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THE FERTILIZER INDUSTRY OF BRAZIL[1/]

by

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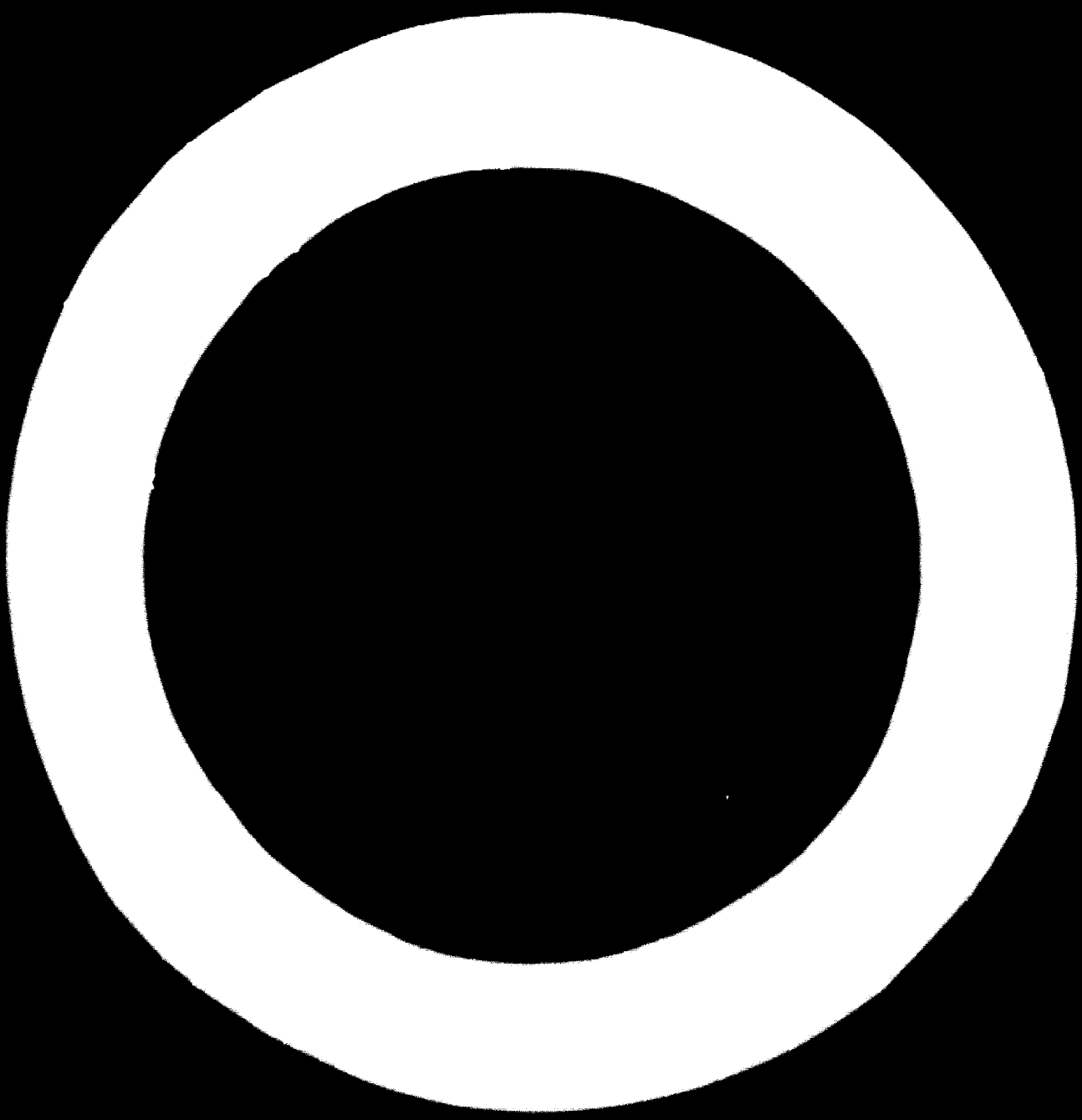

I - INTRODUCTION

1. Population and Income

The preliminary data from the 1970 census show that Brazil's population is 92,5 million people, 42 million of these living in rural areas. The distribution of this population over the 8,5 million km^2 is rather irregular. Figure 1 shows demographic density obtained from dividing the population figure of each state by its area. The two most densely populated areas are the Northeast ("woods zone") and the Center-South (São Paulo, Rio de Janeiro, and Guanabara states). The gross national product per capita is estimated to be US$ 440 at present. The irregularity in the distribution of income by territory is even greater than that of the population. Figure 2 shows the gross product per capita for each state.

This income distribution can be explained by pointing out that industrialization has concentrated in the Center-South region, especially the state of São Paulo, where over 60% of the industrial production of the country comes from: and that the seat of the Federal Government had been Guanabara until recently. The reasonable income of the other states in these two regions (Center-South and South) of the country can be explained by the fact that the latter are the agricultural suppliers of the two states named above.

The much higher income of the two non-agricultural sectors is what raises the gross income to the figures given above. At present, the gross national product per capita of agriculture does not surpass the amount o US$ 140.

A third factor to be considered in analyzing the national problem of agriculture is that the vastness of territory leads to high costs in internal transference of production (see scale in figures 1 and 2).

2. Agriculture

The factors previously mentioned bring about the existence of two extreme types of agriculture in present-day Brazil; modern agriculture and subsistence agriculture.

Subsistence agriculture is found all over the country. It guarantees the survival of a considerable part of the 42 million rural inhabitants, and beyond this, makes possible the supplying of towns far from the industrial core of the country.

The net product from the subsistence agriculture can compete with modern agriculture, quite often with hand cup due not only to the fact that it is a marginal production as it were but also to the differential cost of transportation. Evidently, such a kind of agriculture owes its existence to the condition of under employment in countries in the process of development like Brazil. This subsistence agriculture is usually led in small tracts of land, without any use of fertilizers, mechanization, or safeguards. The land is not, as a rule, owned leased by farmers. Modern agriculture is found in the Northeast ("woods zone") and in the Center-South and the South. Production is intended for export, for use as industrial raw material, or for supplying the population of the industrial region. This kind of agriculture is usually found in broad acres, and uses machines, fertilizers, safeguards, selected seeds, and advanced agricultural methods. Because of the capacity of the overseers of these properties they are the ones which really benefit from Government aid to agriculture, whether minimum prices, credit, storage facilities or others. A third type of agriculture has been having a speedy development lately. This type-which may be called "intermediate agriculture" is concentrated in the Center-South and South. It consists of small tracts located near consumer areas, thus gaining advantage in the differential of transportation. It is maintained by owners with a reasonable schooling, unable to raise large capitals needed to buy large properties and machines, but who use fertilizers, selected seeds, safeguards, and fair agricultural technics. The main supporters of the development of this agriculture are firms dealing with fertilizers which have been employing more and more refined methods in their activity.

3. Fertilizers - Use per crop

The existence of the modern and intermediate agricultures in only a few parts of the country causes the consumption of fertilizers to concentrate in them. Although the national consumption of fertilizers is distributed in three regions for statistical purposes, the concentration is higher that it seems, as seem below:

Northeast - including all states North of Bahia, and Bahia itself. Around 90% of the consumption is in the culture of sugar cane, located in the "woods zone" of the states of Pernambuco and Alagoas the remainder is used in the culture of cotton, tobacco, pineapple, cacao, and others, in insignificant quantities as to the cultivated area.

Center-South - mainly in the states of São Paulo, Paraná, and in Southern Minas Gerais (totaling 85% of the regional consumption). Cultures of coffee, corn, cotton, sugar cane, rice, wheat, and potatoes.

South - mainly in the state of Rio Grande do Sul, in the cultures of wheat, soybeans, corn, tabacco and rice.

Tables I, II, and III, showing data taken from recent work, gives a reasonable image of the distribution of consumption for each culture (1).

II - EVOLUTION OF THE DEMAND FOR FERTILIZERS

As can be seen on table IV, the consumption of fertilizers in Brazil until 1966 showed disencourging rates of growth . Among other causes, this situation can be explained by the fact that agriculture had been used until that year as the main source of subsidies for industrial development and/or basic factor for reducing the increase of inflation.

From 1966 to 1970 there was a considerable increase in the consumption of fertilizers. This rate of increase has continued until the present year and every thing shows that the rate of increase will maintain its high level during this decade. The reason that led to this change are of several kinds, among which we can cite:

1. Governmental

1.1 - Minimum prices for agricultural produces fixation at satisfactory level and effective purchase by government agencies in case the farmer is interested. In the production of wheat, to a minor extent, in the production of rice the policy of minimum prices has played a fundamental role. Minimum prices are fixed annually. One alteration to be considered would be the triannual or quinquennial fixation, with monetary adjustment, in a way to permit a more rational application of investments in each culture.

1.2 - Coverage of financial costs (interests and commission)by the government to purchase fertilizers. To this end FUNFERTIL was created with government resources. The efficiency of this system was guaranteed in using not only government banks but also private banking systems. Recently, the government extingui shed FUNFERTIL and set up FUNDAG, beginning to finance not only the purchase of fertilizers but also the other requirements of agriculture and cattle-raising: seeds, limestone, safeguards, veterinary products, etc. The subsidies provided by FUNDAG, however, cover only 60% of the financial tasks, as opposed to FUNFERTIL'S 100%.

1.3 - Rural Credit - abundant money (conceded financing superior to US$ 1,300,000,000 in one year period) rationally applied by the use of a Central organism for planning (Gerência de Crédito Agricola e Industrial do Banco Central do Brasil)and a decentralized system for execution (federal and states banks, private banks and co-operative associations) (3).

1.4 - Research: - development of a great number of research projects aiming to obtain better seeds, which in turn bring greater yield in the use of fertilizers. These research projects have been developed by entirely governmental agencies as well as by association with the agricultural producers and firms representing interests of dealers.

1.5 - Storage and distribution: - Construction of large storage capacity, construction and paving of highways, repair and reequipment for rairoads, betterment of ports, and improvement of every thing related to the distribution of production.

2. Diverses

2.1 - Retaking of industrial development to levels around 10% raising the purchasing power of urban populations.

2.2 - Substantial reduction in the prices of fertilizers in the international market (figure 3). This reduction has been entirely transferred to national agriculture through import free from taxes.

2.3 - Dynamization and refinement of the activities of firms producing and distributing fertilizers, which are nowadays the main outlet for the spread of modern agricultural methods. Just as example, we have the FAO (United Nations) /ABCAR (Brazilian governmente) /ANDA (Fertilizer Companies Association) Project,with more than 1,400 demonstration centers for a better use of fertilizers.

III - ESTIMATE OF THE FERTILIZER DEMAND IN THE DECADE OF THE '70'S

In 1980, Brazil should have 117 million inhabitants, with a rural population of less than the present (41 million). This populational growth linked to an increase in the gross per capita income, which should not be less than 50%, will bring about an increase

in the consumption of agricultural produc which can be satisfied by a high increase in the use of fertilizers.

Against the positive factors previously mentioned, there are only a few negative factors to consider:

1 st. Until 1975, Brazil should have finished the process of substituting the import of wheat. After reaching self sufficiency the rate of growth in the production of wheat should go down to the level of the national market;

2 rd. The increasing use of fertilizers all over the world may bring about overproduction of agricultural goods in the market which has purchasing power. Thes may cause a reduction in the profit of the Brazilian agricultural export market;

3 rd. Maintenance and expansion of a national fertilizer industry requires customs duty thus eliminating the purchase of fertilizer at margin prices by national agriculture.

Among the several estimates for the national consumption in the decade of the '70's, the one which has been most widely accepted is represented in Table VI. This estimate was prepared by technicians from the Tennessee Valley Authority - TVA - who visited Brazil in 1969. The effective data of the last two years show that consumption may be higher that foreseen in the TVA prediction, but will not be far from the same.

IV - FERTILIZER INDUSTRY IN BRAZIL

To satisfy its own demand of fertilizers, Brazil has recurred mainly to import. The little development of this industrial area was caused by the low profitableness, which in turn was caused by the high cost of raw materials (usually imported), by the small size for existing installations, and mainly by competition not rindered by custom taxes with the margin production of modern and large plants

the world over.

Table VII shows the operating capacity of the national fertilizer industry.

Tables VIII, IX, and X show the contribution of the national fertilizer industry in the supplying of demand. Up to the present, there has been no production of potassium in Brazilian territory (2).

In addition to the industries cited in Table VII, the national agriculture is supplied by a group of mixers and combiners, made up of approximately 10 units in the northeast, 64 units in the Central South (9 being granulators) and 15 units in the south (2 granulators) through which about 70% of the fertilizers consumed by the national agriculture pass (2).

V - FERTILIZER INDUSTRY IN BRAZIL - FUTURE

Several factors have recently changed the situation exposed in the previous chapter. Among these, the most important are the following:

1. Governmental steps

1.1 - Application of customs duties to imported fertilizers, which are adequate to the preservation and development of the national industry.

1.2 - Entailment of the fertilizer import license to the acquisition of the national production.

1.3 - Incentives for investimens (covering all chemical industry).

1.3.1 - Exemption from import tax, and the tax over industrial products of equipment imported that have not a national correspondent.

1.3.2 - Credit to investors in the amount of the tax over industrial products relating to national equipment purchased.

1.3.3 - Provision of financing by official credit agencies, with long term and penury term, covering up to 50% of the financial resources needed for the interprice.

1.3.4 - Promptness in registering foreign financing or investment, the norms dictated by authorities being obeyed.

1.3.5 - Application of accelerated depreciation rates for income tax calculation purposes.

2. Raw materials:

2.1 - Nitrogenous products.

Increasing availability of natural gas in the northeast (Bahia and Sergipe). Exemption from taxes of imported naphtha intended for use as raw material of petrochemistry in general;

2.2 - Phosphate products:

Success in the research conducted by BNDE (National Bank for Economic Development) and others for concentrating the Araxá (Minas Gerais, Center-South) ore, whose reserves are estimated to be 100 million tons. This ore has an average proportion of 22% P_2O_5 , the only negative quality being the high content of iron (20% Fe_2O_3) and barytes; equating of the utilization of the supply of apatitic carbonites from Jacupiranga (100 million tons, with an overage content of 5% of P_2O_5) by concentrating the apatite and simultanearesly

using calcite in the production of cement; possibility of using low freight rates in the import of phosphate ores by using the return freight which comes from the national export of iron ore in ships of large tonnage.

2.3 - Potassium.

Discovery of the reserves in Sergipe (Northeast) by PETROBRAS. The research conducted by government agencies has verified up to now the existence of 450 million tons, of sylvinite and 6 billion tons of carnalite ($MgCl_2.KCl.6H_2O$).

2.4 - In short, from the supplies iten above and depending on the completion of research, especially in the case of the Araxá (phosphate) and Sergipe (potassium) reserves, the following production of raw materials complementary to the present is expected:

A - Natural gas: A minimum of one million cubic meters daily.

B - Phosphates: A minimum of 75,000 tons p.a. of P_2O_5 (Production of Jacupiranga) and a maximum of 150,000 tons p.a. of P_2O_5 (production of Jacupiranga and start of the Araxá production).

C - Potassium: Self - Sufficient and even exceeding for export, in case the problem of the production of KCl from Sergipe is equated. The Government intends to exploit these resources in their initial stage, in the rate of 500,000 tons p.a. of KCl.
We cannot conclude without mentioning the problem of acid consumption in making the phosphate soluble. A project for utilization of pyrites obtained as a by product of the treatment of national coal is under study (Santa Catarina, South). This project aims at a production of 300,000 tons p.a. of sulfuric acid. The continuing fall of the international price of sulfur, is causing dificulties in its evaluation.

Table XI presents the fertilizer projects already approved by government agencies and in an advance stage of consideration of workability. It can be seen in this table, the decision to produce fertilizers with high nutrient.

One of the principal obstacle to be overcome to make northeasthern production projects more economically desirable is the fact that transference costs are overburdened by port tariffs with a value much higher than those really due for services done. This is so in the production of nitrogenous and potassium fertilizers, such as ammonia, urea, and KCl. This obstacle, which has influence negatively national flow by maritime channels of solid and liquid bulks (except those whose expenses are covered by special funds) has deserved consideration of government authorities, its removal being expected soon.

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(1) Belotti, P.V. - The future of the Fertilizer Industry in Brazil - UNIDO.

(2) Cardoso, F.P. - Fertilizers in Brazil - Market and Production - ANDA.

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(4) IBGE - 1970 Demographic Census - Preliminary Data.

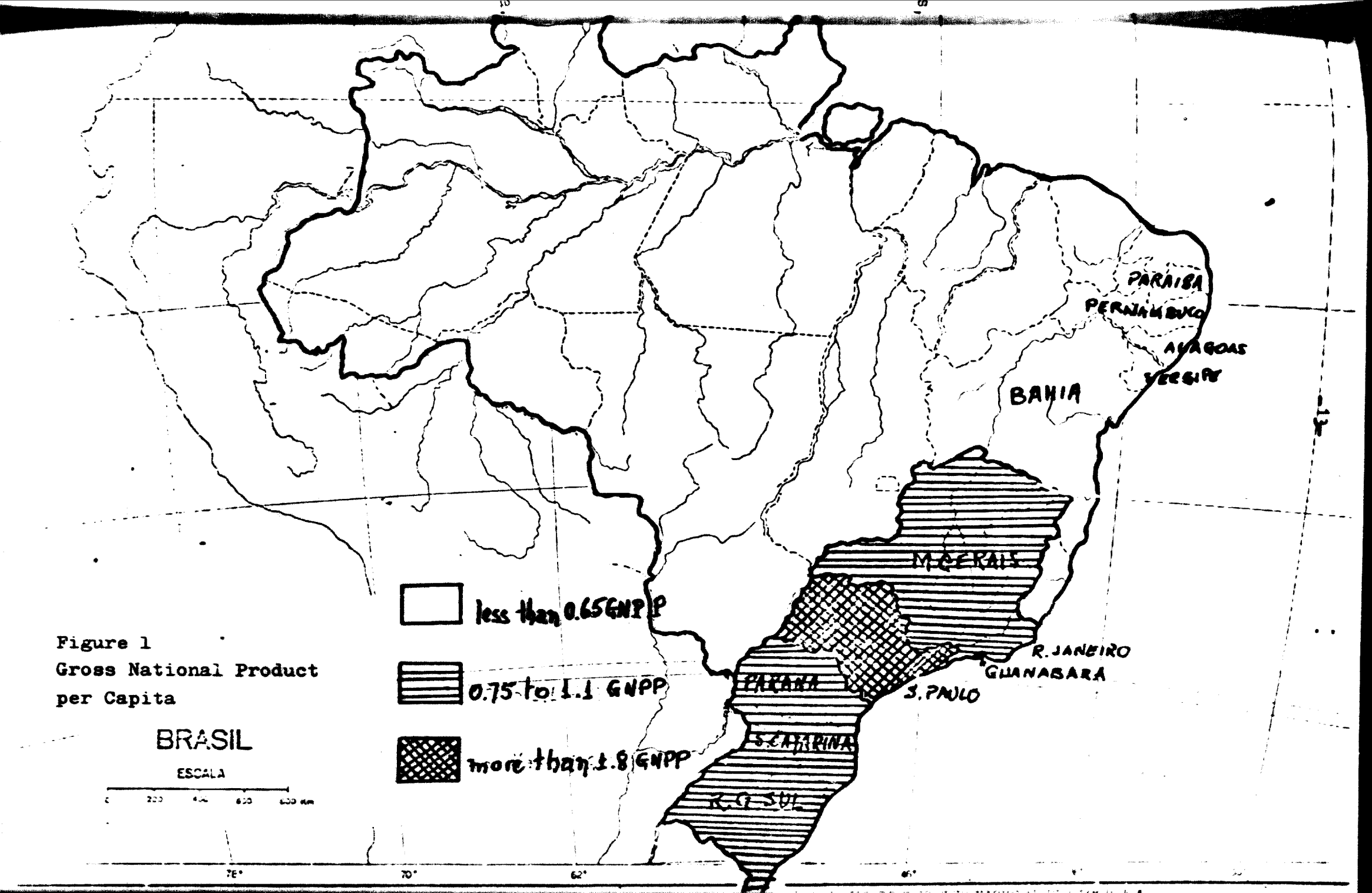


Figure 1
Gross National Product
per Capita

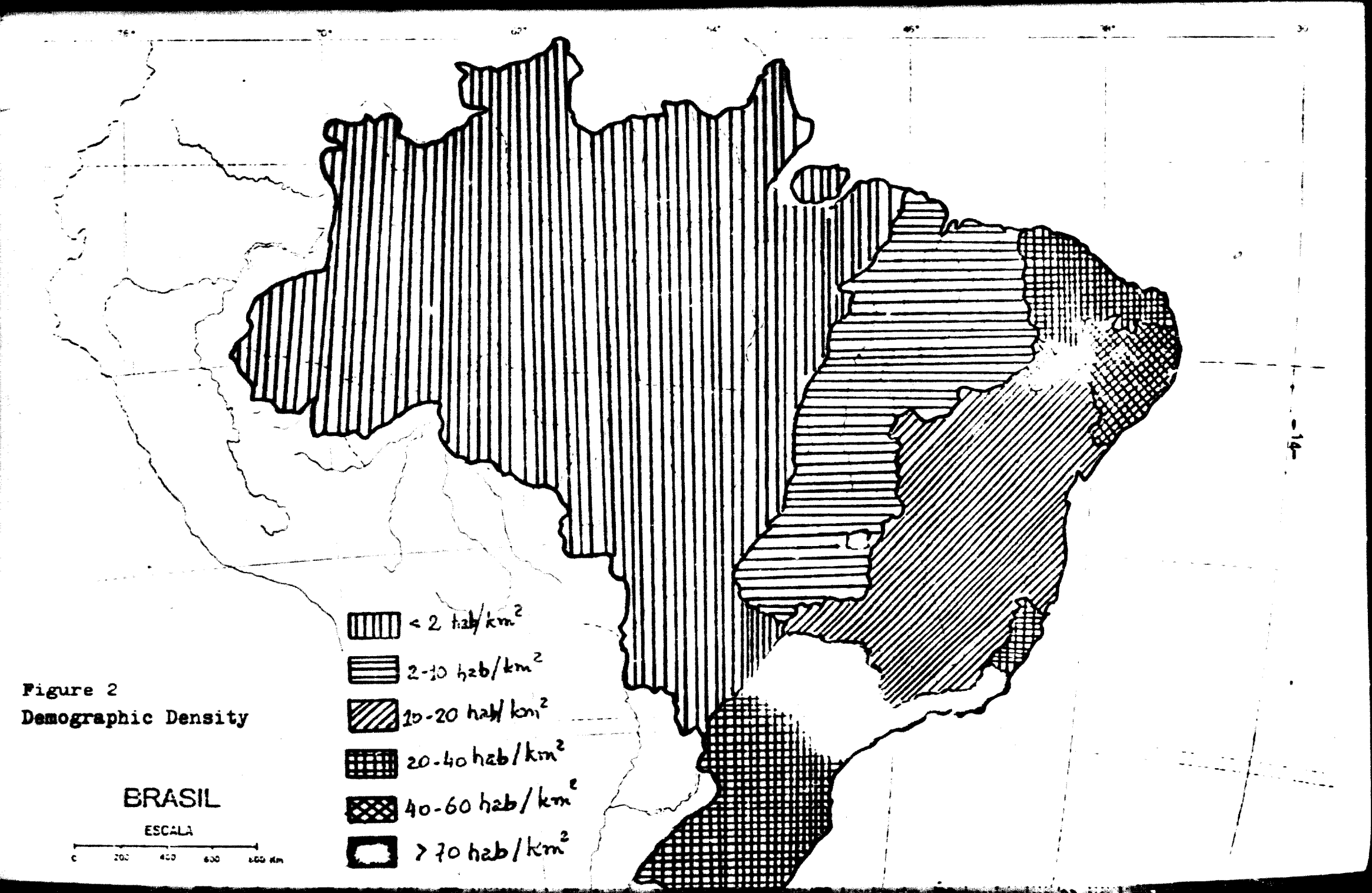


Figure 2
Demographic Density

FIGURE-3
CIF PRICE OF IMPORTED FERTILIZERS

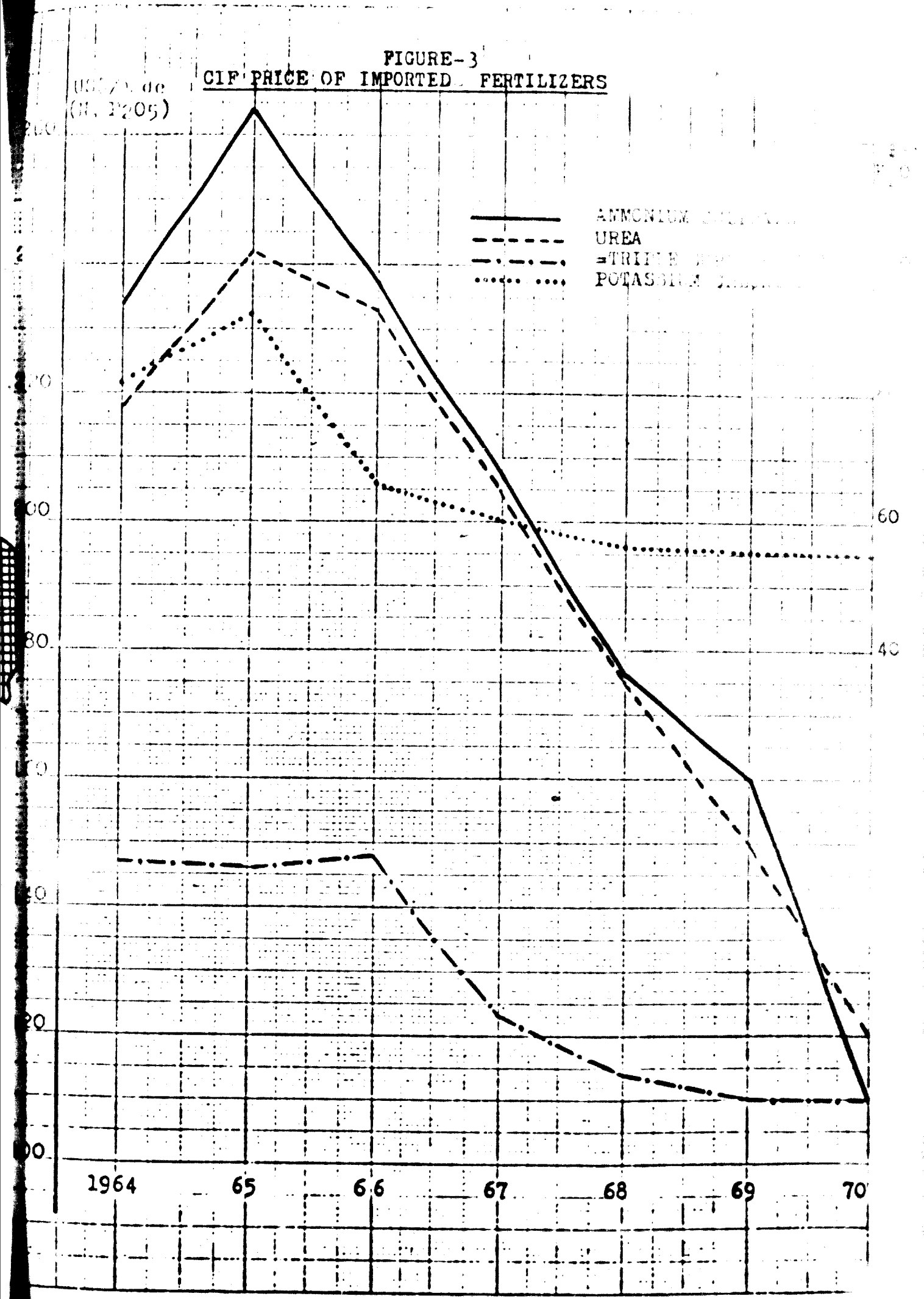


TABLE I

DISTRIBUTION OF NPK CONSUMPTION

CROPS	REGIONS		
	NORTH EAST	CENTER-SOUTH	SOUTH
Coffee	-	24 %	-
Corn	-	12 %	-
Sugar cane	90 %	21 %	-
Wheat & Soybean	-	-	78 %
Rice	-	9 %	15 %
Cotton	-	13 %	-
Potatoes	-	9 %	-
Others	10 %	12 %	7 %

TABLE II

CULTIVATED AREAS (1,000 hectares)

CROPS	NORTH EAST (1)		CENTER-SOUTH(2)		SOUTH (3)	
	Fertilized area	Total	Fertilized area	Total	Fertilized area	Total
Cotton	-	448	636	1,212	-	-
Rice	-	17	250	1,010	191	383
Potatoes	-	-	88	88	-	61
Coffee	-	-	1,000	2,000	-	-
Sugar Cane	146	365	300	756	-	53
Black beans	-	372	28	285	27	274
Tabacco	-	14	-	-	115	115
Manioc	-	185	5	104	13	274
Maize	-	443	1,800	3,600	500	1,670
Wheat & Soybean	-	-	250	583	757	1,314
	146	1,844	4,357	9,638	1,603	4,144

(1) - Estimate for year 1968

(2) - Survey prepared by "ANDA" - T.13/70 - refers to year 1969

(3) - Estimate for year 1968.

T A B L E III

NUTRIENTS CONSUMPTION IN

AREAS CITED IN TABLE II

REGIONS	Consumption of nutrients (ton)	Fertilized area (1000 ha)	Cultivated area (1000 ha)	Consumption of nutrients kg/hectare	
				Fertilized area	Cultivated area
North-East	34,000	146	2,581	232	13
Center-South	400,000	4,357	9,638	92	42
South	110,000	1,603	4,144	68	27
B R A Z I L	544,000	6,106	16,363	89	33

T A B L E IV

1) DEVELOPMENT OF APPARENT CONSUMPTION - TONNAGE OF NUTRIENTS

YEAR	N	P_2O_5	K_2O	TOTAL
1959	45,025	118,851	57,476	221,352
1960	64,735	127,693	106,306	298,734
1961	56,810	118,363	73,004	247,177
1962	50,909	117,519	68,447	236,875
1963	65,212	156,818	92,015	314,045
1964	50,808	135,052	69,564	255,424
1965	70,569	120,097	99,732	290,398
1966	71,134	116,648	93,337	281,119
1967	103,382	204,606	136,937	444,925
1968	144,320	273,094	184,295	601,705
1969	164,430	265,665	200,290	630,385
1970 (1)	235,121	403,190	272,716	911,027

Source: ANDA

T A B L E V

2) DISTRIBUTION OF APPARENT CONSUMPTION BY REGIONS

TON OF NUTRIENTS (N, P_2O_5, K_2O)

YEAR	NORTH/NORTH EAST	CENTER-SOUTH	SOUTH	T O T A L
1964	22,607	190,029	42,788	255,424
1965	21,164	226,268	42,966	290,398
1966	28,129	215,474	37,518	281,119
1967	41,559	321,995	85,372	444,925
1968	38,428	439,883	123,401	601,709
1969	52,462	426,762	151,161	630,385
1970(1)	60,500	584,055	266,472	911,027

(1) Preliminary

Source: ANDA

T A B L E VI

FORECAST OF FERTILIZER CONSUMPTION IN BRAZIL

(1000 ton)

YEAR	N	P_2O_5	K_2O	TOTAL	INCREASE (%)
1968	144	273	184	601	-
1969	-	-	-	660	10.0
1970	222	351	223	796	20.4
1971	-	-	-	934	17.5
1972	-	-	-	1,077	15.3
1973	-	-	-	1,224	13.7
1974	-	-	-	1,376	12.4
1975	515	646	371	1,553	11.3
1976	-	-	-	1,694	10.5
1977	-	-	-	1,860	9.8
1978	-	-	-	2,031	9.2
1979	-	-	-	2,207	8.7
1980	942	931	514	2,387	8.2

Source: T.V.A. forecast.

T A B L E VII

BRAZILIAN FERTILIZER INDUSTRY AND MINING CAPACITIES

LOCATION REGION/PLACE	PRODUCTION LINE	RAW MATERIAL	INSTALLED NOMINAL CAPACITIES - 1000 t/y N	P_2O_5
CENTER-SOUTH				
PIAÇAGUERA - SP	Ammonia Nitric Acid Ammonium Nitrate Sulphuric Acid Phosphoric Acid D.A.P N P K formulations	Naphtha Sulphur Phosphate Rock Pottassium Chloride	110	75
CUBATÃO - SP	Ammonia Nitric Acid Ammonium Nitrate Lime - A. Nitrate	Refinery Gas Lime	28	
V. REDONDA - RJ	Ammonium Sulphate	Coal Coking Gas	2,1	
PIAÇAGUERA - SP	Ammonium Sulphate	Coal Coking Gas	1,8	
IPATINGA - MG	Ammonium Sulphate	Coal Coking Gas	1,4	
UTINGA - SP	Single Superphosphate Triple Superphosphate Sulphuric Acid	Phosphate Rock Sulphur		44,4
CUBATÃO - SP	Sulphuric Acid Single Superphosphate Triple Superphosphate	Phosphate Rock Sulphur Phosphoric Acid		39
CAPUAVA - SP	Sulphuric Acid Single Superphosphate	Phosphate Rock Sulphur		24
CAPUAVA - SP	Sulphuric Acid Single Superphosphate	Phosphate Rock Sulphur		18
V.PAULISTA - SP	Sulphuric Acid Single Superhosphate	Sulphur Phosphate Rock		11
P. CALDAS - MG	Thermophosphate	Apatite Magnesium Slurry		3,8
IPATINGA - MG	Sigle Superhosphate Sulphuric Acid	Phosphate Rock Sulphur		2,0

T A B L E VII

BRAZILIAN FERTILIZER INDUSTRY AND MINING CAPACITIES

CONTINUATION

LOCATION REGION/PLACE	PRODUCTION LINE	RAW MATERIAL	INSTALED NUTRIENT CAPACITIES - 1000 t/y	
			N	P_2O_5
	Not Determined	Not Determined		0,9
	Not Determined	Not Determined		0,3
JACUPIRANGA - SP	Phosphate Rock	Apatite		51
SERROTE - SP	Phosphate Rock	Apatite		8,7
NORTH EAST				
CAMAÇARI	Ammonia Urea	Natural Gas	40	
RECIFE - PE	Single Superphosphate Sulphuric Acid	Phosphate Rock Sulphur		3,0
IGARASSU - PE	Bicalcium phosphate			1,2
SOUTH				
P. ALEGRE - RGS	Single Superphosphate Sulphuric Acid	Phosphate Rock Sulphur		16
P. ALEGRE - RGS	Single Superphosphate Sulphuric Acid	Phosphate Rock Sulhpur		8

TABLE VIII - BRAZILIAN PRODUCTION OF NITROGENOUS FERTILIZERS
(TONS OF NITROGEN)

	1958/62	1963/67	1968/69	1970
Ammonium Nitrate - Lime 20,5% N	11 314	7 553	6 050	5 387
Ammonium Sulphate 20%	1 533	2 236	1 825	1 397
Ammonium Nitrate 33,5%	-	-	-	4 723
DAP - 18 - 46 - 0	-	-	-	8 898
TOTAL	12 847	9 789	7 875	20 405
% national consumption	2,4%	13,5%	5,1%	8,7% (1)

TABLE IX - BRAZILIAN PRODUCTION OF PHOSPHATE ROCK
(TONS OF P_2O_5)

	1958/62	1963/67	1968/69	1970 (1)
North East	35 264	23 980	857	-
Center South	25 898	24 531	45 351	59 040
TOTAL	61 162	48 511	46 208	59 040
% national consumption	48%	33%	17%	15%

TABLE X - BRAZILIAN PRODUCTION OF SOLUBLE PHOSPHATE
(TONS OF P_2O_5)

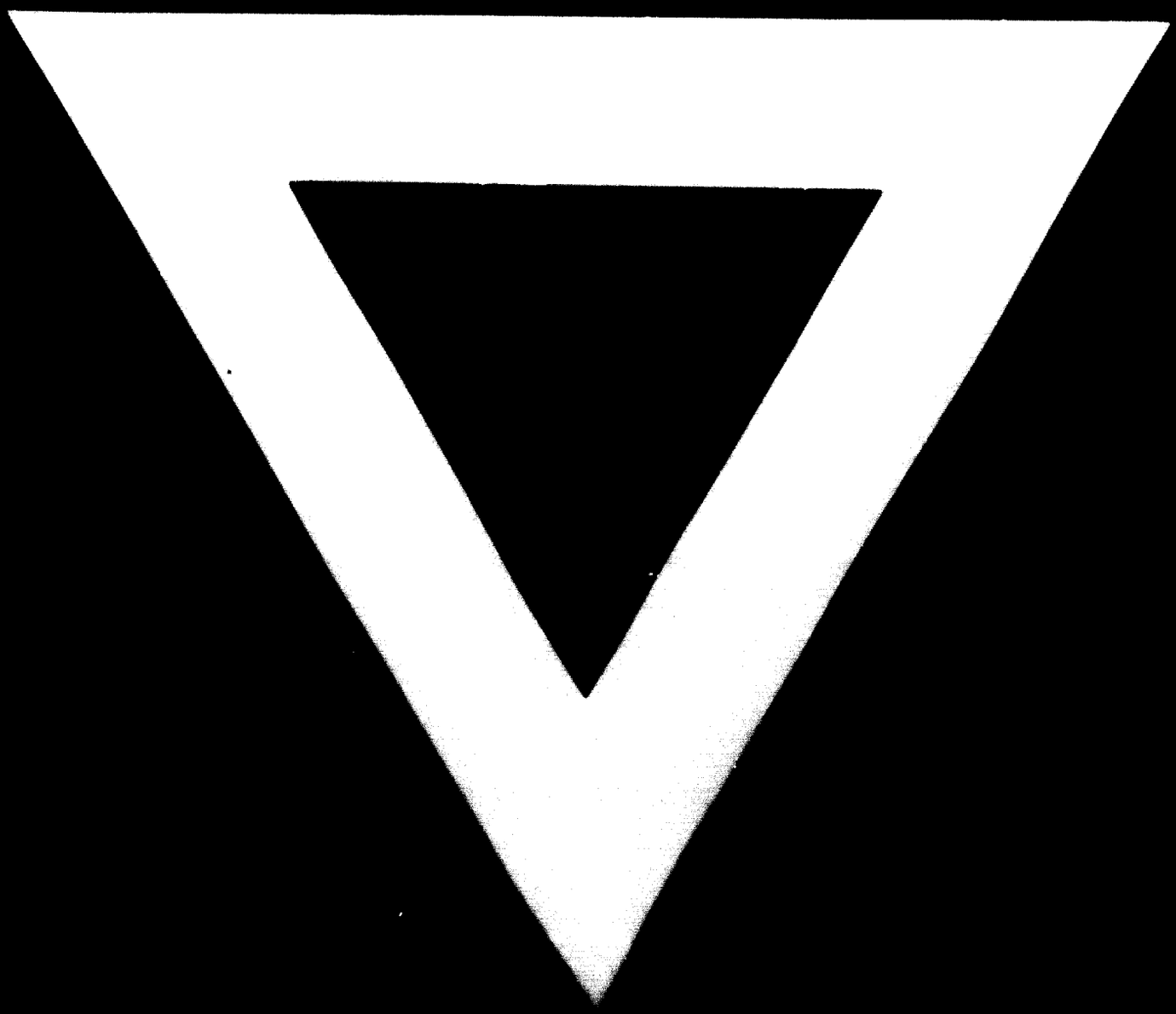
		1958/62	1963/67	1968/69	1970 (1)
Superphosphate	30%	-	-	14 850	15 600
Superphosphate	20%	40 955	70 497	94 465	117 332
Bicalc.phosphate	30%	-	390	600	771
Thermophosphate	20%	-	100	3 959	3 960
DAP	46%	-	-	-	22 741
TOTAL		40 955	70 987	113 874	160 404
% national consumption		54%	65%	50,5%	44,5%

Source: Sindicato da Indústria de Adubos e Colas do Estado de São Paulo
(1) Preliminary

TABLE XI

BRAZILIAN FERTILIZER INDUSTRY - NEW FACTORIES

REGION/PLACE	PRODUCTION LINE	RAW MATERIAL	CAPACITIES-1000 t/y N	P_2O_5	Predicted Start-up
SOUTH/ R.GRANDE - RGS	Triple-superphosphate DAP NPK formulations	Ammonia Sulphuric Acid Phosphoric Acid Phosphate Rock Potassium Chloride Potassium Sulphate	30	81	1972
SOUTH/ R.GRANDE - RGS	Single Superphosphate Triple Superphosphate DAP NPK formulations	Ammonia Sulphuric Acid Phosphoric Acid Phosphate Rock Potassium Chloride Potassium Sulphate Urea	29	100	1972
CENTER-SOUTH/ JACUPIRANGA-SP	Sulphuric Acid Phosphoric Acid Triple Superphosphate MAP	Phosphate Rock Sulphur Ammonia	14	62	1974
CENTER-SOUTH/ CUBATÃO - SP	Sulphuric Acid Phosphoric Acid Single Superphosphate MAP DAP Sodium Tripolyphosphate	Phosphate Rock Sulphur Ammonia	27	100	1975
CENTER-SOUTH/ ARAXÁ - MG	Phosphoric Acid Sulphuric Acid	Phosphate Rock Sulphur		upto 150	1975 ?
NORTH EAST CAMAÇARI-BA	Ammonia Urea ?	Natural Gas	246		1975
NORTH EAST RECIFE - PE ?	Triple Superphosphate MAP DAP NPK formulation	Phosphoric Acid Ammonia Potassium Chloride	15	35	1975



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