FACTORS AFFECTING COTTON PRODUCTION IN SOUTHERN BRAZIL

A Thesis

By

Ruy Miller Paiva

February 1941

Approval as to style and content recommended:

Head of the Department of Agricultural Economics

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Preface

For some time visitors in southern Brazil have constantly predicted that very soon the region would be one of the major cotton producing regions in the world. But it was only in 1933 that the promised increase started. However, the increase came with an unusual intensity surpassing by far the most optimistic expectations. In a few years the production jumped to more than a million bales. A few years later, however, production took a different trend, as the increase stopped sooner than it was expected. These facts make the study of the general factors affecting the region all the more necessary, because it is essential to have a better understanding of the various forces acting in the region before it is possible to make a forecast of the trends of the cotton production in southern Brazil.

The purpose of the present study is to make an analysis of the main forces responsible for the cotton production in southern Brazil, as a first step for a more detailed study.

CHAPTER I

FACTORS AFFECTING COTTON PRODUCTION IN SOUTHERN BRAZIL

NATURAL FACTORS

Cotton is grown in Southern Brazil to some extent in the States of Sao Paulo, Minas Geraes, Rio de Janeiro, Parana, Matto Grasso and Goyaz. Most of this region is located in the tropics. The natural conditions, however, are extremely favorable since the high Central Plateau of Eastern Brazil extends to the entire region.

From southern Brazil to the northern part of the State of Sao Paulo, a range of mountains, known as "Serra do Mar", extends along the coast leaving only a very narrow strip of land at sea level. This narrow area between the range of mountains and the sea is known as "littoral". With the typical humid tropical climate and a fertile soil, the "littoral" is very favorable for banana production. Citrus fruit also grow well here if good drainage is provided. The climate is not very pleasant but it cannot be considered a great handicap to the development of the area. The hottest month of the year in Iguape, a small town on the sea coast in the northern part of the state of Sao Paulo, has an average temperature of 78.2°F. July is the coldest month of the year and has an average temperature for the month of 66.1°F.

The annual rainfall in this region is 69 inches, and is well distributed throughout the year. January has the greatest rainfall,

averaging 8.07 inches, and the driest month is July 2ith 2.6 inches.

Communication between this sea coast region and the populated Brazilian hinterland is difficult. The "Serra do Mar" rises abruptly from the sea. The railways that ascends this wall have been built at great expense which explains the existence of so few railways. connecting the "littoral" with the hinterland. Generally the railways connect the hinterland directly with the sea port and so have been of little help in the development of the "littoral". Until recently this region has not progressed appreciably because of the lack of transportation. This region is not important for cotton production.

This range of mountains, the Serra do Mar, that rises abruptly from the eastern sea coast slowly decreases in altitude toward the west, forming a fertile plateau very favorable for agriculture purposes. It is on this upland region that the production of cotton has shown a marked increase since 1932. The altitude of the city of S. Paulo, located 70 miles from the sea coast, is approximately 2400 feet, while at the western boundary of the state is the small town of Araçatuba, with an altitude of 1200 feet. This gives an idea of the general slope of the plateau.

In the northern part of S. Paulo the plateau changes in general appearance, becoming wider and higher. The coastal range of mountains divide to form several ranges. The "Serra da Canastra" extending to the West widens the plateau, and the other range, known

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[1] W. B. Clayton, World Weather Record, 1921-1930, Smithsonian Miscellaneous Collection, Vol. 90.

as "Serra da Mantiqueira", extending to the North, are of higher altitude. The highest peak in Brazil is found in this latter range. In this portion of the Central plateau is the State of Minas Geraes. In this region a variation in elevation is a disadvantage for agricultural use of the land but the fertility of the soil compensates for this.

Location

The Central Plateau of Eastern Brazil is the most important economic region in Brazil. The states of S. Paulo, Minas Geraes, Rio de Janeiro and the Districto Federal in this plateau account for 67 per cent of the total value of production in Brazil. The industrial production of these states constitutes 78 per cent of the total industrial production of Brazil, while the agricultural production in these states account for 56 per cent of the Brazilian agricultural production. This production is accomplished with a population that is only 43 per cent of the total population of Brazil, while the area covered by these states amount to only 11 per cent of the total area of the nation. The textile industry is also flourishing in these states, as they produce around 60 per cent of the cotton goods produced in the country.

With these figures it is safe to conclude that in the states of S. Paulo, Minas Geraes, Rio de Janeiro and Districto Federal are located the best markets of the country, because they represent the most densely populated regions and also the people with the best buying power of the nation.[1]

This region is provided with a fairly good system of communication. The mileage of railroads and highways has shown a steady increase and at present the states of S. Paulo and Minas have around 40 per cent of the highways and 45 per cent of the total

[1]The per-capita production of the people in those states is 966.5 mil reis (approximately $48.40) compared with 346.6 mil reis (approximately $17.94) for the rest of the country.

railway mileage of the country. The rivers in these states cannot be economically used for transportation. In the state of S. Paulo the rivers originate near the sea and flow westward to the interior, and in the state of Minas Geraes the rivers flow to the north.

The location of the cotton area in Southern Brazil could not be better, as far as a domestic market is concerned, because it lies near the best markets of the country and is connected with the best system of communication in the country. Although the cotton consumption by the domestic industry is relatively small, amounting to only 25 to 30 per cent of the production of the country, its importance cannot be neglected because the prospect for the future is promising. The recent exports of cotton goods to Argentina can be considered as a first step for a further expansion in the South American markets.

So far as a world market is concerned, the location of the cotton area in Southern Brazil is also very favorable. Although a great distance from the European markets, the transportation costs are not excessive because the distance that the cotton has to be transported by land is short. The cotton fields are situated roughly from 100 to 400 miles from Santos and Rio de Janeiro, which are by far the most important ports in Brazil. A fairly good railway system connects the cotton areas with these ports. Together with Buenos Aires and Montevideo, Santos, and Rio de Janeiro make the most important trade route of the continent of South America

with the rest of the world, and is undoubtedly an advantage to the cotton producers of southern Brazil.

TABLE I

AREA AND POPULATION OF BRAZIL AND SPECIFIED STATES

State	Area (Square Miles)	Population[1] (1938)
S. Paulo	112,278	7,131,462
Minas Geraes	221,898	7,958,000
Rio de Janeiro	26,627	2,146,267
Districto Federal	431	1,846,478
Total Brazil	3,275,510	44,115,825

TABLE II

MILL CONSUMPTION OF COTTON IN BRAZIL[2]

State	1938 (Bales)	1939 (Bales)
S. Paulo	217,776	230,807*
Rio de Janeiro and Districto Federal	92,765*	100,849
Minas Geraes	43,815	35,115
Total Brazil	532,625	548,171

[1] Brazil, 1939-1940, Ministerio das Relacoes Exteriores, Rio de Janeiro.
[2] Foreign Crops and Markets, Vol. 41, N:17.
*Estimated

TABLE III

AGRICULTURAL PRODUCTION[1]

State	Value in Contos De Reis
S. Paulo	5,620,660
Minas Geraes	1,598,610
Rio de Janeiro	598,180
Districto Federal	
Total Brazil	10,002,560

TABLE IV

INDUSTRIAL PRODUCTION[1]

State	Value in Contos de Reis	Per Cent of Value
S. Paulo	5,580,000	46.5
Districto Federal	2,328,000	19.4
Minas Geraes	821,000	6.2
Rio de Janeiro	708,000	5.9
Total Brazil	12,000,000	100.0

TABLE V

TOTAL PRODUCTION IN BRAZIL AND SPECIFIED STATES[1]

State	Value in Contos de Reis	Per Cent
S. Paulo	9,975,450	38.89
Minas Geraes	3,184,170	12.41
Rio de Janeiro	1,537,920	5.99
Districto Federal	2,509,100	9.79
Total Brazil	25,646,290	100.00

[1]Brazil, 1938-1940, Ministerio das Relações Exteriores, Rio de Janiero

Land and Soil

Variation in type of rock and climate and differences in elevation have resulted in a number of important soils types. From the heavy and rich "terra roxa" of S. Paulo to the light soil of the "campos" in the state of Matto Grasso, a wide range of soils can be found through the region. However there are three principal types of soil on which cotton is grown most successfully. They are known as (1) the "terra roxa", famous for the yield that can be obtained in the coffee culture; (2) the "terra massa-pe", also rich but usually found in the more hilly regions; and (3) the "terra arenosa", which is the most common through the plateau, especially in the West. Each one of these soils have particular characteristics, varying with the region in which it was formed, but maintaining a common feature in the way it affects the cotton plant.

"Terra Roxa"- The "terra roxa" is a dark red soil with a great percentage of clay. It is a very deep and rich soil and can sustain a coffee tree for a period as long as 100 years. It is particularly rich in nitrogen. There is an old saying among the farmers in Southern Brazil that "cotton does not like a rich soil", and this has its origin in the fact that the nitrogen content is high in "terra roxa". Recent research has proven that this soil some times has an excessive amount of this element.[1] This excess affects the cotton plant through an abnormal vegetative growth at the expense

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[1] Theodureto de Camargo and Paulo Vageler, Os solos do Estado de S. Paulo, p. 21, Boletim Technico No. 40, Instituto Agronomico, Campinas.

of the fruiting branches. The plant develops healthily with numerous large leaves and strong branches, but with relatively few bolls. A rather high percentage of the bolls that set cannot open successfully. At the time of maturity the conditions are not very favorable for the opening of the bolls because the vegetative development does not allow for normal drying, and several minor boll diseases may also appear as a result of these conditions. The cotton produced under such conditions is of a lower quality.

The "terra roxa" soil is also very rich in iron. According to some authorities on this subject, this is responsible, to some extent for the high content of nitrogen in the "terra roxa", since iron readily assimilates the atmospheric nitrogen. This soil is found in the northwestern part of the state of Paraná, and in southern part of Matto Grasso, and in some sections of the state of S. Paulo. Only in the later state has it been used to some extent for cotton production. Although a very good yield can be obtained, it is not as well adapted for cotton production as are others soil , which is probably the reason that the production of cotton has not developed in northwestern Paraná.

"Terra Massa-pe" - The "terra massa-pe" is a soil that is to some extent richer chemically than the "terra roxa". Derived from the crystalline rocks, it has a better structure and is richer in mineral elements than the terra roxa, but is not as deep and is found in more rolling regions than is terra roxa. The soil is

usually found in large areas of Minas and to lesser extention in the state of S. Paulo, principally along the border of Minas Geraes. It is very well adapted to the crops grown in these states, such as coffee, sugar-cane, and corn. A very high yield of cotton and with very good quality of fibers is obtained from this soil.

"Terra Arenosa" - The largest agriculture area in the state of S. Paulo is located in the "terra arenosa". This soil is derived from the sandstone of Western S. Paulo, and is a light sandy soil, not very rich in plant foods but with good porosity and very tillable. In the regions of the state of S. Paulo having this sandy soil is where the cotton cultivation has spread most successfully. The soil type here gives cotton the advantage in competition with other crops. The use of fertilizer, although not essential during the early years of cultivation, increases considerably the yield of cotton. There is, as a rule, little shedding, even with excessive moisture. The quality of the cotton produced in this soil is good. It is claimed that the color of the soil is in part responsible for the good quality of the fibers.

Erosion and the Use of Fertilizer - All the soils are subject to erosion to a certain degree, but in no case is the problem as important as here in the United States. Gullies can be found on any farm, but are always limited to a small area. The amount of soil that runs off is not so large owing to several reasons, mainly that these soils in general have a good capacity of infiltration.

The "terra roxa" is richer in clay than the other soils, thus reducing the porosity, but its depth compensates for this defect.[1] In addition to this the rainy season occurs during the warm months, a favorable environment for the rapid development of a weed cover which helps to hold the water. Despite this fact the Government of the State of S. Paulo has recently initiated a movement among the farmers for a better soil conservation program.

The use of fertilizer has become more general in Southern Brazil since the recent development of the cotton in this region. In the crop year 1938-1939 the acreage cultivated in cotton in the state of S. Paulo was 372,978 "alqueires" and 9 per cent of this area was fertilized.[2] The Government of the State of S. Paulo has an agency to make chemical analyses of soils. The results of these analyses are returned free of charge to the farmers with advice as to the kind of fertilizers to use. Thousand of soil samples are mailed to this agency yearly by the farmers. The proportion of phosphorus in the formulas used by the farmers is remarkably high. Potassium is also widely used. Nitrogen is used much less, mainly by the farmers in the sandy soil.

The widespread use of fertilizers by the farmers is limited by the high price and also by the nature of the soil. With few exceptions these soils do not have the clay element which holds water, but this function is performed by the humus of the soil.[3]

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[1] This soil is found to extend, in some places, to a depth of more than 60 feet.

[2] Official statistics quoted in "revista do Algodao n. 57, V. X-Anov 1.

[3] T. de Camargo and P. Vageler, op. cit. p. 22

Hence the results from using fertilizers on those soils depend largely on the humus content, which explains several cases of complete failure in the use of fertilizers. It is difficult to over-emphasize the importance of the organic matter in the soils of this region.

Climatic Conditions

The climate of the cotton growing region in Southern Brazil is very favorable for cotton culture and very healthful for the people engaged in its production. The coldest period of the year is from May to August but this period is more properly called the dry season owing to the fact that it coincides with the lowest rainfall months of the year. Very seldom does the temperature fall below freezing. The last killing frost in the State of S. Paulo was in 1918. Even during the warmest months the nights are cool and agreeable.

As shown in the map, Figure 1, in the major portion of Minas Geraes the mean temperature for the warmest month is not above 71.6°F. Close relationship is noted between cotton culture and this 71.6°F. isotherm.[1] The cotton culture has developed more successfully in regions where the mean temperature is more than 71.6°F. for the warmest month. However, the temperature never seems to be a limiting factor in the Central Plateau.

The rainfall is a more important climatic factor. As a rule the cotton does not suffer from intense drought. In the state of S. Paulo the average rainfall is approximately 55 inches, but during the dry season, April to August, the total rainfall is only 9 inches. As a rule the distribution is good. However there is one disadvantage

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[1] The Fig. 1 and Fig. 2 are adapted from the maps presented by P. E. Jones in his study of temperature and rainfall limits for the coffee production in Brazil. It cannot be used as a limit for the cotton area, but it gives an interesting coincidence when the isotherm 71.6 and the line of 1500 rainfall shows a relationship with the areas in which cotton is more intensively produced. P. E. Jones. The Coffee Land of Southeastern Brazil, pp. 225-244, Geographic Review Vol. 22 (1932).

Figure 1. Climates of the main coffee producing area of Brazil, after Kopper's system. (Stations for which climatological data are available are shown by small circles.)

-.-.-. marks the distinction between a and b, based on the isotherm of 22 c. (71.6°F.) for the warmest month.

_____ marks the distinction between A (tropical) and C (warm temperate) climates based on the isotherm of 18 c. (64.4°F.) for the coldest month.

- - - - marks the distinction between f, with dry season absent and w with marked dry season from June to August.

Figure 2. Average annual rainfall. (Station for which data are available are shown by small circles.) Data for Stations in the State of Minas Geraes are from 1915 to 1921, for the State of Sao Paulo are mostly from 1912 to 1921.

The region where cotton is grown to a certain extent is shown in red dashes.

Source: P. E. Jones, The Coffee Land of Southeastern Brazil, pp. 225-244, Geographical Review, Vol. 22 (1932.)

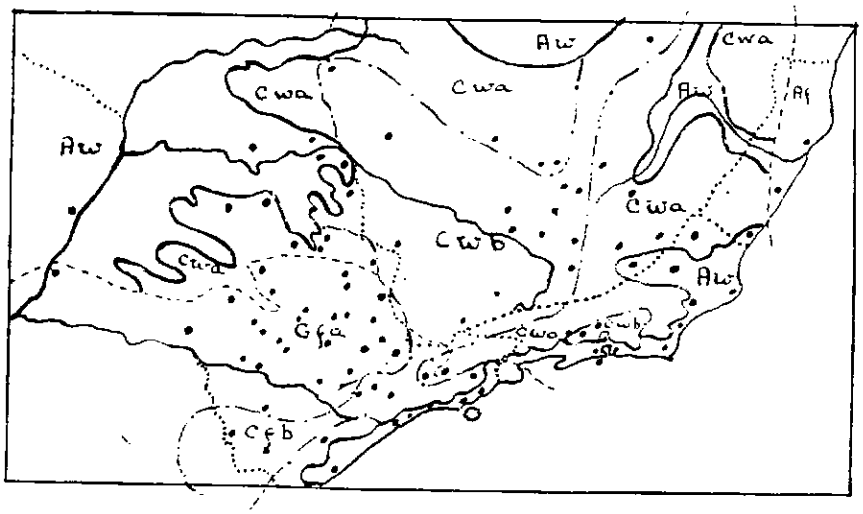

Figure 1

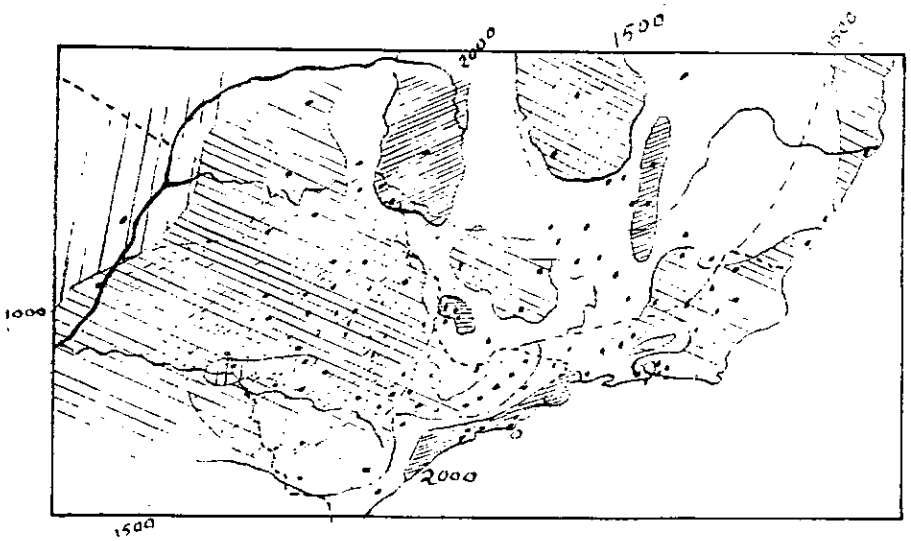

Figure 2

since the rainfall is frequently higher during the last fortnight of March when the picking season begins. Another disadvantage is that during some years the rains are prolonged into April and May, which makes the picking difficult and encourages several minor diseases that lower the quality of the cotton. The state of Minas Geraes has a higher rainfall with nearly 60 inches which is not very favorable for cotton production. There is a close relationship between cotton production in S. Paulo and Minas Geraes and the 1500 mm. line shown in Fig. 2.

The length of the growing season in the Central Plateau often compensates for the yearly variation in the distribution of rainfall. When, for example, the rain came late in October 1939 and caused a delay in planting, the length of the growing season permitted a later development of the plants, and finally a much larger yield than was expected.[1]

Another climatic factor that affects to some extent the quality and the yield of the cotton crops in the Central Plateau is the amount of dew. Although the rainfall is no greater here than in the United States, the relative humidity is much higher with the result that the heavy dew frequently affects the grade of cotton picked. In this region the cotton should be picked after 9 o'clock in the morning because before that time the fibers are wet with dew. But the farmers cannot follow this procedure during the peak of the picking season,

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[1] According to the figures in Revista do Algodao (May, 1940) No.55 Vol. X, the estimation for the crop 1939-1940 was ranging from 200,270 millions of kilos. In September, 1940 the cotton classified by the official agency in S. Paulo was already 296,732 kilograms. They had expected it to be over the three million mark.

and much of the cotton is picked when still damp, thus causing a lowering of the grade. The dew also favors the development of disease in the leaves and the bolls of the plant with a resulting decrease in the yield.

TABLE VI

COTTON: POUNDS OF LINT PER ACRE IN SOUTHERN BRAZIL AND SPECIFIED COUNTRIES, 1921-1922 to 1938-1939[1]

Year	Southern Brazil [2] (Lbs.Lint)	United States (Lbs.Lint)	Egypt (Lbs.Lint)	India (Lbs.Lint)	Argentina (Lbs.Lint)	Uganda (Lbs.Lint)
1921-22	134	133	322	97	207	117
1922-23	104	149	356	93	220	102
1923-24	133	136	363	87	182	123
1924-25	186	165	388	91	124	137
1925-26	171	174	395	88	238	118
1926-27	162	193	409	81	156	92
1927-28	196	162	383	96	262	104
1928-29	127	163	443	85	232	117
1929-30	168	164	442	81	239	78
1930-31	135	157	379	88	211	102
1931-32	168	212	382	68	240	96
1932-33	202	174	433	85	209	110
1933-34	223	213	454	85	198	103
1934-35	176	172	416	81	200	85
1935-36	177	185	488	91	234	95
1936-37	176	199	508	100	96	86
1937-38	160	270	531	89	139	95
1938-39		236	446	84	143	80

[1] "Cotton Handbook with related data." Sept. 1939, A.A.A. Statistical Publication No. 2.

[2] Omer W. Herrmann, South America New Land of Cotton, Farm Credit Administration Circular No. C-117.

Weather alone does not account for all the variations. Insects and diseases have some part also. According to some authorities the fluctuation from year to year in the cotton yield in S. Paulo can also be partly explained by the fact that the growers, during periods when economic conditions are unfavorable to cotton, give less attention to the cultivation of their cotton crop. Their time can be employed to better advantage on other crops.[1]

Another method used to judge if the climatic conditions of a region is suited for cotton culture is that of examining the quality of the product obtained. The mills in Europe consider the character of the cotton of Southern Brazil inferior to the American cotton, and this is probably the result of less favorable climatic conditions. It should not be attributed to inferior seed since the Government has an efficient control on the seed distribution.

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[1] P. H. Morris, Cotton Production in Southern Brazil, F.B. 65 (Revised), p. 8.

Insects and Diseases

Southern Brazil is fortunate in that there are no diseases or insects that seriously threaten the cotton plant. Neither the boll-weevil nor root-rot has been reported in this region. The stigmatomicosis or internal boll rot, which is a terrible disease in large regions in Africa, has been found in the State of S. Paulo, but the intensity of its attack is of minor importance.[1] Although there is no one disease or one insect that seriously threatens the cotton plant, there are enough injurious insects and diseases to do considerable harm from time to time.

The Root-borer, (Gastercercodes gossypii) is the most important of the injurious cotton insects found in the region. So far it has only been reported in South America. There is no known means of controlling it. The adult insect is small, only one-eighth inch in length. It lays its eggs on the stem of the plant near the ground. The larvae that soon develop bore holes in the stem and down in the root. As a result the nutrition of the plant is slowly cut off. The leaves change their color, the plant withers and is usually broken off by the wind before dying. Some infected plants recover and produce some cotton, the amount of recovering depending upon the environmental conditions. However the yields are small and the quality of the lint is usually very poor with a high percentage of dead fibers. The young plant when attacked have little or no chance

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[1] H. P. Krug, A podridao interna dos capulhos do algodoeiro, Bol. Tech. No. 23, Instituto Agronomico de Campinas.

to survive and it is during this period that the insect is more plentiful. The degree of damage seems to depend in part on the climatic conditions. As previously stated, no method of direct control has yet been found and the only efficient way to control it has been to defer the time of planting until the last two weeks of October. The farmers have been forced by law to destroy the stalk at the end of the harvest. So far this practice has not been proven very effective.

The Pink boll worm (Platyedra gossipiella) has spread in all the regions of the country since its introduction in Brazil. After the Government assumed the control of seed distribution in the state of S. Paulo, the attack of Pink boll worm has been reduced by fumigation of all seed used in the planting. But even today the loss in the yield and quality of the crop is not insignificant. This is specially true when the cotton is planted later than October. The early plantings do not suffer from Pink boll worm attack. Unfortunately early planting cannot be practiced because the "root borer" causes heavy losses to the early plantings. Thus the planting date is limited within a short period by those two insects. The intensity of the attack depends on the climatic conditions. As a rule, the insect does more damage in the State of Rio de Janeiro and Minas Geraes because of the higher rainfall in these areas.

The Leaf-worm (Alabama argillacea) is always expected in the state of S. Paulo, and farmers always keep a supply of chemicals and

machines to combat this insect. In years of continued rains during December and January the importance of the insect increases and heavy losses can be expected from its attack, because the rain washes from the leaves all the arsenate of lead that is used to combat the leaf-worm and therefore the control of the insect is impossible.

Anthracnose (Glomerella gossypii) occurs in practically all Southern Brazil and is considered the most serious disease in the region. It appears mainly on the bolls and the lint from the infected bolls is often stained pink and is inferior in quality. Some control is practised by the Government when the seed are tested for germination by eliminating the lots of seed that show a high percentage of infection. These tests are done in laboratory and a sample of all lots of seed that will be used for planting are tested in the same manner. The amount of damage done by this disease is largely dependent on the climatic conditions.

Several other diseases are common in the region like the Verticilium wilt, Bacterial blight, etc., but are all considered of minor importance.

CHAPTER II

SOCIAL AND HUMAN FACTORS

The production of cotton in Southern Brazil has recently shown an enormous increase. The production in 1930-1931 was 81,000 bales and early in 1933-1934 it was more than 500,000 bales. The steady increase continued, reaching in 1937-1938, a total of 1,330,000 bales. During the past few years the rate of increase has been less. It is well agreed among the cotton experts in Brazil that the cotton production in Southern Brazil cannot be greatly increased, primarily because of the present shortage of labor.[1] According to the same authorities there is only one possibility of overcoming this handicap, and that is to improve the capacity of production of the laborer, since the immigration laws are severe and there is no likelihood of a change in these laws in the near future.[2]

The social and human factors that affect the capacity of production of the agricultural laborer engaged in cotton production in Southern Brazil will be analyzed in this chapter.

There are certain characteristics peculiar to national groups of people in the way they conduct business and accept life. The business man who flies to Brazil on a hurried trip with his mind saturated with business affairs usually does not fully appreciate the way the Brazilians conduct their business, and necessarily

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[1] This statement should not be accepted so literally. Any change in the supply or demand of the other crops that compete with the cotton or any other fact that disturbs the present economic situation of the country may bring a shift of labor from one industry to the other, resulting in a increase or a still further shortage of labor to the cotton industry.

[2] Immigration is restricted to a number from each nation annually amounting to not more than 2% of the number who came during the last 50 years.

receives the impression that the people are lazy. That is very common with the American business man. For a South-American business man to talk immediately and hastily of business affairs with a newcomer is accepted as a poor business policy or unpolitness. But the Americans look on this as loss of time resulting from laziness. It is just a matter of opinion, resulting from a different philosophy of life. The lack of a better understanding of each other has been a relatively important handicap in the development of better trade relations between Brazil and United States.

On the other hand, when dealing with agricultural laborers, the picture is different. The production per laborer is really small and this small output has very little to do with the philosphy of life. There are economic and social reasons causing this present situation. Herrmann in his bulletin, "South Brazil New Land of Cotton"[1] reports gins operating in Southern Brazil with 45 men while the same gin is usually operated by 12 or 16 men in the United States. More important is the fact that a good worker in the State of S. Paulo can pick only 120 pounds of seed cotton per day. The average for the State is around 70 pounds, which is excessively low, especially when compared with the production of an agricultural worker in the United States. In the Cotton Belt, 120 pounds per day per man is a small amount. There are several points, however, that are pertinent to the agri-

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[1]Farm Credit Administration, Circular C-117.

cultural situation and to the practice followed in Southern Brazil that must be considered when comparing output per laborer in the two countries. There are certain things that tend to lower labor efficiency in Brazil. They are: (1) The picking operation usually does not start before 9 o'clock in the morning because the cotton is damp with dew. (2) The picking is done very carefully, as it can be proven by the grades shown by the S. Paulo crop in the present year (1939-1940.)[1] (3) Cotton is usually picked three times during the harvesting period, leaving a space of time of 20 days between two consecutive pickings, with the result that each time the worker finds a relative small number of bolls opened. (4) The average includes the work of many hired men and it is reasonable to expect more efficiency in picking when the owner of the crop does the picking. But considering these facts the average of the workers in Brazil are less efficient than those in the United States. Thus it is necessary to examine some of the human and social factors that are responsible for the present situation.

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[1] Official reports show that in September 1940 more than 85 per cent of the cotton already classified was above type 5. (Similar to American Strict Middling.) p. 743, Foreign Crops and Markets, Vol. 41 N.20.

Population

There are no accurate statistics on the distribution, according to races, of the population in Southern Brazil, but by far the highest percentage of the population is white. The white people are mostly descendants of former Portuguese settlers. During the time the country was a colony of Portugal and for sometime after this period the Portuguese immigration was high.[1] Italian, Spanish, and more recently Japanese immigration, has also been high. According to the 1920's census the population of the state of S. Paulo was 4,592,188. Of this population 18.2 per cent or 833,709 were foreign born. The percentage of negroes is not high. The Indian population in this region was small even before the arrival of the white man and since then has been reduced by intermarrying with the whites. The same mixture has occurred, but to a smaller extent, with the negro population. Considering these facts the working class taken as a whole can be considered as a favorable factor as far as the quality of population is concerned. The people have quick minds and are intelligent, being able to learn and perform a piece work fast and efficiently.

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[1] "The Council of Immigration on Colonization by a resolution issued on April 22, 1933 . . . resolved to consider Portuguese citizens to be exempt from any numerical restriction whatsoever, as regards to those entering into National Territory." . . . from page 42, Brazil 1939. A new survey in Brazilian life, Rio de Janeiro.

Health

The climate in Southern Brazil may be considered as favorable for human activities. Although the region is located mostly in the tropics, it does not have the characteristic humid tropical climate. It has very agreeable winters and relatively cool summers owing to the high elevation of the region. The yearly average temperature is approximately 67°F. The temperature very seldom drops below freezing and heat waves are practically unknown. Occasionally the temperature may reach 95°F. The rainfall is approximately 55 inches, the major portion occurring from July to May. During the dry season, which coincides with winter, only 9 inches fall. In this area the disease of epidemic nature such as cholera, plague, and sleeping sickness do not occur. The diseases present in the agricultural regions are not exceptionally bad because they can be easily controlled. Their toll, although they can be controlled, on the agricultural population and on the economy of the region has been enormous. The most common disease among the agricultural laborers in Southern Brazil are malaria, hook-worm, and trachoma, which is a disease of the eyes. A very high percentage of the rural population has some or all of these diseases. The percentage of mortality from these diseases is very low. However the individuals that acquire these diseases are slow to recuperate with the inadequate nutrition that they usually have. Hook-worm and trachoma are the most injurious of the diseases to the common people, since they attack the children and treatment will be

delayed for sometime. As a result the children affected with these diseases develop a very weak constitution. With the inadequate nutrition they have it is not possible to expect a complete recovery. These children can never be completely healthy adults. It is not possible for a man to perform efficient work if his health is impaired. The low production per laborer in Southern Brazil can be explained partly by the lack of health of the rural population.

These diseases are partly due to the poor financial condition of the agricultural population. Medical attention, remedies and adequate nutrition cost money. According to a survey made in 1939 of an area in the State of S. Paulo, 34.37 per cent of the deaths in the preceding 6 years occurred without medical attention.[1] It is not only the lack of money, but also the lack of education that is responsible for a damage so heavy to the population. These diseases could be easily controlled with improved sanitation. The population in towns as a rule are not affected by these diseases, because the cities are provided with better sanitary facilities.

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[1] O. Mendes Sobrinllo, Bulletin Technico No. 68, Instituto Agronomico, Campinas, Brazil, p. 12.

Education

The education of the agricultural population in Southern Brazil is very unsatisfactory. If illiteracy is used as a measure, the education of the people as a whole is far from satisfactory, although there has been some progress recently.

TABLE VII

ILLITERACY IN BRAZIL[1]

Year	Per Cent of Illiteracy in Brazil
1872	79.1
1890	78.0
1900	65.3
1920	64.5
1936	52.1

The states of Southern Brazil are doing more to educate the people than other states, which is indicated by the fact these states have 43 per cent of the population of the whole country, but have 55 per cent of the total enrollment of the country.

TABLE VIII

SCHOOL ENROLLMENT IN BRAZIL AND SPECIFIED STATES[2]

States	General School Enrollment	Population
S. Paulo	701,607	6,634,389
Minas Geraes	459,898	7,583,673
Rio de Janeiro	148,986	2,038,673
Districto Federal	279,887	1,711,466
Total Brazil	2,862,616	41,560,147

[1]Brazil, 1938, Servico Graf. Inst. Braz. Geog. Est., Rio de Janeiro.
[2]Brazil, 1939-1940, p. 61, Ministerio dos Relacões Exteriores, Rio de Janeiro.

The figures cited are for the total population, including both rural and city population. Considering the fact that the cities are better provided with school facilities and second that the type of the work in agriculture is suitable to the use of child labor, it is reasonable to expect a much higher percentage of illiteracy among the farming population than the 52 per cent shown for the whole country as a whole.

It is important to remember that education is more than merely knowing how to read and write. Education is necessary in order to appreciate the value of proper nutrition, proper sanitation, and adequate technical knowledge for labor. In several respects the education of the laborers in Brazil is very deficient. The inadequate nutrition of the rural population affects their capacity for production. This could easily be overcome since the regions are very favorable for the production of almost any kind of vegetable or fruit. Improper sanitation among the people is another example of the lack of education that affects the productivity of labor through his health. The agricultural population in Southern Brazil are not sanitation conscious. Very little is done to prevent diseases growing out of poor sanitary conditions. To fix a good sewage disposal system according to the system recommended by the government agencies incurs very little cash expense. However the people do not have the necessary education to visualize the importance of such accomplishment. They are careless with the water they drink and with the drainage of the place where they live.

The skill of the agricultural laborer is very unsatisfactory. No skillful labor can be expected of a man without a proper education. The use of machines in Brazil has lagged in part owing to the fact that the laborers have received no training in this respect. The recent increase in the cotton production has forced a larger use of machines, but a large area is still cultivated with the hoe as is shown in the following table.

TABLE IX

THE AMOUNT OF MANUAL AND MECHANICAL COTTON FARMING IN S. PAULO[1]

Year	Manual Farming "Alqueires"	Mechanical Farming "Alqueires"
1931-32	10,000	5,000
1932-33	51,000	7,000
1933-34	80,000	10,000
1934-35	150,000	20,000
1935-36	200,000	40,000
1936-37	240,000	80,000
1937-38	355,000	120,000
1936-39	295,000	120,000

Undoubtedly a wide use of machines in agriculture would result in a better production per capita for the agricultural population. In short, the low production of the laborer of Brazil can be accounted for in large measures by the lack of education. This lack of education affects the production of the labor in two different ways. It directly affects the skill of the laborers as the laborer cannot be skillful without proper education. The other way is more indirect. It is through the health of the individual because adequate nutrition and proper sanitation are only possible with some education.

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[1]Data presented by the Rev. de Agr. in September 1939, p. 2892, Tab. 51, Vol. III, Ano V.

Opportunity

Another factor constantly used to explain the low production per capita of the laborer in Southern Brazil is the lack of ambition. The term lack of ambition usually means that the laborer does not want to work more because he is satisfied with his present condition.

When considering individuals with practically the same natural ability, health, and education in the United States and in Brazil and observing the energy used by them in their work, it is amazing to see the difference. The people in Brazil use less energy and are less dedicated to their work. This is usually accepted as lack of ambition and explained on the bases of difference in philosophy. Undoubtedly they use less energy and less dedication but the reason for that is not solely the lack of ambition. Some of the differences can be explained on the basis of difference of philosophy but another factor of much importance must be considered and this is "opportunity." The laborers have no incentive to work if they have no opportunity of a better life. And that is what has happened in Southern Brazil. The stage of tenancy is just beginning in the region. A large percentage of agricultural laborers are hired hands. The laborers have less opportunity than the laborers in the United States and the difference between the opportunity of the laborers in the two countries is so large that the effect of the difference in philosophy or lack of ambition can be ignored. A superficial analysis of the conditions will show that the lack of opportunity is one of the causes for the

low production of the laborers in Brazil.

The Absence of Free Land - The coffee development in the State of S. Paulo several years ago caused a movement of population to the West. New frontiers were opened and towns grew up fast. At present cotton is causing a new westward movement similar to the coffee movement but on a smaller scale. But both are entirely unlike the old westward movement in the United States, because in Brazil the frontiers are developed under a different type of leadership. Although the frontier regions of Brazil were uninhabited or scarcely settled, ownership of the land was acquired by a few private individuals early. These individuals were usually owners of plantations in the old regions and as they moved west they took with them capital and labor. The laborers have gone as laborers and not as homesteaders of the land. Thus the laborers derived no particular benefits from the abundance of land. The government retained practically no public land in this region as a result of its vicious policy of granting title to a relatively few individuals.

The Shortage of Farm Credit - The laborer has to buy land if he wants to become a farmer. It would be relatively easy to find good land to buy if he had money enough to make the purchase. No support is obtained from the Government in the form of credit. An attempt has been made recently by the government to make available short term loans to the farmers to finance their production but so far nothing has been done to help the laborers and tenants to acquire farm lands.

They have to depend entirely on their own savings. This is difficult because the wages are so low that it is almost impossible to save enough out of wages to purchase land.

Low Wages - The question of low wages in Southern Brazil needs some consideration. The wages of agricultural laborers ranges from 30 to 35 cents a day. During the picking season they receive 10 to 15 cents per 30 pound of seed cotton. The wages can be explained in terms of supply, demand and marginal productivity of laborers. The demand for labor in Southern Brazil is very low considering the laboring class as a whole which explains the low wages prevailing. The natural resources other than land have not been fully developed. Hence industries can absorb little of the increasing population in the rural districts. The laborers cannot shift to other industries from agriculture. In case of a better development of the natural resources it would result in an increase in the demand for the laborers. This increase in the demand for the laborers would result in higher wages for that region.

But in cotton the situation is different. Cotton growers would employ more laborers at the present wages. That is to say cotton production would increase if there were more labor available at the present wage. The fact that more workers are not employed at this wage indicates that the marginal productivity per worker in cotton is now about the same as in competing enterprises. The labor situation which apparently prevailed in cotton relative to competing industries

is shown in Figure 3a and 3b.

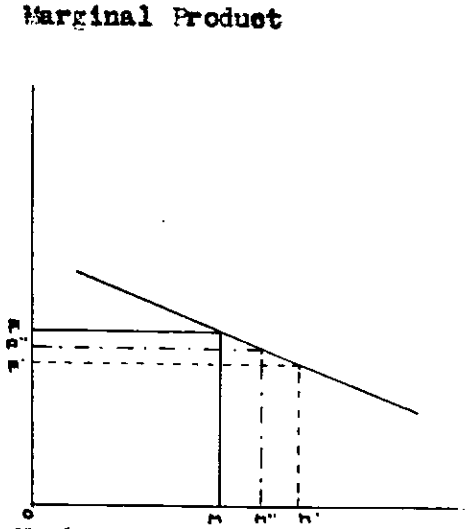


Figure 3a Cotton

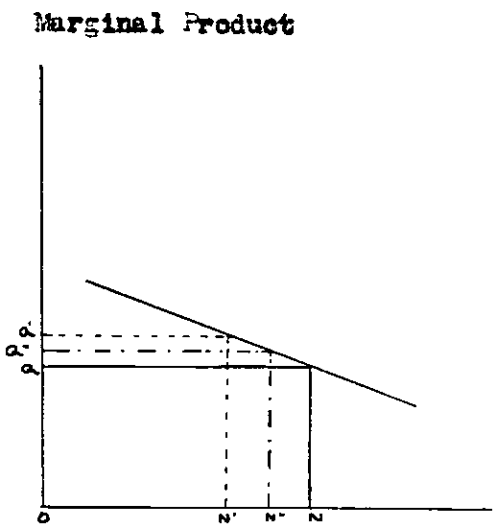


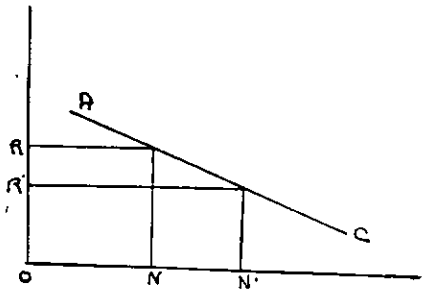
Figure 3b Competing Enterprise

Figure 3

PRODUCTION OF MARGINAL WORKERS IN COTTON AND COMPETING ENTERPRISE

In Figure 3a with ON workers employed the product of the marginal worker was OP while in 3b with ON workers the marginal product was OQ which is less than OP. Hence cotton employers would pay more than competing enterprises causing workers to move from this enterprise to cotton. This would lower the marginal product in cotton to ON'' and rise it to ON'' in competing enterprises until the two are equal. This would suggest that there can be little further increase in cotton production in southern Brazil unless the price of cotton rises or the marginal worker becomes more efficient.

Considering a fixed amount of labor some increase should be expected in the productivity per capita with an increase in the amount of land or capital, in one enterprise, according to Figure 4.



Line AC represents the productivity of labor. In the axis OX are measured the units of labor that are combined with the same amount of land, capital entrepreneurship.

Figure 4

PRODUCTIVITY OF LABOR WHEN COMBINING VARYING UNITS OF LABOR WITH FIXED AMOUNTS OF LAND, CAPITAL AND ENTREPRENEURSHIP

In west Texas, for example, the production per capita in the picking of cotton is higher than the production in east Texas because each man is in charge of larger producing areas. They pick more cotton at the expense of the grade of the cotton. It would be interesting to know why the producers in S. Paulo do not follow the same practice, but a proper answer would require more study than is possible for this thesis. Undoubtedly they could increase the area cultivated with the same number of laborers if the picking were not so carefully done. The government has fostered propaganda for a better grade of cotton, which is natural since they are in the process of acquiring new market outlets. However, as soon as the quality of cotton of the State of S. Paulo becomes better known and markets established, it is reasonable to expect a change in the present policy; i.e., the farmers will increase the area at the expense of the grade of the cotton produced, and this may result in higher wages for the laborers. However so far there is no movement in this direction.

If there is no free land, no facilities for credit, and the wages are low, the possibilities of a laborer in Southern Brazil to become

a farmer are small. Furthermore the life for the man in this region is relatively easy. There is no hard winter which creates the necessity for a lot of clothing and fuel. Food is rather plentiful. Some food like cassava, and palmito can be obtained without work. Many kinds of fruits can be found in most places. The easiness of life, together with the lack of opportunity, do not make an environment suitable and encouraging for the use of more energy in the work. Such things therefore are important reasons for the low production per laborer in southern Brazil.

According to the official records on the size of the cotton farms in the State of S. Paulo presented in Table X, the number of small producers of cotton is large. About 65.79 per cent of the cotton producers have in cultivation less than 60 acres in cotton. This fact could be accepted as evidence that the factor "lack of opportunity" is not so important in explaining the low production per capita of the laborer. Owing to the fact that these producers cultivate only 36.68 per cent of the area planted in cotton in the same state, it is necessary to calculate the number of hired laborers engaged in cotton production in order to have a better picture of the situation. The average yield per acre in the State of S. Paulo is approximately 600 pounds of seed cotton. As cotton is picked three different times, the quantity for each picking is 200 pounds. Taking 70 pounds per day for the average of the pickers in the region, it requires about 3 days for a man to do one picking on one acre, or 3 men do the work in one day. But as the picking is usually done over a period as long

TABLE X

CLASSIFICATION OF COTTON PRODUCERS IN THE STATE OF S. PAULO

ACCORDING TO THE AREA CULTIVATED: CROP YEAR

1938-1939 "ALQUEIRO - 5.9798 ACRES"

Class of Alqueiro	Number of Producers	Per Cent of Producers	Area in "Alqueiro"	Per Cent of the Total Area
1-2	30,612	48.51	44,660	10.01
3-5	14,853	23.50	55,017	12.39
6-10	8,690	13.78	63,887	14.33
11-15	3,071	4.87	36,336	8.15
16-20	1,862	2.96	31,284	7.00
21-25	825	1.30	18,562	4.16
26-30	706	1.11	18,650	4.18
31-40	717	1.14	23,288	5.25
40-50	589	0.92	26,358	6.05
51-60	275	0.44	13,967	3.03
60-80	290	0.46	18,060	4.06
81-100	210	0.39	17,633	3.98
101-150	200	0.31	22,392	5.03
151-200	95	0.16	13,508	3.04
201-300	72	0.11	13,315	9.82
301-400	30	0.05	8,176	1.83
401-500	9	0.014	2.291	0.51
501-700	6	0.009	2.305	0.52
701-1000	4	0.006	4,040	0.00
1000	7	0.011	12,060	2.71
	63,101	100.00	445,759	100.00

Source: Published in the "Revista do Algodao, (1939) No. 52, Vol. IX

TABLE XI

NUMBER OF COTTON PRODUCERS IN THE STATE OF S. PAULO

ACCORDING TO THE NATIONALITY - CROP YEAR 1938-1939

Nationality	Number	Per Cent
Brazilian	40,224	6.6
Italian	7,355	11.7
Japanese	7,260	11.4
Spanish	3,826	6.1
Portuguese	2,004	3.4
Societies	2,432	3.9
Total	63,101	100.0

TABLE XII

PERCENTAGE OF THE AREA CULTIVATION IN THE STATE OF S. PAULO

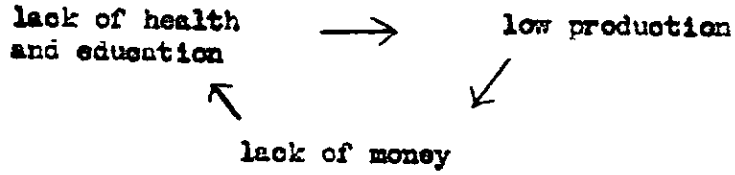
ACCORDING TO THE NATIONALITY - CROP YEAR 1938-1939

Nationality	Per Cent of Area
Brazilian	56.0
Japanese	23.8
Italian	9.5
Societies	4.1
Spanish	3.8
Portuguese	2.5

Source: Revista do Algodao, (1939) No. 52, Vol. IX, from Official Sources

as 60 days, it is understood that after the 3 men have finished the first picking in one acre they have 19 days before they do the second picking in the same area. During this period they can work 19 more acres, which gives roughly an average of 6 acres per man. Now considering that the producers with more than 120 acres do not work in the field, we have an area of 48.17 per cent of the total area, or 1,515,020 acres that have to be picked with hired labor. This area needs a little more than 200,000 persons during the picking season, just for the picking of cotton. This was calculated for the hired people that are necessary for the picking of the cotton, but it is necessary to remember that during this time other work has to be done in connection with cotton production that will put the number of hired personnel at a much higher number. These people are all affected by the factor "lack of opportunity."

Possibilities for Improvement - The analyses of the present labor situation of the region indicates that there are three factors tending to explain low productivity of the laborers in the production of cotton. The factors are health, education and opportunity. These factors are closely interrelated. There is no cause and effect among them. It is one vicious circle:



In order to determine the possibility of improvement it is necessary to know how the causes for the laborer to be in his present

position in which these factors act in a vicious circle. To find this it is necessary to go farther back in the history of the country. Since the founding of the first Brazilian colony, the land policy used by the government has been one of favoring large estates. After gaining national independence, the nobility of the new Empire was entirely of big landlords, and new titles were given to those who could go to the interior and establish a large plantation. After the establishing of the Republic, the owners of plantations were no longer given titles but they formed the majority of what may be called the "ruling class."[1] They have exercised authority of government to maintain the same situation.[2] The taxation system of the country is entirely favorable to large landowners, and the percentage of the government expenditures that goes for an improvement of the conditions for laborers is small. Immigration, especially in the state of S. Paulo, has improved conditions somewhat. (See Table XI and XII.) New people with better health, education, and more ambition could break more easily the chain that holds the laborers to the hired labor position. Recently the immigrants have received some help from their country of origin, in the form of credit and education, which

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[1] Mrs. Catherine Carr, "South America Primer", New York, Reynold and Hitchcock, (1939).

[2] For instance, by decree of the federal government promulgated in 1937 it reduced by 50 per cent all debts secured by mortgage or lien or agricultural property and also the debts of farmers to banking houses. U.S.D.A. Foreign Crops and Markets, Vol. 32, No. 22.

explains how the Japanese cultivate 23.8 per cent of the area planted in cotton in the State of S. Paulo. Even the immigrants, once they become large landowners and become part of the ruling class, seldom failed to acquire the usual way of thinking and attitude of the ruling class that preceded them.

There is a constant tendency in Brazil for the ruling classes to worry about the rising wages. The landowners think it is important to have cheap labor and do not think about the buying power of the population. Any movement of laborers to the cities from the farms are accepted by the landowners as a calamity.

The possibilities of some improvement in the situation of the agricultural laborers depends almost entirely on a better understanding of the ruling class. The present government has done a little in the development of other natural resources, minimum wages, higher wages in the civil service, etc. Also the government has done some for the education and health of the poor people, opening more public schools and offering some free medical clinics. However a change in the land policy and a large increase in the per cent of the government expenditure that is actually used to improve the health and to offer a better education to the agricultural laborer is very difficult to accomplish.

If the increase of cotton production in Southern Brazil depends on the improvement of the capacity of production of the laborers in the region it is improbable that in the near future there will be a great increase in production.

CHAPTER III

POLITICAL AND ECONOMIC FACTORS

The recent increase in cotton production in Southern Brazil from less than 100,000 bales in 1930 to more than 900,000 in 1935 cannot be explained in terms of change in natural and social conditions in the region. These conditions did not undergo any important change in this short period of time. Political and economic conditions on the other hand, did undergo sufficient change during this period to create more favorable conditions for production of cotton. An attempt will now be made to analyze the influence of economic and political forces upon production of cotton in Southern Brazil.[1]

Prices

The first factor to be considered is the price of the cotton, and since cotton is an annual crop, acreage is expected to rise and fall with the price of cotton.

There are several markets in which the price of the Sao Paulo cotton is determined, but two, Liverpool and Sao Paulo, are of greater importance to this study. The market in Liverpool gives the world price and the market in the city of Sao Paulo gives the domestic price of the Sao Paulo cotton. A close relationship between the prices in these two markets should be normally expected. However, this is not entirely true. The spot price of the Sao Paulo cotton in the Sao Paulo market, quoted in milreis, in recent years has been

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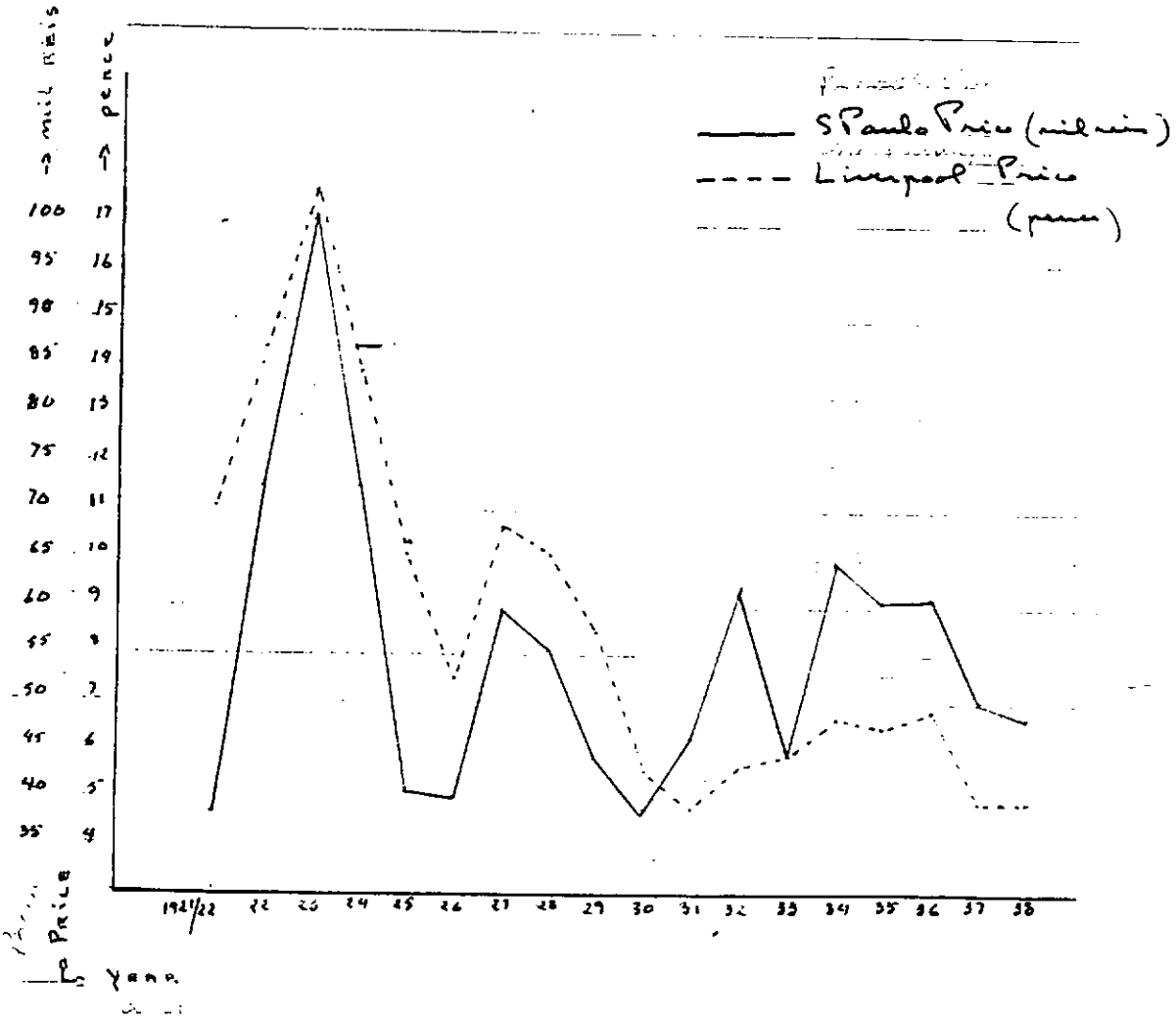
[1] As this increase has occurred mostly in the State of Sao Paulo this study will consider mostly the economic and political situation of this State.

at a higher level than the prices in the period from 1922 to 1930, while at Liverpool, considering the same period of time, the quotations for the same cotton, in terms of pence, has been at a much lower level. (Figure 5) The fluctuations in price from year to year in these markets also do not show as high relationship as might be expected. As shown in Figure 6, the fluctuations in the domestic price are much greater than the fluctuations in the Liverpool market, and in two periods, 1930-1931 to 1932-1933 and 1932-1933 to 1933-1934, the changes were in opposite direction. Several factors are responsible for the present disparity in the prices of these markets. Among them are the Brazilian monetary policy and the tariff policy which will be discussed later. First in importance, perhaps, in stimulating an increase in production of cotton in Sao Paulo have been domestic prices of Sao Paulo cotton and not world prices.

World Price of S. Paulo Cotton - The world prices of S. Paulo cotton do not seem to be an important factor in the increase of the cotton production. The average price in the years 1934-1935 and 1935-1936 was roughly 6.50 pence, while the prices in the period from 1920-1921 to 1928-1929 were constantly above 10 pence, with only one exception in 1926-1927, when the price fell to 7.46 pence per pound. In spite of these prices the production of cotton in the region during the period from 1920-1921 to 1928-1929 only once exceeded more than 150,000 bales, while in 1935-1936 the production was more than 300,000 bales. (Figure 7)

Figure 5

S. Paulo cotton quoted in Liverpool (pence)
& in S. Paulo (mil reis)



Source: Statistics on cotton & related data - 1934.
U.S.D.A

Figure 6

Change from year to year in price of S Paulo Cotton in Liverpool Market (in pence) & in S Paulo Market (in mil rs).

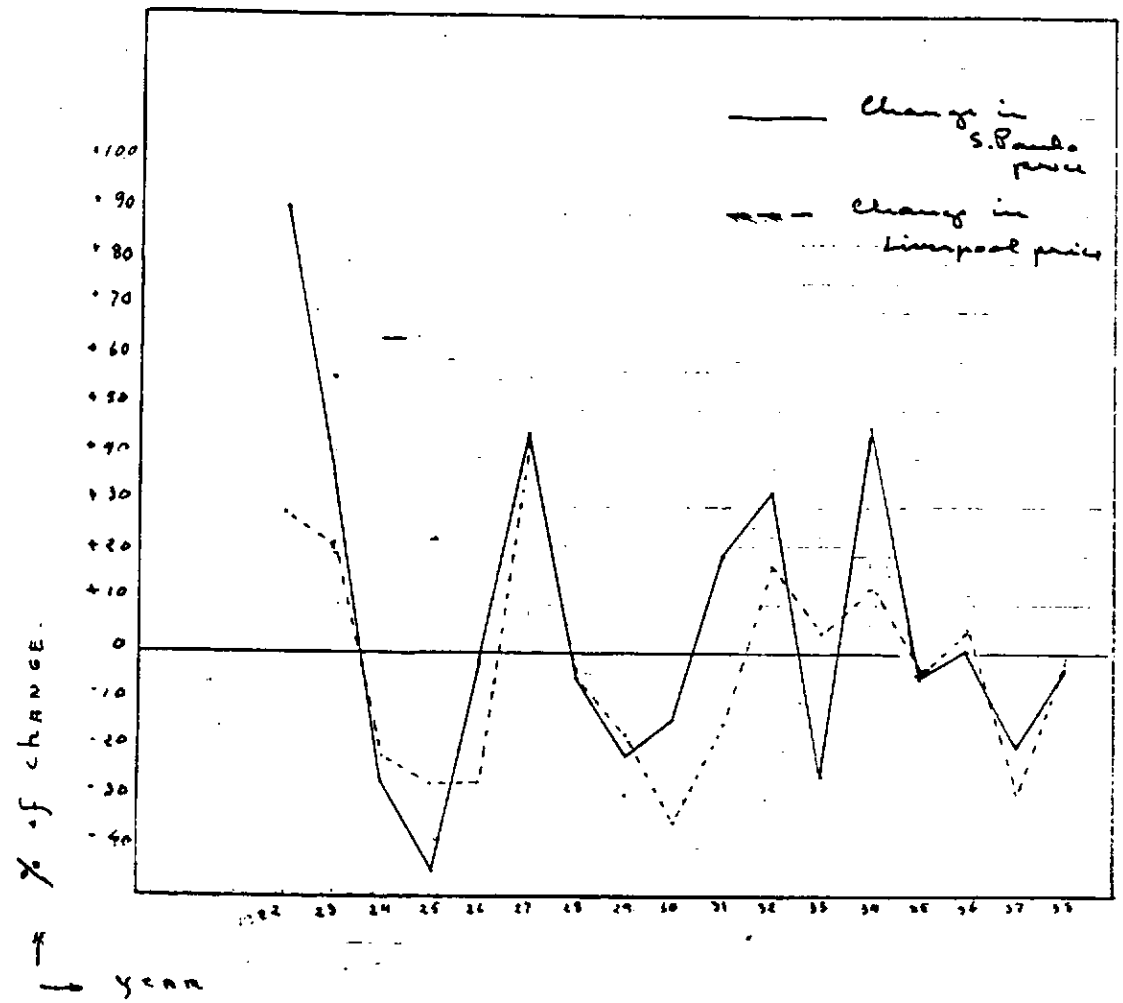
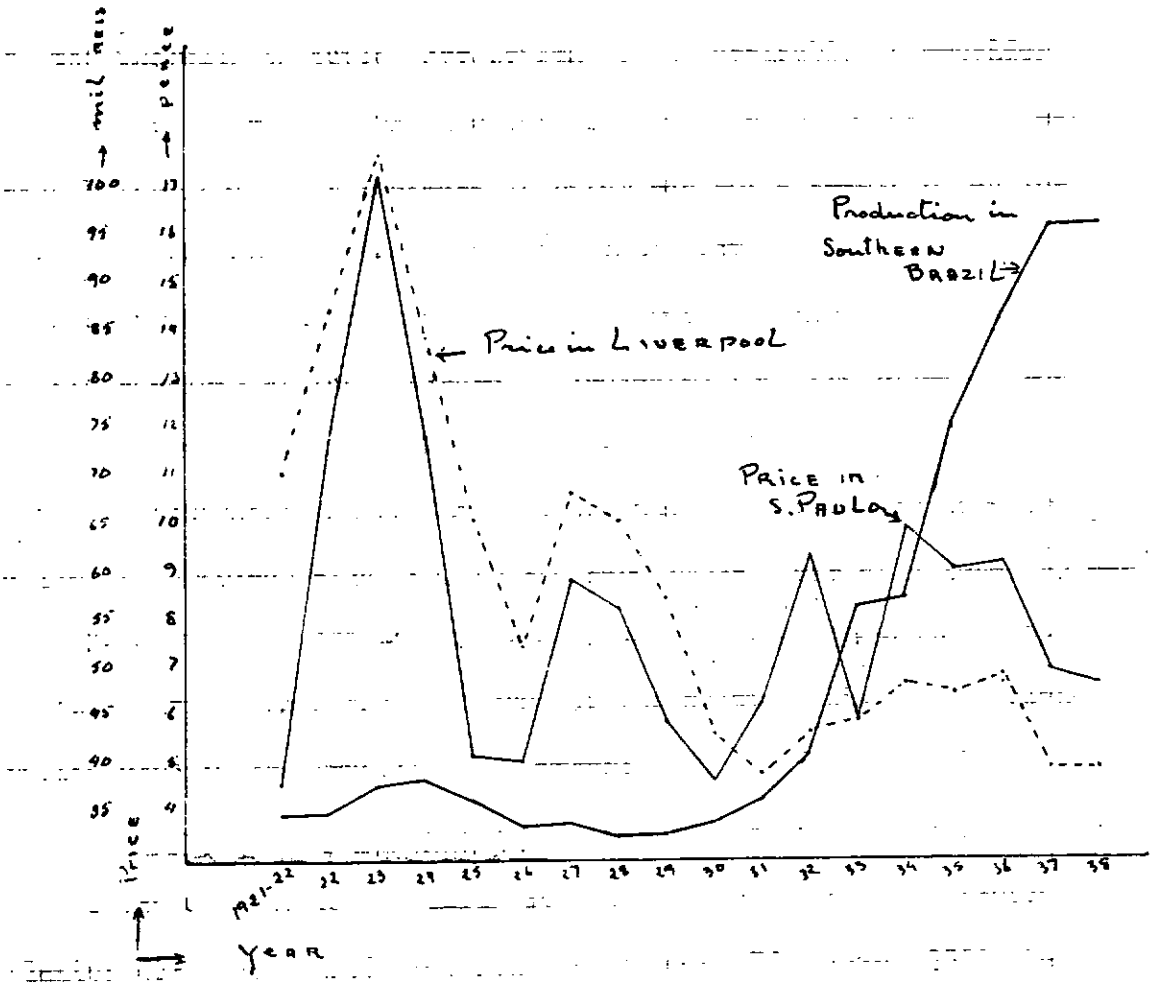


Figure 7

Prices of the S. Paulo Cotton at Liverpool & at S. Paulo and Production in Southern Brazil (1921-22 to 1938-1939)



Sources: Data on prices from Statistics on Cotton & Related Data, 1939. U.S.D.A. pg 79
Data on production from "Soils of Brazil, New Land of Cotton", by O.W. Hummer U.S.D.A.

Domestic Price of S. Paulo Cotton - The domestic price of the S. Paulo cotton shows a closer relationship with the increase in production. The increase in the domestic prices since 1934-1935 shows some apparent correlation with the increase in production, although it cannot be entirely responsible for this increase. (Figure 7). If this rise in the domestic price can be considered as one of the causes of the increase of cotton production, it is advisable to consider briefly the reasons of the increase in the domestic prices. It was said before that this increase in price was not a result of an increase in the world price of the Sao Paulo cotton. (Figure 5). It is also true that it does not follow a previous increase in the price of the American cotton. Figure 8, indicates that the price of the Sao Paulo cotton, at Sao Paulo, from January 1935 to 1937 was at a level approximately 20 per cent higher than the prices in 1927-1928, while the American Middling, in the same period, was at a level 30 per cent lower than in 1927-1928. The causes for such increase in the domestic prices then must be found in the monetary and in the tariff policy used by the Brazilian Government.

Monetary and Tariff Policies -"Brazilian monetary policy has been to a large extent, one of inflation with the large and influential planter class constantly favoring cheap money."[1] Before 1928 whenever the world price of coffee was low the tendency was to permit

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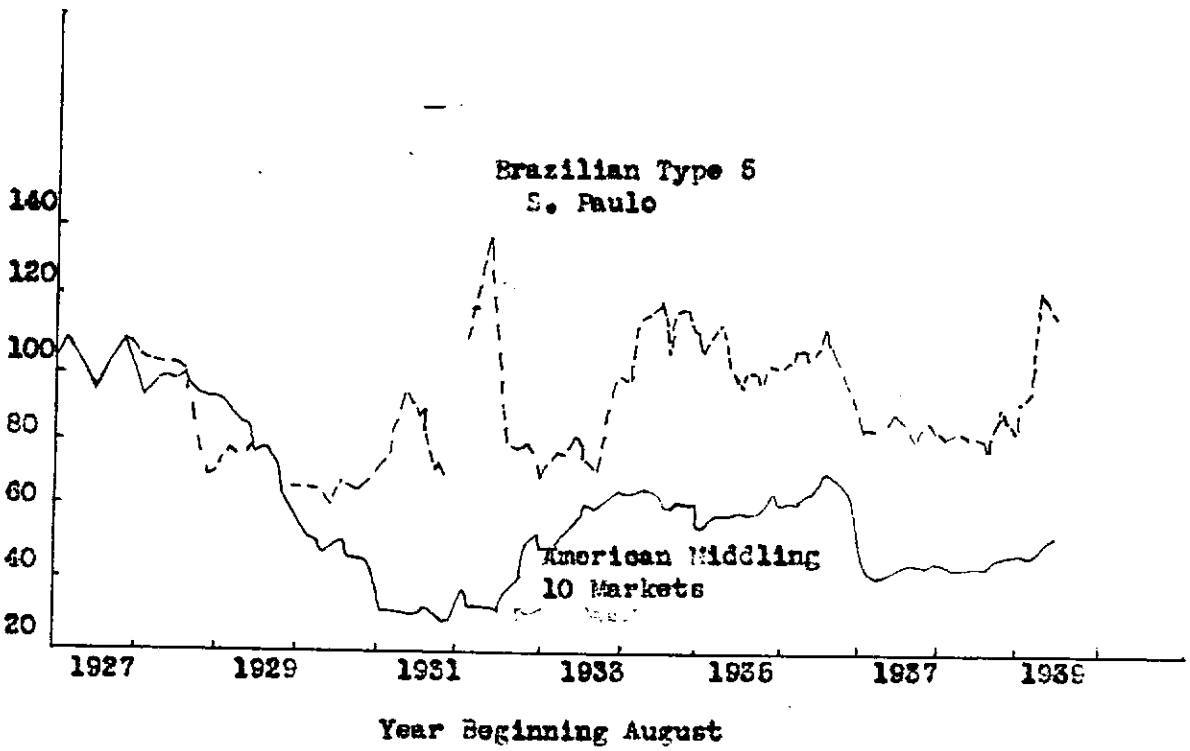
[1] Foreign Agriculture, Vol. 11, No. 2 p. 79, U.S.D.A.

FIGURE 8

COTTON PRICE RELATIVE IN FOREIGN CURRENCIES, SPECIFIED MARKETS, 1927-1939, AUGUST 1927 to JULY 1928 = 100



Source: Reproduced from The Cotton Situation, April 30, 1940.

the milreis to depreciate in order to maintain, in terms of Brazilian money, the same income to the coffee growers. After 1929, when world coffee prices decreased greatly, breaking the "coffee valorization" plan of the Brazilian Government and leaving the farmers in debt, it was necessary to further devaluate the melreis. As indicated in Figure 9, by the middle of 1931 the milreis had been devaluated almost 50 per cent of its former value in 1927-1928. The devaluation served another purpose other than increasing prices to the producer of cotton and coffee. Brazil as a debtor country needed to reduce imports since her exports were declining after 1929, and thus avoid an abnormal dislocation of the balance of international payments.

In September 1931 the Federal Government decided to take under control the foreign exchange transactions. Having the control of the exchange, it did not take long for the Government to decide to favor the exports of certain commodities. "For example during the last half of 1934 and early part of 1935, exporters of certain products other than coffee, including cotton, were permitted to sell all of their bills of exchange at the free market rate while coffee exports were compelled to sell around 85 to 90 per cent of their coffee bills at the less favorable official rates."[1]

The control of exchange as it was used in case of cotton had the same effect of a still further devaluation of the milreis. The differences between the free market and the official market have

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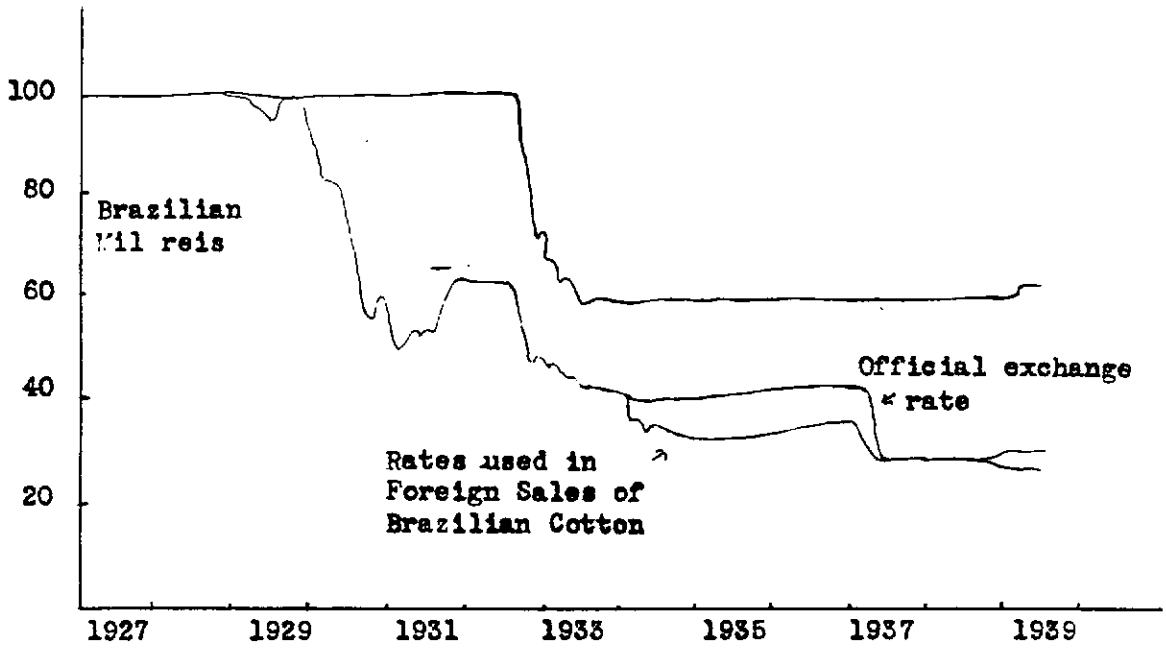
[1] U.S.Dept. Foreign Crops and Markets, Vol. 32 No. 22

FIGURE 9

RELATIVE GOLD VALUES OF SPECIFIED CURRENCIES, LONDON 1927-1939*



Source: Reproduced from Cotton Situation, May 29, 1940.

*Since September 2, 1939, Based on Official Rate of British Pound rather than on free market value.

been large. This is shown in the following table:

TABLE XIII

THE DIFFERENCE BETWEEN FREE AND OFFICIAL MARKETS[1]

Year	Free Market	Official Market
1934	14.843	11.831
1935	17.365	11.796
1936	17.314	11.622
1937	16.076	11.373
1938		17.625
1939	19.582	16.896

This control has some advantage over a plain devaluation scheme as it may regulate not only the export but also the import of goods .... "It also declared that on all merchandise imports henceforth, 60 per cent of the value of drafts would be paid at official exchange and that 40 per cent must be acquired on the free market."[2] The proportion of the bills of exchange that must be sold or bought in the official exchange is variable depending upon the vital interest of the country. Thus for the following changes were made in cotton exports in the period from September 1934 to April 1939:

Before September 1934 - - - - - - - - - -	Official exchange rate, 100 per cent
September 10, 1934 to February 11, 1935 -	Free market rate, 100 per cent
February 11, 1935 to October 14, 1937 - -	Composite average of official 35 per cent and free markets 65 per cent rate.
October 14, 1937 to November 13, 1937 - -	Composite average of official 20 per cent and free market 80 per cent rate.
November 16, 1937 to April 10, 1939 - -	Free market rate 100 per cent.
April 11, 1939 to ... - - - - - - - - - -	Composite average of official 30 per cent and free market 70 per cent rate.

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[1] Brazil, 1939-1940, p. 466.
[2] U.S.D.A. Commerce Reports, No. 29, September 29, 1934.

It is necessary to consider also the clearing agreement since it has been widely developed for the purpose of adapting foreign trade to the new system of exchange control.[1] Traders in the countries with controlled exchange tend to increase their purchases from the countries with similar controls, since problems of importing and exporting of goods between such countries is simplified. The increase in the cotton exports to Germany has been great as a result of such controls. Before 1933 the exports to Germany never reached 10 per cent of the total Brazilian cotton exports, while in 1935 the exports to that country increased to a little more than 60 per cent.

The Brazilian tariff policy during the present century has generally been one of protectionism. The tariff rates practically prohibit imports of foreign cotton, as the rate, including surtax, amounts to 4.575 milreis per gross kilogram.[2] The local textile industry is protected by one of the highest tariffs on yarns or finished goods, if not the highest in the world.[3]

The tariff has been effective, in years of a short cotton crop, in raising the prices of raw cotton in Sao Paulo. From September 1932 to April 1933 there were no exports of cotton from Brazil due to small crops in the country.[4] As a result, the domestic price of the Sao Paulo cotton rose, in terms of pence, above the world price. (See Figure10)

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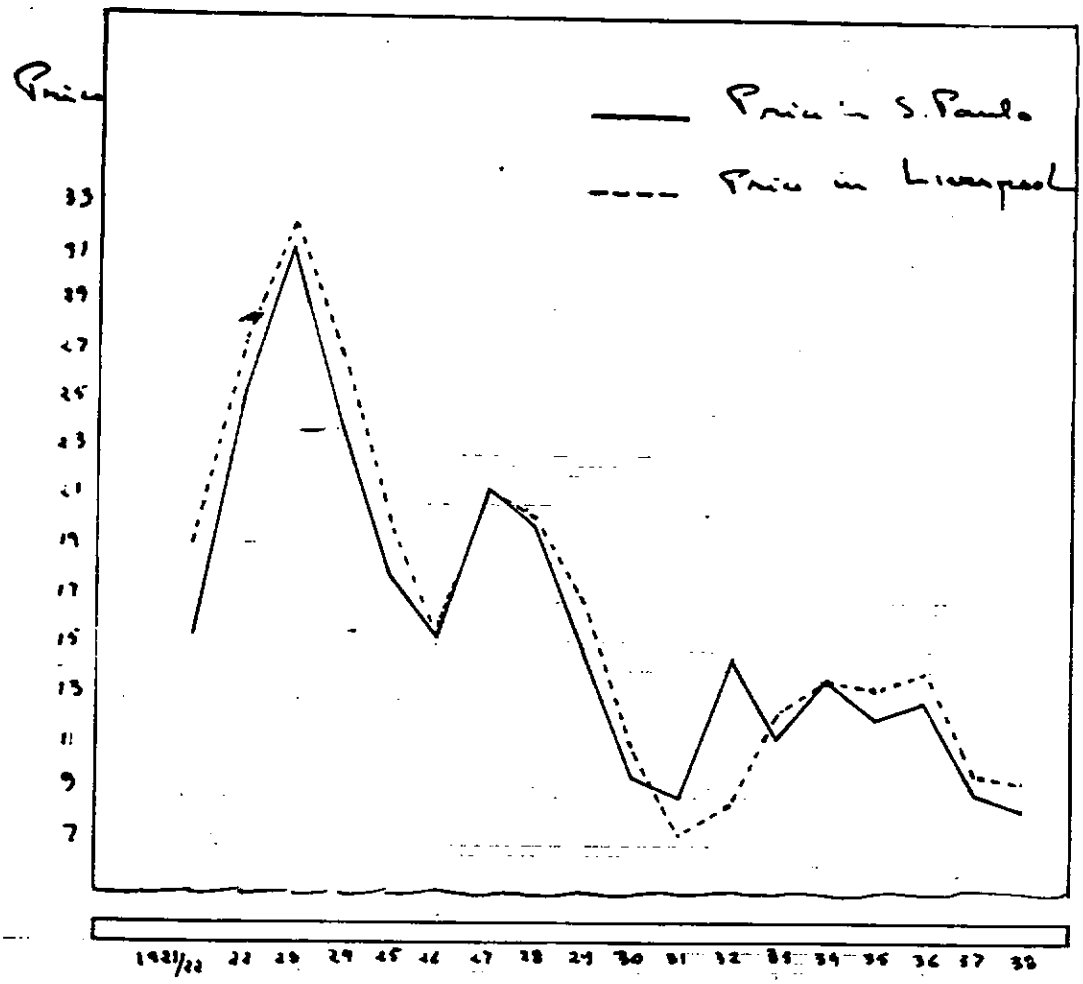
[1] U.S.D.A. Foreign Agriculture, Vol. 11 N. 1 (January 1938).
[2] On official exchange rate of 1939 it is equivalent to [illegible] per pound.
[3] "Cotton in Brazil," Bulletin of the Pan American Union, October 1938.
[4] U.S.D.A. Foreign Crops and Markets, Vol. 31 N. 24 (1935).

Figure 10

Prices of S. Paulo Cotton in Liverpool & in S Paulo (United in cents per pound. (1921-22 to 1938-39)



Source: Data from Statistics on Cotton & Related Data.

The tariff on cotton and cotton goods has also been effective in increasing the consumption by the domestic mills. Brazilian mills consume only Brazilian cotton and their consumption has shown a steady increase

TABLE XIV

BRAZILIAN MILL CONSUMPTION

(Year Beginning in August)[1]

Year	Consumption
1927	435,000 Bales
1928	372,000 "
1929	327,000 "
1930	309,000 "
1931	367,000 "
1932	367,000 "
1933	420,000 "
1934	588,000 "
1935	657,000 "
1936	699,000 "
1937	828,000 "
1938	615,000 "

The effect of tariffs and the monetary policy on cotton production has been very favorable. It has provided a temporary stimulus to the producers in the form of high prices. Perhaps the cotton industry in Southern Brazil should be considered as a case of an "infant industry" that grew up under a governmental protective policy. In the short run the effect of this policy on the country as a whole seems to be favorable. New industries tend to develop while there is a lag

[1] Statistics on Cotton and Related Date, Bur. of Agr. Econ., Washington, D.C.

between the rise of the domestic prices and the cost of living. Simons has calculated that only in the State of Sao Paulo during the last 5 years... "industrial production has grown considerable in absolute value; i.e., 60 per cent as compared with 1934".[1] However, in the long run it is difficult to appraise the real effect of this policy.

[1] Brazil's Industrial Production, Sao Paulo, Escola Livre de Sociologia e Politica, (1939) p. 38.

Relative Price

Another form of price that is worth while to consider is the relative price of the cotton. The study of cotton prices in relation to the prices of the other agricultural products will be restricted to the relation of cotton to coffee prices, since coffee production in Brazil accounts for a very high percentage of the total agricultural production of the region.[1] If the world price and the domestic price did not show a high degree of correlation with the increase of cotton in Southern Brazil, a closer relationship with the relative price should be expected because it gives a more accurate picture of the situation. In 1929 coffee suffered a great drop in price, falling from more than 33 milreis to less than 16 milreis in 1931. Prices continued downward to 15 milreis in 1933. After 1934 the coffee prices showed some improvement, but cotton prices, which did not fall to the same extent, made greater increases. This caused the cotton to be the most profitable crop for the farmers. It was natural therefore for farmers to increase cotton production because it became the most profitable crop and the farmers were in need of a new source of revenue. However in the relationship between the acreage in the State of Sao Paulo and the ratio of cotton and coffee price presented in Figure 7 is not high. Also the changes in acreage from year to year do not show a high relationship with the change in the ratio of cotton and coffee price, using for the cotton the prices of the previous months

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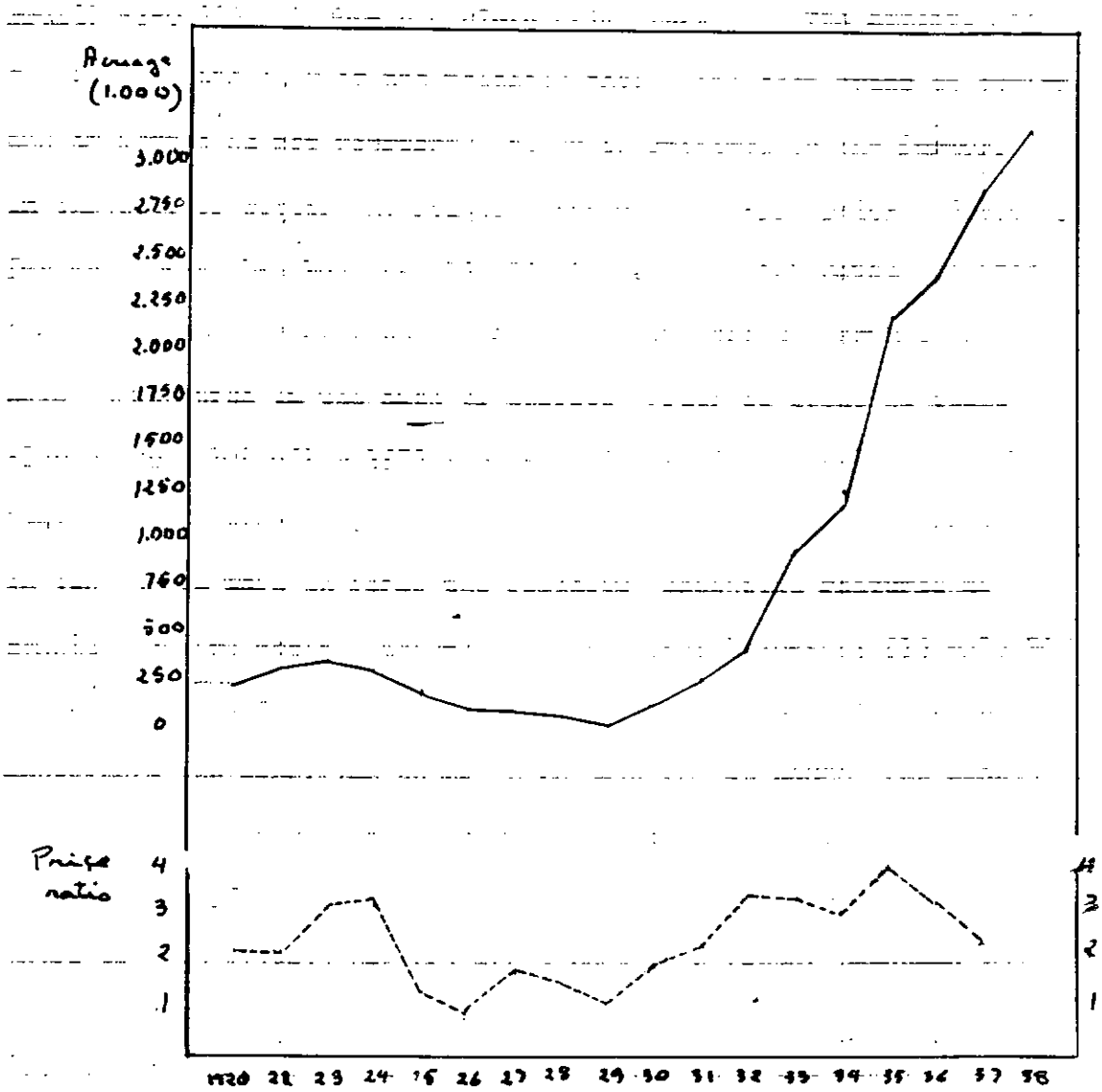
[1] During the period from 1921 to 1930 the exports of coffee accounts for 69.8 % of the total value of the Brazilian exports.

Fig. 11

Relationship between acreage and the ratio cotton/coffee price in the State of S. Paulo



Source: Data on cotton prices → U.S.D.A Statistics on Cotton and related data; of cotton prices → Departamento Nacional do Café, Anuario Estatistico (1939) Rio de Janeiro; of acreage in Northern South of Brazil, new land of cotton, U.S.D.A

of July and August and for the coffee the average for the annual price. (See Figure 12).

Several authors studying the coffee and cotton situation in Brazil also did not obtain a close relationship.[1] The explanation for this is the lack of the reliable data. The spot price of cotton and of coffee do not represent the price received by the farmers. In the case of cotton the relation between the spot price and the farmer's price has been practically the same, which makes possible the use of spot price without committing any serious error. But the same is not true in the case of coffee. Prior to 1931, it could also be used but after 1931 the error incurred is large due to the "valorization program" carried on by the Government. For instance in 1938 there were in force the following essential features of Brazil's coffee control program for the current season: (1) only 30 per cent of the 1938-1939 crop to be sold for export, 30 per cent constitute the sacrifice quota to be paid for at 5$000[2] (29 cents) per bag, and 40 per cent to serve as retained quota to be paid for at 65$000 ($3.72) per bag.[3] At this time, considering that the spot price was 140 milreis per bag and supposing a farmer produced 100

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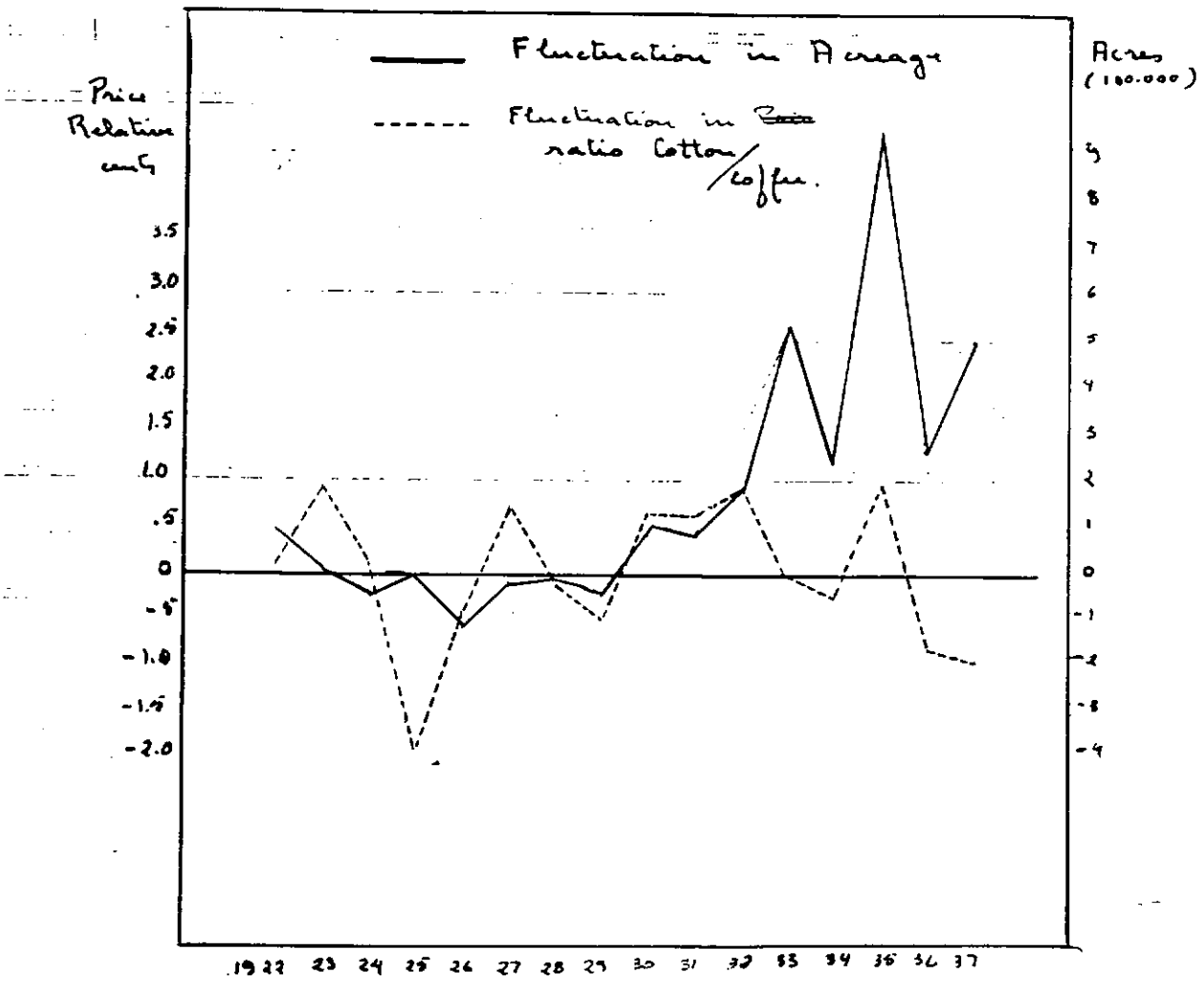
[1] E. P. Keeler, Cotton vs. Coffee in Brazil, U.S.D.A. For Crops and Mark. Vol. 31, No. 24 (1936).
L. H. Bean, Changing Trends in Cotton Production, (Address by the author before the Annual Convention of the American Cotton Shippers Association, New Orleans, Louisiana, April 29, 1928.
P. H. Morris, Cotton Production in Southern Brazil, F. S. 63.

[2] This is the standard way of writing milreis.

[3] U.S.D.A. Foreign Agriculture, Vol. 1 No. 1.

TABLE 12



Changes in the ratio of prices cotton/coffee

and changes in cotton acreage

from year to year.

bags of coffee, he would have received for his coffee the following price:

30 bags sold for 140 milreis

40 bags sold for 65 milreis

30 bags sold for 5 milreis.

This gives an average of 69 milreis per bag. Thus the "valorization" program has added 71 milreis (140 minus 69) to the spread between the farmers price and the spot price. Naturally there is an expected better relationship when the ratio of cotton and coffee farm price is used.[1]

[1] Official agencies did not send information on the farm prices of cotton.

American Agricultural Policy

Just how much influence the American agricultural policy had on the increase in cotton production in Southern Brazil cannot be exactly determined. However some considerations of its influence is worth while.

The principal effect of the American policy should be on the demand for the Sao Paulo cotton, since, theoretically, with the United States controlling the supply of cotton the prices of the American cotton should rise and induce the consumers to shift to other cotton. They should change freely the Sao Paulo cotton because it has the most similar characteristics of the American cotton. Increasing the demand for Sao Paulo cotton should increase the prices and thus tend to further increase the supply. This is what actually happened in practice. Arnold has calculated in cents the increase in price of the American cotton due to the American cotton program:[1]

TABLE XV

UNITED STATES ACTUAL AND CALCULATED FARM PRICE

Year	Actual United States Farm Price	United States Calculated Farm Price Without the Program
1933-34	10.2	6.9
1934-35	12.4	7.3
1935-36	11.0	7.8

[1] Arnold, P. H., Thesis, Unpublished.

The price of the American and the Sao Paulo cotton have evidently a very close relationship as is shown in Figure 13, where the Sao Paulo fair is given as percentage of the American Middling. Furthermore the domestic price of the Sao Paulo cotton is compared with the price of the Sao Paulo in Liverpool. (Figure 5.) Thus it is safe to say that the internal price of the Sao Paulo cotton was raised as much as that of American cotton, or at least very near that amount.

The best way to show the effect of the American program on the increase in cotton production in Southern Brazil is by comparing this increase with the one due to the Brazilian monetary policy.

The percentage of increase in this internal price that is due to the monetary policy may be roughly calculated. The prices of the Sao Paulo cotton in Liverpool and in Sao Paulo during the period 1928, 1929, 1930, 1933, 1934 and 1934 are shown in the following table.

TABLE XVI

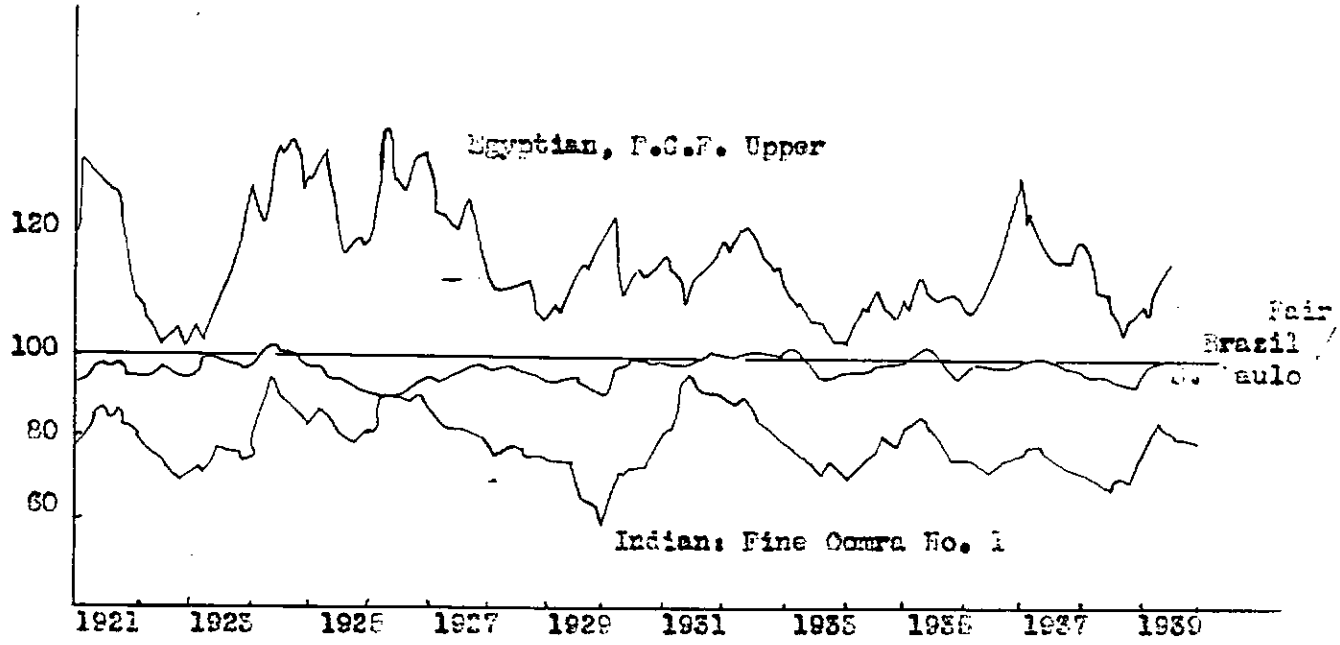
PRICE RANGE OF SAO PAULO COTTON IN LIVERPOOL AND SAO PAULO

Year	Liverpool (Cents)	S. Paulo (Milreis)	Year	Liverpool (Cents)	S. Paulo
1928-29	20.64	56,396	1933-34	12.28	44,854
1929-30	17.27	44,625	1934-35	13.86	64,903
1930-31	11.36	38,542	1935-36	13.45	60,439
Average	16.42	46.521	Average	13.17	56,732

It should be expected that the internal prices would fall the same amount that the prices of the Liverpool did, if it were not for the monetary policy in the country. Taking the average of the two periods

FIGURE 18

COTTON: PRICES OF EGYPTIAN, INDIAN, AND BRAZILIAN EXPRESSED AS PERCENTAGE OF AMERICAN MIDDLING, LIVERPOOL, 1921-1939



Source: Reproduced from Cotton Situation, March 29, 1940.

at Liverpool, the decrease in prices is approximately 20 per cent which means that the internal price in Brazil should have been 37.217 milreis for the average in the period from 1933 to 1935. However the average for this period was 56.732 milreis which means an increase of 52 per cent, which is practically all due to the monetary devaluation.

The percentage of increase of American cotton due to the American cotton program according to Arnold's study is approximately 60. As was mentioned before, the internal price of the Sao Paulo cotton has probably been raised by a like amount.

Before coming to any conclusions it is wise to see the effect in absolute values instead of in percentage. According to Arnold's study the price of the American cotton should be 37.5 per cent less in the period from 1933 to 1935 if it were not for the cotton program. (The actual price was 11.2 cents and the estimated 7.0 cents.) Admitting the same effect on the S. Paulo cotton in Liverpool the price for the same period should be 8.23 cents which would be approximately 23.161 milreis in the internal market. (The latter value was calculated subtracting 37.5 per cent from 37.217 milreis, and consequently not considering the increase in prices due to the monetary policy.) Thus the increase in absolute value, in the domestic price due to the American cotton program was 13.956 milreis, (37.217 milreis minus 23.161 milreis) and the increase due to the Brazilian monetary policy was 19.515 milreis (56.732 milreis minus 37.515 milreis). Therefore the American cotton program, although having an important role in the

development of cotton in Brazil, loses some of its importance owing to the monetary policy used by the Government.

The American program for cotton probably affected the cotton production in Southern Brazil by increasing the interest of the consumer countries in developing new sources of cotton. The flow of foreign capital to Brazil may be due in part to the uncertainty brought to the world markets resulting from the American policy of controlling a great percentage of the supply of cotton in the world. No figure is available on the amount of foreign capital used in cotton production in Brazil, but very likely it amounts to a considerable sum. The capital has been almost exclusively used in gin installations and marketing of cotton. Some crop production financing is done by foreign firms but they raise but small amounts of the cotton.

Governmental Aids

The aid given by the Government to the cotton producers and merchants is a very important factor, especially in the State of S. Paulo where the Government is provided with better facilities. The program carried on by the Government in order to give to the producers better planting seed and technical advice and the program to give the merchants a better quality product and safe rules of trade has been quite successful.[1] The producers and the merchants have been attracted to the cotton industry because the regulations controlling the production and the trade of cotton makes their work easier and safer.

Herrmann says that "the program is a model of coordinate action in which many divisions and sections of the Federal and State departments, as well as certain trade agencies, cooperate to the end that South Brazil may produce and merchandise a commodity of such quality as to be readily acceptable in world cotton markets."[2] In this present study only the most important phases of the program will be analyzed.

Seed Selection and Advice on the Cultural Methods - One of the most important of the Governmental aids has been in selecting the quality of the seed stock and the wise technical advice given to the farmer. Long before the Government undertook any control over the production of cotton seed for planting, the Instituto Agronomico had started research work in cotton breeding, use of fertilizers, cultural

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[1] C. W. Herrmann, "South Brazil, New Land of Cotton", (Farm Credit Administration Circular C-117) for a detailed and clear description of the cotton program in the State of S. Paulo.

[2] C. W. Herrmann, op. cit., p. 2.

practices, control of insects and diseases, etc.[1] By the time large numbers of farmers became interested in cotton production the Instituto had the best quality seeds and knowledge of the agricultural practices in Southern Brazil. At the beginning the farmers were skeptical of all the measures fostered by the Government but they soon realized that the quality of seed was good and that the advice could be accepted with large profits. The farmers enthusiastically accepted governmental control and gave the government authority for complete control over the seed production and distribution.

The seed selected in the Instituto Agronomico were selected from the American varieties, Express and Texas, introduced early in the country. These varieties developed new characteristics under the new environment. The staple lengths of the fibers and the lint percentage were definitely improved. Staple now runs from 1 inch to 1 1/32 inch while the percentage of lint runs to 35 per cent of the weight of seed cotton. The "character" however has not shown any improvement, being considered now inferior to American cotton. The breeding and selection work has been successful because the new strains of cotton are very well adapted to the new environment and their uniformity has been maintained and improved to some extent.

The cultural practices advised by the Government have also been successful, which is indicated by comparing the yields obtained on the cooperating farms,[2] with the average yield of the State. The

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[1]The Instituto Agronomico is the official agency of the State of S. Paulo in charge of the experimentation and research in agriculture. The work in cotton has been under the direction of R. O. Martins.

[2]Cooperating farmers are those who produce planting seeds for the entire State of S. Paulo, under the supervision of the Department of Agriculture.

cooperators have an average yield of 325 pounds of lint cotton per acre while the average for the State is only 180 pounds per acre. This difference is largely due to the fact that the cooperators have to follow the advice of the Government's experts. Table No. XVII gives the agricultural practices usually performed by the Instituto in the culture of the cotton and the number of days necessary for one man to cultivate one acre. This table may also give a partial view of the agriculture technique of the region, although the results of a little more than 35 days for a man to work one acre should not be compared with the 84 hours usually required in the United States,[1] because the methods used in both calculations are not necessarily the same. The agricultural practices in the two countries are necessarily different also. The yield obtained with these practices is unusually high, more than 450 pounds of lint cotton per acre. The farmers in the State of S. Paulo have a lower yield in their crops but as a rule they use less hours work to produce one acre of cotton.

The cost of production on the cooperating farms may be used also in judging the value of the agricultural practices used in the region. Taking the average of 133 cooperators in 1938-1939 the cost of production was only 0.351 milreis for a pound of seed cotton, which is equivalent to 5.40 cents per pound of lint cotton.[2] (See Table XVIII)

Seed Control and Distribution - As already indicated, the Government has practically complete control over the cotton seed

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[1] U.S. Dept. of Agr., World Cotton Situation, Part II, p. 59.
[2] With the exchange rate of 19.700 milreis for one dollar.

TABLE XVII

NUMBER OF DAYS USED FOR A MAN TO CULTIVATE ONE ACRE TO COTTON

	1930-31	1931-32	1932-33	1933-34	1934-35	Average
Plowing	1.6	1.6	1.16	1.16	1.16	1.16
Disking	0.50	0.29	0.80	0.33	0.50	0.41
Seed Bedding Preparation	0.33	0.29	0.41	0.37	0.25	0.33
Applying Fertilizer	1.50	1.00	1.16	1.25	0.91	1.21
Planting	0.21	0.21	0.21	0.21	0.16	0.20
Thinning	1.50	1.11	-	1.41	1.12	1.3
Replant	0.08	-	0.66	1.66	0.58	0.6
Plow Cultivation (3 to 5 times a year)	2.66	1.62	2.08	1.37	1.98	1.86
Hoeing (4 to 5 times a year)	6.25	6.66	7.50	11.58	9.66	8.06
Spraying	5.86	1.91	2.16	2.83	4.41	3.43
Destroying Affected Plants	.33	1.04	0.50	-	-	0.37
Supervision	2.16	1.75	1.25	1.0	2,33	1.70
Removing stocks	2.83	2.58	3.11	4.50	7.25	9.08
Total						24.76

"1 man needs 24.76 days of work in order to produce 1 acre in cotton. The average production was 1.375 pounds of seed cotton. Admitting a man can pick 100 pounds per day it is necessary that 13.75 more days of work be done. Thus: If in 38.51 days of work 1 man produces 1375 pounds of seed cotton, in one days work (x) x $\frac{1375}{38.51}$ 35.7 In 1 days work a man produces 35.7 pounds of seed cotton.

Source: Figures obtained in the Instituto Agronomico by kindness of Mr. O. Neves, and Dr. P. Cuba.

TABLE XVIII

COST OF PRODUCTION OF THE COOPERATOR FARMERS OF THE STATE OF SAO PAULO

Zone of the State	Number of Farmers	Total Acreage	Average Yield Per Acre "Seed Cotton"	Average Cost Per Pound of Seed Cotton in "milreis"
1	19	11,190.0	983.4	.364
2	16	6,125.0	985.6	.361
3	18	9,726.0	814.5	.348
4	9	4,560.0	960.8	.368
5	3	804.0	875.0	.322
6	5	4,839.0	867.1	.412
7	2	915.0	899.2	.311
8	19	13,992.0	952.6	.333
9	4	1,696.0	781.2	.391
10	8	3,714.0	963.0	.338
11	4	1,770.0	1060.1	.364
12	10	5,899.0	894.3	.370
13	10	5,899.5	1188.7	.337
14	6	3,798.0	917.1	.307
Total Average	133	72,895.5	955.6	.360

Source: From the "Instituto Agronomico" by kindness of Mr. W. D. H. de Millo

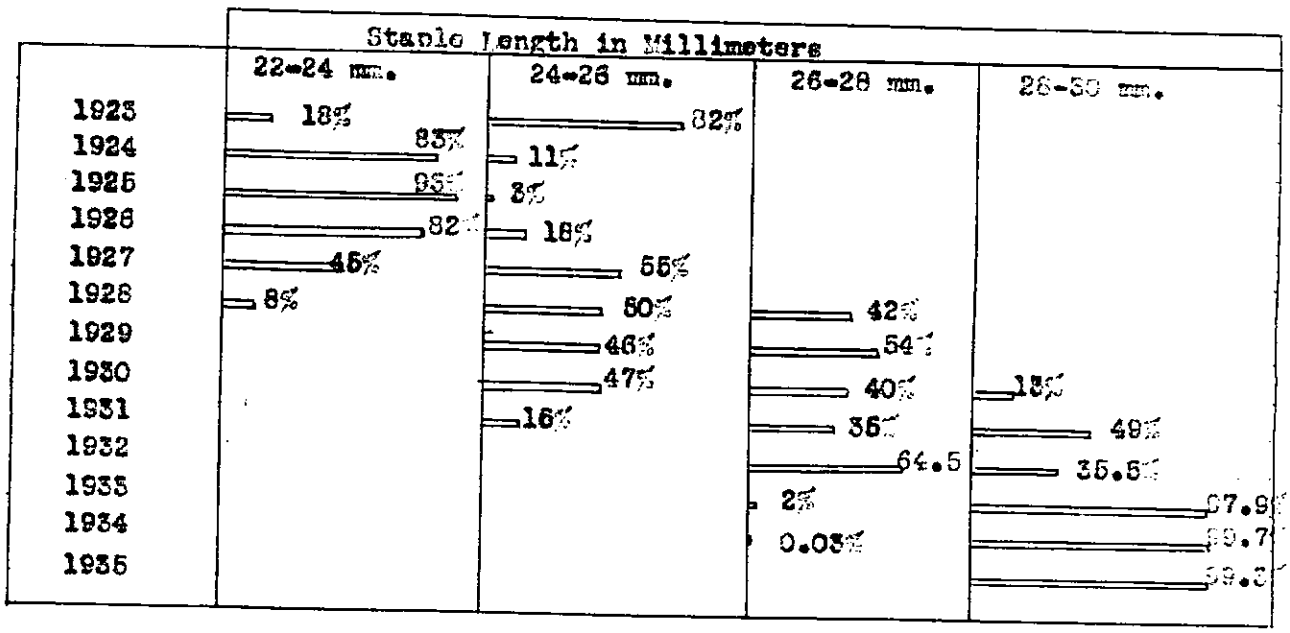
planted in the State of S. Paulo. The Government has a contract with the outstanding farmers for the multiplication of the seed selected in the Experimental Stations. The cooperating farmers raise, pick, and gin the cotton under the supervision of experts from the Department of Agriculture. Before purchasing the seed the Government takes samples of the seed to the laboratory, passing them through a fairly complete examination. If the seed show the qualities required the purchase is made. After that the seed are fumigated and stored until the next year's planting.

Having such control over the seed planted and having varieties very well adapted to all the State, it has not been difficult to improve the quality of the commercial cotton produced in the region. Data given in Figure 14 indicate staple was greatly improved in a short period of time. In 1925, 97 per cent of the production of the State was less than 24 mm. (15/16 inch)[1] and in 1935 practically no cotton was produced with a staple length less than 28 mm. (1 1/8 inches). The uniformity of the commercial cotton was much improved, with 99.3 per cent of the cotton produced in 1935 included in only one class, 28-30 millimeters. Undoubtedly such staple and such uniformity are important advantages to the producers and merchants because these are the qualities most commonly desired by the largest consumer markets. At present the Government has no intentions to further improve the length of the staple, because it is understood that this staple length has the largest markets and is the one that gives the best profits to the farmers.

[1]The values are converted on the basis of 25.4 millimeters for one inch.

FIGURE 14

STAPLE LENGTHS OF THE PRODUCTION IN THE STATE OF S. PAULO FROM 1923 to 1935



Source: Reproduced from "Algodao, cultivo e commercio" by H. H. Hunnicutt.

As a result of this program the Government has changed completely the State's production to a new variety within 5 years time.

Hail Insurance - In connection with the sale of the seed the Government gives to the producers insurance against loss from hail. The compensation may go as high as 500 milreis per alqueire, approximately $4.15 per acre.

Supervision and Inspection of Gins - In order to have complete control over the distribution of the planting seed, the Government has one representative in each gin plant. These representatives check to see that there is no sale of seed for planting purposes by the ginners. With these representatives in each gin plant it is possible for the Government to enforce several other measures facilitating the marketing of the cotton.

The gin stands are always in good mechanical condition. There are inspectors that check their conditions and a gin plant cannot operate without a favorable report from the inspector. Several other regulations specify the conditions under which the cotton must be stored and ginned. The size and the weight of the bales are also subject to strict regulations. The bales have to be wrapped properly, according to the specifications of the Government, and must be protected from the weather. At the time the representative draws the sample for the classification each bale and sample is numbered.

With these regulations the cotton is properly ginned and there is practically no country damage of the cotton, which explains in part the high grade of the cotton classified in the State.[1] The quality of the product and the clean appearance of the bales are some of the advantages shown by Southern Brazil's cotton in the world market.

Classification - Another important feature of the cotton program is that every bale of cotton is classified by an official agency.[2] The grade classification is according to the 9 types of the Brazilian official cotton standards. No standard for color has yet been established. For staple only 3 or 4 bales out of 100 are classed. After a bale has been classified, one grade certificate with the number, grade, and staple length of the bale is issued. In the sale of the cotton these certificates are accepted without question, especially in the transactions between ginners and merchants and exporters.[3]

Purchasing cotton on government classification reduces marketing costs and insures the seller a price based upon quality.

In addition to the first classification, all the cotton exported is reclassified at the port before it is shipped. The Federal Government is in charge of this classification. Samples are drawn from 10 per cent of the cotton upon arrival at the port. This classification not only protects the export business against unfair transactions

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[1] Official reports show that by September 31 more than 85 per cent of the crop in 1939-1940 already classified was above type 5. (Similiar to American Strict Middling, U.S.D.A. Foreign Crops and Markets, Vol. 41 No. 20, p. 743.

[2] The classing is done by the "Merchandise Exchange" of S. Paulo with the cooperation of the Fed. Dept. of Agr. and the S. Paulo Dept. of Agr.

[3] The farmers usually sell their cotton to the ginners in the seed.

but also gives to the Government accurate statistics on the amount and quality of the cotton exported to different countries. It provides a sound base for changes in the cotton program, adjusting the production to the needs of the foreign market.

Minor Factors

There are several factors of minor importance that must not be omitted when considering the factors that are responsible for the increase in cotton production in the region.

One of these has been the necessity of a new source of revenue for the coffee farmers. Prior to 1929, under the coffee valorization program carried on by the Government, the producer received from an official bank 70 per cent of the value of his harvested coffee. The coffee had to be stored for one or more years, and at the time of the sale the farmer had to pay back to the bank the amount received. In 1929, when the world crisis came, the bank could not get a new loan in Wall Street, and the Federal President refused to allow any additional issue of paper money for this purpose. The farmers needing financial aid were compelled to secure loans from non-official institutions. Furthermore their debts were increased because at the time their coffee was sold the price was excessively low and the amount obtained was not enough to cover their debts with the bank.(1) The fact that the farmers were deeply in debt was a strong reason for them to cultivate any crop that could bring some cash revenue.

Another factor of minor importance was the Federal decree No. 19.398 of February 1930, levying a heavy tax on new coffee trees planted in the States with more than 50 million trees. The tax was heavy enough to be practically prohibitive. If there had been no tax, farmers in Sao Paulo might have planted additional coffee trees but it is doubtful if they would have because the future of the coffee

was too dark to be attractive. For instance the State of Parana with fertile virgin land did not greatly increase her acreage although farmers in this state were not penalised by any tax for increasing coffee production.

Unusually favorable weather to the cotton crops during the years 1933, 1934, and 1935 was another form of help. The farmers going into the cotton production realized very good profit due in part to the favorable yields obtained these years. This increased the interest of other farmers, increasing the number of newcomers to cotton production.

The abnormal international situation has also had something to do with the increase. Countries like Germany and Japan, with their tight economic control, were encouraging the use of the barter system and blocked currency. Brazil, among the cotton producing countries, was in a favorable position to deal with these nations, which explains the ease with which Brazil has disposed of her cotton. As far back as 1929 the country has had practically no carryover of cotton. A constant market for the product has been a stimulus to the producers and the trade in general.

Recapitulation

So far in the present study of the economic and political factors influencing cotton production in Southern Brazil each factor has been analyzed separately. It is now proper to appraise the influence of all the factors combined.

Prior to 1929, cotton could not develop because coffee was the major crop, attracting practically all the capital and labor of the region. The price of cotton had to rise to a relatively high level before the production could be increased, as was the case in 1922, 1923, and 1924, when the acreage went above 350,000 acres. Of course an abnormal situation, as in 1918 when a frost killed a large percentage of the coffee trees in the region, could also attract the farmers to cotton production. Judging by the return in milreis for cotton production, a larger production of cotton should have been expected but the farmers were not attracted to it because they could not find easy credit, gins in good conditions, and facilities for the marketing of their cotton. Every phase related to the marketing of the product was difficult and uncertain. High prices also failed to offer any great stimulus because coffee was uppermost in the minds of every one in the country. After 1929, when the prices of coffee decreased greatly, affecting not only the agricultural class but all the nation, the farmers, the Government, and the public in general, started a search for a new source of revenue. It was some time before the attention of the farming class was turned to cotton production, partly

due to the fact that there was hope for a rapid recovery in the coffee business. In 1932 the relative price of cotton rose to a high level, not entirely because of the drop in the coffee price but also because of a rise in the domestic price of cotton. This rise in the domestic price was due to a small crop in the country and to the tariff that did not allow the importation of foreign cotton. In the following year (1933) the farmers started a slow movement towards cotton production. The first farmers going into the cotton production made a good profit owing to the unusually favorable weather and to the good seed and technical advice furnished by the Government. The success among the beginners attracted more farmers, capital and labor to the new crop. In 1934 and 1935 the prices rose again as a result of the Brazilian monetary policy, American cotton program, and a further drop in the farm coffee prices. Also by this time the facilities for marketing the product had improved. In 1935 the rate of increase reached the highest peak with an increase of more than 1,000,000 acres over 1934. In 1936 and 1937 there were also further increases in production in spite of lower prices. It is generally accepted that the foreign capital had an important role in this increase. The capital was brought to the country partly because of the safeness assured in the cotton industry under the Government's program. In the later years the production still increased but at a much lower rate as shown by the following estimates:

TABLE XIX

PRODUCTION IN SAO PAULO

Year	Bales	
1937-38	1,145,000	
1938-39	1,260,000	(Final Estimate)
1939-40	1,382,000	(First Estimate)

Production has apparently reached a more stable position and from now on the fluctuation in the acreage should follow closely the fluctuations in prices, which has not been true in recent years.

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CHAPTER IV

POSSIBILITIES OF FURTHER INCREASE IN PRODUCTION

The study so far has been limited mostly to the State of Sao Paulo. In addition to this state there are several other states in Southern Brazil that have some possibilities for cotton production, although they are not of any great importance at the present time.

The States of Matto Grosso and Goyaz - These states comprise a large area west of the States of Minas Geraes and Sao Paulo. Here we find an extension of the Central Plateau of Eastern Brazil with an elevation of 1600 to 2500 feet, consisting of broad flat topped areas known as "chapadas".[1] There is a distinctly dry season during winter in the area as a whole. This unequal distribution of heavy rainfall through the year is conducive to a tropical savanna. The total annual rainfall is a little over 60 inches. The mean temperature in two important towns of these States are 79.9°F. and 75.2°F.[2] The soil is derived from the sandstone and is inferior to those found in the State of São Paulo. This region is predominantly grassland, locally known as "campos." Forests are usually found following the stream courses.

Taking natural factors as a whole, the region may be considered as fairly suitable to cotton production. If the production does not increase the cause is most likely to be found in the competition with the cattle industry. The region has an abundance of grass land and a

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[1] T. T. Jones, Economic Geography, April 1929, Vol. 5 No. 2.
[2] H. H. Haas, Journal of Geography, 1928, Vol. 28, p. 86.

small population. Markets are a considerable distance away. Sparse population and distance to markets are heavy handicaps to cotton production but do not affect the cattle industry to the same extent. The cotton production is not as profitable as cattle production, because the latter is exploitative in nature.

The development of cotton in the region depends primarily upon an increase in the population and on better means of transportation, which is not probable in the near future, since there are better lands and better conditions in the State of Sao Paulo which is also dependent on population and capital for development. The immigration from other states and the use of capital would be naturally attracted to Sao Paulo first. The States of Matto Grosso and Goyaz do not show much probability of increase in the near future.

The State of Parana - The northwestern part of the State has large areas with the fertile "terra roxa" soils and made rapid progress in coffe production during the period of high prices for coffee. However this area has not been successful with the production of cotton. Soils poorer than these seem to be better adapted to cotton production. The climate here is not as suitable for cotton as it is in Sao Paulo. The state is also sparsely populated. However these are not serious handicaps to the production of cotton. The State is not as well adapted to cotton production as the State of Sao Paulo but some increase may be expected in the near future.

States of Minas Geraes and Rio de Janeiro - These states have a relatively large population that could be used in cotton production.

Their soils and climate are favorable. Notwithstanding these facts the increase in the production has been small. Comparing the situation in these states with the one in the State of Sao Paulo it is noticed that agriculture is more advanced and farms better organized in the latter state. Farms having more machines, more efficient labor and better knowledge of agriculture, can shift to cotton production from other enterprises more easily. In the States of Minas and Rio de Janeiro there is need for an improvement in the agricultural technique. In Minas Geraes the region best adapted to cotton is the basin of the Sao Francisco river, but it has been a cattle region and has been slow to change to cotton. The change from cattle ranching to row crops is not so easily made. Governmental aids to farmers in these states have been less efficient and effective than has been the case in Sao Paulo.

The State of Minas has more possibilities in cotton production than the State of Rio de Janeiro, because it has better land, and probably more agreeable climate. However, the development in both States depend primarily on the use of a more technical knowledge, and on more efficient aid from the Government in the field of production and marketing.

The State of Sao Paulo - The State of Sao Paulo presents a different picture since the farmers have a relatively good knowledge of agricultural practices and the cotton program conducted by the Government is successful. The limiting factor in the cotton production therefore is in the insufficient supply of labor. Considering that

there is a constant immigration of labor from other states of the country, it is reasonable to expect in the future a constant but small increase in the acreage planted to cotton. The fluctuation from year to year in the acreage planted will tend to follow more closely the variations in the relative price of cotton since the crop has now reached a more stable position.