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MAJOR SHIFTS IN THE LOCATION OF THE AGRICULTURAL PRODUCTION IN A SELECTED COUNTRY—BRAZIL

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IN the economic history of Brazil, as in many other large countries, a moving frontier can be identified. In older days this was located along the Atlantic coast, but now it has started to radiate from the beautiful central capital of Brasília.

'The history of the Brazilian economy is a sensational record with amazing fluctuations. Its leitmotif is the perpetual change of the "kings"—sugar, cocoa, gold, cotton, rubber, coffee—each of which has its place in the history of the country and was at one time the axis of the national (or State) economy, leading Brazil to a temporary world supremacy.'¹

My paper consists of three parts. In the first, examples of the principal products of the Brazilian agricultural economy during the colonial period will be described: the magnitudes of exports, moves in the location of production, and the more notable causes and consequences. In the second part, the behaviour of the principal products in the five geophysical regions of the country in the period 1931-60 will be analysed.² In the third part, some general conclusions will be presented, together with data on the situation in Brazil in recent years, and some perspectives for the near future.

Early Agricultural Production Patterns

Brazil wood. In taking advantage of the recently discovered territory (1500), first the Portuguese, and later the French, noted that the

¹ J. F. Normano, *Brazil—A Study of Economic Types* (p. 18), Chapel Hill, North Carolina, The University of North Carolina Press, 1935, 254 pp. Similar interpretations are encountered, also, among the principal analysts who have concerned themselves with the economic history of the country. The first part of this paper is largely based upon the works of these writers: (a) Robert C. Simonsen, *Historia Economica do Brazil*, 4^e ed., São Paulo, Companhia Editora Nacional, 1962, 475 pp. (b) Caio Prado Junior, *Historia Economica do Brazil*, 7^e ed., São Paulo, Editora Brasiliense, 1962, 354 pp. (c) Celso Furtado, *Formação Economica do Brazil*, Rio de Janeiro, Editora Fundo de Cultura S. A., 1959, 291 pp.

² When developing this part I received substantial help from my distinguished staff colleague, Dr. G. Edward Schuh, who also courteously translated this paper from Portuguese into English.

Brazilian coast was quite rich in a plant containing a valuable dye. The peaceful conquest of the Indians provided an adequate supply of labour, and a vast tonnage was extracted and transported to Europe, the devastation lasting to the middle of the sixteenth century.

Sugar cane. What was known of Brazil in terms of climate and soil indicated possibilities for sugar-cane production. A few years of production verified this conclusion. Moreover, the product was experiencing a rapid expansion in demand in Europe with a consequent rise in prices. Nor did the Portuguese lack the secrets of its manufacture and trade.¹ There was interest in the sugar trade among both them and the Italians, the latter were masters of the trade in that period. The picture of favourable conditions was completed by the existence of Dutch and Flemish financing, both in the transportation of sugar to Europe and of African slaves to Brazil. This was perhaps the most important factor in establishing the sizeable sugar industry in the north-east of the country. For years, Brazil was the world's largest producer of sugar. At times, its annual export attained levels of more than 100 million pounds. The north-east was then proud of its rich colonies, in contrast to the accented poverty of the south. We shall see later that this situation was completely reversed. The industry prospered in an extraordinary manner from 1580 to 1655 and only began to decline with competition from the West Indies. The decline was further stimulated by the search for gold and diamonds in the eastern region.

Gold and livestock production. The flow of population to the mining areas in the early 1700's became a rush of a greater relative proportion than the famous California rush.² In a few decades an area of 2 million square kilometres was populated and the economic centre of the country moved from the north-east sugar region to the east and west central (1763). With an annual exportation of gold that reached 2.5 million pounds in 1760, and a free population³ of 300,000 people engaged in the gold industry, it would appear that the industry would exert an important influence on the regional agriculture. This did not happen initially, because the investment return in mining was much higher than in agriculture. In fact, during the initial phase, serious hunger existed alongside incalculable riches. Eventually, increases in food prices encouraged the application of resources to the production

¹ For more detail see Noel Deerr, *The History of Sugar*, London, Chapman & Hall Ltd., 1949, 2 vols., and Celso Furtado, *The Economic Growth of Brazil*, Berkeley and Los Angeles, University of California Press, 1963.

² Caio Prado Junior, op. cit., p. 65.

³ As distinct from the slaves.

of foodstuffs, principally beef cattle. In addition, the production of mules for transport also became important. The combination of the demand for beef cattle and mules in the eighteenth century made a combined market larger than the sugar economy at its maximum.¹ At the time, the principal production regions of the country (the north-east and the south) were practically isolated from each other. The exploration for gold was the principal factor responsible for integrating the two sectors. This integration, with the exploration for gold in the centre attracting cattle from the north and mules from the south, was the beginning of a slow process of integration that has continued to the present. Livestock production was increasingly profitable and had to its credit the settling and integration of the various geographic regions.² However, it did not develop independently. Its success was conditional on the production of gold and, with the exhaustion of the mines, the livestock industry did not continue its process of expansion.

Cotton. Beginning about 1750, there occurred a series of events that favoured greatly the world market for tropical products. Among these were the War of Independence by the United States, the French Revolution and the disturbances caused in its colonies, the Napoleonic wars, and the collapse of the Spanish empire in the American hemisphere. These events made possible the appearance of a new industry in the north of Brazil—that of cotton—as an export crop. The production of this crop, exportation of which dates from 1760, rapidly expanded to the whole country. However, its period of success lasted only a few years. With the decline in cotton prices at the start of the nineteenth century, largely owing to the expansion of North American production, its cultivation continued only in two regions, the north-east and the south. Even there it was produced primarily for the internal market. Aside from the exports in that early period, only in the period of the Second World War has the country exported a sizeable quantity of cotton.

Cocoa. The native cocoa production in the Amazon region, where the crop originated, was always very modest. Of larger economic importance was that planted in the south of Bahia (eastern region) where the conditions of climate, soil, and easy access made possible an occupation by the migrants from the north-east. In 1825 the country registered its first export to Great Britain, of 26.8 tons.³ Modest

¹ Celso Furtado, *op. cit.*, p. 95.

² For more information, see Robert C. Simonsen, *op. cit.*, chap. viii.

³ All references to tons in this paper are to metric tons, which are equal to 1,000 kilograms or 2,204 pounds.

exports continued up to 1880 when the total reached 1,688 tons. From that date the tonnage exported grew at a rapid rate, surpassing 13,000 tons in 1900 and today amounting to 60,000 tons a year.

Rubber. Brazil possessed one of the world's largest reserves of native rubber in its northern Amazonas region. This resulted in an industry of sizeable economic importance. From 1901 to 1910 the annual average export was 13,400 tons, valued at 13.4 million pounds gold-sterling. The record export was 42,000 tons in 1912. By 1910 rubber alone amounted to 31.1 per cent. of total Brazilian exports. The trade then declined because of a scarcity of trees and competition from English, French, and Dutch plantations. The production that developed in the orient (principally Ceylon and Malaya) arose under highly technical conditions of production. Brazil, which made little progress in this sense, was never again a major contributor to the international trade in rubber.

Coffee. Although introduced initially in the north (1727), coffee never became an important product in the economy of that region. In 1770 it was taken to Rio de Janeiro (eastern region). This was the beginning of an extraordinary expansion and the development of a wealth which, from that date to the present, has contributed enormously to the economic life of the country. The success of this implantation in the south was due to (1) an abundance of labour owing to the fact that the region was in a serious economic crisis because of the exhaustion of the gold industry, (2) the climate and the existence of virgin lands, both of which favoured the new undertaking, (3) the stimulus given by exportation, which, dating from 1829 was greater than the coffee of Java (from that period to the present Brazil has been the largest coffee exporter), and (4) the construction of railroads in São Paulo, which made possible the exportation through the port of Santos.

For almost one-and-a-half centuries coffee has averaged, in value, more than 53 per cent. of all Brazilian exports.¹ Between 1875 and 1941 Brazil exported more coffee than all her competitors combined. There were some periods when these exports fluctuated between 73 and 83 per cent. of the world total (1897-1907).² The influence of coffee in the development of the eastern and southern regions is incontestable. 'During a little more than a century the panorama of our (São Paulo State) growth and our progress unfolded in a setting of

¹ In some years it reached more than 70 per cent.

² Constantino C. Fraga, 'Resenha Historica do Cafe no Brasil,' *Agricultura em São Paulo*, vol. x (1), pp. 1-23, (Janeiro, 1963). (Bolotim da Divisao de Economia Rural, Secretaria da Agricultura—São Paulo).

small mountains streaked with coffee trees. Everything turned on the "green gold"; from it everything came and to it everything went: men, animals, and machines. The tired land that the coffee abandoned became depopulated, poverty stricken, and debilitated; the virgin land that it deflowered soon became pregnant with active life, enriched, and progressive.¹ The exports in that period were of such an order, according to Simonsen, that the value of exports *per caput* in São Paulo was, in 1887, around three times greater than in the U.S.A., and around four times greater than in Argentina. If São Paulo experienced an extraordinary progress in the last century, much of its industrial progress of today is equally due to the influence of coffee, whose exports permitted the accumulations of saving that were applied in this sector.² Bulhoes³ gives special emphasis to the high productivity of the coffee industry, which allowed for investing in other sectors and touched off the economic take-off in the São Paulo region. Equally notable progress was being experienced in the state of Parana (southern region) whose source of development was restricted almost exclusively to the production of coffee. Since 1960 this state has been the largest coffee producer in the country. But the influence of coffee was decisive not only in the development of the eastern and southern regions, which have indices of progress very superior to the other regions. Through schemes which protected the coffee economy during the crisis of 1930, and which made possible an appreciable formation of capital in the country without the aid of foreign loans, it was possible to stimulate both industry and agriculture.⁴

Regional Shifts in Production in the Last Three Decades

In almost every case, production of the crops discussed in the previous section expanded rapidly, reached a peak, and then declined as world markets were lost. One crop or product did not substitute for another, but rather each developed independently and concurrently with the development of a region. As more land came into cultivation, the cyclic effect tended to diminish, and we see shifts in

¹ Sergio Milliet, *Roteiro do Café e Outros Ensaio*s, São Paulo, Coleção Departamento de Cultura, 1939, 188 pp.

² Robert C. Simonsen, 'Aspectos da Historia Economica do Café' (p. 189), *Revista do Arquivo Municipal*, vol. lxxv (1940).

³ O. G. Bulhoes, 'Agriculture and Economic Development', International Economic Association—cited by Ruy Miller Paiva in *Proceedings of the Eleventh International Conference of Agricultural Economists* (p. 222), Cuernavaca, 1960.

⁴ *Ibid.* (p. 223), stresses this and gives details of the schemes adopted.

location of production from one part of the country to another as the laws of comparative advantage come into play. In this case there is a substitution of the production of one product for another, the phenomenon to which I now turn.

The analysis will be based on the following factors: (1) the changing proportion of the product that is produced within the several regions; (2) whether production is increasing or decreasing absolutely as well as relatively; and (3) some attempt to assess what products were substituted in the regional shift in production. We shall see that major shifts in regional importance have occurred in all products studied. Each product¹ will be discussed separately. A table and figure for this discussion may be found as an appendix.

Coffee. The major portion of the coffee is produced in two regions, the south and the east. Since 1940 there has been a sizeable percentage increase in production in the west-central region, yet by the end of 1960 it still did not make up 5 per cent. of the country's total output. In gross terms, the production of coffee showed similar cyclic patterns in the east and south in the period under study. From 1931 to the war years, production dropped. In the eastern region it reached a low point in 1940, and in the south in 1945. After the war, total production in both regions increased considerably, with a much larger percentage increase in the south. In the central-west, production was increasing in the entire period. In relative terms, the regions east and south seem to have substituted for each other. As the figure shows, when the proportion of total production was increasing in the south, it was decreasing in the east, and vice-versa. The west-central was gradually increasing its share over the entire period.

The major shifts in shares of production occurred in two periods. From 1940 to 1945 the eastern region increased its share of the market, while the south region lost an important part of its share. Then, from its peak share of the market in 1945, the importance of the east in total production has declined. In large measure this share has been taken by the south region. These shifts in production may be understood in terms of the following factors:

- (1) Government restriction on new plantings brought about by the accumulation of large surplus stocks.
- (2) Agreement with the U.S.A. establishing export quotas. This forced reduced production on the south.
- (3) A series of frosts in the south, resulting in increased production in the frost-free east.

¹ The six products considered were chosen for their economic importance and the fact that they did experience sizeable shifts in location.

- (4) Dangers of war-time ocean shipment of sugar from the north, resulting in substitution of sugar cane for the domestic market for coffee in the south.

From 1945 to the present, the east, although continuing to increase its production absolutely, has increasingly lost its share of total production to the south. Older regions have gone out of production, and the land turned to pastures for dairy cattle. From 1955 to 1960 the south experienced a tremendous increase in production. A favourable price led to the development of the still large virgin lands in the area, particularly in the northern part of Parana state (south region).

Rice. The major fraction of the rice is produced in the south. The east and the west-central have similar shares of total production, each region averaging around 20 per cent. of the total production. Rice has experienced a large increase in production over the entire period from 1931 to 1960. The north-east and west-central have increased a great deal percentagewise, although from a small base. Production shifts have included a rather continuous relative decline in the south through the entire period, with relative increases in the north-east and west-central, the latter being especially strong in the decade from 1950 to 1960. Production in the south experienced a large relative decline from 1935 to 1940, owing both to lower production in the region and greater production in other areas. From 1955 to 1960 the south experienced another large relative decline, this time mainly owing to larger increases in the other regions. The 1935-40 period saw a large increase in cotton production in the south in addition to a more than doubling of the production of beef. In the more recent 1955-60 period, the south nearly doubled sugar cane production. These increases have been largely responsible for the reduced planting of rice in this region in these two periods. The increase in the north-east and west-central was mostly due to increased plantings occurring in the north-east from 1950 to 1955 and in the west-central from 1955 to 1960. The increase in production in both these regions came largely from the settlement of new lands rather than production shifts within the regions.

Corn. Corn also is produced in large part in the two regions of the east and south, with a lesser proportion in the west-central. Production in the east increased by 27 per cent. from 1931 to 1935, then declined to its previous level, by 1945, where it has remained more or less constant. The south did not experience any sizeable increase until 1940-5, when it increased 14 per cent. and has since increased rapidly. The west-central experienced a sizeable reduction from

1940 to 1945, with a steady increase since that date. The shifts in shares of total production have occurred in two phases. The increase in the east from 1931 to 1940, while production stayed more or less constant in the south, resulted in an increase in the share produced in the east. The rapid increase since that time in the south, together with the rather constant production in the east, has resulted in a rapid decline in the share of the east, and a corresponding increase in the south. The decline in the east has been accelerated by the increase in the central-west. This increase in both the south and the west-central has been due in large part to an increase in area planted with little or no increase in yields.

Food beans. The major share of the beans are produced in the south and east. Aside from an increasing share of the production from 1931 to 1940 in the east, both regions have experienced a secular decline in their share of the production. The west-central and north-east increased their share of production from about 7 per cent. in each region in 1931 to 14 per cent. in 1960. Total production in each region except the north and south increased throughout the period. Production in the north declined until 1945, and then increased to 1955, whence it declined. Total production in the south, on the other hand, declined from 1931 to 1940, and then increased throughout the rest of the period. The decline in production in the south is associated with an increase in the production of beef and rice and a large increase in cotton. The decline in the north is part of the total picture of agricultural stagnation and decline in that region.

Sugar cane. The shifts in production of this crop represent one of the largest geographic shifts in the location of production in the history of the country. From 1931 to 1960 the south moved from a region of relative unimportance to that of being the major producing region. At the same time, the eastern region, the major producer in 1940, dropped from 45 per cent. of the market to 22 per cent. in 1960. The north-east, with about 26 per cent. of the production in 1931, gradually declined to about 22 per cent. in 1960. The major share of the production is in these three regions. Production in the less important west-central region increased from 1955 to 1960. Total production in the three major production regions increased over the entire period. Regional shifts probably are due in large part to the much more rapid relative increase in production in the south. These shifts are largely due to the change from an external to an internal market. As noted earlier the sugar industry was originally based on an export market. The location of production in the north was ideal for this purpose. As the external market disappeared production was

used to an increasing extent for the internal market. But the population centre of the country was in the south, mainly centred in the two metropoli of Rio de Janeiro and São Paulo. Since the country lacked an adequate highway and railroad system connecting the north and the south, the product had to go in ships. The prohibitive transport costs, therefore, gave the south a comparative advantage for the growing local market. This shift took place despite government policies to retain production in the north-east as a means of ameliorating the regional poverty problem.¹

Cotton. In the early part of the period, almost 60 per cent. of the cotton was produced in the north-east. Rapid expansion of production in the south from 1931 to 1940 carried the south to the front with over 80 per cent. of the production. The north-east dropped to around 10 per cent. of the total. Production in the north-east increased rapidly from 1931 to 1935, but then experienced almost a corresponding drop from 1935 to 1945. From its low point in 1940 it has experienced almost a continuous increase. The east has experienced a similar pattern, although this region has never produced a sizeable portion of the total production. The south experienced a big drop in production from 1940 to 1945 as did the north-east and east to a lesser extent. But production continued to drop in the south while the east and north-east started to increase their production and their share of the market.

General Conclusions

Colonial Brazil was born and developed during the commercial revolution with her resources used initially for expansion of Portuguese trade. Since Brazil did not learn that other countries could compete with her in the international trade, she did not change her extensive processes of production. For this, she remained a prisoner of the world market. Since the propelling forces of this external market were of a driving and dynamic character, fundamentally based on a competitive principle, the country easily lost her temporary supremacy in tropical products as competitors entered the market. Among all the factors responsible for the big cycles of the Brazilian economy, the stimulus of price offered by the international market was the fundamental cause. The secret of the temporary supremacy of Brazil lay in the fact that the country could supply large quantities. The compensating price, allied with vast areas

¹ For more detail, see Eduardo Martini, *Açúcar no Brasil—Produção, Procura e Preço*, Viçosa, Brazil, Escola de Especialização da Universidade Rural do Estado do Minas Gerais, 1964 (unpublished thesis).

suitable for large-scale production explained the changes in production from one region to another as resources were exhausted. The movement of coffee through the five physiographic regions of the country offers the best example of this situation. During the colonial period we had practically no cases of product substitution, but rather the concurrent development of an industry and a region. During the past thirty years there have been many shifts in the location of production from one region of the country to another.

Sugar cane represents one of the largest geographic shifts in the history of the country. The south recently moved from a position of relative unimportance in the production of this crop to one of major importance. Similar patterns are observed in coffee production in the east and south, where coffee was a major crop. The west-central region has gradually increased its share since 1931 and the north and north-east regions have changed little. These shifts within and between regions have been due basically to the availability of virgin territories, usually the principal resource required for the new coffee plantations.

In terms of the general economy, the country presents extraordinary indices of progress. The National Council of Economics¹ reports a 180 per cent. real growth of the economy over the past twenty-one years. In other words, the physical volume of goods and services produced, and real incomes, practically tripled. In the same period the population increased 63 per cent., agricultural production 45 per cent., commerce 137 per cent., and transport 210 per cent. Although these indices are quite favourable in terms of the total economy, they tell us nothing about the regional distribution. In fact, the regional indices show a veritable concentration of the progress in some regions, to the detriment of others.

A comparison of the five different regions of Brazil in terms of more or less economic development indicates that the northern and central west regions contribute little to the total economy. Since each of these regions has around 4 per cent. of the country's total population, they seem not to present major problems. The north-east, however, is without doubt a serious problem. With over 20 per cent. of the population, it has very low incomes *per caput*, illiteracy and health problems.

Strictly speaking, modern Brazil, whose indices of growth are quite impressive, is largely located in the eastern and southern regions. For example, they consume 95 per cent. of the country's

¹ Conselho Nacional de Economia—*Exposiçao Geral da Situaçao Economica do Brasil*, Rio de Janeiro, 1961, p. 23.

electrical energy, produce 99 per cent. of the steel, contain 79 per cent. of the railroads, produce 94 per cent. of the industrial goods, produce 90 per cent. of the agricultural exports, and account for an equal percentage of the bank clearances.¹ In these regions, highway construction, vehicle movement, construction of hydro-electric power plants, increasing urbanization, expansion of industrial parks, activity in the national and international airports, and numerous other facts present to the visitor a picture analogous to that observed in any other developed country. But problems exist: serious inflation, unfavourable balance of payments and concern among the people. But for all of the problems there are attempts at solution. To each defeat, similar to what occurred with the economic cycles of the traditional agriculture, we are placing victories.

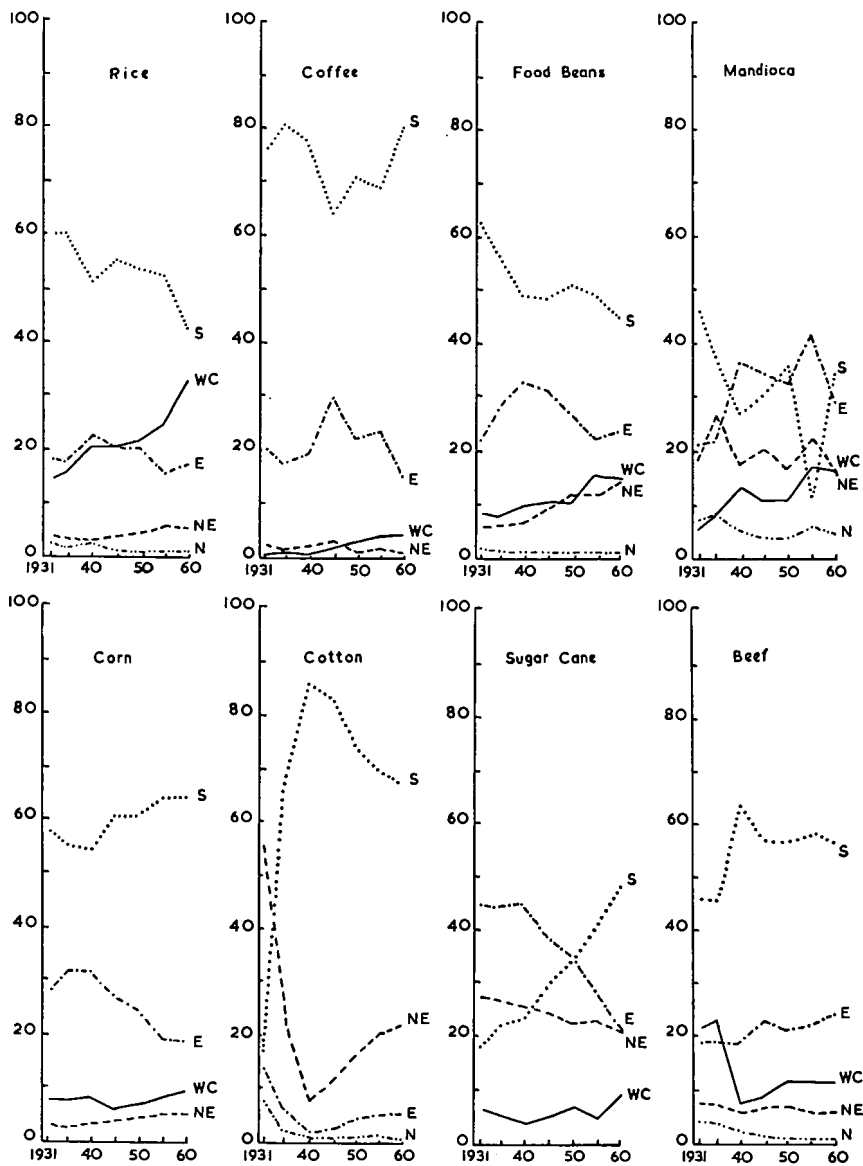
It is difficult to predict at the present time the economic future of Brazil. It is possible that the examples of those who have already developed their agriculture (for example Japan, the United States, Israel, Denmark, Holland, and many others) will be inspiration, stimulants, and guides for us. At least we see some encouraging signs. In electoral campaigns the politicians are trading the promises of kilometres of paved highways for thousands of primary schools, hundreds of secondary schools, and a doubling of university matriculation; 70 per cent. of the recent graduates of our schools of agriculture are preferring the hard work of assisting, or better, educating the farmer; the secretaries of agriculture are strengthening the agricultural schools, institutes, and experiment stations in order to train people and create technically superior factors of production, and at the same time are starting stimulative programmes for the rapid multiplication of these factors. All of this indicates, at least in the agricultural sector, that universities, technicians, and politicians have started to work together. All have apparently adopted the same goal, to modernize agriculture. There is a concern with investing in farm people, with creating superior technical factors of production, and with teaching farmers how to use these new factors. It may be, then, that we have broken the chain of the great 'kings'—sugar, cotton, cocoa, rubber, and coffee; and that the new history will tell us of a permanent agriculture, whose beginning will date from the middle of the twentieth century.

¹ Oswaldo Benjamin de Azevedo, *Spes*, Rio de Janeiro, vol. iv (16), pp. 41-52.

Indices of Production of individual products in Five Major Regions, 1931-1960

(Three-year moving averages)

Year	North Index	West Central Index	North- east Index	East Index	South Index	North Index	West Central Index	North- east Index	East Index	South Index	North Index	West Central Index	North- east Index	East Index	South Index
<i>Coffee</i>					<i>Sugar cane</i>					<i>Mandioca</i>					
1931	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
1935	81	102	51	89	106	192	73	103	104	125	107	95	124	92	68
1940	302	108	53	71	78	382	76	115	126	159	126	289	137	261	76
1945	105	201	58	76	43	368	102	141	139	280	97	362	228	352	133
1950	78	446	53	84	72	393	194	167	160	376	116	396	209	377	173
1955	85	680	74	89	70	358	174	210	170	586	174	619	270	442	50
1960	151	2,714	101	210	327	397	411	284	166	961	217	852	273	479	250
<i>Corn</i>					<i>Rice</i>					<i>Beef</i>					
1931	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
1935	100	111	97	127	108	90	149	121	120	130	106	128	113	121	120
1940	118	108	108	118	98	194	225	113	188	134	104	75	146	201	276
1945	68	74	126	102	112	123	336	187	257	223	48	72	143	195	202
1950	66	98	167	102	125	112	477	293	343	284	57	124	210	259	275
1955	100	149	217	96	153	122	648	590	309	327	51	135	193	285	303
1960	100	204	268	104	177	145	1,150	744	433	353	62	150	222	359	346
<i>Food Beans</i>					<i>Cotton</i>										
1931	100	100	100	100	100	100	100	100	100	100					
1935	48	100	101	134	92	85	325	175	217	1,840					
1940	59	129	128	166	85	87	360	139	114	4,862					
1945	36	175	197	200	106	18	332	110	96	2,705					
1950	58	203	274	211	136	23	1,193	124	132	1,894					
1955	87	389	379	209	156	28	1,962	153	164	1,792					
1960	75	393	498	241	162	14	2,128	202	226	2,163					



Brazil. Percentage of the Production of Principal Products, by Physiographic Region, 1931-60

M. ALTAF HUSSAIN, *Agricultural Development Corporation, Lahore, Pakistan*

Professor Brandão has related the course of events and some principal causes which lead to major shifts in the location of agricultural production. He has chosen to confine himself to a study of Brazil of which, unfortunately, I have no first-hand knowledge. Primarily for this deficiency, I propose to raise certain points some of which may appear elementary to those who have had the privilege of being personally acquainted with Brazilian agriculture. The speaker has selected a few agricultural commodities for his study and has given an historical account of shifts in the location of these commodities. But the causes responsible for the shifts have been described casually, or completely ignored.

Partly for convenience of treatment and partly to follow the style of the main paper, I propose to illustrate my point commodity by commodity.

Brazil wood. According to the speaker, this 'valuable dye' has faded out in Brazil primarily on account of unplanned and unsystematic exploitation. To me, however, it seems to have gone the same way as did indigo in British India. It is well known that the disappearance of indigo was caused by declining demand resulting mainly from competing synthetics which were easy to produce at cheaper cost. I would guess that neither large-scale 'transportation' nor 'nomadic nature of exploitation' present the whole truth about the fate of this dye. Discovery of more remunerative substitutes combined with the birth of man-made dyes must have hampered its survival. Perhaps, the truth if ascertainable would be found to lie somewhere between Professor Brandão's belief and my conjecture.

Sugar cane. Professor Brandão brought out four major factors under which cane cultivation flourished in Brazil. First, suitable soil and climate; second, demand for sugar from Europe that gave high returns to growers; third, skill in production and processing which the Portuguese and Italians possessed, and, fourth, efficient transporting out and in of sugar and slaves respectively by Dutch and Flemish tradesmen. Despite ideal conditions which sustained its prosperity for three-quarters of a century, the industry began to decline by 1955. If these favourable factors are not exaggerated then the causes of the eclipse of the sugar industry are curious. Enriched by experience of seventy-five long years and gifted with all the natural and circumstantial advantages for growing sugar cane, Brazil should have faced the competition from the West Indies at least in its neighbouring and conventional markets. Should we believe that

the latter possessed far superior soil, skill, transport, and trade at the time the decline commenced in Brazil? I suppose the increase in sugar-cane production in the south was caused by favourable natural conditions, rising demand of a growing population, and the consequent attractive prices available in the domestic market. This phenomenon seems to have taken place independently of the fall in cane production in the north. It is unknown, however, how the economics of sugar production was effected by this migration. Further, while dealing with coffee, the speaker stated that sugar cane replaced coffee in the south because 'a series of frosts' moved coffee to the frost-free zone in the east. I wonder if there is any evidence to discount the proposition that sugar cane was attracted by the comparative economic advantage of the south, despite the occurrence of frosts. In our part of the world frost is detrimental to sugar cane as it causes inversion leading to low sugar content. Could we inquire about Brazilian experience with frost?

Gold and livestock. The paper discloses that the pendulum of livestock growth swung with the extent of gold mining. The decline in the production of mules resulted from exhaustion of the mines, and that of beef cattle from a fall in incomes of the population of the zone. That is logical. One observes, however, that mules for gold transportation were reared in the south and beef cattle for feeding mining labour in the north. I am sure the reasons for the north to specialize in beef and the south in mules would be interesting.

Cotton. Cotton has been exported from Brazil since 1760. Until the middle of the nineteenth century, however, it was unimportant as an export. Nevertheless, with the occurrence of a series of wars in the United States, France, the French colonies, and Spain, cotton gained a prominence which it lost with the cessation of disturbances, but regained for a short period during the Second World War. It appears that cotton as an export crop was important to Brazil only when wars were in progress. I find that this situation is analogous to that of Pakistan where, following the outbreak of the Korean War in 1951, the production of cotton jumped by nearly 30 per cent. despite the fact that the next planting season was too close to allow any large scale adjustments in cropping schedule. The rapid expansion in production and export of both cotton and jute is still remembered as the Korean boom in trade circles of my country.

Professor Brandão seems to imply that the location of cotton production in Brazil has been conditioned only by the place of its disposal when he remarks that cotton cultivation for convenience of shipments abroad was concentrated in the north when it was grown

for export, and in the south for local consumption. Would he want us to believe that physical factors such as soil and climate did not play any part in determining the location of cotton? Lately, Brazil seems to have lost the foreign market for cotton mainly to North America just as it lost the sugar market to the West Indies. One wonders why Brazil with all its bountiful natural resources, and extensive experience in production and trade could not compete with the new producers. I think major shifts in location of cotton resulted not only from the change in markets from foreign to domestic, but also from the soil and climatic conditions.

Cocoa. Brazil can rightly feel proud of her uninterrupted expansion in export of cocoa from 26.8 tons in 1825 to 13,000 tons in 1900. During the past sixty years the quantity exported has further increased to 60,000 tons—an increase of about 500 per cent. within the average expectation of human life. According to a study I recently made, the course of events points to a less optimistic future, as there is a bend in the curve of production of cocoa in Brazil. During the period 1953-63, for example, the world production of cocoa rose by about 50 per cent. In Ghana alone, which is the largest cocoa producing country, it has almost doubled. On the contrary, Brazilian production with large annual fluctuations has recorded a nominal increase in terms of a triennial moving average. The really disturbing feature is revealed by a United Nations study which says that Brazil is left with limited unexploited good cocoa lands and that sixty per cent. of its existing plantations where the yields are falling, are more than fifty years old.

Several cocoa-producing countries have growing trade relations with socialist States which are among the chief consumers. I have a feeling that Ghana and other African countries are emerging as formidable rivals of Brazilian cocoa in the world market. It would have been interesting if the effect of apparent competition on the shifts in the location of production of cocoa in Brazil had been indicated by Professor Brandão.

Rubber. There is no mention of any shifts in the location of rubber production in the paper. Perhaps there was none. The speaker has stated that Brazilian rubber accounted for 31 per cent. of total exports in 1910, and that in subsequent years it received a setback from English and Dutch plantations in the Far East and French plantations in Africa. It was stated further that production of rubber decreased also because of a scarcity of trees. It is the cause and not the result of decline which one would have liked to know. Nothing has been said even of its present place in the Brazilian economy.

Coffee. I note with great pleasure that coffee has been produced in increasing quantities both in the east and south zones. Its prosperity in the south, according to the speaker, was due to availability of abundant labour, congenial climate, suitable virgin soil, export potential, and efficient means of transportation. We are told that coffee alone brings to Brazil more than half of her export earnings, and in quantity accounts for 80 per cent. of the global trade. Brazil also owes to coffee the capital formation for development and industrialization. As such, coffee can be regarded appropriately as the queen of Brazilian agriculture. Nevertheless, I read in recent reports that the production level of 1959-60, despite fresh plantings in the mid-fifties, has not been reached in any subsequent year.

Professor Brandão offered reasons for the frequent shifts in the location of coffee from east to south and back. The arguments against the south are both confused and confusing. The south enjoyed numerous advantages which he stressed in his paper. Should one believe that it was less economical to produce coffee in the south than in the east? If so, how is it that the south, as he has asserted, experienced a tremendous increase in production between 1955 and 1960 despite official measures designed to achieve the opposite.

I find no mention of the International Coffee Agreement which was signed for the second time in 1963 when Professor Brandão was writing his paper. Did it, or would it, not influence shifts in coffee location?

Rice. The causes of shifts in the location of production of rice have been described. Rice competes for land and resources with sugar cane and cotton. The interchangeability coupled with suitability of soil might explain the swing of rice from one zone to another. I would have liked to know what influenced the replacement of rice either by sugar cane or cotton. Was it because of price levels, fluctuating demand for food, or just a matter of national prestige, to achieve self sufficiency in a particular product at a particular period?

Corn. We have been told that the production of corn has been fluctuating in different zones at different times. The causes have not been indicated. I suppose this is a minor crop and its location has been influenced by the extent of cultivation of major crops. Equally probable is the economic phenomenon that crops occupying relatively small acreages are highly responsive to changes in price.

Food beans. The shifts in the location of production of food beans have been associated with their replacement by rice and cotton, as well as cattle. Substitution of food beans with rice or cotton may have been due to higher expected acre returns, but the logic of

changing food beans with beef cattle is paradoxical. I presume that the objective of raising large numbers of beef cattle would be easy to realize if good cattle feed is available which neither rice nor cotton essentially are. It is possible that a better fodder than these crops could be raised. The question is: was it so?

In summary, Professor Brandão has quoted several factors to explain shifts in production. Among those are: (1) wars, which affected production of cotton and Brazil wood; (2) foreign markets, which changed the location in the north of once important cotton, sugar cane, and rubber and still very important cocoa and coffee, and (3) local demand, which influenced rice, corn, and food beans, and (4) government policy, which envisaged changing the location of coffee production. The efficacy of the last measure is questionable as, contrary to official policy, production of coffee did increase in the south. I must not be misunderstood as saying that such policies are ineffective. The success of February Reviews in Britain and the Cotton Control Act in Pakistan in shaping the pattern of shifts in production has amply demonstrated their efficiency. Taken together these factors mean nothing more than price-market mechanism. I agree that what Professor Brandão has concluded is largely true, but I wholeheartedly decline to accept it as the whole truth. Price alone is unlikely to explain shifts in all situations and all countries. Equally important, if not more so, are the natural resources of land and water, climate, socio-economic structure of the farming community, technical and technological stages of development, and conventional cropping patterns, which in my view must exert their influence in one way or another on any shift in the location of agricultural commodities.

C. MURGESCOU, *Bucharest, Rumania*

Professor Brandão's subtle analysis of the principal shifts in location of Brazilian agricultural production invites us to reflect on one of the more complex problems of agricultural development. What other purpose could our congress have if not precisely that of preparing the ground for such reflections, and for exchanges of opinion on the problems which concern us?

In presenting to us the succession in time, and the movement in space, of the various 'kings' which have dominated Brazilian agriculture—sugar, cocoa, cotton, rubber, coffee—Professor Brandão remarks that each of these products, taken separately, has at a given moment represented the principal support of Brazil's national economy, and has determined its position in the world market; one

product did not replace another—and I might say that it did not even complement another—but each one developed independently. It seems to me that here we enter an extremely wide field, to do with the *unilateral development* of a country's agricultural production, and the excessive mobility of the economy proceeding from it. To base the agriculture of a country or a region upon a single product increases the sensitivity of the national economy to the world market. More seriously, it makes it dependent upon the market in a single product—the 'king' product.

On the world market, the decline or death of a king is compensated by the rise of another, or even of several others who share the succession. Thanks to this, in countries of diversified agriculture the effects of the fluctuations of the world market are limited. On the other hand, countries of unilateral agricultural development cannot benefit from the effects of this compensatory process, hence the scale of the social and economic consequences arising from the instability of the world market. From this angle the problem raised by Professor Brandão's paper has a wider validity than the special case of Brazil; we shall find it again, in different forms and degrees of intensity, in many developing countries. This is why I accept the conclusion of the speaker that perhaps in the end we shall break the chain of the great 'kings', and history will some day tell us of a stable agriculture, the beginnings of which it will place in the middle of the twentieth century. I hope that I am not betraying the intentions of the speaker if I see in this conclusion the aspiration to a more varied agriculture, rationally and stably localized, and equipped with modern techniques. This progressive aspiration—with, I repeat, a wider validity—implies concrete solutions in function of the natural and national peculiarities of each country. I emphasize this because the remarks which follow are mainly inspired by the experience of my own country, Rumania.

Like all countries of extensive agriculture, unilaterally developed and dependent on the world market, Rumania, until the setting up of the people's régime twenty years ago, also had its 'kings' and its 'movable frontiers' for its different cultivations. These 'kings', it is true, were less vast than those of which Professor Brandão has been telling us, and the movable frontiers rather less spectacular. But that is a question of latitude and dimension, not a basic problem. Twenty years ago we broke the chain of these 'kings' and we are making efforts to create a stable, modern agriculture. I would like to make some comments on this situation.

For countries which set themselves the goal of moving from a

unilateral extensive agriculture to a multilaterally developed intensive agriculture—and this only now in the middle of the twentieth century—in the conditions of immense technical progress characteristic of the agriculture of the developed nations, this transformation implies in the first place a radical change of the agricultural social structure, with the aim of fitting it for technical progress and for the organization and rational localization of production. In the second place, this transformation would be impossible without a close correlation of agricultural development with the development of other branches of the national economy, and especially with the *national industry*, alone able to provide agriculture with the basis necessary for carrying out such a transformation. In the third place, it demands a careful analysis of the natural conditions, taking into account the fact that agriculture is a field of activity in which the social process of production is closely linked with the natural processes of production. In Rumania, for example, the policy of multilateral development of agricultural production is justified by the fact that in a relatively small territory varied natural conditions of climate, soil, relief, &c. are harmoniously united. In consequence, we have undertaken complex regional dispositions, with the aim of securing the most rational and intensive use of the land, as well as the fullest use of labour. Certainly, such an enterprise entails a great variety of work: draining and irrigation programmes, planting of vines and orchards on slopes, the extension of the cultivation of industrial and forage crops, the rational combination of different branches of agriculture, notably of the cultivation of cereals with stock-rearing, the development of the network of institutions of scientific research and local experimental stations, the building up of the staffs of specialists necessary to this process, as well as the popularization of agricultural knowledge. In the fourth place, the realization of such a transformation cannot be separated from the social form and the dimensions of the agricultural unit. No one, I think, could imagine that such a rational localization within a territory can be obtained while agriculture remains divided into latifundia or peasant holdings. In Rumania the change to a multilateral and intensive agriculture rests on the basis of the socialist forms of production, on the state farms and the peasant co-operatives. This makes it possible to carry out complex regional dispositions as well as a specialization of the different units, taken separately, and so organized as to achieve optimum dimensions in functions of this specialization.

Finally, the process of rational diversification and modernization raises the problem of the considerable investment required for

mechanization and the introduction of chemical aids, utilization of land, scientific research, teaching staffs, &c. Every step taken in the direction of multilateral intensive development supposes a corresponding increase in the sums invested in agriculture. In Rumania, for example, the State investment connected with this process in the last four years (1960-3) has been 6.6 times greater than in the years 1950-4, without taking into account related spending (on extending and modernizing means of communication and transport, rural dispositions, and other spending demanded by the infra-structure. The active role of the State is not limited to supporting the financial effort; it ensures also a maximum efficiency for its investments, especially by the co-ordination on a national scale of all the elements of this very complex process.

I have done no more than mention certain aspects to do with the rational localization of agricultural production, the general tendencies of the progress of contemporary agriculture, and the concrete historical conditions of a country which is in the process of carrying out this transformation.

A. T. BIROWO, *University of Uppsala, Sweden*

Professor Brandão employs descriptive and intuitive methods in analysing the locational shifts of Brazilian agriculture, for example, where he presents the phenomena of regional shifts in location and then relates them to possible causal factors such as price changes, export quotas, and climatic elements. Dr. Hussain has presented several arguments against the validity of these relations. Since his arguments have covered most of my points, I would not go into more detail here. They support my thesis that intuitive and non-formal methods do not satisfactorily explain the significant causes of the location shifts. At the end of his oral presentation, Professor Brandão stated that his paper was just a description of the problem, and that more research should be done in this field. If I do not misunderstand him, in writing this paper, in explaining the analysis and in explaining the process of regional shifts, he has not based his explanations on empirical studies or on studies which employ quantitative methods. As I am looking forward personally to making a location study in Indonesia which, I would think, is comparable to Brazil with respect to the state of agricultural development, I would put a very important question to Professor Brandão. Does he agree with me that the logical next step, after having intuitively stated hypotheses concerning the factors of regional production shifts,

would be to conduct a quantitative study to test the hypothesis? By using simultaneous equations we can estimate the past relations and the past relative advantages of a region, and by using linear programming methods we can estimate the normative relations for guidance in policy considerations.

E. D. BRANDÃO (*in reply*)

Due to shortage of time I shall unfortunately be able to make only the very briefest reply to the discussion.

I shall take Dr. Hussain's comments as inspiring ideas for research. As I mentioned at the end of my paper I could not do more than I did because of the lack of data. I am not in disagreement on the subject of the climatic and other natural requirements of cotton. In fact, the cotton produced in the north-east of Brazil, a long fibre cotton, does not grow well in other parts of the country. Dr. Hussain misinterpreted what I said, as in no place in my paper did I say that for convenience of shipment abroad cotton cultivation was concentrated in the north when it was grown for export and in the south for local consumption. What I intended to convey was that in these two regions it was produced primarily for the internal market. Regarding rubber, this was an enterprise which we lost entirely, but during recent years we have been planting many new trees again.

I should like to register my thanks to Mr. Murgescou for his stimulating comment.

I was particularly interested in Mr. Birowo's comments. I hope that the research project that he mentioned will proceed satisfactorily, but to my mind the limiting factor is not the choice of technique of analysis as such but obtaining reliable data with which to apply them. I hope that he will have less difficulty in gathering data for this research than I had.