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COUNTRY CASE STUDY
BRAZIL

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by

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SUMMARY

From 1950 to 1974, Brazilian economy has had one of the highest growth rates in the world.

Despite some perverse effects of some economic policies adopted during this period, it averaged a growth rate of 7,1% per year.

Brazilian labor force has been mobile; despite this, sizable wage and productivity differences persist; both interregionally for the same sector and intersectorally for the same region.

A specific labor market study has suggested a strong link between the industrial and the agricultural labor markets. This link explains the interaction between the two sectors which reflects in the well-being of rural people the failures of the industrial employment process.

Educational effects tend to suggest that education will tend to lower the supply of labor to the agricultural sector (a result not unambiguous), see Alves (1).

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

In the subsistence sector of the agricultural labor market, family labor is used to the limit of its capacity. There seems to be little room for improvement of income of the subsistence farmers by programs with the goal of increasing production through more intensive use of family labor.

The Brazilian population was, in 1970, reaching the one hundredth million. Its rate of growth was high in the fifties, higher in the sixties, reaching about 3,0% per year.

The population is not evenly distributed but there is considerable mobility interregionally.

Despite its fast-growing trend and its concentration in regions such as the Northeast not adequately arrayed for the population it holds, the real population problems faced by the government are related to two other characteristics: The age composition of the population and its level of education. These two characteristics of the population are carried to the labor force and have their adverse effects on the performance of the whole economy. Fifty-three percent of the population aged 15 through 60 make up 92% of the labor force. About 30 percent of the labor force are illiterate. This group and the graduates of elementary school 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. 99 percent of the rural labor force are illiterate or are elementary school graduates.

Rural-urban migration is intensive. With the kind of education the rural population has they end up increasing urban unemployment.

The population problems in Brazil are tackled indirectly via hygiene, health care and education programs.

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 10 percent of the population migrate within a decade's time period. 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 region's characteristics.

High income levels and urbanization of a region tend to prevent people from migration out.

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 distinguished fact to be mentioned is that the 1970 census has shown the rural sector of the country with less than half of its population.

Via regression equations, 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 km², 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 found indicated that the higher the rural/urban income ratio, the more people will migrate out of 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 2/3 or 3/4 of the increase in the demand for food.

The policy changes of the agricultural sector have made Brazil an exporter of commodities produced by its primary sector.

Extrapolation of the country's production capacity shows that the country will continue to build 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 concerns the caloric intakes. Over a third of the country's population is reported to have daily caloric intakes smaller than 2.450 calories.

In terms of the computed averages, the country is reported to be above 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.

The projections made leave the country in a rather comfortable situation as far as the cereal production is concerned. Wheat is the exception here. But, wheat is also a crop in which increases in production in the future should be faster than the historical trend. The country is up to increase its wheat production.

To change the historical pattern of production, the Brazilian government has decided to implement policies that will change the picture quite 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 has realized its potential as an exporter of food commodities.

The country is up to explore its potential.

I. INTRODUCTION

The present document was prepared to be the Brazilian Case Study to be presented at the Symposium on Population and Food sponsored jointly by the International Association of Agricultural Economists and the Food and Agricultural Organization of the United Nations.

Upon accepting the sponsors' invitation to prepare the present paper, the authors signed a "Joint Authors Contract" with FAO.

The paper was supposed to follow a broad outline proposed by the Symposium organizers. While preparing the paper efforts were made to cover as well as possible the points emphasised by the given outline.

The paper contains a brief general background on the overall performance of the Brazilian economy. The period from 1950 to the present was the major focus of the information provided.

After the general background, the Brazilian labor market is analysed. A few tables are offered to provide the basic information that allows a brief evaluation of its functioning. Several key empirical studies were reviewed and their implications for the purposes of the present paper are explored.

The next section of the paper deals with the population issues. Three subsections compose this part of the paper. At first general information concerning population is offered.

Rates of growth, regional movements, age pyramid and educational composition are described here. Then a close look is taken at the internal migration process. Here a brief analysis of the population convergence patterns is made. An econometric exercise attempts to point out the variables influencing internal migration in Brazil. In the third subsection rural-urban migration is analysed. With the use of regression equations the variables more closely associated with the movement of people from the rural to the urban areas are analysed for their effects on rural-urban migration.

The last session of the paper analyses the food and the nutritional situation of Brazil. Considerations of income and population growth are made as means to projecting the demand for food. These projections are briefly compared with projections of the supply of agricultural products. Using information of a country wide survey made by Vargas Foundation in Brazil, the nutritional situation of the country's population is discussed. Here caloric intake deficiencies are put in perspective.

The supply of agricultural products is analysed next. The comparisons of projected supply of and demand for agricultural commodities in Brazil do communicate optimistic feelings about the country's situation. The extrapolation into the future of the historical series of information on the agricultural sector shows supply consistently outrunning the demand. When mention is made of the agricultural policies the country is implementing, one has to believe and expect better days for the agricultural sector of the country. and for the contributions Brazil will be able to make to the solution of the world's hunger problems.

II. GENERAL BACKGROUND

The Brazilian economy has been expanding at reasonably high rates for a rather long period of time (Table 1). It had one of the higher rates of growth in the world in the period of 1950-1974, during which the gross domestic product expanded at an average rate of 7.1 percent.^{1/}

Table 1 - Average of five year rates of change (%), Agricultural and Industrial Sectors, 1950-1974. (Gross Domestic Product).

Sector	1950-1954	1955-1959	1960-1964	1965-1969	1970-1974*
Agriculture	3.9	4.4	4.1	4.7	6.0
Industry	8.2	10.3	6.7	7.2	12.0
Total	5.8	6.3	5.9	6.2	10.4

* For 1970-1974 the data are preliminary estimates.

Source - IBRE, Fundação Getulio Vargas.

^{1/} General background on the Brazilian economy can be obtained in Werner Baer (2) and G. Edward Schuh (36). A collection of essays which contain more penetrating analysis of specific aspects of the Brazilian economy may be found in Howard S. Ellis (11), and Langoni (25).

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 negative.^{2/}

In that year Brazil experienced the highest rate of inflation in its history (an annual rate of 92 percent).

The post 1964 government chose a gradualistic approach to controlling inflation in order to avoid a serious depression. However, the 1964-1966 period, which was characterized by rather severe "containment" policies, was still difficult, particularly for the industrial sector. The economy did experience a small growth in this period, however, 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 from 9.3 to 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

^{2/} A number of interpretations of this stagnation have been made. For a recent summary, see Werner Baer and Andrea Maneschi. (3)

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 labor for the industrialization of the country.

It has been argued by some that the growth rates of agriculture could 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 rather heavily against it.^{3/}

The economic policies which stimulated industrialization while at the same time discriminating against the agricultural sector reinforced the natural tendency for a reallocation of labor 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).

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 9 percent per year, industrial employment was growing at a rate only slightly greater than 2 percent per year. The result was that a rather large flow of rural-urban migrants was channeled into the low productivity service sector, or accumulated as urban unemployed.

^{3/} For an evaluation of the role of these general development policies on the agricultural sector, with special reference to Brazil, see G.E. Schuh (38).

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

Sources - The data for 1940 and 1950 were taken from: United Nations (49) p. 379

The data for 1960 came from United Nations (50) p. 308

The data for 1970 are preliminary estimates and were provided by the IBGE

III. THE LABOR MARKET

The Brazilian economy has historically had a rather mobile labor force. Even with such high mobility, however, sizable differentials in both wage rates and labor 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 nonskilled labor working in the rural areas of selected states in Brazil. They document the rather 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 pattern.

Table 3 - Monthly Wages of Unskilled Rural Labor, 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, 1963 p. 83-93, 283.

It is of interest to note that variations in wages in non-agricultural rural employment are much greater than those in agriculture. In addition, they do not have the same systematic North-South pattern.

Additional data on the rather substantial geographic dispersion of wage rates within the agricultural sector are presented in Table 4.

Table 4 - Variation of the Wage Rates of Hired Labor in Agriculture, Based on Municipio Averages, 1963-64.

States	Daily Average Wage Rate <u>a/</u> (Cr\$)	Standard Deviation <u>b/</u>	Coefficient of Variation <u>b/</u>	Nº of Municipios 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

Source - Getúlio Vargas Foundation, Survey of 1963-64.

a/ Daily average wage rate was calculated for each municipio from the sample data.

The average for the State is a simple average of the municipio averages.

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

These data, which are taken from the survey by the Getúlio Vargas Foundation, indicate that in addition to the rather large differences in wage rates among states, there are also rather sizable variations among municipios (counties) within the same state. Table 4.

The data on wage rates and average productivity tend to indicate

that the labor 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 in a systematic way. 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 reasons:^{4/}

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-labor price ratio were different in the industrial sector. In essence, the capital stock outruns the flow of migrants;
2. Capital-labor 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 labor 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 labor market we are going to draw heavily on recent studies which indicate some of the forces at work in the inter-sectoral labor market.

Whitaker (51) attempted to explain why labor absorption declined so drastically in Brazilian industry in the 1950's. It appeared that during

^{4/} For a more detailed discussion see Schuh, (37) p. 56-63.

this period labor became increasingly sealed off from employment in the industrial sector, where rapidly rising returns to labor were observed (relative to other sectors).

An econometric model was formulated to explain the major determinants of demand for and supply of labor in the industrial sector. The model was estimated with cross sectional data for 1950. It was estimated for Brazil, and for 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 for Brazil as a whole.

One of the interesting findings of this study was that the agricultural labor market is linked to the industrial labor market, with a stronger link found to the traditional sector than to 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 labor to industry. The implication for the agricultural labor market is that an increase in education will possibly decrease the supply of labor 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 labor should lead to substitution of capital for labor, 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 labor absorption in the manufacturing sector.

In a recent study Saylor (36) estimated a two equation model for the labor 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 labor 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 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 in the end of 1963 but its enforcement, to significant degree, started 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 3.0.

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 10% and 25% 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% in the real wage it was at the expense

of a substantial decrease in employment between 153,000 (9.6% of rural labor force in 1963) and 345,000 (21.6% of the rural labor force in 1963) workers, in the short and long run respectively.

An increase in the productivity of land is in line with greater utilization of labor. 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.

Saylor gives an interesting interpretation for the above result. Given a production function like the following:

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

where:

K_T = Capital associated with land (T)

K_L = Capital associated with labor (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 (35) 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 labor force. As was shown before, the state of São Paulo has been for a long period

Table 5 - Structural Supply and Demand Equations. Regression Coefficients,
Standard Error of Estimates, Durbin-Watson Statistics (D.W).
State of São Paulo 1948-1970. The Model was 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)	-
Labor Force (lagged one year)	.938 (.108)	.529 (.126)
Off-Farm Income	.197 (.083)	-
Immigration	.029 (.017)	-
Dummy Variable (Minimum Wage) (1948-62 = 0; 163-1970 = 1)	-	- .035 (.009)
D.W.	1.754	1.947

Source - Saylor, op. cit., p. 136.

a net gainer of population. In the period covered by the study part of the population that migrated to São Paulo was incorporated first into the agricultural labor 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 (22) showed that this coefficient is positively influenced by the level of education, and amount of information, and other variables not so much related to the labor force. His findings seems also to apply to the supply of labor, since, as it will be shown, the level of education of the agricultural labor force is very low and until recently very little information was provided to the workers about the conditions of the agricultural labor market.

To the best of our knowledge Saylor is the first to succeed in estimating a two-equation model for the agricultural labor market, but his results cannot be generalized to Brazil as 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. Futhermore, Saylor uses a concept of total agricultural labor force. He does not separate the hired labor force from the other components: family and operator labor. In a state, as seems to be the case of São Paulo, where the hired labor is a high proportion of the total agricultural labor force, his specification of the supply equation is acceptable. But if that is not the case as in a(majority of Brazilian state) it is necessary to specify different functions for the supply of hired labor and family labor. Alves (1) has shown that the variables of the demand equation enter into the supply equation for the case of family labor. In essence, they

measure the income available for hiring labor and family use. It is only after knowing this that the head of the family can decide how much labor will be offered to the farm enterprise. This is nothing more than to recognize that, in the case of family labor, the decisions with respect to how much labor to offer to productive activities are intertwined with decisions with respect to how much labor to utilize on the farm and to offer to non-farm activities.

Alves (1) divided the labor market into two sectors: The subsistence sector and the commercial sector. In the first sector are the farmers that do not hire labor. 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 labor).

Conceptual models for the subsistence sector are based on the idea that the head of the family allocates his and the family's time between work and leisure, within the constraints given by 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 labor to an industry. They also take into consideration that the decision with respect to how much family labor to offer to productive activities are intertwined with decisions with respect to how much labor 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 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 considering the subsistence sector, there are indications that family labor is used to the limit of its capacity in all groups of states except group 4. This implies that there is little room to improve the income of the subsistence farmer by programs that have as a goal an increase in production through more intensive use of family labor. Education appears to affect the level of labor used in the farms, although in some regions it has a positive effect and in others a negative effect. In 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 the difference in 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 education attainment is so low in that region, and consequently that 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 a consistency with the results for the East (Minas Gerais and Espírito Santo). Both regions are characterized by an excess of agricultural labor, and have experienced sizable out-migrations during most of the post-World War II

Table 6 - Statistical Results for the Subsistence Sector. Regression Coefficients, R^2 and the Constant Term.

Variables	Group of States	Statistical Results (Regression coefficients and R^2)
Physiological (L) Possible Maximum of Family Labor	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 percent level;

* - Statistically significant at the 5% level.

L - First, the number of man-equivalents of the family was determined. The working days of the year were then counted. The number of working days was multiplied by the number of man-equivalents to produce the estimate of L.

E - It is 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 - This variable is the sum of the value (in Cr\$) of land, permanent crops, buildings, animals, farm machinery and equipment. Debt were not discounted. For more details see:

Alves, Eliseu Roberto de Andrade, op. cit, p. 91 and 198-202.

period. If this out-migration is viewed as a ~~the~~ goal, then the statistical results indicate that an increase in education can contribute to attaining that goal.

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

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

Finally, the statistical results ~~side~~ some support for Johnson's fixed asset theory. The ability of ~~cluded~~ variables to explain the level of employment within agriculture ~~suggest~~ that the family labor is treated as a fixed asset. This is at least ~~some~~ evidence for the existence of sizable imperfections in the ~~lab~~et, a basic postulate of

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 labor 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 is the case of Santa Catarina and Rio Grande do Sul.

The inventory asset was used as a proxy for cash 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 suggest that the family labor is treated as a fixed asset. This is at least supportive evidence for the existence of sizable imperfections in the labor market, a basic postulate of

the Johnson work.

Policies such as education, which open a wider range of opportunities to the labor force, would be one possible measure to cope with the labor 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 also should 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 labor. Of the results of analysis of the commercial sector the following were separated:

1. One of the interesting results obtained was the rather 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 labor to the left in order to raise income are going to have a relatively large effect on employment and a relatively smaller 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 effect the labor-capital price ratio more generally would also appear to have a rather large employment effect, since the results indicate that capital and labor 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. The evidence appears to be rather strong that an increase in land per farm increases the demand for labor 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 labor.
4. The coefficient of the labor intensity variable (or product intensity variable) indicates that an increase in labor intensity of the product mix does increase the demand for labor. Moreover, the response is greater than one in every case for which satisfactory results were obtained. These results suggest that a shift in the labor 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 labor equation (family labor). The results suggest that an increase in expected non-farm income reduces the quantity of labor 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 labor market indicates that the forces acting in the labor market have induced brazilian population to migrate searching for new regions where salaries are higher. This fact induced the present study to look close, into the internal migration flows in the country.

IV. POPULATION - INTERNAL MIGRATION

RURAL-URBAN CHANGES

Population.

With its 8.2 million square kilometers and its population, measured in 1970, of about 95 million people, Brazil would not be a country with the most 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 the people living in places like São Paulo, one of the largest urban centers of Latin America, or even the overall situation faced by people living in the Brazilian Northeast.

In the 50's Brazilian population experienced its highest rate of growth up to that point. The overall average was of about 2.5 percent per year. In regional terms this rate of growth varied from a low of 1.93% in the Eastern region up to a high of 3.71% in the Middle West.

Despite these growth rates, one observes that in the sixties their were still higher. The overall rate of growth reached 2.9% a year as an average. Around this average, the extremes had the same locations. The Esatern states had the lowest rate of population change, about 1.5 or 2.0% 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 actions toward population growth orientation, or at least some guides to population movements.

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

Three of four examples can be offered to illustrate this affirmation. In building Belo Horizonte, one of the largest Brazilian urban centers, Contagem, a satellite town in its neighborhood, 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 and specially Contagem is one of fastest growing centers in the country.

The building of Belo Horizonte is also mentioned as a process which was very influential on the neighboring agriculture, Schultz (41). The second example of the same nature happened with São Paulo and Osasco.

The third and, in terms of the size of the migration flows, the most important in the Brazilian population history is the migratory movement that in the forties and fifties was initiated towards the state of Paraná. This was induced by the settlement of that state, a land development process pulling in the migratory flows.

The flow into Paraná 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, more than just the construction of the city, 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 these days. In terms of its population effects it can be seen as a trend towards redirecting the migratory flows.

The population increase of that region draws a lot of people from the Northeast and from the Southeast (mainly Minas Gerais, a state close by). 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 is to 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 the fact 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, despite the fact that it is 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 labor market.

In the age distribution one sees quite a concentration of

people in the low and inactive age groups, Table 7.

The age pyramid shows that male population of ages between 15 and 49 years add to a total of about 21,590,000

If one considers this group to be defined as the labor force, it makes up about 23 percent of the total population. Allowing the definition

Table 7 - Age, Rural-Urban and Sex Composition of Brazilian Population

(population in 1,000's)								
Age Group	Total Populat.	% of Group	Urban Populat.	% of Age group	Rural Populat.	% of Age group	Total Male	Total Female
0 to 4	13,811	14.8	6,811	13.0	7,000	17.0	6,969	6,841
5 to 9	13,460	14.4	6,959	13.3	6,500	15.8	6,799	6,659
10 to 14	11,859	12.7	6,377	12.2	5,482	13.4	5,934	5,924
15 to 19	10,253	11.0	5,761	11.1	4,491	10.9	4,995	5,257
20 to 24	8,286	8.9	4,840	9.3	3,445	8.4	4,037	4,249
25 to 29	6,504	7.0	3,820	7.3	2,684	6.5	3,173	3,330
30 to 34	5,664	6.1	3,409	6.5	2,255	5.5	2,800	2,864
35 to 39	5,089	5.5	3,075	5.9	2,013	4.9	2,502	2,587
40 to 44	4,535	5.9	2,754	5.3	1,781	4.3	2,288	2,247
45 to 49	3,546	3.8	2,138	4.1	1,407	3.4	1,795	1,751
50 to 54	2,940	3.2	1,746	3.4	1,193	2.9	1,486	1,453
55 to 59	2,288	2.4	1,385	2.7	903	2.2	1,160	1,128
60 to 64	1,791	1.9	1,079	2.1	711	1.7	903	887
65 to 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 (16) page 2.

to cover also the males in the fifties, the labor force comes to about

24,236,000 people, which represents around 26 percent of the total population.

From these figures one sees that about a fourth of the population has to work for the whole population.

This claim overemphasizes the non-working component of the population since women, people beyond 60 and below 15 are part of the labor force. Women represent about 20% of the Brazilian labor force, and people below 15 and above sixty add up to about 7,5%, Table 8.

Table 8 - Age Composition of the Labor Force - 1960 and 1970 census

Age Group	Participation in the Labor Force	
	1960	1970
10 - 14	1.98	2.37
15 - 19	10.47	11.86
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

Attention is called to the fact that the younger groups (up to 25) that make up the labor force have increased their participation. The others have decreased. The younger components of the labor force are increasing.

Considering the whole population, the combination of data in Tables 7 and 8 shows that:

About 53% of the population (ages 15 through 60) hold 92% of the labor force. The non-active components of the population weigh very heavily in the population composition.

Other special characteristics of Brazilian population which concerns the country's government is its educational structure, especially that of the labor force. Considering especially the labor force components, Table 9 shows its educational composition.

Table 9 - Educational Structure of the Labor Force.

Level of Education	Labor Force Composition	
	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 (24) page 86.

In 1970, about 30% of the labor force were illiterate. Over half it (54%) had only elementary education. Only about 15% had education beyond primary school. Comparison of the 1960 figures with those of 1970 indicates that the changes have moved in the right directions, although it can be said that a lot of improvement is required yet. This is no doubt a

serious problem faced by Brazilian government. A more specific picture can be offered by the differentiation of the rural and urban labor forces. Table 10.

Table 10 - Education Levels of the Rural and Urban Labor Forces - 1970 Censuses

Education Level	Rural Sector	Urban
Illiterate	53.34	13.99
Elementary School	45.58	60.41
Jr. High School	0.79	12.87
Senior High School	0.19	8.61
College	0.10	4.12

Source - Langoni (24) page 18.

The urban component of the labor force shows a better educational situation, specially when one is concerned with 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 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 an Alves (37) page 50, 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 programs would prepare the out-migrating component of the population to enter the industrial

market. Those who stay in the rural sector would make it simple for the technological innovations which might be brought up to be adopted.

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

Internal Migration.

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 (18). The study covers the period of 1872-1970. Attention here will be concentrated on the parts of that study which show the pattern of convergence and divergence among states or groups of states, over the period of 1940-1968.

The states are classified into two groups. The upper-group contains (group 2) states with 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 1940-1968. These numbers indicate that:

- a. In the decade 1940-50, there was a widening divergence in income per capita among the states of Brazil, associated with a strong divergent growth between low-income and the high-income states.
- b. The decade 1950-1960 and the period 1960-1968 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 to be

Table 11 - Measure of the Difference Between the Income and Population Shares
for selected groupings 1940-1968^{a/}

Group of States	1940	1950	1960	1968
	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	38.32	43.58	36.52	35.90
Upper group treated separately	46.49	45.85	41.09	40.92
Lower group treated separately	20.67	17.19	16.88	16.20

a/ 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, Douglas H. (18).

Source - Graham and Hollanda Filho, op. cit., p. 110, Table IV-1, Population data are from demographic census with 1968 population data based on interpolation between 1960 and 1970 demographic censuses.

investigated. 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 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 shifted residence in the decades of 1950-1960 (5.7 million people - 11% of 1950's population) and of 1960-70 (6.4 million people 9,0% of 1960's population). In a relative sense, the amount of the 1960-70 decade is slightly smaller than in the previous decade, although it still 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

* Net internal migration for each state was calculated by the formula $M = P_{t+n} - R_n P_t$ 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 , the state intercensal survival rate, 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 intercensal period by the number of Brazilian Native born living in the country at the beginning of the period. For more details see: Graham and Hollanda Filho, op. cit, p. 99-101.

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 into the frontier areas of first 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 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).

STATES	1940-1950		1950-1960		1960-1970	
	Migration nº of inhabitants	% of 1940 population	Migration nº of inhabitants	% of 1950 population	Migration nº 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	-2.40
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	135,512	-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
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
BRASIL						
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 and Hollanda Filho (8) 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)

An Econometric Approach to the Migration Problem.

With a somewhat different approach and using a different combination of data, the present section examines the overall internal migration in Brazil. Using data from the 1970 census a small econometric exercise is performed.

A perusal of the literature related to migration leads to the separation 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 (32, 33), when he characterizes the push and pull factors which basically relate to the structure of the agricultural process and the bright lights of towns, respectively.

Simon Kusnets (23) with his works on population and economic growth of the United States has led the so-called "Harvard School" approach, Sahota (34). 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 (43) and Schultz (40) and for this reason is associated with the "Chicago School".

Sahota, (34) 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 (47, 48).

Looking 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

Level of employment.

Empirical studies of the migration process have also tried to relate migration with 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 the Brazilian migratory movements.

For the purpose of our present workshop the overall migration phenomenon is important to the extent to which it affects the agricultural labor force. Within the overall migration process, one should try to cast some light on the rural-urban migration flows. This will be dealt with in the next section.

The Migration Model and the 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 of 1950-1968.

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

Education measured by the percentage of literates of age 5 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 used come from several sources. Basically the majority of the information comes 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 estimated 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, Table 13.

Table 13 - Interregional Migration - Brazil, 1970.

Variable	Coefficient	Student
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	

Data on migration are in Matta (26), on income levels, growth and dispersion in Langoni (25); all others from IBGE (16, 17).

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 the destination tend to affect 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 that they may expect to find at their destination. If this is the case, the ratio of income growth at the origin over 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, it should be mentioned that this kind of relationship was consistently found in other specifications of the model.

Attempting to explore the meaning of the estimates, it can be said that:

As the income level of people in their regions increases they tend to migrate.

Income inequality at the origin induces people to migrate out. Income growth at the origin favours migration. Income levels at the destination also is 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.

As more people get educated, out migration increases.

Rural Urban Changes

The first thing to which one's attention is called concerning the rural-urban population compositions in Brazil is the loss of importance of the rural sector. In 1950, the rural sector of the country held almost 2/3 of its population. The 1970 census shows the rural sector with a population of slightly less than 45% of the total. In absolute numbers, the figures are the following. Table 14.

Table 14 - Population changes in Brazil, 1950-1970 - Censuses.

	1950	1970	Total	Rates 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 situation would be expected for 1970 if no migration had taken place:

- rural population - 60.334
- urban population - 34.174

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 eighteen 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 lies in the fact that the census shows only the last move that people made. It will be likely that in the span of twenty years some migrants change places more than once. Another very important reason is the appearance of new towns in places before considered to be rural areas. Finally it is only fair to assume the same rate of growth to 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, show the following situation, Table 15.

The total shown on 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 (24, 26, 14), 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 labor force. This characteristic makes the intra-regional movements to be of special interest to the present paper.

Considering these elements, an attempt was made to determine

Table 15 - Rural-Urban Migration, the intra-regional movements, Brasil
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, Pa raíba, 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 Fe deral	61.392	2,3
	Total	2.569.528	6,3

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

the variables interfering with intra-regional migration. The information of Table 15 was then associated with data concerning the following variables, via simple regression equation:

Transportation availability measured by:

- Total road available in the region
- Total road 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
 - Gini coefficient for the urban sector
 - Gini coefficient for the rural sector

Of the equations fitted, the following were selected:

$$M = - 0,241 + 0,631 x_3$$

$$tb_3 = 3,140 R^2 = 0,55$$

$$M = -3,534 + 1,940 x_4$$

$$tb_4 = 1,860 R^2 = 0,30$$

$$M = - 7,143 + 3,113 x_5$$

$$tb_5 = 3,773 R^2 = 0,64$$

$$M = - 3,011 + 5,804 x_6$$

$$tb_6 = 3,156 R^2 = 0,55$$

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 sector.

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 some 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 at rural as well as at the urban sector were 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 uneven 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 before.

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 the time, other things equal, one can see that the more uneven the income distribution in the urban sector (urban/rural ratio larger) the less 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 on the hope of having a more equalitarian income distribution.

V. FOOD-NUTRITION

THE PERFORMANCE OF THE AGRICULTURAL SECTOR

FUTURE PROSPECTS

Food Demand

With the rates of growth of income and population that Brazil has been experiencing pressure from the demand for food is to be expected on the agricultural sector. With the poverty areas that the country exhibits it is known that malnutrition prevails in many parts of the country.

In the present section, the paper considers the food situation in Brazil. Conclusions about the demand for food are drawn initially. Then the nutrition problem is considered. The performance of the agricultural sector is considered, vis-a-vis the situation of the demand for food.

The paper ends with comments on the policies Brazilian Government has been considering and implementaring related to these points.

Food Demand

Food demand in Brazil grew at the rate of 40 to 42% a year in the fifties, Delfin Netto (10). In the following decade this rate rose to about 4,6% a year. With the assumption of fixed product price ratios, fixed distribution patterns and fixed consumers preferences and considering;

P to be the rate of population growth

N to be the income elasticity of the food demand

R to be the per capita income growth

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

$$D = P + NR$$

Making 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 census for population, Langoni's (24) data for income and income elasticities from Vargas Foundation studies one can see components of the growth of internal demand for food in Brazil, Table 16.

Table 16 - Annual Rate of growth of food demand in Brazil, 1960-1970

Region	Rural Sector					Urban Sector					Total Demand
	h	P	R	N	Dr	(1-h)	P	R	N	Du	
N	0,55	2,1	-0,2	0,44	2,0	0,45	5,3	2,2	0,62	6,7	4,1
NE	0,58	1,3	1,1	0,44	1,8	0,42	4,6	1,9	0,62	5,8	3,5
SE	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
BRAZIL	0,44	0,7	1,4	0,40	1,3	0,56	5,2	3,7	0,55	7,2	4,5

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

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

Income elasticities for food in the urban areas are higher than in the rural sector. 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 breaking down of the growth of demand for food into the population and the income components is seen on Table 17.

Table 17 - Population and Income components of the growth in demand for food.

Region	Population %	Income %
N	86	14
NE	78	22
SE	61	39
S	78	22
NW	91	9
BRAZIL	70	30

One can see that the major component of the increase in the demand for food is the rate of population growth.

In a long run perspective, the rate of growth in demand is expected to be influenced by both the population and the income components.

With the same procedure, and assuming a rate of growth of per capita income of 7,5% a year, the same income elasticities and the same population growth, one can get the following rates of growth of the demand for the specific food commodities, Table 18.

Table 18 - Annual rate of growth of domestic demand for six food commodities, Brazil

Commodities	REGIONS					
	N	NE	SE	S	MW	BRAZIL
Rice	6.0	5.4	5.8	4.8	7.5	5.3
Potato	9.5	9.6	8.9	6.6	9.2	7.3
Bean	4.2	3.2	4.0	3.6	6.6	3.8
Wheat	10.7	11.0	10.5	5.9	9.7	7.2
Corn	5.4	4.5	1.6	3.4	5.5	3.0
Manioc	5.6	5.1	7.6	5.4	8.1	6.1

Departing from the rates of growth of Table 18 and considering the quantities of the commodities consumed in 1970 (a centered mean of the years 69, 70 and 71), the quantities demanded of the commodities can be projected, as in Table 19.

Table 19 - Projections of Quantities Demanded of six food commodities Brazil 1979* - 1000 tons

Commodities	REGIONS					
	N	NE	SE	S	MW	BRAZIL
Rice	189	1.616	5.578	1.352	825	9.560
Potato	40	222	1.467	593	55	2.377
Bean	49	796	1.202	425	212	2.684
Wheat	180	1.644	5.012	1.319	166	8.321
Corn	603	4.646	4.464	4.610	2.274	16.597
Manioc	1.977	14.724	6.863	9.492	3.113	36.169

* Proposed rate of income change = 0 7,5% a year.

While the information in Table 19 is mostly self-evident, to the fact that the South and Southeast regions would use over 2/3 of all the six commodities considered.

The situation with cassava could become considerably different from what is shown in Table 19 if the extraction of alcohol from cassava becomes widespread should increase considerably.

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

The Vargas Foundation has published recently a preliminary version of a group of supply and demand projections of agricultural goods (15). To project production a simple and straightforward one-equation model was used, taking time as the one independent variable. This means, extrapolating production patterns observed over time.

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

Table 20 - Projections of production and demand of six food crops

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
Whcat	n.a	8.321

If the trends prevail major problems in meeting demand major problems are not expected. As far as the quantities are concerned production will outrun domestic demand. A close look at this situation will be taken later on.

A few remarks on the nutritional side demand are appropriate.

Nutritional Needs

Vargas Foundation in 1970 published a thorough study of the nutritional situation of Brazilian families (14). The study used data from a survey of 8.600 households. It is shown in the study that about 38 percent of Brazil's population had daily diets with less than 2450 calories. Over half of the country's urban population and over a third of its rural people had a calorie intake of less than 2450. 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 to be made in the present section come basically from the Vargas Foundation study. Regional or local studies are available, which were based on more recent surveys. They tend to confirm the results of the Foundation's survey. For example, a study done at Montes Claros (45) a county in the Minas Gerais in the Eastern region 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% of the lower value.

Table 21 gives a more detailed picture of the situation with

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Table 21 gives a more detailed picture of the situation with

the regional differences, and associates caloric intake with income classification. The country's average caloric intake is 2565 with a high of 2771 in the South and a low of 2207 in the Northeast. The minimum required of caloric intake is 2450 calories.

The protein intake situation is shown in Table 22. Beyond the regional and rural urban differentiation the source of protein is also pointed out by V (Vegetal) 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.

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

The average national consumption of fats Table 23 was 63 grams daily, per capita. The lowest consumption was again in the Northeast, with 41 grams. The highest in the South with 75 grams. Again the figures, examined by their average, seem to be satisfactory. One should not forget that in the groups below average one will find several groups of people with 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

Table 21 - Daily Per Capita Caloric Intake, by Region, Sector and Income Class, Brazil, 1960

Annual Family Income Class ^b	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
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

^a Adapted from (14).

^b Income increases from I to IX.

Table 22 - Daily Per Capita Protein Intake, by Region, Sector, Source and Income Class, Brazil, 1960 ^{a)}

Annual Family Income Class ^{b)}	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	<u>51</u>	32	15	47	22	10	32	27	8	<u>35</u>	24	9	33	28	9	37	49	16	<u>65</u>	38	12	50	25	10	35	37	13	<u>50</u>	32	12	<u>44</u>		
II	30	16	<u>46</u>	34	21	55	32	20	<u>52</u>	29	11	40	41	16	57	35	14	<u>49</u>	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	<u>53</u>	41	17	58	37	18	55	38	13	51	49	23	72	44	19	63	36	18	<u>54</u>	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	<u>54</u>	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		

^{a)} Adapted from (14).

^{b)} Income increases from I to IX. V = vegetal, A = animal, T = total.

caloric intake from cereals (pag. 14 e 24). When cornmeal is added as the fourth commodity one takes account of 77 percent of the cereal caloric intake in the South, 88 percent in East and 92 percent in the Northeast.

Fats and oils category is the second most important calory group.

Sugar cane is responsible for about 12 percent of the nation's caloric intake and the meat commodity group ranged from 10 to 7 percent of the the caloric intake.

Table 23 - Daily percapita fat intake of Brazilian population differentiated by Regions, Sector and Income class^{1/}

Annual Family Income	Nordeste			Leste			Sul			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	74	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	115
Total	46	38	41	63	65	67	71	76	75	63	60	63

^{1/} Adapted from Getulio Vargas Foundation (14).

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

The Performance of the Agricultural Sector - The Food Supply

Several studies have independently argued and shown that the agricultural sector of Brazil has played its role quite satisfactorily: Schuh (39) makes a general argument in favour of the primary sector of the Brazilian economy. Pastore (30) has studied the price elasticity of the supply of agricultural products. Mendonça Barros (28) has examined the generation of foreign reserves from trade of agricultural products, Fishlow (12) analysed 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 been also argued and it can be shown that the performance of the sector is not to be measured by increases of the land productivity levels. Pastore et alii (31) 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 definition to promote yield increase, at the same time that new land will be brought into the production process, has been made by 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 actions to raise the

productivity levels of the resources used in agriculture, the projections transcribed 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.

For the specific purpose of the present paper an exercise was performed of 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. The following situation was reached, Table 24.

Table 24 - Supply projections of six food commodities - Brazilian Regional
1000 tons, 1979

Commodity	REGIONS					
	N	NE	SE	S	MW	BRAZIL
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

Comparing the values on Table 24 with those of Table 19 will show the regional projected balances, Table 25.

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

Table 25 - Balance of Supply and Demand Projections - Six food commodities
Brazil 1979^{a/}

Commodities	Regional Balance (1000 t)					
	N	NE	SE	S	MW	Brazil
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

a/ Demand projections assumed an income growth at the rate of 7,5% per year.

The approach taken to construct Table 25, was simple. As far as the supply side is concerned, it was also very conservative. Specifically in the case of wheat, the supply projection does not reflect the decision that has been taken by Brazilian government to reach self-sufficiency as early as 1977.

In terms of the regional figures one can say that the outcomes for the North are not unexpected. The country has decided to colonize the region, but it will not be within a five year period that the outcome of such a colonization process will be obtained. In this light, the deficit shown for the North is not something to worry about.

The southeast is the other region with a consistent deficit for all six commodities. That is a region in which technological changes will have to be installed if it does not want to import its food commodities. Cassava

and beans are the two commodities which may easily change the sign of 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 pastureland. Finally, one finds the cerrado area, which probably will not be "tamed" before the end of the present decade.

A closer look into the supply side can be taken from a different approach. Separating the agricultural products into:

- industrial raw material
 - export goods
 - food
- ones sees the following situation over the period of 1950-1968. Table 26.

Table 26 - Average rates of growth in yield (kg/ha)

Time period	Industrial raw material <u>a/</u>	Export goods <u>b/</u>	Food products <u>c/</u>
1940 - 1945	-3,72	-0,89	1,34
1945 - 1950	1,72	0,31	0,97
1950 - 1955	4,48	-2,37	-0,45
1955 - 1960	1,32	5,07	2,07
1960 - 1965	4,05	3,33	1,32
1965 - 1968	0,44	8,94	1,08

Source - Mendonça de Barros (29) page 24.

a/ cotton, peanuts, sugar cane, tobacco, soybeans, wheat

b/ cocoa, castor beans, agave, coffee

c/ rice, sweet potatoes, onions, beans, manioc, corn, bananas, oranges, pineapples, coconut, tomatoes, potatoes, grapes.

Concerning 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 is to 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.

Yield growth is just one component of the total production changes. Total production growth can be decomposed in the following components:

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

This decomposition was proposed by Delfin Netto (10), later by Pastore and Alves and Rizzieri (31) have also used it. Griliches (20) and Hayami and Ruttan (21) have called attention to the fact that it allows identification of the source of production growth. Table 7 shows each of the components in the case of Brazilian on agricultural production, for the

same period of 1940 to 1968.

Table 27 - Components of the rate of growth of agricultural production,
Brazil 1940-1968

Components	1940 to 1945	1945 to 1950	1950 to 1955	1955 to 1960	1960 to 1965	1965 to 1968
Increase in Production per area (%) $\frac{\Delta \frac{P}{A}}{P/A}$	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 Labor Force (%) $\frac{\Delta N}{N}$	1,55	1,55	3,53	3,53	1,36	1,36
Production Growth (%) Rate $\frac{\Delta P}{P}$	3,11	3,49	4,51	6,98	5,98	4,51

Source - Pastore, Alves and Rizzieri (31)

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

Attempting to prognosticate one would say that in the years to

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

With the emphasis that the country is putting on research and technical assistance, increases in productivity and in the total production can be expected.

Historically the decisive agricultural policies of the country have been adopted under critical pressures of the demand for food, mainly imposed by the large industrial centers: São Paulo and Rio de Janeiro; Smith (44). The situation is not different these days. The pressures from the large urban centers are considerable. Now there is more than just São Paulo and Rio de Janeiro, but these two centers exert today a stronger pressure than they ever did.

Brazil has started to develop a tradition as exporter of a few agricultural foods. 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 the decision has been made to make the sector as strong as possible. Brazilians know these days that their country will be of the size of its agriculture.

Future Prospects - Towards a More Aggressive Agricultural Policy

The data examined in the last section contain just the initial effects of the new policies for the agricultural sector. The changes in the policies were quite important and will be considered in the present section. It is regrettable that more recent data could not be used.

With a model 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 labor, 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 regained by the economy and the clear option to fight for external markets for agricultural products started to require increases of the supply of agricultural products beyond what could be obtained via the expansion of the agricultural frontier.

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

It is interesting to notice that the food demand crises continue to play an important role in the reformulation of the country's agricultural policies.

Some specific aspects of the new policy are discussed, at this point. Before looking at them the major guidelines will be described:

- a. The central objective is to promote production.
- b. The increase in production in the needed scale cannot be obtained only in function of the use of more land. It is necessary to have a self-sustained increase in productivity.
- c. The modernization of agriculture associated with improvements of the labor and capital markets will bring about better standards of living for the rural population without having to depend upon too-deep reforms.
- d. Productivity increases can be obtained through the use of instruments such as
 - minimum prices
 - rural credit
 - research and technical assistance programs.
- e. In regions where the land tenure structure would impede modernization, a limited agrarian reform would be established, with the central objectives of increasing productivity.

A brief description of the instruments to be used is offered.

(1) The incorporation of the Amazon and of the cerrado area. Two specific programs were defined here: The POLAMAZONIA and the POLOCENTRO.

The programs seek to expand the agricultural frontier in the

directions of the abundant fertile lands of the two regions. They intend also to stimulate a migratory flow the Northeast to these two regions.

The mainn points of the agricultural side of the programs are:

For the POLAMAZONIA (5)

- Agricultural and livestock research
- Technical Assistance
- Regularization of the land tenure process and colonization
- Marketing
- Natural renewable resources
- 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 programs
- Educational programs

About 295 million dollars have been allocated to the POLAMAZONIA program, to be used from 1975 through 1979.

For the POLOCENTRO (6) the major lines of action are:

- Agricultural and livestock research to be promoted via EMBRAPA'S units and the state research organization, universities, and others organizations in the area.

- Promotion of agricultural extension.
- Stimulus to forestation and reforestation with the help of fiscal incentives.
- Road construction (estradas vicinais).
- Rural eletrification.
- Implementation of a system to process, store and transport the agricultural products.
- Stimulate the regional production and marketing of lime and other inputs.
- Regularization of the land process.

About 250 million dollars have been allocated to be used in the POLOCENTRO in the 1975-1977 period. With other possible resources to be allocated to the region it is believed that about one billion additional dollars may be added to the program's budget for the same period (6).

Similar regional programs have been devised and are in the process of implementation. Among these, mention is made of the Pantanal Program of Mato Grosso, and the program for the geoeconomic region of Brasília. For the latter about US\$ 185 million dollars have been allocated to be used from 1975 through 1977.(7). The POLONORDESTE program will apply 850 million dollars in the period of 1975 through 1979.(8).

(2) Minimum Price Policy

The objectives of this policy are manifold. Traditionally it has been used in other countries as a means to stabilizing farmers' product prices and farmers' income. In the Brazilian case it would also have the

objective of accelerating the growth of production.

. It would also induce increases in the production of those commodities with favourable markets at the same time that it discriminates against those with unfavourable market situation.

. It also serves the purpose of channeling more production into the markets. Subsistence crops have a substantial part that is 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 put to support the minimum price program, Table 28. About 25 commodities are covered by the program. Among these, corn, cotton, soybean, rice, bean and groundnut are a few of the most important.

Table 28 - Amounts of money put into the price support program 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 alone, has tended to discriminate

against the agricultural sector. If for 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 labor, 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 their use more attractive to farmers. Once the farmers have learned to use them they continue to do it even if the subsidy is cut off, Smith (44) has found evidence of this effect in Brazil with fertilizers. In this case another objective of the credit program is to facilitate the modernization of the 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 the modern inputs, or cannot use them correctly. Here is where the technical assistance fits in.

The Brazilian experience has consisted of combining in a single program the agricultural credit and the technical assistance. This

experience has been working in Brazil since the late forties. Of the several adaptations which 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 sizeable responses.

This program has been responsible for the acceleration of the utilization of fertilizers. From 1967 to 1972 the fertilizer applications in the country went from 445.000 tons to 1.746.000 tons. About seventy per cent of these fertilizers are imported.

Table 29 shows the amounts of money gone into the agricultural credit programs after 1970. The figures are in Us dollars at the November 75 exchange rate.

Table 29 - Amounts of Agricultural Credit

Year	Amount (US 1.000)
1970	2.140
1971	2.615
1972	3.333
1973	4.908
1974	7.824

Source - Banco Central (4).

(4) Reformulation of the federal institution for agricultural and livestock research

Historically, the agricultural research capacity of the federal government has been rather deficient both quantitatively as well as qualitatively. With the overall change in agricultural policy it has been possible to make the reform that created EMBRAPA (The Brazilian Company for Agricultural and Livestock Research). It is attached to the Ministry of Agriculture and yet enjoys the flexibilities of private companies.

Basically the main characteristics of EMBRAPA can be summarised as follows (46):

- Major decisions of resource allocation with a commodity orientation.
- Concentration of research resources in the problems related to fewer products.
- Selection of the priority problems with the use of the systems approach.
- Resource allocation oriented by well-defined programming process.
- Aggressive human resource policy. Here one finds as least three distinguished lines of action:
 - Graduate training of the research staff leading toward formal degrees (MS and PhD).
 - One-the-job training programs for some researchers, but basically for the supporting personnel.

- An aggressive wage policy that has converted the research job option in one of those which compete for the researcher's talent in the job market.
- Foreign technology transfer is adopted in the EMBRAPA'S model also. Three basic approaches are exercised here.
 - The training of the researchers abroad
 - The importing of a few equipment items and other materials which embody new technologies.
 - The hiring of researchers in the international market.
- The private sector acts as a source of problems to be researched and also as demander and 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 well connected with the agricultural extension institutions.
- Administrative flexibility allows for searching for financial resources in different directions. 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 the 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 - Brazil

Year	US\$ (1000)
1970	10.600
1971	9.500
1972	8.800
1973	14.000
1974 <u>a/</u>	26.470
1975 <u>b/</u>	80.000
1976 <u>b/</u>	91.294

a/ EMBRAPA started to respond for the agricultural research in the country.

b/ Proposed budget.

(5) Export corridor

This program covers the majority of states in the center-south region. It intends to:

- a. build and equip harbours to lower the cost of embarking the agricultural goods.
- b. build roads for the transporting of agricultural production.
- c. build of silos and other storage facilities.
- d. provide and technical assistance to stimulate production of specific commodities such as: corn, cotton, beef, wood and cassava.

The center-south region has been the main focus of the policies due to its better conditions to compete in the international market.

The money allocated to this program gets distributed among others already mentioned.

On the consumer's side governmental policies related to the 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 oscillation in the food quantities available to the population. The agricultural producers also benefit from their activities.

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

The above-described are the benchmarks of the new agricultural policy of Brazil. The authors refrain from adding to the list other items.

Promotion of production through enlarging the agricultural frontier with increases in productivity is the main focus. 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 on its benefits. Larger farmers will benefit from the majority of the incentives. Meanwhile social security and other programs are being conceived and implemented to favour the agricultural workers.

- REFERENCES -

- (1) Alves, Eliseu Roberto de Andrade, "An Econometric Study of the Agricultural Labor Market in Brazil: A Test of Subsistence and Commercial Family Farm Models". Unpublished PhD Thesis, Lafayette, Indiana, Purdue University, June 1972.
- (2) Baer, Werner, Industrialization and Economic Development in Brazil, Homewood, Richard D. Irwing, 1965.
- (3) Baer, Werner and Maneschi, Andrea, "Import Substitution, Stagnation and Structural Change: An Interpretation of the Brazilian Case," Journal of Developing Areas, V, January 1971, pp. 177-192.
- (4) Banco Central do Brasil - Relatório Anual - Several issues.
- (5) Conselho de Desenvolvimento Econômico, "Polamazonia - Programa de Polos Agropecuários e Agro-minerais da Amazônia", Exposição de Motivos Interministerial nº 015/74, Setembro 1974 (folder).
- (6) Conselho de Desenvolvimento Econômico, "Polocentro - Programa de Desenvolvimento dos Cerrados", Exposição de Motivos Interministerial nº 002/75, Janeiro 1975 (folder)
- (7) Conselho de Desenvolvimento Econômico, "Programa Especial da Região Geoeconômica de Brasília", Exposição de Motivos Interministerial nº 004/75, Janeiro 1975 (folder).

- (8) Conselho de Desenvolvimento Econômico, "Polonordeste - Programa de Desenvolvimento de Áreas Integrantes do Nordeste," Exposição de Motivos Interministerial nº 269-B, Outubro 1974 (folder)
- (9) Conselho de Desenvolvimento Econômico, "Programa Especial do Norte Fluminense," Exposição de Motivos Interministerial nº 396-B, Dezembro 1974, (folder).
- (10) Delfim Netto, A. et al., "Agricultura e Desenvolvimento Econômico do Brasil", Estudos ANPES nº 5 (Versão Preliminar) São Paulo, 1965.
- (11) Ellis, Howard (ed) - The Economy of Brazil, Berkeley, University of California Press, 1969.
- (12) Fishlow, A. "Origens e Consequências da Substituição de Importações no Brasil", Estudos Econômicos, Vol. 2, nº 6, 1972.
- (13) Fundação Getúlio Vargas, Projections of Supply, and Demand for Agricultural Products of Brazil Through 1975, Rio de Janeiro, 1968, 204 pages.
- (14) Fundação Getúlio Vargas, Food Consumption in Brazil, Family Budgets Survey in the Early 1960's, Rio de Janeiro, Brazil, 1970, 283 pages.
- (15) Fundação Getúlio Vargas, Brasil, Projeções de Demanda e da Oferta de Produtos Agrícolas, 1975 a 1980 (Versão Preliminar), Rio de Janeiro, Março 1975, 119 pages.

- (16) Fundação IBGE, Censo Demográfico-Brasil, VIII Recenseamento Geral 1970, Série Nacional, Volume 1.
- (17) Fundação IBGE, Anuário Estatístico do Brasil, Several Issues.
- (18) Graham, Douglas H., "Divergent and Convergent Regional Economic Growth and Internal Migration in Brazil, 1940-1960"; Economic Development Cultural Change, Vol. 18, nº 3, April 1970.
- (19) Graham, Douglas H. and Hollanda Filho, Sérgio Buarque de, Migration, Regional and Urban Growth and Development in Brazil: A Selective Analysis of the Hystorical Record - 1872/1970, Vol. 1, 1971,
- (20) Griliches, Zvi, "Sources of Measured Productivity Growth: United States Agriculture", Journal of Political Economy, August 1963.
- (21) Hayami, Yugiro and Ruttan, Vernon, Agricultural Development: An International Perspective, The John Hopkins Press, Baltimore, 1971.
- (22) Huffman, Wallace E., "Decision Making: The Role of Education" American Journal of Agricultural Economics, Vol. 56, nº 1, February 1974, pp.85-97.
- (23) Kusnets, Simon, Thomas, Dorothy, et al., Population Redistribution and Economic Growth - United States, 1870-1950, 3 Volumes, Philadelphia, American Phylosophical Society, 1957, 1960, 1964.

- (24) Langoni, Carlos Geraldo, Distribuição da Renda e Desenvolvimento Econômico do Brasil, Rio de Janeiro, Editora Expressão e Cultura, 1973, 315 pages.
- (25) Langoni, Carlos Geraldo, A Economia de Transformação - Coleção Brasil em Questão, Rio de Janeiro, Livraria José Olímpio Editora, 1975, 213 pages.
- (26) Mata, Milton da, Carvalho E. W. de, Castro e Silva M. T. I. I. de, "Migrações Internas no Brasil", Aspectos Econômicos e Demográficos, IPEA, Coleção de Relatórios nº 19, 217 pages.
- (27) Mazundar, Dipak, "The Theory of Urban Unemployment in Less Developed Countries" Development Economics Department, The World Bank, Washington, D.C., May 1973.
- (28) Mendonça Barros, J. R. "Desenvolvimento da Agricultura e Exportação de Produtos Primários não Tradicionais", IPE, Série Monográfica, nº 4, 1973.
- (29) Mendonça Barros, J. R., "A Evolução da Agricultura Brasileira", IPE, Trabalho para Discussão, nº 17, (mimeo).
- (30) Pastore, Affonso Celso, A Resposta da Produção Agrícola aos Preços no Brasil, APEC, São Paulo, 1973.
- (31) Pastore, A. C., Alves, E. R. de Andrade and Rizzieri, J., "Inovação Induzida e os Limites da Modernização na Agricultura Brasileira" in Alternativas de Desenvolvimento para Grupos de Baixa Renda na Agricultura Brasileira, IPE-USP, São Paulo, pages 185-240.

- (32) Ravenstein, E. G., "The Laws of Migration", Journal of the Royal Statistical Society, Vol. 48, nº 2, June 1888, p. 167-227.
- (33) Ravenstein, E. G., "The Laws of Migration", Journal of the Royal Statistical Society, Vol. 52, nº 2, June 1889, p. 198-199.
- (34) Sahota, Gian, "An Economic Analysis of Internal Migration in Brazil", J.P.E. LXXVI, nº 2, March 1968, p. 218-245.
- (35) Sanders, J. H. "Mechanization and Employment in Brazilian Agriculture 1950-1974", Unpublished PhD Thesis, Minesota, Minneapolis, University of Minesota, 1973.
- (36) Saylor, R. G., "Procura e Oferta de Mão de Obra Agrícola no Estado de São Paulo, Agricultura em São Paulo, Ano XXI, Tomo III (1974), p. 129-142.
- (37) Schuh, G. E. (in collaboration with Alves, Eliseu R. de Andrade), The Agricultural Development of Brazil, New York, Praeger Publishers Inc. 1970.
- (38) Schuh, G. E., "Effects of Some General Economic Policies on Agricultural Development", American Journal of Agricultural Economics, Vol. L, nº 5, December 1968, p. 1283-1294.
- (39) Schuh, G. E., "Modernization of Brazilian Agriculture" in Alternativas de Desenvolvimento para Grupos de Baixa Renda na Agricultura Brasileira, Vol. II, 1974, p. 1-119.

- (48) Todaro, Michael and Harris, J. P., "Migration Unemployment and Development: A Two Sector Analyses", AER, Vol. 60, n° 1, March 1970, p.
- (49) United Nations, Demographic Yearbook, New York, 1961.
- (50) United Nations, Demographic Yearbook, New York, 1962.
- (51) Whitaker, Morris D., "Labor Absorption in Brazil: An Analysis of the Industrial Sector", Unpublished PhD Thesis, West Lafayette, Purdue University 1970.