued improvement in the quality of the product.

The State government has aided growers directly through the distribution of pure disease-free seeds and protection against pests and plant diseases and indirectly by providing improved transportation facilities. In addition the Federal Government has improved marketing conditions through commercial agreements with other countries and through the stimulation of domestic consumption of cotton.

Certain definite trends are evident in the history of São Paulo's expansion in cotton production. There has been a steady "march to the west" by cotton farmers seeking newer, more fertile lands after exploiting the soils of the central and eastern zones to their limit. Along with this "march to the west" there has been an exodus of rural population into urban centers, reducing the amount of labor for agricultural production.

Agricultural practices such as fertilization, rotation of crops, and use of insecticides were practically unknown to the growers of cotton, since when yields started to decline, the practice was to abandon the land and move to newer areas in the western part of the State.

However, in 1945, these factors plus a relaxation of governmental encouragement of cotton production started to affect cotton production in São Paulo. The western-most frontiers had been reached and no new lands were available. Poor agricultural practices had badly eroded the rich but
Friable soils of São Paulo and farmers found it less and less profitable to cultivate cotton. An increasing number of rural inhabitants invaded the cities in search of higher wages and better living conditions, resulting in a steady decline in production.

The Special Cotton Commission has studied the problem and is putting into operation an intensive recuperation campaign. The main objective of their plan is to increase the productivity of the depleted soils of São Paulo and to augment the efficiency of the dwindling labor force by instructing the farmers in the use of fertilizers, insecticides, crop-rotation, and the technology of modern agricultural machinery.

Through this combined effort of official organizations and producers of cotton, if favorable weather prevails, cotton production may be expected to regain the level of production attained during World War II in the near future. However, predictions for long-run developments have to consider certain basic drawbacks in São Paulo's agricultural economy.

There are certain facets of the São Paulo agricultural economy that cannot be revised over a short period of time and that will work in opposition to the new program to expand cotton production.

One such factor is the inadequate use of the lands. The number of cotton farmers who earn their living working on unproductive lands is enormous. They work on lands of inferior quality which have been abandoned by the large landholders after proving unprofitable. Such a situation represents not only a diminution of production for the country, but also, and mainly, an injustice to the small farmers who, tied to their properties, have to continue cultivating the worst lands. This factor has contributed to the great flux of people away from farms and into the cities in search
of better wages and living conditions.

The lack of better labor contracts and of better land rental systems are also factors responsible for the present agricultural situation. Improved employer-employee relations and improved agricultural practices which results from a good system of labor contracts and land rentals, always will result in an increase in production.

Certain other factors impeding the development of São Paulo's agriculture can be overcome by the coordinated efforts of an integrated campaign, such as the Special Cotton Commission's program, in a relatively shorter period of time. Items like small agricultural production and low productivity of labor; poor living conditions of the agricultural workers along with deficient agricultural technology; high prices of products required by the farmers and lack of social assistance to agricultural enterprises.

Pointing out the causes and factors involved in the agricultural problem that faces São Paulo and Brazil, today, is the first part of the story. The second part is deciding how to resolve these problems and this part is not easy. To solve the problem of inadequate use of land, for example, points of constitutional law such as ownership of property are involved. Modifications of this nature have never been easily evolved.

However, although these elements in São Paulo's agricultural scene will provide certain handicaps for the future development of cotton, many of them can be and are being overcome by the coordinated efforts of the parties, both public and private, who wish to see the cultivation of cotton, so satisfactory and important a product in the past, regain its position in the economy for the benefit of São Paulo and of Brazil.
Footnotes

Chapter I

1. Preston E. James, Brazil, p. 34.
2. Facts about the State of São Paulo, British Chamber of Commerce of São Paulo and Southern Brazil, p. 4.
3. James, op. cit., p. 32.
4. José Jobim, Brazil In the Making, p. 33.
7. Loc. cit.
8. James, op. cit., p. 35

Chapter II

10. James, op. cit., p. 126.
12. Ibid, p. 85
15. Loc. cit.

Chapter III

18. All bales referred to in this chapter are 478 pounds in weight.

22. Loc. cit.


27. Ibid, p. 7.


Chapter IV


34. Dr. Acacio Gomes, "O Algodão em São Paulo", Revista dos Mercados, Bolsa de Mercadoria de São Paulo, Ano 11 No. 9, Maio 1951, p. 85.


36. Ibid, p. 4.


42. "Suprimento de Insecticidas Para a Defesa da Lavoura Algodeira", A Agricultura em São Paulo, Ano 1 No. 4, Julho 1951, p. 28.

43. Loc. cit.

44. Ibid, p. 29.

Chapter V


47. Herrmann, op. cit., p. 13.


51. Herrmann, op. cit., p. 20.

52. Ibid, p. 22.


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Abstract

São Paulo, although Brazil's greatest industrial area, is also one of the country's largest agricultural producers. Its past tradition of monoculture is now giving way to a more diversified economy, cotton becoming the State's (and Brazil's) second largest export crop. São Paulo is well suited for growing cotton although the clay soils of the State tend to erode very rapidly, especially when cultivated to a clean-culture crop such as cotton. This tendency has resulted in a steady shift of cotton and other agricultural production in the State, moving from the old zones of the east to newer, more fertile soils in the west.

In periods of world crisis, when the price of São Paulo's main export crop, coffee, was adversely affected, farmers turned to cotton as a second cash crop. Cotton production rose and fell, depending on the coffee situation, until the early 1930's. At this time, the State government initiated the following services to stimulate cotton production: study and improvement of cotton fibres; production and distribution of pure disease-free seeds; constant experimentation to develop new varieties of cotton, better adapted to São Paulo soils and climate; supervision and inspection of the ginning of cotton; establishment of a cotton classification service.

After the depression, cotton prices rose more rapidly than coffee prices. Responding to governmental stimulation and favorable price factors, cotton production in São Paulo increased steadily, reaching a peak of 2,161,567 bales in 1944, which represented almost eighty percent of Brazil's total cotton production.

A decline in cotton production started in 1945 due mainly to the
following causes: lack of crop-rotation and resulting soil erosion; degeneration of the cotton varieties, lack of adequate financing capital; attacks of insects; poor weather condition; and lack of fertilization of soils.

In addition, demographic changes also affected cotton cultivation. Preliminary results of São Paulo’s 1950 census reveal that there has been a considerably larger increase in urban population than rural population and there has been a rural exodus from the central regions of the State. Diminishing agricultural labor and rising needs for products of the soil is producing a crisis in cotton and all agricultural production in São Paulo.

As a result of the 1945 decline, the latest organization to revive cotton production in the State, the Special Cotton Commission, was formed in May 1950. This organization, made up of both government officials and cotton producers, has studied the problems presently facing cotton producers in the State. Among these problems are: lack of new lands for further expansion of cotton production; badly eroded soils in many areas; demands for raw materials by growing domestic textile industry; instability of the dwindling rural labor supply due to poor living conditions and the system of short-term labor contracts.

The main objective of the Special Cotton Commission is to increase the productivity of the depleted soils of São Paulo and to augment the efficiency of the diminished rural labor force by instructing the farmers in the use of fertilizers, insecticides, crop-rotation, and modern agricultural machinery.
With continued governmental encouragement and favorable weather conditions, cotton production in the State of São Paulo may be expected in the near future to regain the level of production attained during World War II.