

DEMOGRAPHIC ASPECTS OF AGRICULTURAL DEVELOPMENT: BRAZIL, 1950-1974¹

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INTRODUCTION

The Brazilian economy has been expanding at a reasonably high rate for a fairly long period (Table 1). It had one of the higher rates of growth in the world in the period 1950-74, during which the gross domestic product expanded at an average rate of 7.1 percent².

The economy lost its impetus for growth in the early 1960's, and in 1963 the growth in gross domestic product per capita was actually negative³. In that year Brazil experienced an annual rate of inflation equal to 92 percent.

The post-1964 government chose a gradualistic approach to controlling inflation in order to avoid a serious depression. However, the 1964-66 period, which was characterized by rather severe "containment" policies, was still diffi-

¹ Reprinted with permission from: Ensminger, D., ed. **Food Enough or Starvation for Millions**, New Delhi, Tata McGraw-Hill Publishing Company Limited, 1978. p.3-43.

² General background on the Brazilian economy can be obtained in Baer (1965) and Schuh (1968). A collection of essays which contain a more penetrating analysis of specific aspects of the Brazilian economy may be found in Ellis (1969) and Langoni (1975).

³ A number of interpretations of this stagnation have been made. For a recent summary, see Baer & Maneshi (1971).

TABLE 1. Average of five year rates of change (%) (Gross Domestic Product).

Sector	1950-54	1955-59	1960-64	1965-69	1970-74*
Agriculture	3.9	4.4	4.1	4.7	6.0
Industry services	8.2	10.3	6.7	7.2	12.0
Total	5.8	6.3	5.9	6.2	10.4

* For 1970-74, the data are preliminary estimates
Source: IBGE, Fundação Getúlio Vargas.

cult, particularly for the industrial sector. The economy did, however, experience a slight growth in this period, largely due to the high rates of growth obtained by agriculture. This sector benefited to some extent from the economic policies designed to reduce interventions in the market. The prices of agricultural products were freed, and as a consequence, agricultural production spurred ahead.

Since 1966, the economy has recovered its impetus for growth. In the period 1968-74, the growth rates were even higher than in the 1950's and attained levels in the range of 9.3-11.4.

An important aspect of the Brazilian economy in the post-World War II period was the sustained drive toward industrialization. This tendency goes back to the 1930's, but gained momentum after World War II when forced draft import substituting industrialization policies were vigorously pursued. In this period, the agricultural sector also expanded, but at a lower rate than the industrial sector (Table 1). However, agriculture has performed reasonably well in this period, and has supplied substantial quantities of capital and a sizable flow of labour for the industrialization of the country.

It has been argued that the growth rates of agriculture would have been higher were it not for the set of economic policies adopted at the end of World War II and pursued up to 1964. These policies at best neglected the agricultural sector, and at worst discriminated heavily against it⁴.

The economic policies which stimulated industrialization, at the same time discriminating against the agricultural sector, reinforced the natural tendency for

⁴ For an evaluation of the role of these general development policies on the agricultural sector, with special reference to Brazil, see Schuh (1968).

a re-allocation of labour from the farm to the non-farm sector. The result was a very rapid rate of urbanization, particularly during the 1950's and 1960's, with the result that the urban population became larger than the rural population in about 1965 (Table 2).

TABLE 2. Urban-rural population trends in Brazil (in millions).

Year	Urban population		Rural population		Total number
	Number	Percentage of total	Number	Percentage of total	
1940	12.8	31.2	28.4	68.8	41.2
1950	18.8	36.2	33.1	63.8	51.9
1960	32.0	45.1	39.0	54.9	71.0
1970	52.1	55.9	41.1	44.1	93.2

Source: Data for 1940 and 1950: (Organização das Nações Unidas 1961).

Data for 1960: (Organização das Nações Unidas 1962).

Preliminary estimates for 1970 were provided by the IBGE.

One of the characteristics of the economic development which resulted during the decade of the 1950's, was the very low rate of growth in employment in the industrial sector. Although industrial output was expanding at rates greater than nine percent per year, industrial employment was growing at a rate only slightly greater than two percent per year. The result was that a rather large flow of rural-urban migrants was channelled into the low productivity service sector, or accumulated as urban unemployed.

THE LABOUR MARKET

The Brazilian economy has historically had a rather mobile labour force. Even with such high mobility, however, sizable differentials in both wage rates and labour productivity persist. These differentials exist among economic sectors within the same region, and geographically within the same economic sector.

Data on these phenomena from an earlier period are presented in Table 3. These data are average wages for non-skilled labour working in the rural areas of selected states in Brazil. They document the large geographic differentials which

exist in both agricultural and non-agricultural wages within the same state. Wage rates within the agricultural sector tend to have North-South patterns.

Variations in wages in the non-agricultural rural employment sector are much greater than those in agriculture. In addition, they do not have the same systematic North-South pattern.

TABLE 3. Monthly wages of unskilled rural labour, selected states, 1959. (Cr\$).

States	Type of employment	
	Agricultural	Non-agricultural
Maranhão	1.90	6.54
Ceará	1.61	2.92
Pernambuco	2.05	15.38
Bahia	2.06	7.83
Minas Gerais	2.30	24.19
Rio de Janeiro	2.85	19.40
São Paulo	3.65	67.82
Paraná	3.68	18.14
Santa Catarina	3.63	17.70
Rio Grande do Sul	4.30	18.90
Mato Grosso	3.24	2.70
Goiás	3.30	2.13

Source: Anuário Estatístico do Brasil (Fundação IBGE, s.d.).

Additional data on the substantial geographic dispersion of wage rates within the agricultural sector are presented in Table 4. These data, which are taken from the survey made by the Getúlio Vargas Foundation, indicate that in addition to the large differences in wage rates among states, there are also sizable variations among *municípios* (counties) within the same state.

The data on wage rates and average productivity tend to indicate that the labour market, in spite of the high rates of migration, is not performing its equilibrating function well. When one is restricted to wage rate and average productivity, however, there is little that one can say systematically. There is a presumption, however, that average productivities and wage rates would converge. If this convergence does not take place, it may be due to one or a combination of three reasons⁵:

⁵ For a more detailed discussion see Schuh (1970).

TABLE 4. Variation of the wage rates of hired labour in agriculture. (Based on *município* averages, 1963-64).

States	Daily average wage rates* (Cr\$)	Standard deviation ⁺	Coefficient of variation ⁺	No. of <i>municípios</i> in the sample
Minas Gerais	. 43	. 1140	27.0	38
São Paulo	. 49	. 1877	38.0	151
Espírito Santo	. 23	. 0633	28.8	24
Santa Catarina	. 34	. 0815	24.0	44
Rio Grande do Sul	. 30	. 0405	13.7	44
Pernambuco	. 29	. 0892	30.9	42
Ceará	. 33	. 1040	30.6	48
Seven States	. 39	. 1641	42.2	391

* Daily average wage rate was calculated for each *município* from the sample data. The average for the State is a simple average of the *município* averages.

⁺ The *município* averages are used to calculate the standard deviations and coefficients of variation for the states. The *município* averages are used in calculating the same statistics of the seven-state average.

Source: Fundação Getúlio Vargas, Survey, 1963-64.

1. As the economy expands, economic incentives are such that investments are induced in the capital-intensive sector. This could happen, for example, if the government were stimulating the growth of the industrial sector and if the capital-labour price ratio were different in the industrial sector. In essence, the capital stock outruns the flow of migrants.

2. Capital-labour substitution possibilities are limited in the expanding sector.

3. The rate of technical change in the expanding sector is more rapid than in the trailing sector. In this case, labour productivity in the leading sector may outrun the trailing sector, even though migration is taking place at a rapid rate.

To gain more insights on the performance of the labour market we are going to draw heavily on recent studies which indicate some of the forces at work in the intersectoral labour market.

Whitaker (1970) attempted to explain why labour absorption declined so drastically in Brazilian industry in the 1950's. It appeared that during this period labour became increasingly sealed off from employment in the industrial sector, where rapidly rising returns to labour were observed (relative to other sectors).

An econometric model was formulated to explain the major determinants of demand for and supply of labour in the industrial sector. The model was estimated with cross-sectional data from 1950, for Brazil, the North and South regions, and for modern, traditional, and total manufacturing industry. State averages were used as observations. The statistical results were better for the model of Brazil as a whole.

One of the interesting findings of this study, was that the agricultural labour market is linked to the industrial labour market, with a stronger link found with the traditional sector than with modern industry. This suggests that failure of employment opportunities to grow in the industrial sector can affect the well-being of rural people.

The statistical evidence of the influence of education in this study was not strong. However, the results suggest that an increase in education increases both the demand for and the supply of labour to industry. The implication for the agricultural labour market is that an increase in education will possibly decrease the supply of labour to agriculture.

Increases in technology and capital stock both have a strong positive impact on employment. If the product market effect is considered, the effect is much less, but still positive, unless the demand for the product is inelastic. Moreover, increases in the price of labour should lead to substitution of capital for labour, as evidenced by the relatively large wage-elasticity of demand. This is more true in traditional than in modern industry, which is consistent with the analysis of labour absorption in the manufacturing sector.

If a recent study Saylor (1974) estimated a two-equation model for the labour market of the state of São Paulo. The data cover the period 1948-70. The study uses the model developed by Schuh to examine the supply and demand for labour in the state of São Paulo. The supply and demand functions are simultaneously estimated using two stage least squares. The wage elasticity of demand is less than one in both the short and long run, but the wage elasticity of supply is estimated to be 3.0. Important shift variables in the demand function were prices received by farmers relative to prices paid, increase in land productivity, and a rural legislation dummy variable (the minimum wage legislation was approved at the end of 1963 but its enforcement, to a significant degree, started only at the end of 1964). In the supply function, an immigration variable and a time trend variable were important shift variables. An off-farm income variable was also statistically significant but had an unexpected sign.

The estimated coefficient for the minimum-wage variable indicates an annual reduction of employment of the order of magnitude of 100,000 workers when the supply elasticity is three.

Saylor suspects that this is an upper limit. But even if the reduction is half of that – 50,000 workers – the impact is still substantial. On the other hand, the estimated coefficients suggest an annual increase between ten percent and 25 percent for the agricultural real wage. Putting the employment reduction and wage increase together, the conclusion is that if the minimum wage brought about an increase of 25 percent in the real wage, it was at the expense of decrease of employment between 153,000 (9.6 percent of the rural labour force in 1953) and 345,000 workers (21.6 percent of the rural labour force in 1963) in the short and long run, respectively.

An increase in the productivity of land is in line with greater utilization of labour. The response, however, is inelastic both in the short and in the long run, 10 and 20, respectively. The estimated coefficients are in Table 5.

TABLE 5. Structural supply and demand equations. Regression coefficients. Standard error of estimates, Durbin-Watson statistics (D.W.), state of São Paulo 1948-70. (Model estimated in log form).

Variables	Supply equation	Demand equation
Constant	-.044	.827
Real rural wage	.169 (.118)	-.424 (.151)
Prices received/prices paid	-	.293 (.069)
Productivity Index	-	.105 (.056)
Trend	-.041 (.015)	-
Labour force (lagged one year)	.938 (.108)	.529 (.126)
Off-farm income	.197 (.083)	-
Immigration	.029 (.017)	-
Dummy variable (minimum wage) (1948-62 = 0; 1963-70 = 1)	-	-.035 (.009)
D.W.	1.754	1.947

Source: Saylor (1974).

Saylor gives an interesting interpretation of this result. Given a production function like the following:

$$Y = F [f(K_T, T), G(K_L, L)]$$

where

K_T = Capital associated with land (T)

K_L = Capital associated with labour (L)

There is a high rate of substitution between K_T and T and K_L and L. But the rate of substitution between K_T and L is low. Although the present econometric model does not directly measure the rate of substitution between K_T and L, the low coefficient of productivity index indicates that the rate of substitution between K_T and L is low. A recent work of Sanders (1973) measures the elasticity of substitution between K_L and L. He found it equal to 1.5 for Brazil and 1.1 for São Paulo, which is consistent with a high rate of substitution between K_L and L.

Immigration contributed significantly to the agricultural labour force. As was shown before, the state of São Paulo has been a net gainer of population for a long period. In the period covered by the study, part of the population that migrated to São Paulo was incorporated first into the agricultural labour force and later moved to the cities.

The coefficient of adjustment in the supply equation is very small, approximately equal to 0.06. In a different context, Huffman (1974) showed that this coefficient is positively influenced by the level of education, amount of information, and other variables not so closely related to the labour force. His findings seem also to apply to the supply of labour, since, as it will be shown, the level of education of the agricultural labour force is very low and until recently very little information was provided to the workers about the conditions of the agricultural labour market.

To the best of our knowledge, Saylor is the first to succeed in estimating a two-equation model for the agricultural labour market, but his results cannot be generalized for Brazil as a whole. The agriculture of São Paulo and its industrial and services structure are quite different from the rest of the country on a number of counts. Further, Saylor uses a concept of total agricultural labour force. He does not separate the hired labour force from the other components: family and operator labour. In a state where the hired labour is a high proportion of the total agricultural labour force, as seems to be the case in São Paulo, his specification of the supply equation is acceptable. But if that is not the case (as in a majority of the

Brazilian states), it is necessary to specify different functions for the supply of hired labour and family labour. Alves (1972) has shown that the variables of the demand equation enter into the supply equation in the case of family labour. In essence, they measure the income available for hiring labour and family use. It is only after knowing this that the head of the family can decide how much labour will be offered to the farm enterprise. This is nothing more than to recognize that in the case of family labour, the decision on how much labour to offer to productive activities are intertwined with decisions on how much labour to utilize on the farm and to offer to non-farm activities.

Alves (1972) divided the labour market into two sectors: the subsistence sector and the commercial sector. In the first sector are the farmers that do not hire labour. For the first sector, only an employment equation is estimated. For the second sector, a three-equation model of the market is specified: one demand equation and two supply equations (family and hired labour).

Conceptual models for the subsistence sector are based on the idea that the head of the family allocates his and the family's time to work and leisure within the constraints of the resources he commands and the technology used. The conceptual models for the commercial sector are based on the theory of demand for a factor of production and the theory of supply of labour to an industry. They also take into consideration the fact that the decision on how much family labour to offer to productive activities is intertwined with decisions on how much labour to utilize on the farm and to offer to non-farm activities. The data used to estimate the model are from a cross-sectional sample, and do not permit the disentangling of the short-run and the long-run elasticities. The models were estimated with data of four groups of states: Group 1 - Pernambuco and Ceará; Group 2 - Minas Gerais and Espírito Santo; Group 3 - São Paulo; and Group 4 - Santa Catarina and Rio Grande do Sul. The sample included 1771 "*estabelecimentos*" and 391 "*municípios*". For the purpose of the study it is obviously a very small sample. The estimated coefficients for the subsistence sector are in Table 6.

In the subsistence sector, there are indications that family labour is used to the limit of its capacity in all groups of states except Group 4. This implies that there is little room for improving the income of the subsistence farmer by programmes with the goal of an increase in production through more intensive use of family labour. Education appears to affect the level of labour used in the farms, although in some regions it has a positive effect and in others a negative effect. In the Northeast and East, an increase in education decreases employment on the farm, other things being equal, while in São Paulo and the South it increases employment. The difference in response to this variable may be related in part to

TABLE 6. Statistical results for the subsistence sector.

Variables	Group of states	Statistical results (regression coefficients and R ²)
Physiological (L) Possible maximum of Family labour	Group 1	.68 *
	Group 2	.89 *
	Group 3	.77 *
	Group 4	.97 *
Education (E)	Group 1	-.06
	Group 2	-.18
	Group 3	.20 **
	Group 4	.41 **
Inventory value (V)	Group 1	.16
	Group 2	.20 *
	Group 3	.01
	Group 4	.00
R ²	Group 1	.55
	Group 2	.98
	Group 3	.98
	Group 4	.93

* Statistically significant at the 1% level

** Statistically significant at the 5% level

L The number of working days in the year multiplied by the number of man-equivalents in the family produces the estimate of L.

E The school grade of the head of the family, measured in the following way: illiterate = 1; incomplete elementary school = 2; elementary school = 3; high-school = 4; technical school = 5; BS = 6.

V The sum of the value (in Cr\$) of land, permanent crops, buildings, animals, farm machinery and equipment. Debs were not discounted. For further details see: Alves (1972).

the difference in the economic environment among regions. For example, the coefficient for education was not significantly different from zero in the Pernambuco and Ceará (Northeast) group. This may reflect the fact that educational attainment is very low in that region, and consequently, there was not enough variance in the variable to identify a significant relationship.

However, if the negative coefficient for that region is accepted as the probable direction of influence for that variable, there is some consistency with the results for the East (Minas Gerais and Espírito Santo). Both regions are characterized by an excess of agricultural labour, and have experienced sizable out-migrations during

most of the post-World War II period. If this out-migration is viewed as a desirable goal, then the statistical results indicate that an increase in education can contribute to attaining that goal.

The positive coefficient for São Paulo and the South (Rio Grande do Sul and Santa Catarina) indicates that the effect of an increase in education is to increase agricultural employment. This suggests that education may raise the productivity of labour in farm activities. One factor that makes this finding plausible is that there is more new production technology available for adoption in the southern part of the country. If education of the labour force is complementary to the generation and adoption of new production technology, then it might well increase the level of employment, particularly if that new technology involves the adoption of new varieties and improved cultural practices as in the case of Santa Catarina and Rio Grande do Sul.

The inventory asset was used as a proxy for each on hand in the theoretical model. It was believed to be the only proxy that would be suitable across a wide range of farm types and farm sizes. The statistical support for the variable is not strong. The coefficient does have the expected sign that was postulated in the conceptual model, although in at least two of the four regions the relationship is rather weak.

Finally, the statistical results provide some support for Johnson's fixed asset theory. The ability of the included variables to explain the level of employment within agriculture suggests that family labour is treated as a fixed asset. This is at least supportive evidence for the existence of sizable imperfections in the labour market, a basic postulate of the Johnson work.

Policies such as education, which open a wider range of opportunities to the labour force, would be one possible measure to cope with the labour market imperfection, as well as subsidies to facilitate migration and changes in employment. If part of the imperfection is a result of restrictions to entry in off-farm employment, these should also be reduced and eliminated.

The statistical results for the models of the commercial sector were reasonably good for Pernambuco and Ceará (Group 1) and Santa Catarina and Rio Grande do Sul (Group 4). They were very weak for Minas Gerais and Espírito Santo (Group 2). For São Paulo (Group 3) the statistical results were only reasonably good for the supply of family labour. From the analysis of the commercial sector the following results were separated:

1. One of the interesting results obtained was the large elasticities obtained for agricultural wage in the demand equation when the parameters of this equation were properly identified. Three implications of this finding stand out:

- (a) Measures designed to shift the supply curve of labour to the left in order to raise income are going to have a relatively large effect on employment and a relatively smaller effect on wage rates.
- (b) Policy measures which raise the agricultural wage by administrative decree (minimum wages, for example) are likely to have a very large employment effect.
- (c) Policies which affect the labour-capital price ratio more generally would also appear to have a large employment effect, since the results indicate that capital and labour are substituted for each other fairly easily in production. This has important implications in Brazil, for an important policy instrument for agricultural development is the extension of credit at highly subsidized real rates of interest. Given the demand elasticity obtained, these policies probably have negative employment effects.

2. The land variable is a consistently strong variable in the demand equation. There is strong evidence that an increase in land per farm increases the demand for labour by those farms.

3. A significant coefficient for education is found only in Region 4, Santa Catarina and Rio Grande do Sul. The elasticity in that region is fairly large indicating that education has a fairly large effect on the demand for labour.

4. The coefficient of the labour intensity variable (or product intensity variable) indicates that an increase in labour intensity of the product mix does increase the demand for labour. Moreover, the response is greater than one in every case for which satisfactory results were obtained. These results suggest that a shift in the labour intensity of the product mix is one means of increasing employment and wage rate in agriculture.

5. The expected non-farm wage was one of the strongest variables in the supply of labour equation (family labour). The results suggest that an increase in expected non-farm income reduces the quantity of labour supplied to agriculture. However, the elasticity tends to be less than one, which indicates that the effect is not large. In any case, the results suggest that increasing the expected non-farm

wage can reduce employment in agriculture, which, other things being equal, will assist in raising the wage rate in agriculture.

6. The study of the structure of the labour market indicates that the forces acting in the labour market have induced the Brazilian population to migrate, searching for new regions where salaries are higher. This fact induced the present study to look into the internal migration flows in the country.

POPULATION

With its 8.2 million square kilometers and its population, measured in 1970, of about 95 million people, Brazil should not be a country with a very serious population problem. However, it needs to be considered that while its average population density overestimates the man/area ratio in the Brazilian Amazon, it does not show at all the problems faced by people living in places like São Paulo, one of the largest urban centres of Latin America, or even the overall situation faced by people living in the Brazilian Northeast.

In the fifties the Brazilian population experienced its highest rate of growth up to that point. The overall average was about 2.5 percent per year. In regional terms this rate of growth varied from a low of 1.93 percent in the Eastern region up to a high of 3.71 percent in the Middle West.

In the sixties the growth rates were still higher. The overall rate of growth reached 2.9 percent a year, on an average. Around this average, the extremes had the same locations. The Eastern states had the lowest rate of population change, about 1.5 or 2.0 percent and the Middle Western states the highest with a rate of population growth of 5.6 percent a year.

With such a pattern of population change, one would expect to have some action toward population growth orientation, or at least some guide to population movements.

The interregional population changes in Brazil can be seen as a by-product of other developmental policies. People move around, the birth and death rates show differing figures from year to year as a consequence of policies related to other problems, or at least to the development of other resources.

Some examples will illustrate this statement. In building Belo Horizonte, one of the largest Brazilian urban centres, Contagem, a satellite town in its

neighbourhood, was also planned to be its industrial area. In their development process both Belo Horizonte and Contagem drew from the state's interior, large numbers of migrants. These two towns, especially Contagem, are among the fastest growing centres in the country.

The building of Belo Horizonte also greatly influenced the neighbouring agriculture, Schultz (1964). The second example of the same nature is São Paulo and Osasco.

The third and, in terms of the size of migration flows, the most important in Brazilian population history, is the migratory movement that was initiated towards the state of Paraná in the forties and fifties. This was induced by the settlement of that state, a land development process pulling in the migratory flows. The flow into Parana is still very lively. Paraná is among the states with the highest population gains from the migration process.

A more familiar example is the tremendous population pull originated with the building of Brasília. Here one can see not just the construction of the city, but the whole idea of land resources development and the colonization of the country's western lands. The development of the Brazilian Midwest is widely known. In terms of its population effects it can be seen as a trend towards re-directing the migratory flows.

The population increase of that region draws many people from the North-east and from the Southeast (mainly Minas Gerais, a nearby state). The major effects of these movements have been the releasing or avoiding the intensification of the demographic pressure upon large cities such as Rio de Janeiro and São Paulo.

The move towards the West will bring about new concepts of population nuclei and will make the colonization of the region a fact in the near future.

A distinct characteristic of the Paraná Midwest examples is that in these cases the flows were generated by the opening up of new agricultural opportunities, while in the first two examples, the pull factors were basically in the industrial-urban, or at least in the non-agricultural sector.

Considering the overall situation, the rate of population growth, although high, does not seem to be a major problem. To compensate for the unevenness of its distribution one also notes the relative population mobility which shows a considerable responsiveness to the forces that act in the labour market.

As for age distribution, one sees a concentration of people in the low and inactive age groups (Table 7). The age pyramid shows that the male population of between 15 and 49 years adds up to a total of about 21,590,000.

If one defines this group as the labour force, it makes up about 23 percent of the total population. Stretching the definition to cover males in their fifties, the labour force comes to about 24,236,000 people, representing about 26 percent of the total population.

TABLE 7. Age, rural-urban and sex composition of the population (population in thousands).

Age group	Total population	% of group	Urban population	% of Age group	Rural population	% of Age group	Total male	Total female
0- 4	13,811	14.8	6,811	13.0	7,000	17.0	6,969	6,841
5- 9	13,460	14.4	6,959	13.3	6,500	15.8	6,799	6,659
10-14	11,859	12.7	6,377	12.2	5,482	13.4	5,934	5,924
15-19	10,253	11.0	5,761	11.1	4,491	10.9	4,995	5,257
20-24	8,286	8.9	4,840	9.3	3,445	8.4	4,037	4,249
25-29	6,504	7.0	3,820	7.3	2,684	6.5	3,173	3,330
30-34	5,664	6.1	3,409	6.5	2,255	5.5	2,800	2,864
35-39	5,089	5.5	3,075	5.9	2,013	4.9	2,502	2,587
40-44	4,535	5.9	2,754	5.3	1,781	4.3	2,288	2,247
45-49	3,546	3.8	2,138	4.1	1,407	3.4	1,795	1,751
50-54	2,940	3.2	1,746	3.4	1,193	2.9	1,486	1,453
55-59	2,288	2.8	1,385	2.7	903	2.2	1,160	1,128
60-64	1,791	1.9	1,079	2.1	711	1.7	903	887
65-70	1,216	1.3	759	0.1	456	1.1	604	611
Over 70	1,708	1.8	1,053	2.0	654	1.6	787	920
Age ignored	184	0.2	110	0.2	73	0.2	93	91
Total	93,139	100	52,085	100	41,054	100	46,331	46,807

Source: Fundação IBGE (1970).

From these figures one sees that about a fourth of the population has to work for the whole population. This exaggerates the non-working component of the population, since women and men over 60 and under 15, are also part of the labour force. Women represent about 20 percent of the Brazilian labour force, and people under 15 and above 60 add up to about 7.5 percent (Table 8).

It should be noted that the younger groups (up to 25) that make up the labour force have increased their participation. The others have decreased theirs.¹

TABLE 8. Age composition of the labour force (1960 and 1970 census).

Age group	Participation in the labour force		
	1960	1970	
10-14	1.98	2.37	
15-19	10.47	11.88	
20-24	14.86	15.81	
25-29	14.21	13.71	
30-39	24.22	23.03	
40-49	17.36	17.18	
50-59	10.29	10.05	
60-69	4.92	4.49	
	1.66	1.30	
Sex	Male	83.22	79.52
	Female	16.78	20.48

Considering the whole population, the combination of data in Tables 7 and 8 shows that about 53 percent of the population (aged 15 to 60) make up 92 percent of the labour force. The non-active components of the population weigh very heavily in the population composition.

Another special characteristic of the Brazilian population, which concerns the country's government, is its educational structure, especially that of the labour force. Table 9 shows the educational composition of the labour force components.

TABLE 9. Educational structure of the labour force.

Level of education	Labour force	
	1960	1970
Illiterate	39.05	29.75
Elementary	51.71	54.47
Jr. High School	5.16	8.03
Sr. High School	2.67	5.24
College	1.40	2.51

Source: Langoni (1973: 86).

In 1970, about 30 percent of the labour force was illiterate. Over half (54 percent) had only an elementary education. Only about 15 percent had studied beyond primary school. Comparison of the 1960 figures with those of 1970 indicates some change in the right direction, although a lot of improvement is required yet. This is undoubtedly a serious problem faced by the Brazilian government. A more specific picture can be offered by the differentiation of the rural and urban labour forces (Table 10).

TABLE 10. Education levels of the rural and urban labour forces (1970 Census).

Education level	Rural sector	Urban sector
Illiterate	53.34	13.99
Elementary School	45.58	60.41
Jr. High School	0.79	12.87
Sr. High School	0.19	8.61
College	0.10	4.12

Source: Langoni (1973: 14).

The urban component of the labour force is in a better educational situation, especially regarding the percentage of illiterates.

Historically, the rural population of Brazil has been moving to the urban sector. With the kind of education that the rural population has always had, those migrating to the urban sector were not prepared to be absorbed by the industrial sector of the economy. As a consequence, the level of unemployment in the urban sector increased considerably, forcing the absorption of part of the unemployed by the service sector, a process well-described by Schuh & Alves (1970) relating to the situation of the fifties.

The importance of education in such a situation can hardly be overemphasized. Especially for the rural sector, education programmes would prepare the out-migrating component of the population to enter the industrial market. Those who stay in the rural sector would be better equipped for the technological innovations which might be adopted.

The recent emphasis on literacy programmes and other kinds of adult education shows the government's sensitivity to this basic problem. The health care and hygiene programmes can be seen as a way to increase the life expectancy of the Brazilian population, thus increasing the average age of the country's labour force.

INTERNAL MIGRATION⁶

A very detailed descriptive study of the internal migration process in Brazil, and its association with the country's growth and development has been made recently (Graham 1970). The study covers the period 1872-1970. Attention here will be concentrated on these parts of the study which show the pattern of convergence and divergence among states or groups of states over the period 1940-68.

The states are classified into two groups. The upper group (Group 2) contains states with a high per capita income. They belong to the Central West, Southeast and South regions. The lower group (Group 1) – the low income group, includes the states of the Northeast and the North. Table 11 summarizes part of the data for the period 1940-68. These numbers indicate that:

1. In the decade 1940-50, there was increasing divergence in income per capita among the states of Brazil, associated with a strong divergent growth between low-income and the high-income states.

2. The decade 1950-60 and the period 1960-68 showed a slight convergence in income per capita among states, and also a marked convergent growth between the high-income and low-income groups of states.

These results suggest a migration pattern that deserves investigation. Table 12 is an adaptation of a table in the original study. It is important to mention that it neither accounts for the migration within states nor for the cases in which a person moves from one state to another but returns to the original state before the beginning of the census interviews.

The states are classified in two groups as before. The estimates indicate that:

1. A sizable part of the native-born population changed residence in the decades 1950-60 (5.7 million people, 11 percent of the 1950 population) and 1960-70 (6.4 million people, 9.0 percent of the 1960 population). The amount

⁶ Net internal migration for each state was calculated by the formula $M = P_t + n + nR_n P_t$ where $P_t + n$ is the Brazilian native-born population living in the state at the end of the intercensal period, who were already born at the beginning of the intercensal period. P_t is the Brazilian native-born population living in the state at the beginning of the intercensal period. R_n for each period were calculated by dividing the number of native-born Brazilians in the country at the end of the intercensal period who were living at the beginning of the intercensal period. For more details see: Graham & Hollanda Filho (1971).

TABLE 11. Measure of the difference between the income and population shares. *

Group of states	1940	1950	1960	1970
	Sum of absolute differences	Sum of absolute differences	Sum of absolute differences	Sum of absolute differences
All states	55.72	57.80	50.98	49.18
Between Upper and Lower				
States each Treated as Groups (Upper Group)	38.32	43.58	36.52	35.90
Treated Separately (Lower Group)	46.49	45.85	41.09	40.92
Treated Separately	20.67	17.19	16.88	16.20

* First the difference between the share of the state in total population and total income is calculated. The sum of the differences, ignoring sign, weighted by each state's share of the total population is a measure of relative income inequality per capita. See Graham (1970).

Source: Graham & Hollanda Filho (1971), Table IV-1. Population data are from demographic census with 1968 population data based on interpolation between 1960 and 1970 demographic censuses.

of the 1960-70 decade is relatively slightly smaller but confirms the observation that the Brazilian population is rather mobile.

2. The low-income group of states, in the 1960-70 decade, continued to be a net exporter of population, with the exceptions of Pará and Rio Grande do Norte.

3. In the high-income group, Minas Gerais continued to lose its population to other states at a very high rate. Rio Grande do Sul also continued as a net exporter of population, and at a somewhat higher rate than in the previous decade. The inflow of population to Paraná and Goiás continued at a high rate. The flow of migrants for Mato Grosso and Maranhão also continued to be large.

4. The data also show the large-scale push first into the frontier areas of Paraná and later Goiás, Mato Grosso and Pará, and a slowdown of the out-migration from the Northeast, especially in the decade 1960-70. In the areas of

TABLE 12. Cont'd.

States	1940-50		1950-60		1960-70	
	n. ^o of inhabitants	% of 1940 population	n. ^o of inhabitants	% of 1950 population	n. ^o of inhabitants	% of 1960 population
Guanabara	345,352	22.60	372,816	15.68	372,181	11.25
São Paulo	362,270	5.70	712,706	7.80	993,428	7.66
Paraná	342,263	29.28	912,855	43.58	790,169	18.39
Santa Catarina	4,089	0.36	- 63,441	- 4.07	- 49,237	- 2.29
Rio Grande do Sul	13,515	0.42	- 162,532	- 3.90	- 339,909	- 6.24
Goiás	91,831	11.15	259,310	21.34	449,076	21.42
Mato Grosso	2,251	- 0.55	131,859	23.59	268,517	27.38
Immigration	+ 1,159,320	+ 4.84	+ 2,630,000	+ 8.18	+ 3,074,686	+ 6.68
Out-migration	- 669,391	2.80	- 819,359	- 2.55	- 1,890,725	- 4.11
Immigration and out-migration	1,828,711	7.64	3,449,359	10.73	4,965,411	10.78
Brazil						
Immigration	+ 1,170,764	+ 2.94	+ 2,852,130	+ 5.51	+ 3,190,267	+ 4.49
Out-migration	- 1,171,749	- 2.94	- 2,861,141	- 5.51	- 3,190,296	- 4.49
Immigration and out-migration	2,342,513	5.88	5,713,271	11.02	6,380,563	8.98

Source: Graham & Hollandá Filho (1971). Table III-A-1, p.98. The results for the territories of Roraima, Amapá, Rondônia and Fernando de Noronha were included with those of the states of Amazonas, Pará, Mato Grosso and Pernambuco respectively in 1950, 1960 and 1970.

TABLE 12. Net internal migration of native-born brazilians by states and group of states 1940-50; 1950-60; 1960-70.

Stages	1940-50		1950-60		1960-70	
	n. ^o of inhabitants	% of 1940 population	n. ^o of inhabitants	% of 1950 population	n. ^o of inhabitants	% of 1960 population
Group 1						
Acre	- 6,344	- 8.08	- 2,758	- 2.41	- 3,687	- 2.30
Amazonas	- 23,862	- 5.55	1,261	0.24	- 17,983	5.52
Pará	31,255	+ 3.35	8,638	0.74	89,410	5.52
Maranhão	5,100	0.41	- 212,231	13.40	220,542	+ 8.85
Piauí	- 25,120	- 3.07	- 157,655	- 15.05	- 18,858	- 1.49
Ceará	- 36,843	- 1.76	- 330,739	- 12.27	- 82,859	- 2.48
Rio Grande do Norte	- 16,037	- 2.09	- 133,723	- 13.82	- 26,171	- 2.26
Paraíba	- 81,174	- 5.71	- 256,418	- 14.97	- 204,418	- 10.13
Pernambuco	- 14,322	- 0.53	- 372,565	- 10.97	- 203,231	- 4.91
Alagoas	- 98,070	- 10.32	- 182,636	- 16.71	- 92,917	- 7.31
Sergipe	- 40,163	- 7.41	- 99,123	- 15.38	- 88,313	- 11.62
Bahia	- 132,512	- 3.47	- 506,165	- 10.47	- 366,763	- 6.12
Immigration	+ 11,444	+ 0.07	+ 222,130	+ 1.12	+ 115,581	+ 0.46
Out-migration	- 502,358	- 3.16	- 2,041,782	- 10.32	- 1,299,571	- 5.21
Immigration and out-migration	513,802	3.23	2,263,912	11.44	1,415,152	5.67
Group 2						
Minas Gerais	- 601,788	- 8.96	- 593,386	- 7.62	- 1,273,746	- 12.79
Espírito Santo	- 46,230	- 5.94	44,612	4.66	- 227,833	- 16.06
Rio de Janeiro	- 19,122	- 1.06	195,842	8.53	201,315	5.92

the Northeast, Goiás, Mato Grosso and Pará, the large-scale investments of the federal government, especially in the last decade, are playing an important role in slowing down the rate of migration (in the case of the Northeast) and directing the migratory movements to rural areas in regions in the process of settlement (Mato Grosso, Goiás and Pará).

An Econometric Approach to the Migration Problem

A different approach and different combination of data characterize an econometric examination of the overall internal migration in Brazil, using data from the 1970 census.

A perusal of the literature related to migration leads to the differentiation of three basic approaches to the problem of explaining why people migrate. In a historical perspective one finds the "laws of migration" proposed by Ravenstein (1888, 1889) when he characterizes the push and pull factors which basically relate to the structure of the agricultural process, and the lure of city life, respectively.

Simon Kusnets (1964) with his studies on population and economic growth of the United States has led the so-called "Harvard School" approach (Sahota 1968). Here people's attitudes towards risk act as the argument of selectivity that explains why some migrate and some do not.

The third approach is based on the neoclassical theory of investment. It is supposed to have appeared with the works of Sjaastad (1962) and Schultz (1962) and for this reason is associated with the "Chicago School".

Sahota (1968) in a study of migration, has neatly contrasted these three approaches. After Sahota's paper came out, the migration process, with special emphasis on developing countries, was studied with a more accurate definition of the income variable. The expected income of the migrant was supposed to be influenced by the income of the unemployed. The leading writer here is Michael Todaro (Todaro 1969 and Harris & Todaro 1970).

Looking as at what could be considered the theoretical background of the approaches, one would see that migration flows could be induced by the following variables: income differentials, distance, education, urbanization, industrialization, and level of employment.

Empirical studies of the migration process have also tried to relate migration to the sex and age of the migrants.

In the present section, it is aimed to associate the migratory flows within Brazilian regions with some of the above variables. An attempt is made to indicate the ones with better chances of explaining Brazilian migratory movements.

For the purpose of this chapter, the overall migration phenomenon is important as it affects the agricultural labour force. Within the overall migration process, one should view the rural-urban migration flows. This will be dealt with in the next section.

The Migration Model and Data

A single equation migration model is used. A power function, linear in logs, is estimated, with out-migration as the dependent variable.

Income levels - measured by the average income of the rural and urban sector in 1970.

Income changes - measured by per capita income growth in the period 1950-68.

Income distribution measured by a Gini (the bigger, the more uneven) index average in the rural and urban sectors.

Education - measured by the percentage of literates aged five or more, to the total population.

Urbanization - measured by the proportion of the population living in cities of 5,000 inhabitants or more.

Population density - taken as the number of people per square kilometer.

Out-migration, the dependent variable, was measured as the ratio of migrants to the total population in the region.

The data come from several sources, though, basically, from the 1970 census. The unit of observation is a region. For migration studies Brazil has been divided into ten regions. From each region we considered the out-migration to the other nine. There are, then, 90 observations. In the exercises performed to fit the equation, the same explanatory variables were considered both at the origin region as well as at the destination.

The levels of significance of the estimate coefficients and the explanatory power of the fitted equations consistently indicated that the explanatory variables taken at the origin were the more important ones. After a few runs the following estimate was selected. See Table 13.

TABLE 13. Interregional migration, 1970.

Variable	Coefficient	Student's "t"
Constant	11.740	-
Income level at origin	-3.552	7.599
Income level at destination	0.199	1.413
Income growth origin/destination	0.200	3.027
Income dispersion at origin	30.93	13.641
Education at origin	8.776	10.465
Urbanization at origin	-2.181	6.580
Density at origin	0.175	3.014
R ²	0.84	

Source: Data on migration (Mata et al. s.d.); on income levels, growth and dispersion: Langoni (1975); all others: Fundação IBGE (1970, s.d.).

Interpreting the migration phenomenon in Brazil from the estimated equation leads to the following inference: income levels and urbanization at the region of origin prevent people from moving out. Taking now the variables positively associated with out-migration, it seems that income inequality and the education factor both taken at the origin are the two most important. Income level at the destination, demographic density at the origin and the ratio between income growth at origin over that at the destination affects migration with equivalent intensities. Income growth at the destination, according to the estimation of the model, would tend to discourage out-migration. This is somewhat unexpected. Usually one would reason that people migrate, attracted by the opportunities at their destination. If this is the case, the ratio of income growth at the origin to that at the destination should be positively related to migration, but the obtained result does not agree with such logic. To lend credibility to this finding, this kind of relationship was consistently found in other specifications of the model.

Exploring the meaning of the estimates, it can be said: as the income level of people increases, they tend to migrate; income inequality at the origin induces people to migrate, income growth at the origin favours migration; income levels at the destination also are positively associated with migration; with the appearance of large cities in their own regions they do not go to other regions; if they migrate,

they stay in their regions, moving to these larger towns. Demographic density at the origin favours out-migration in addition.

As more people are educated, out-migration increase.

Rural-Urban Changes

The outstanding feature of rural-urban population compositions in Brazil is loss of importance of the rural sector. In 1950, this sector held almost two-thirds of its population. The 1970 census shows the rural sector with a population of slightly less than 45 percent of the total. The absolute numbers are provided in Table 14.

TABLE 14. Population changes in Brazil. (1950-70 in '000).

	1950	1970	Total rate of change	Rate of change % per year
Rural population	33,162	41,604	25.4	1.2
Urban population	18,783	52,904	181.7	9.0
Total	51,945	94,508	81.9	4.1

If one assumes the rate of growth for the total population to be the same for both the rural and urban sectors, the following situations would be expected for 1970, if no migration had taken place:

Rural population - 60.334.000

Urban population - 34.174.000

These two values, compared with the figures found in the 1970 census, show a migration flow from the rural to the urban sector equivalent to about 18 million people.

In fact, such an exercise gives a figure above the number registered in the last census, which shows a number of rural-urban migrants smaller than eight million people. The main reason for such a difference is that the census shows only the last move that people made. It is likely that in the span of 20 years, some migrants change places more than once. Another very important reason is the appearance of new towns in places previously considered rural areas. Finally, it is only fair to

assume the same rate of growth will apply to the rural as well as to the urban sector.

In terms of intra-regional migration, the exits from the rural sector, net of the entries, are shown in Table 15.

TABLE 15. Rural-Urban migration, the intra-regional movements, Brazil (1970 Census).

Region	States	Exits minus entries rural sector	Percentage of rural population
I	Amazonas, Pará, Rondonia, Acre, Roraima	46,957	2.4
II	Maranhão, Piauí	20,792	0.6
III	Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas	446,437	5.5
IV	Sergipe, Bahia	77,252	1.6
V	Minas Gerais, Espírito Santo	467,162	7.4
VI	Rio de Janeiro, Guanabara	234,844	21.5
VII	São Paulo	651,759	18.6
VIII	Paraná	202,620	4.6
IX	Santa Catarina, Rio Grande do Sul	360,313	7.5
X	Mato Grosso, Goiás, Distrito Federal	61,392	2.3
Total		2,569,528	6.3

Source: Tabulações Especiais do Censo Demográfico de 1970. FIBGE/IBI.

The total shown in Table 15 is considerably smaller than the number of rural-urban migrations in the country. The intra-regional movements are just a portion of the total rural-urban flow of population.

It is important to consider the intra-regional movements of people. The stepwise process, which has been shown to be the one adopted by migrants from the rural to the urban sector (Langoni 1973, Mata et al. s.d. and Fundação Getúlio Vargas 1970), leaves an important role to be played by intra-regional migration.

Above all, the first step of the migration process is the one in which the effects of the movements are felt in the agricultural labour force. This characteristic makes the intra-regional movements of special interest.

Considering these elements, an attempt was made to determine the variables interfering with intra-regional migration. The information in Table 15 was then associated by a simple regression equation with data concerning the following:

Transportation availability measured by:

Total roads available in the region;

Total roads available in the region as a percentage of the total roads in the country;

Roads available in the region per square kilometer;

Income levels measured by per capita income in the rural sector;

Per capita income in the urban sector;

Income distribution measured by

a) Gini coefficient for the urban sector

b) Gini coefficient for the rural sector

Of the equations fitted, the following were selected:

$$M = -0.241 + 0.631 x_3$$

$$tb_3 = 3.140, R^2 = 0.55$$

$$M = -3.534 + 1.940 x_4$$

$$tb_4 = 1.869, R^2 = 0.30$$

$$M = -7.143 + 3.113 x_5$$

$$tb_5 = 3.773, R^2 = 0.64$$

$$M = -3.011 + 5.804 x_6$$

$$tb_6 = 3.156, R^2 = 0.55$$

x_3 = road extension per square kilometer

x_4 = per capita income in the rural sector

x_5 = per capita income in the urban sector

x_6 = income distribution - Gini index (the bigger the more uneven) for the rural section

M = migration, exits from rural areas, net of entries.

Among all the misgivings about the use of single explanatory variable models, the possibility of having an independent variable associated with other effects is an important one in the present situation. When models with more explanatory variables were tried, x_3 (road extension), lost its apparent importance as a migration inducer.

The level of income in the rural as well as in the urban sector was positively associated with migration. From the urban sector viewpoint it is natural that the higher the levels of income the more people will be attracted to it. Concerning the rural sector, one could reason that a certain income level is required before people

will migrate. The need to cover the migration costs could explain the positive association between rural income level and rural-urban migration.

Income distribution was also positively associated with migration. The way it is measured, the larger its values, the more unevenly the income is distributed. All that the estimated coefficient implies is that people migrate out as the rural income distribution worsens. This result is consistent with the similar one noted earlier.

An additional statistical exploration of the data was also tried. The reduced number of degrees of freedom would impose severe limitations on the number of explanatory variables in the estimated equations. Due to this, variables combining information from the origin and from the destination were proposed. The definition of the dependent variable, "Exits net of Entries", contains the same type of combination.

From the estimated models, the following was selected:

$$M = 0.500 + 2.571 x_{54} - 5.500 x_{76}$$

$$t_{54} = 1.927 \quad t_{76} = -3.719 \quad R^2 = 0.70$$

x_{54} = urban/rural income ratio
 x_{76} = urban/rural income distribution ratio.

Again, the present findings are consistent with the earlier ones. The higher the ratio of urban to rural incomes, the more people will migrate.

The effect of the income distribution ratio on migration is negative. Taking one element of the ratio at a time, other things being equal, one can see that the more uneven the income distribution in the urban sector (urban/rural ratio larger), the fewer people migrate. The more uneven the income distribution in the rural areas, the smaller the ratio and the smaller the negative effect on migration. People tend to migrate from places where the income distribution is uneven. They migrate in the hope of having a more equalitarian income distribution.

FOOD-NUTRITION: THE PERFORMANCE OF THE AGRICULTURAL SECTOR - FUTURE PROSPECTS

Food Demand

With the rates of growth of income and population in Brazil, a certain pressure

is to be expected on the agricultural sector. It is also known that malnutrition prevails in many poverty areas of the country.

According to Delfin Netto (1965), food demand in Brazil grew at the rate of 4.0 to 4.2 per cent a year in the fifties. In the following decade this rate rose to about 4.6 percent a year. With the assumption of fixed produce-price ratios, fixed distribution patterns and fixed consumers' preferences, considering P = the rate of population growth; N = the income elasticity of the food demand; R = the per capita income growth.

The total growth in demand, D , could be defined as:

$$D = P + NR$$

To estimate the proportion of the rural population in the total population, one could write:

$D = h Dr + (1 - h) Du$; Dr = growth of demand of rural population; Du = growth of demand of urban population.

Using data from the 1960 and 1970 population census, Langoni's (1973) data for income and income elasticities from Vargas Foundation studies, one can see components of the growth of internal demand for food in Brazil in Table 16.

TABLE 16. Annual rate of growth of food demand, 1960-70.

Region	Rural sector					Urban sector					Total demand
	h	P	R	N	Dr	$(1-h)$	P	R	N	Du	
North	0.55	2.1	-0.2	0.44	2.0	0.45	5.3	2.2	0.62	6.7	4.1
North-east	0.58	1.3	1.1	0.44	1.8	0.42	4.6	1.9	0.62	5.8	3.5
South-east	0.27	-1.8	2.4	0.38	-0.9	0.73	5.1	4.4	0.56	7.6	5.3
MS	0.55	2.2	0.5	0.36	2.4	0.45	5.2	3.9	0.50	7.1	4.5
MO	0.52	3.1	-0.2	0.40	3.0	0.48	9.0	2.2	0.58	10.3	6.5
Brasil	0.44	0.7	1.4	0.40	1.3	0.56	5.2	3.7	0.55	7.2	4.6

Without making any attempt to evaluate the quality of information used, one could call attention to the following:

Total demand for food grew in the sixties at rates which differ from region to region.

Income elasticities for food in urban areas are higher than in rural areas. Another component of the growth of demand is to be expected from the migration of people from the rural to the urban sector. This is an indication that the rates shown are an underestimation of the demand growth rate.

The breakdown of the growth of demand for food into population and income components is seen in Table 17.

TABLE 17. Population and income components of the growth in demand for food.

Region	Population %	Income %
North	86	14
Northeast	78	22
Southeast	61	39
South	78	22
Midwest	91	9
Brasil	70	30

The major component in increase of demand for food is the rate of population growth. In perspective, the rate of growth in demand is expected to be influenced by both population and income components.

With the same procedure, and assuming a rate of growth of per capita income of 7.5 percent a year, the same income elasticities and the same population growth, the following rates of growth of the demand for the specific food commodities can be seen in Table 18.

Departing from the rates of growth of Table 18 and considering the quantities of the commodities consumed in 1970 (a centred mean of the years 1969-71), the quantities demanded of the commodities can be projected. (Table 19).

The South and Southeast regions would use over two-thirds of all the six commodities considered. The situation with cassava could change considerably if the extraction of alcohol from cassava should increase.

Comparing projections of production with demand, we can examine how the projections tend to match.

TABLE 18. Annual rate of growth of domestic demand for six food commodities.

Commodities	Per capita income growth	Regions					
		North	North-east	South-east	South	Mid-west	Brazil
Rice	4.5	6.0	4.3	4.9	4.3	7.0	4.5
	7.5	6.0	5.4	5.8	4.8	7.5	5.3
Potato	4.5	7.0	6.8	6.8	5.4	7.7	5.7
	7.5	9.5	9.6	8.9	6.6	9.2	7.3
Bean	4.5	3.9	3.1	3.9	3.6	6.5	3.7
	7.5	4.2	3.2	4.0	3.6	6.6	3.8
Wheat	4.5	7.5	7.6	7.7	5.0	8.4	5.7
	7.5	10.7	11.0	10.5	5.9	9.7	7.2
Corn	4.5	4.7	3.8	2.4	3.5	4.2	3.2
	3.5	5.4	4.5	1.6	3.4	5.5	3.0
Manioc (Cassava)	4.5	4.8	4.7	6.0	4.7	7.4	5.0
	7.5	5.6	5.1	7.6	5.4	8.1	6.1

TABLE 19. Projections of quantities demanded of six food commodities in Brazil (1000 tons).

Commodities	Per capita income growth	Regions					
		North	North-east	South-east	South	Mid-west	Brazil
Rice	4.5	122	1.459	5.140	1.293	791	8.855
	7.5	189	1.616	5.578	1.352	825	9.560
Potato	4.5	32	171	1.208	528	48	1.987
	7.5	40	222	1.467	593	55	2.377
Bean	4.5	48	786	1.186	425	210	2.655
	7.5	49	796	1.202	425	212	2.684
Wheat	4.5	127	1.148	3.680	1.145	139	6.239
	7.5	180	1.644	5.012	1.319	166	8.321
Corn	4.5	566	4.361	4.843	4.646	2.009	16.425
	7.5	603	4.646	4.464	4.610	2.274	16.597
Manioc (Cassava)	4.5	1.930	14.524	6.719	9.094	3.110	35.505
	7.5	1.977	14.724	6.863	9.492	3.113	36.169

The Vargas Foundation has recently published a preliminary version of a group of supply and demand projections of agricultural goods (Fundação Getúlio Vargas 1975). To project production a simple and straightforward one-equation model was used, taking time as the one independent variable. This means extrapolation of production patterns observed over time.

The projections for the country as a whole are in Table 20.

TABLE 20. Projections of production and demand of six food crops (1000 tons).

Commodities	Quantity produced	Quantity demanded*
Rice	12,254	9,560
Potato	2,380	2,377
Bean	3,883	2,684
Corn	23,947	16,597
Manioc	50,144	36,169
Wheat	n.a	8,321

* Proposed rate of income change = 7.5% a year.

If the trends prevail, there should not be major problems in meeting demand. Regarding quantities, production will outrun domestic demand.

Nutritional Needs

The Vargas Foundation published a thorough study of the nutritional situation of Brazilian families in 1970 (Fundação Getúlio Vargas 1970). The study used data from a survey of 8,600 households. It shows that about 38 percent of Brazil's population had a daily intake of less than 2,450 calories. Over half of the country's urban population and over a third of its rural residents had a caloric intake of less than 2,450. Over 7 percent of the urban population and almost 6 percent of the rural population fell below the daily reference standard of 55 grams of protein and 40 grams of fat.

The comments in the present section come basically from the Vargas Foundation study. Regional or local studies based on more recent surveys are available. They tend to confirm the results of the Foundation's survey. For example, a study done in Montes Claros (Brasil. SUDENE 1970), a county, in the eastern region of Minas Gerais, showed an average caloric intake of 2,774. The Foundation's study showed for the whole eastern region, a caloric intake of 2,575. Between the two numbers, the difference is smaller than 8 percent of the lower value.

Table 21 gives a more detailed picture of the regional differences, and associated caloric intake with income classification. The country's average caloric intake is 2,565 with a high of 2,771 in the South and a low of 2,207 in the Northeast. The minimum recommended caloric intake is 2,450 calories.

The protein intake situation is shown in Table 22. Beyond the regional and rural urban differentiation, the source of protein is also indicated by V (Vegetable), A (Animal) and T (Total). Groups with a protein intake of less than the recommended minimum of 55 grams are found only at the lower income levels.

For protein consumption, the country's daily per capita average is 77 grams. A regional low, found in the East and the Northeast, was 73 grams daily. The high level was 83 grams, found in the South. Despite the favourable averages, it is known that considerable sections of the population suffer from protein shortage, especially in the Northeast.

The average national daily per capita consumption of fats (Table 23) was 63 grams. The lowest consumption was again in the Northeast, with 42 grams, the highest was in the South with 75 grams. Again, the averages seem to be satisfactory. In the groups below average, one will find several groups with a shortage of fats in their diets.

Cereals furnish about half the average daily caloric intake per person in the country. Rice, beans and bread supply two-thirds of the caloric intake from cereals (Langoni 1973). When cornmeal is added as the fourth commodity, one accounts for 77 percent of the cereal caloric intake in the South, 88 percent in East and 92 percent in the Northeast (counting beans).

Fats and oils form the second important calorie group.

Sugar-cane is responsible for about 12 percent of the nation's caloric intake and the meat commodity group ranged from 10 to seven percent of the caloric intake.

In all three tables, the Northeast is the region with greatest nutritional deficits. In all the regions of the country the urban sector also shows higher deficiencies.

The Performance of the Agricultural Sector - Food Supply

Several studies have independently argued and shown that the agricultural sector of Brazil has played its role quite satisfactorily. Schuh (1974) makes a

TABLE 21. Daily per capita calorie intake, 1960.

Annual Family Income Clan*	Northeast			East			South			Brazil		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
I	1237	1502	1407	1184	1425	1321	1485	2383	1928	1315	1755	1551
II	1497	1812	1687	1531	2104	1829	1735	2894	2308	1639	2241	1952
III	1997	2135	2100	1876	2212	2050	1967	2498	2248	1937	2291	2115
IV	2322	1820	2002	2091	2721	2418	2048	2862	2437	2134	2505	2317
V	2415	2282	2349	2225	2674	2457	2361	2975	2703	2319	2650	2492
VI	2863	2453	2531	2630	2921	2788	2473	2998	2747	2704	2751	2699
VII	3310	3382	3309	2824	3058	2929	2782	3777	3283	2955	3537	3278
VIII	4040	2866	3287	3273	3042	3157	3085	4128	3601	3383	3331	3359
IX	4288	2900	3548	3750	4103	3891	3168	4773	4024	3754	4014	3854
Total	2309	2145	2207	2399	2769	2575	2498	3058	2771	2428	2640	2565

* Income increases from I to IX.

Source: Fundação Getúlio Vargas (1970).

TABLE 22. Daily per capita protein intake, 1960 (in grams).

Annual Family Income Clan*	Northeast									East									South									Brazil										
	Urban			Rural			Total			Urban			Rural			Total			Urban			Rural			Total			Urban			Rural			Total				
	V	A	T	V	A	T	V	A	T	V	A	T	V	A	T	V	A	T	V	A	T	V	A	T	V	A	T	V	A	T	V	A	T	V	A	T	V	A
I	25	11	36	34	17	51	32	15	47	22	10	32	27	8	35	24	9	33	28	9	37	49	16	65	38	12	50	25	10	35	37	13	50	32	12	44		
II	30	16	46	34	21	55	32	20	52	29	11	40	41	16	57	35	14	49	34	10	44	55	26	81	45	18	63	31	12	43	42	21	63	38	17	55		
III	38	26	64	42	26	68	41	26	67	34	19	53	41	17	58	37	18	55	38	13	51	49	23	72	44	19	63	36	18	54	44	22	66	40	20	60		
IV	44	37	81	34	24	58	37	29	66	38	24	62	53	18	71	46	21	67	38	16	54	55	31	86	46	23	69	40	23	63	46	24	70	45	24	69		
V	48	35	83	48	32	80	48	33	81	40	27	67	44	23	67	42	26	68	43	23	66	55	43	98	49	32	81	43	28	71	49	32	81	46	30	76		
VI	51	47	98	45	36	81	47	40	87	46	38	84	56	23	79	51	31	82	45	24	69	56	39	95	50	32	82	60	35	95	52	33	85	50	34	84		
VII	61	53	114	62	51	113	62	52	114	47	45	92	52	28	80	50	36	86	48	36	84	67	55	122	50	46	96	51	45	96	61	45	106	56	45	101		
VIII	64	87	151	54	46	100	57	61	118	52	57	109	50	31	81	51	43	94	51	43	94	70	56	126	52	49	101	54	58	112	58	44	102	56	51	107		
IX	64	84	148	45	43	88	51	57	108	59	77	136	87	40	127	72	57	129	47	57	104	83	84	167	57	70	127	55	72	127	70	60	130	64	66	130		
Total	43	34	77	42	29	71	43	31	74	42	33	75	51	22	73	45	28	73	45	27	72	57	38	95	51	32	83	43	31	74	50	30	80	47	30	77		

* Income increases from I to IX. V = vegetable, A = animal, T = total.

Source: Fundação Getúlio Vargas (1970).

TABLE 23. Daily per capita fat intake of Brazilian population (in grams).

Annual family income	Northeast			East			South			Brazil		
	V	R	T	V	R	T	V	R	T	V	R	T
I	21	22	21	28	30	29	38	41	40	30	30	32
II	25	28	21	35	47	41	46	62	54	39	45	41
III	37	35	37	48	50	49	52	61	57	46	49	46
IV	44	31	36	52	59	56	57	63	59	52	57	51
V	47	48	49	57	64	60	67	77	75	56	64	60
VI	62	43	49	68	69	69	72	78	75	72	64	65
VII	71	70	71	78	71	78	85	94	90	81	94	88
VIII	110	64	81	94	84	90	93	124	108	96	91	89
IX	131	58	82	107	107	102	110	140	133	114	112	113
Total	46	38	41	63	65	67	71	76	75	63	60	63

Source: Adapted from Fundação Getúlio Vargas (1970).

general argument in favour of the primary sector of the Brazilian economy. Pastore (1973) has studied the price elasticity of the supply of agricultural products. Barros (1973) has examined the generation of foreign reserves from trade of agricultural products, Fishlow (1972) analyzed the capital transfer from agriculture via the exchange mechanism. In all these studies the conclusions indicate that the agricultural sector has performed reasonably well.

It has also been argued that it can be shown that the performance of the sector is not to be measured by increases of the land productivity levels. Pastore et al. (1974) have considered this particular characteristic in a historical perspective. Their conclusion is that even this characteristic was guided by rational actions which tended to use the abundant factor first, land in this case.

A decision to promote yield increase, at the same time that new land is brought into the production process, has been made by the Brazilian Government. Investments in research, technical and financial assistance are the means to be used to promote the technological changes that will raise the productivity levels in agriculture.

Even without considering any special action to raise the productivity levels of the resources used in agriculture, the projections in Table 20 were shown to outrun the domestic demand expansion. That was the first evidence that as long as the solution of the Brazilian food problem depends upon quantities produced, the agricultural sector of the economy will solve it.

An exercise was performed by extrapolating both the land area and the land productivity trend, to obtain estimates of production of the six commodities considered earlier on a regional basis. Table 24 shows the conclusions:

For the country as a whole, potatoes and wheat projected a deficit at the end of the present decade.

Comparing the values in Table 24 with those of Table 19 will show the regional projected balances (Table 25).

In terms of regional figures, the outcomes for the North are not unexpected. The country has decided to colonize the region, but not within a five-year period. In this light, the deficit shown for the North is not a major problem.

TABLE 24. Supply projections of six food commodities, 1979 (1000 tons).

Commodities	Regions					
	North	North-east	South-east	South	Mid-west	Brasil
Rice	156	1953	1843	2997	4218	11167
Potato	-	41	590	719	2	1352
Beans	14	1108	436	1297	310	3165
Wheat	-	-	22	2579	7	2608
Corn	88	2396	5648	9200	1931	19263
Manioc	1980	14907	6297	11648	2529	37361

TABLE 25. Balance of supply and demand projections, 1979 (1000 tons).

Commodities	Regional balance					
	North	North-east	South-east	South	Mid-west	Brasil
Rice	-33	337	-3735	1645	3397	1607
Potato	-40	-181	-877	126	-53	-1025
Bean	-35	312	-766	872	98	481
Wheat	-180	1644	-4990	1260	159	-5713
Corn	-515	2250	1884	4590	-343	2666
Cassava	3	183	-566	2156	-584	1192

Demand projections assumed an income growth at the rate of 7.5% per year.

The Southeast is the other region with a consistent deficit for all six commodities. It is a region in which technological changes will have to be made if its food commodities are not to be imported. Cassava and beans are the two commodities which may easily change the balance. This region has been settled and almost all of its tillable lands have been incorporated into the production process. Whatever is left is more likely to be converted into pasture land. The cerrado area that remains, probably will not be "tamed" before the end of the present decade.

Dividing agricultural products into industrial raw material, export goods, and food, a closer look into the supply side can be taken over the period 1950-68 (Table 26).

In Table 26, attention is called to the two extreme groups of commodities. The food group is the one with the smallest growth in yields; the fastest growing yields are of the export crops. The rates of growth would be even greater in this group if the table were to show the six crop years after 1968. The soybean boom came in the seventies.

What Table 26 shows is the trend of the export goods that had already started to grow in the early sixties. Apart from the differences in the rates of growth, it can be seen that all three groups of commodities show increasing yields. With the new policies that government has decided to implement for the agricultural sector, yields can be expected to increase more rapidly.

TABLE 26. Average rates of growth in yield (kg/ha).

Time period	Industrial raw material*	Export goods †	Food products ††
1940-45	-3.72	-0.89	1.34
1945-50	1.72	0.31	0.97
1950-55	4.48	-2.37	-0.45
1955-60	1.32	5.07	2.07
1960-65	4.05	3.33	1.32
1965-68	0.44	8.94	1.08

* cotton, peanuts, sugar-cane, tobacco, soybeans, wheat.

† cocoa, castor beans, agave, coffee.

†† rice, sweet potatoes, onions, beans, manioc, corn, bananas, oranges, pineapples, coconuts, tomatoes, potatoes, grapes.

Source: Barros (s.d.).

Yield growth is just one component of the total production changes. Total production growth can be broken down into the following components:

$$\frac{\Delta P}{P} = \frac{\Delta(P/A)}{P/A} + \frac{\Delta(A/N)}{A/N} + \frac{\Delta N}{N}$$

This breakdown was proposed by Delfim Netto (1965), later by Pastore et al. (1974) have also used it. Griliches (1963) and Hayami & Ruttan (1971) point out that it allows identification of the source of production growth. Table 27 shows each of the components for Brazil of agricultural production, for the same period 1940-68.

Since 1955, though yield increase has been an important component of the growth in agricultural production, it is not the most important one. Increase in the rural labour force has also played an important role in the total growth of agricultural production.

In the years to come, increase in production per area will definitely play a major role. The investment in production of new technology will guarantee better yields for the land. The rural/urban migration process will decrease the rural labour force and, as a consequence, increase the land/man ratio.

With the emphasis that is being put on research and technical assistance increases in productivity and in the total production can be expected.

Historically, the decisive agricultural policies have been adopted under the critical pressures of the demand for food, mainly imposed by the large industrial Centres, São Paulo and Rio de Janeiro, (Smith 1968). The situation is not different today. The pressure from the large urban centres apart from São Paulo and Rio de Janeiro is considerable but first two centres exert today a stronger pressure than ever before.

Brazil is developing a tradition as an exporter of some food products. This new venture is another strong source of demand pressure. The need for foreign currency and the problems of the balance of payments both require larger surpluses to be exported. The country has realized that with a strong agricultural sector it will be able to cope with these pressures, and it has been decided to make the sector as strong as possible.

TABLE 27. Components of the rate of growth of agricultural production, 1940-68.

Components		1940-45	1945-50	1950-55	1955-60	1960-65	1965-68
Increase in production per area (%)	$\frac{\Delta P/A}{P/A}$	0.58	0.48	0.18	2.99	2.14	2.36
Increase in the land-man Ratio (%)	$\frac{\Delta A/N}{A/N}$	0.59	1.46	0.80	0.46	2.48	0.79
Increase in the rural labour Force (%)	$\Delta N/N$	1.55	1.55	3.53	3.53	1.36	1.36
Production growth (%) rate	$\Delta P/P$	3.11	3.49	4.51	6.98	5.98	4.51

Source: Pastore et al. (1974).

Future Prospects - Towards a More Aggressive Agricultural Policy

The data examined in the last section contain only the initial effects of the new policies for the agricultural sector. The changes in policies were quite important and will be considered here. More recent data were not available.

With a policy based on import substitution industrialization, low food prices, reduction of the utilization of capital in the agricultural sector, an implicit intensification of the use of the abundant factors, land and labour, the agricultural sector of Brazil would not be able to respond to the intense demand pressures exerted on it since the mid-sixties. The high rates of growth resumed by the economy and the clear option to fight for external markets for agricultural products, began to require increases in the supply of agricultural products beyond what could be obtained from the expansion of the agricultural frontier.

The Brazilian Government soon understood that the strategy of agricultural policy had to be changed. The new orientation should favour the incorporation of new lands, but at the same time technological modernization would be necessary. The new agricultural policies now have two objectives: expansion of the agricultural frontier and an increase in the productivities of land and labour.

The food demand crises continue to play an important role in the reformulation of the country's agricultural policies.

The major guidelines of the new policy are the following:

1. The central objective is to promote production.

2. The increase in production on the needed scale cannot be obtained only as a function of the use of more land. It is necessary to have a self-sustained increase.

3. The modernization of agriculture associated with improvements of the labour and capital markets will bring about a better standard of living for the rural population without having to depend upon fundamental reforms.

4. Productivity increases can be obtained through the use of instruments such as minimum prices, rural credit, and research and technical assistance programs.

5. In regions where the land tenure structure would impede modernization, a limited agrarian reform would be established, with the central objective of increasing productivity.

The instruments to be used are:

(1) The incorporation of the Amazon and of the cerrado area. Two specific programs were defined here: the *Polomazonia* and the *Polocentro*. The programs seek to expand the agricultural frontier in the direction of the abundant fertile lands of the two regions. They intend also to stimulate a migratory flow northeast to these two regions.

The main points of the agricultural side of the programs are, for the *Polomazonia* (Conselho de Desenvolvimento Econômico 1974a): agricultural and livestock research, technical assistance, regularization of the land tenure process and colonization, development of marketing and natural renewable resources such as fisheries. Other components of the program that are related to the agricultural sector are: construction of the transportation infrastructure, construction of the electrical energy infrastructure, development of the mining industry, health care and educational programs. About 295 million dollars has been allocated to the *Polomazonia* program, to be used from 1975 to 1979.

For the *Polocentro* the major lines of action are: agricultural and livestock research (to be promoted through EMBRAPA's units and the state research organization, universities, and other organizations in the area); promotion of agricultural extension; stimulus to forestation and reforestation with the help of fiscal incentives; road construction (feeder roads); rural electrification; implementation of a system to process, store and transport agricultural products; stimulate the regional production and marketing of lime and other inputs; regularization of the land ownership. About 250 million dollars have been allocated to be used in the *Polocentro* in the 1975-77 period. With other possible resources allocated to the region, it is

believed that about one billion additional dollars may be added to the programme budget for the same period (Conselho de Desenvolvimento Econômico 1975a).

Additional regional programs have been devised and are in the process of implementation. Among these, is the Pantanal Programme of Mato Grosso, and the programme for the geo-economic region of Brasília. For the latter about US\$ 185 million has been allocated to be used from 1975 to 1977 (Conselho de Desenvolvimento Econômico 1975b). The *Polonordeste* programme will apply 850 million dollars in the period 1975-79 (Conselho de Desenvolvimento Econômico 1974b).

(2) Minimum price policy. The objectives of this policy are manifold. Traditionally it has been used in other countries as a means of stabilizing farmers' product prices and farmers' incomes. In the Brazilian case, it would also have the objective of accelerating the growth of production.

It would also promote increases in the production of those commodities with favourable markets while it discriminates against those with an unfavourable market situation.

It also serves the purpose of channeling more production into the markets. Subsistence crops have a substantial part, consumed within the producing unit.

As a risk-reducing device, minimum price policy should pave the way to modernization of agriculture. It should also induce the expansion of land utilization.

Considerable amounts of money have been used to support the minimum price program (Table 28). About 25 commodities are covered by it: corn, cotton, soybean, rice, bean and peanut are some of the most important.

TABLE 28. Amounts of money put into the price support programme (US\$, Equivalent).

Year	US\$ (1000)
1970	91,897
1971	98,754
1972	174,535
1973	141,853
1974	423,958

(3) Agricultural credit and technical assistance. The credit market, left to itself, has tended to discriminate against the agricultural sector. If nothing else, the

industrialization mood would lead to such discrimination. Agricultural subsidized credit is seen as a correction to such imperfection. It facilitates the better use of land and agricultural labour, contributing to the use of more land, a basic objective of the whole set of policies. At the same time, credit subsidies lower prices of modern inputs, making them more attractive to farmers. Once farmers have learned to use them they continue to do so even if the subsidy is cut off; Smith (1969) has found evidence of this in Brazil with fertilizers. In this case another objective of the credit programme is to facilitate the modernization of agriculture.

Three factors were mentioned by Smith that would influence the success of the credit policy: the demand elasticity of the subsidized input; the excess of the social marginal productivity over the social cost; the size of the demand shift caused by the knowledge acquired and the experience accumulated by the farmers. In this way agricultural credit will facilitate the modernization of agriculture.

Another component of the problem here is that a great majority of farmers do not know of modern inputs, or cannot use them correctly. Technical assistance is required.

The Brazilian experiment has consisted of combining, in a single programme, agricultural credit and technical assistance. This experiment has been going on in Brazil since the late forties. Of the several adaptations it has gone through, the one made in the name of the new policy has been implemented since 1964. With the emphasis on production as the main focus of the agricultural policy, the extension system, together with the Central Bank, decided to assist the big farmers in an attempt to obtain faster and more sizable responses.

This programme has been responsible for the accelerated use of fertilizers. From 1967 to 1972 the fertilizer application in the country rose from 445,000 tons to 1,746,000 tons. About 70 percent of these fertilizers are imported.

Table 29 shows the amounts of money in the agricultural credit programmes after 1970. The figures are in US dollars at the November 1975 exchange rate.

(4) Reformulation of the federal institution for agricultural and livestock research. Historically, the agricultural research capacity of the federal government has been deficient both quantitatively and qualitatively. With the overall change in agricultural policy it has been possible to make the reform that created EMBRAPA (The Brazilian Agricultural Research Corporation, attached to the Ministry of Agriculture).

TABLE 29. Amounts of agricultural credit.

Year	Amount (US\$ 1000)	Year	Amount (US\$ 1000)
1970	2,140	1972	3,333
1971	2,615	1973	4,908
		1974	7,824

Source: Banco Central do Brasil.

The main characteristics of EMBRAPA are: (Teixeira Filho s.d.).

Major decisions of resource allocation on the commodity basis.

Concentration of research resources on problems related to fewer products.

Selection of priority problems with the use of the systems approach.

Resource allocation oriented by a well-defined programming process.

Aggressive human resource policy. Here one finds at least three distinct lines of action:

1. Graduate training of the research staff leading to formal degrees (M.S. and Ph.D.).

2. On-the-job training programmes for some research workers, but basically for supporting personnel.

3. An aggressive wage policy that has converted the research job option into one which competes for the researcher's talent in the job market.

Foreign technology transfer is also adopted in EMBRAPA's model. Three basic methods are exercised here:

1. Training researchers abroad.

2. Importing equipment and other materials which embody new technologies.

3. Hiring research workers in the international market.

The private sector acts as a source of problems to be researched and the major consumer of the research results.

The agricultural research system works well, articulated with the National Systems for Science and Technology.

The agricultural and livestock research system is closely connected to the agricultural extension institutions.

Administrative flexibility allows searching for financial resources in different areas. The management of the financial resources of EMBRAPA can be made according to its own priority definitions.

EMBRAPA was created in 1972. It has been in charge of agricultural research in Brazil since 1974. Table 30 gives an idea of the kind of budgetary impact the organization has had on resources allocated to research.

TABLE 30. Federal resources allocated to agricultural and livestock research.

Year	US\$ (1000)	Year	US\$ (1000)
1970	10.600	1973	14.000
1971	9.500	1974 *	24.470
1972	8.800	1975 †	80.000
		1976 †	91.294

* EMBRAPA started to respond for the agricultural research in the country.

† Proposed budget.

(5) Export corridor. This program covers the majority of states in the center-south region. It intends to:

1. Build and equip harbours to lower the cost of embarking agricultural goods;
2. Build roads for transporting agricultural produce;
3. Build silos and other storage facilities;
4. Provide technical assistance to stimulate production of specific commodities such as corn, cotton, beef, wood and cassava.

Since the center-south region has better conditions for competing in the international market, it has been the main focus of the policies. The money allocated to this program is distributed among others already mentioned. As to the consumer, government policies related to agricultural products deal basically with the marketing process.

CIBRAZEM, the Brazilian Company for Grain Storage, and COBAL, the Brazilian Company for Food Supply, enter the marketing process to avoid variation in food quantities available to the population. Agricultural producers also benefit from their activities.

SUNAB, the National Superintendency of Food Supply, as an overall supervisor of commodity prices, also watches prices of agricultural products, both at the wholesale and retail levels.

The main focus is on promotion of production through expanding the agricultural frontier along with growing productivity. It is foreseeable that considerable demand for labor should be created in the rural sector. Capital is also subsidized with negative interest rates.

The policy certainly will not be distributionally neutral in its benefits. Larger farmers will benefit from the majority of the incentives. Meanwhile social security and other programs are being conceived and implemented to favor agricultural workers.

SUMMARY

From 1950 to 1974, the Brazilian economy had one of the highest growth rates in the world. Despite the perverse effects of some economic policies adopted during this period, it averaged 7.1 percent per year.

The Brazilian labour force has been mobile; in spite of this, sizable wage and productivity differences persist both interregionally for the same sector and among different sectors for the same region.

A special labour market study has suggested a strong link between the industrial and the agricultural labour markets. This link explains the interaction between the two sectors which is reflected in the well-being of rural people, and the industrial employment process.

Educational effects tend to suggest that education will tend to lower the supply of labour to the agricultural sector (an ambiguous result).

Minimum wage policy has been responsible for the reduction of employment (in the state of São Paulo). There is high potential for substitution between labor and capital because of the high wage elasticity in the demand equation.

In the subsistence sector, family labour is used to the limit of its capacity. There seems to be little room for improvement in the income of subsistence farmers through programs which attempt to increase production through more intensive use of family labour.

The Brazilian population was nearly one hundred million in 1970. Its rate of growth, which was high in the fifties, was even higher in the sixties, reaching about 3.0 percent per year.

The population is not evenly distributed and there is considerable mobility interregionally. Despite its fast growth and its concentration in regions such as the Northeast, which has few resources, the real population problem faced by the government is related to two other characteristics: the age composition of the population and its level of education. These two characteristics of the population are reflected in the labor force and have their adverse effects on the performance of the whole economy. Fifty three percent of the population, aged 15 to 60, make up 92 percent of the labor force. About 30 percent of the labor force is illiterate. This group and those with elementary schooling add up to about 55 percent of the labor force. Only 2.5 percent of the workers have college education. For the rural sector the situation is even worse. Ninety nine percent of the rural labor force is illiterate or has only elementary school education.

Rural-urban migration is intensive. With the kind of education the rural population has, urban unemployment increases.

The population problems in Brazil are tackled indirectly through hygiene, health care and education programmes.

The Brazilian population is rather mobile; convergence analyses of the trend of the population movement show the poor states losing population. Two rich states (Minas Gerais and Rio Grande do Sul) are net exporters of population.

Paraná, Goiás, Mato Grosso and Maranhão are the net importers. The Northeastern states are the ones that lose most population. About ten percent of

the population migrates within a decade. With migration, it seems that the income differences between the population of the state tend to diminish. This seems to be true when all the states are taken together, when the high- and the low-income states are taken as separate groups, and also when one looks at each group separately.

An econometric analysis of the migration process indicated that people tend to migrate, or not to migrate, in response to their own the region's characteristics.

High-income levels and urbanization of a region tend to prevent people from emigrating. Inequality of income distribution and education tend to be positively associated with out-migration from a region. Income growth and demographic density at the origin favour migration as do high-income levels at the destination. Concerning rural-urban migration, the distinguishing fact is that the 1970 census has shown the rural sector of the country with less than half of its population.

By means of regression analysis, efforts were made to explain the rural-urban migration process.

Within the simple regression models, the variables showing significant effect on migration were: road extension per km,² per capita income in the rural sector, per capita income in the urban sector and income inequality in the rural sector.

The nature and the effects of the explanatory variables prevailed when a multiple regression model was used. The most important directional effect indicated that the higher the rural-urban income ratio, the more people will migrate from the rural sector.

Income and population growth will necessarily represent demand pressure upon the food-producing sector. Between the two, the population component would be responsible for about two-thirds or three-quarters of the increase in the demand for food. The policy changes in the agricultural sector have made Brazil an exporter of commodities produced by its primary sector.

Extrapolation of the country's productivity trend shows that the country will continue to build up its exportable surpluses. The mere extrapolation of the production capacity is a rather conservative outlook. The country's potential as an agricultural producer will allow for more than just the historical growth path that it has shown.

As far as the nutritional situation is concerned, the country is reported to

have serious deficiencies in specified sectors of its population. The most notorious deficits concern the caloric intake. Over a third of the country's population is reported to have a daily caloric intake of less than 2,450 calories.

In terms of the computed averages, the country is reported to have more than the required minimum of per capita consumption of protein and fats. Partially obscured by the averages, however, is the fact that for significant parts of the population, protein and fat intakes are below the required minimum. The cereals are the major group of foodstuffs to furnish the Brazilian population with calories.

Projections leave the country in a favorable situation as far as cereal production is concerned, with wheat as an exception. Wheat is also a crop in which increases in production in the future should be faster than the historical trend. To change the historical pattern of production, the Brazilian government has decided to implement policies that will change the picture drastically. Agricultural research and technical assistance will be two very important tools in this process.

Agricultural credit will also be highly subsidized. Marketing infrastructure will also be improved considerably. More than just satisfying its domestic demand, Brazil is aware of its potential as an exporter of food commodities. The country is now preparing to explore this potential.

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