

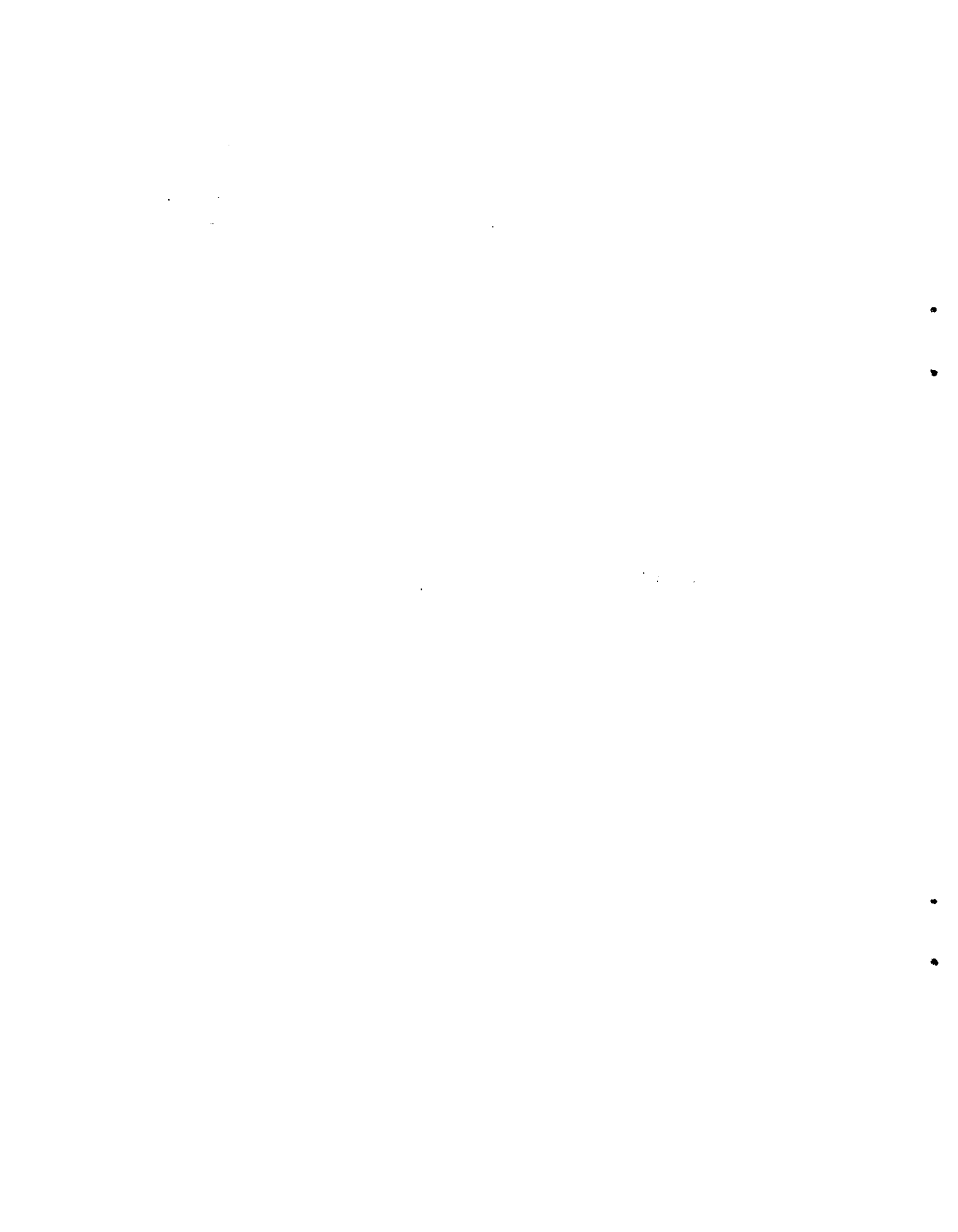
Distr.  
RESTRICTED  
E/CEPAL/R.324  
8 September 1982  
ENGLISH  
ORIGINAL: SPANISH

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C E P A L  
Economic Commission for Latin America

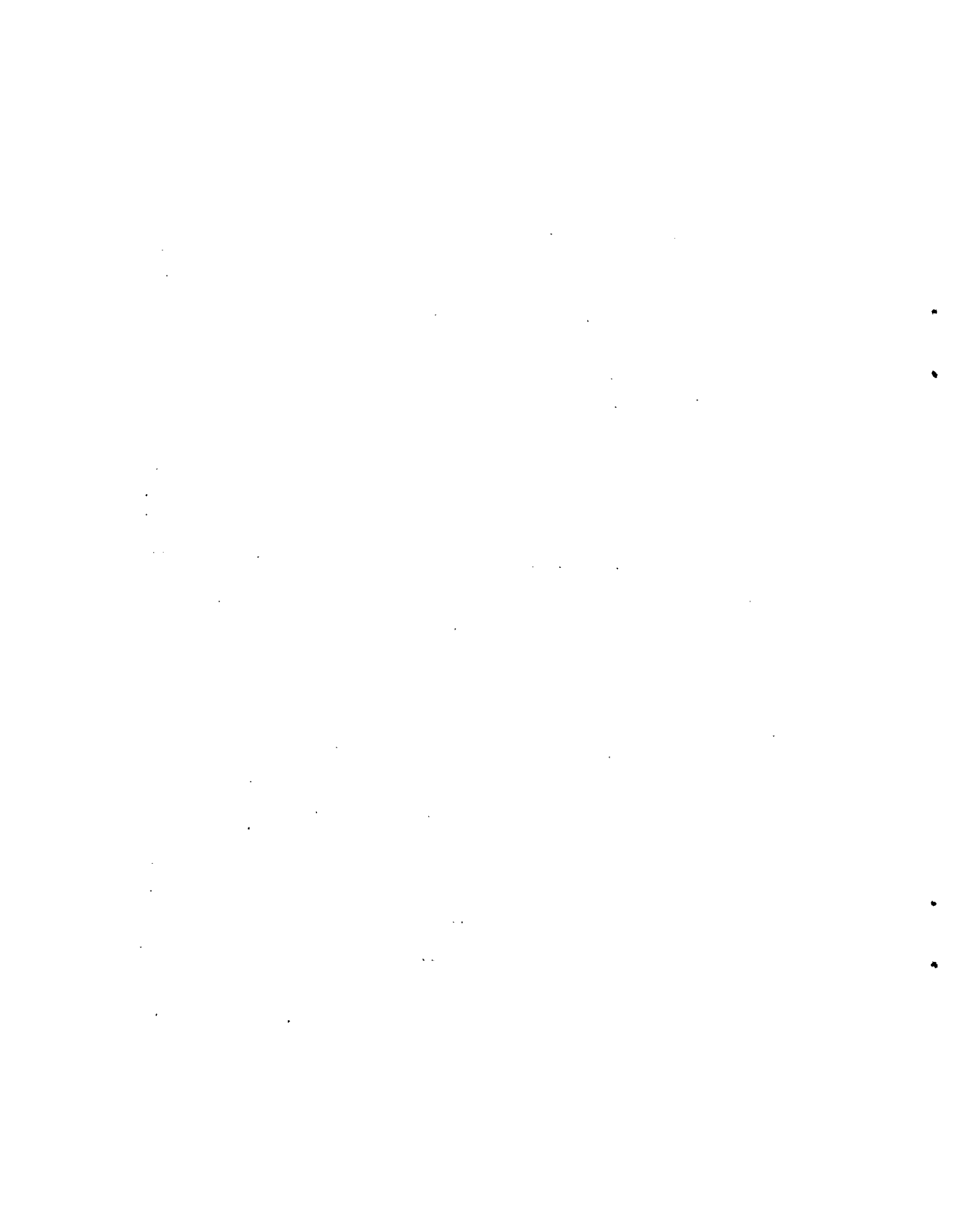
SUGAR CANE, ALCOHOL PRODUCTION AND THE INTERESTS OF TRANSNATIONAL  
CORPORATIONS IN BRAZIL

82-7-1471



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## INTRODUCTION

In July 1977, an aide-mémoire was signed by the Executive Secretaries of the Economic Commission for Latin America (CEPAL) and the Economic and Social Commission for Asia and the Pacific (ESCAP) calling for interregional co-operation between the two commissions in the field of transnational corporations. In that aide-mémoire, the Executive Secretaries agreed to launch an interregional research project on the impact of transnational corporations on primary commodity exports from developing countries. Based on appropriate provisions incorporated into the understanding, the Economic Commission for Africa (ECA) joined the project in early 1978.

It was agreed at that time that the three regional commissions, together with the United Nations Centre on Transnational Corporations in New York (UNCTC), would co-operate in the conduct of in-depth country case studies on the impact of transnational corporations on the export of primary commodities from selected developing countries. To provide a common focus for the country case studies, a general conceptual framework was prepared focusing on: (i) factors determining the relative bargaining positions of host governments and transnational corporations and (ii) the resulting distribution of benefits between the host country and the transnational corporation.<sup>1/</sup>

The conceptual framework for the case studies has been kept very broad in order to accommodate the multivaried conditions which exist among primary commodity export industries in different countries. It is therefore meant to apply to the various forms of transnational corporation involvement in such industries, from the traditional major direct investment by one or more transnational corporations in production, transformation and trade of primary commodities, to the newer forms of licensing agreements, joint ventures, trilateral arrangements, production-sharing agreements and others. It is also meant to apply to negotiations and renegotiations associated with the nationalization of a foreign direct investment already operating in a host country.

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<sup>1/</sup> See, "Transnational corporations in export-oriented primary commodities: a study of relative bargaining positions and distribution of gains", CEPAL/CTC Joint Unit (Santiago, Chile, 30 August 1977) and the modified version "Transnational corporations in export-oriented primary commodities: A general conceptual framework for case studies", Joint ESCAP/CTC Unit on Transnational Corporations, Working Paper No 1, New York, September 1978.

The ultimate aim of the case studies carried out according to the conceptual framework, and indeed of the whole interregional project, is to provide host developing country governments with an input of objectively derived material with which they can evaluate TNC involvement and agreements with them and realize their potential for increased bargaining capacity vis-à-vis the TNCs, as well as ascertain the relative advantages and disadvantages of policy options at their disposal. To this end, an interregional expert group meeting was convened at ESCAP headquarters in Bangkok in October 1979 to review the case studies completed up to that point by the three regional commissions. The meeting suggested the most important policy issues and further areas of research in the interregional project and the integration of the case studies from each region into global commodity and sectoral studies to be presented at an interregional seminar in Geneva (November 1982) on transnational corporations and primary commodity exports.<sup>2/</sup>

In addition, at its last three regular sessions (1975, 1977 and 1979), CEPAL adopted individual resolutions on co-operation among developing countries and among developing regions of different geographical areas.<sup>3/</sup>

Following the conceptual and institutional framework indicated above, CEPAL, through its Joint Unit with the United Nations Centre on Transnational Corporations, has been concerned with this subject over the last few years. Case studies have been completed on TNC involvement in seven commodities in the different countries of the region (bauxite in Jamaica, copper in Chile and Peru, tin in Bolivia, cotton in Mexico, bananas in Honduras and Panama, coffee in Colombia, and sugar cane and its use for energy in Brazil), applying the common methodology of the interregional project and taking into account the specific problems and needs of the region and the selected countries.

The findings of the studies on copper and tin were presented to the Seminar on Alternative Approaches to Negotiating with Foreign Investors and Transnational Corporations in the Copper and Tin Industries, organized by CEPAL in Santiago, Chile, 9-12 December, 1981, with the participation of high-level officials of the public and private sectors and representatives of foreign enterprises from Bolivia, Brazil

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<sup>2/</sup> See, "Report of the Interregional Expert Group Meeting on Transnational Corporations in Primary Export Commodities", Bangkok, 8-15 October 1979 (CTC/ESCAP/PEC/12) and UNDP, "Proyecto de los Gobiernos de Bolivia, Brasil, Colombia, Chile, Honduras, Jamaica, México, Panamá y Perú sobre el fortalecimiento del poder de negociación de los gobiernos huéspedes en sus tratos con las empresas transnacionales dedicadas a la exportación de productos básicos" (RLA/80/016/A/01/02).

<sup>3/</sup> See CEPAL resolutions 363 (XVII) adopted in Guatemala and 387 (XVIII) adopted in La Paz.

Chile and Peru <sup>4/</sup> and to the Seminar on Policies and Negotiations with Transnational Corporations in the Mining Sector, organized by the United Nations Centre on Transnational Corporations and CEPAL in co-operation with the Ministry of Mining and Metallurgy of Bolivia, in La Paz, 17-22 May 1982, with the participation of high-level officials of the public and private sectors of this industry. Finally, a similar seminar is envisaged for export-oriented tropical commodities (bananas, coffee, cotton and sugar cane), to take place in Panama in co-operation with the Union of Banana Exporting Countries (UPEB) and the Government of Panama.

In the forthcoming phase of the Interregional Project in CEPAL, commodity and sectoral studies, integrated for the three developing regions, will be carried out for bananas, sugar cane, tin and minerals.

This study presents an analysis of the sugar cane industry in Brazil and the use of sugar cane in the production of alcohol in relation with the interests of the transnational corporations (TNCs).

Because of the very nature of the sugar cane industry in Brazil, a special approach to it is called for within the interregional project.

As is generally known, the problems created by the increasing need to import oil led Brazil to adopt measures aimed at reducing its external vulnerability. The main measure taken in this connexion was the creation of the National Alcohol Programme -PROALCOOL- currently underway throughout the national territory, which is one of the largest agroindustry programmes known in the world.

Created in 1975, PROALCOOL opened up new prospects for sugar cane which, next to oil, is the main source of liquid fuel -ethanol- largely used as a fuel in automobiles and as a raw material in several segments of the chemical and pharmaceutical industries.

In that regard, the Brazilian sugar cane industry must be analysed within the broader context of the alcohol sector and the energy policy of the country.

There is virtually no direct TNC involvement in the production of sugar cane and the alcohol sector. Nevertheless, the TNCs do play an important role in several sectors that are interrelated with sugar and alcohol production, as will be seen in the study.

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<sup>4/</sup> See, Report of the Seminar quoted above (E/CEPAL/R.306, Restricted, February 1982).

The first three chapters of this study summarize the situation in the sugar industry in Brazil up to approximately the mid-1970s. The changes that have taken place during the second half of the 1970s in the alcohol industry and the interrelated sectors of production are discussed in the last part of the paper, with emphasis being given to possible foreign involvement and interests.

The study was prepared by a Brazilian consultant and edited in the CEPAL/CTC Joint Unit on Transnational Corporations. The opinions expressed in this study are, in so far as this phase of the interregional project is concerned the sole responsibility of the Unit and may not reflect the views of CEPAL.



## I. THE IMPORTANCE OF SUGAR CANE IN THE BRAZILIAN ECONOMY

During the early 1970s, Brazil became the main world exporter of sugar cane. As may be noted in table 1, Brazilian sugar production in 1973 was 29% higher than Cuban production. During the second half of the 1970s, this gap closed considerably and towards the end of the decade, in 1979, the relative positions of Brazil and Cuba were reversed.

One of the main factors in this performance was the creation in 1975 of the National Alcohol Programme -PROALCOOL. Indeed, with the great initial expansion of alcohol production between 1975 and 1980, sugar was largely replaced by alcohol. Nevertheless, Brazil is still the main producer of sugar cane in the world.

The sugar sector had a very positive and important impact on the overall performance of the Brazilian economy, particularly during the first half of the 1970s. The share of sugar in total exports rose from 5 to 16% between 1970 and 1974, which is remarkable considering that total exports rose by 190% during the same period (see table 2). During the first four years of the 1970s, the increase in sugar exports represented very important percentages of the total increase in exports and amounted to 40% of the total increase in 1974.

The world market crisis of the mid-1970s had a very negative effect on the performance of the sugar economy. In only 5 years, from 1974 to 1979, the share of sugar in total exports dropped from 16% to a little over 2%. A particularly negative year was 1976, when sugar exports dropped from the 1975 level of 1 100 million dollars to 307 million.

In recent years, 1980 and 1981, sugar exports again showed substantial growth, reflecting not only an increase in physical quantity but also an improvement in prices on the international market. The structure of the sugar trade also changed, as refined sugar accounted for a higher share of total exports.

Table 1  
MAJOR SUGAR CANE PRODUCERS OF THE WORLD  
1973-1979  
(1 000 tons (crude value))

|                    | 1973          | 1979          |
|--------------------|---------------|---------------|
| Brazil             | 6 937         | 7 362         |
| Cuba               | 5 383         | 7 800         |
| India              | 3 982         | 6 080         |
| Mexico             | 2 810         | 3 095         |
| Australia          | 2 583         | 2 961         |
| Philippines        | 2 093         | 2 390         |
| South Africa       | 1 953         | 2 143         |
| Argentina          | 1 637         | 1 411         |
| Dominican Republic | 1 178         | 1 200         |
| <u>World total</u> | <u>44 360</u> | <u>53 557</u> |

Source: International Sugar Organization.

Table 2

BRAZIL: VALUE OF SUGAR EXPORTS AND OF TOTAL EXPORTS

|      | Sugar exports       | Total exports | Share of sugar exports in total exports | Percentage increase of sugar exports within total increase of exports <u>a/</u> |
|------|---------------------|---------------|---|---|
|      | Millions of dollars |               |   |   |
| 1970 | 128                 | 2 739         | 4.7                                     |   |
| 1971 | 153                 | 2 904         | 5.3                                     | +15   |
| 1972 | 404                 | 3 991         | 10.1                                    | +23   |
| 1973 | 553                 | 6 199         | 8.9                                     | ++7   |
| 1974 | 1 262               | 7 951         | 15.9                                    | +40   |
| 1975 | 1 100               | 8 670         | 12.7                                    | -23   |
| 1976 | 307                 | 10 128        | 3.0                                     | -54   |
| 1977 | 463                 | 12 120        | 3.8                                     | +8  |
| 1978 | 350                 | 12 659        | 2.8                                     | -21   |
| 1979 | 364                 | 15 244        | 2.4                                     | -   |
| 1980 | 1 288               | 20 132        | 6.4                                     | +14   |
| 1981 | 1 062               | 23 293        | 4.6                                     | -7  |

a/ Negative values reflect a drop in the value of sugar exports as a percentage of the increase in total exports.

## II. A HISTORICAL BACKGROUND OF THE STRUCTURE AND FUNCTIONING OF THE SUGAR CANE SECTOR IN BRAZIL

Sugar cane farming began in Brazil during the early part of the colonial period and became a major source of export resources based on a crop. The textbooks divide Brazilian history into two periods, with sixteenth and seventeenth centuries being described as the "sugar cane cycle". This is to emphasize the period of the sugar cane boom in the Northeastern part of the country, where sugar was virtually the only export commodity and was responsible for the dynamism and wealth of the colonial economy.

In the late nineteenth and early twentieth century, however, the sugar cane sector had fallen behind in the national economy, although it continued to be important in the Northeast and its export market from the standpoint of the marketing of sectoral production. During this period, the sector was faced with new external problems, as it felt the pressure of competition from other regions in supplying the world market. The volume of exports from Brazil dropped from 2 million tons during the decade 1881-1890 to 648 thousand tons during the first decade of the twentieth century and its share in total exports dropped from 10% to a little over 1% during the same years. Competition from beet sugar and the European market, as well as the growing importance of Cuba and Java, and especially the technical lag and the exhaustion of production lands in Brazil, contributed to this decline.

The sector became more and more dependent on the domestic market for its survival. However, it was small with respect to productive capacity. This led to considerable price fluctuations and the building up of undesirable stocks while at the same time encouraging the action of intermediaries in marketing the product. One special problem was that relating to the regional location of production and of the domestic market: whereas production was concentrated in the Northeast, the market was growing very rapidly in the Centre-South, following the flow of the coffee boom and the incipient (but important) industrial growth and the resulting urbanization.

By 1911, sugar cane entrepreneurs were suggesting that the Government should intervene in the market, purchasing surplus production and exporting it on its own account (with the obvious subsidies to producers). The war of 1914-1918 and problems relating to weather changes in Europe led to substantial price increases, thus allowing Brazilian production to become competitive. The medium-term consequences, however, were quite negative, because once again the sugar production capacity was increased and the tendency to overproduce became a permanent feature of the 1920s.

In 1920, sugar production amounted to 455 000 tons, of which 109 000 were exported; in 1925, 816 000 tons were produced, while exports were negligible (3 000 tons).<sup>5/</sup> During these years, several government and private attempts were made to protect the level of production and increase exports; in 1923, a general plan for the protection of sugar, aguardiente and alcohol was drawn up at the initiative of the entrepreneurs of the sector.

The crisis of 1929 obviously made the critical situation of the sector worse. The revolution of 1930 and the installation of the Vargas Government made it possible to work on solving the crisis under the new interventionist policy of protecting the domestic income level.<sup>6/</sup> Thus, the state intervened at the request of the private sector itself and in its defence. During the entire period from 1930 to 1970, one of the central concerns was the protection of production, especially in the North-East, from competition from the new and more productive sugar economy that was developing in Rio de Janeiro and mainly in São Paulo to serve the market of the Centre-South. In institutional terms, the government created the "Commission for the Protection of Sugar Production" (1931) and the "Study Commission on Motor Alcohol" (1931).

The main measure that was adopted immediately consisted of purchasing surplus production, part of which was exported at great loss and the remainder of which was used to build up stocks to regulate the market. Thus began direct government intervention in the marketing of sugar, at both the domestic and the export levels, a situation which still prevails, as we will see later on.

Over the medium-term, the proposal made by producers and taken up by the Government was to expand the production of alcohol for use as fuel in automobiles. This policy line was supported by a diagnosis which showed that there was a crisis in the external sugar market and that it was not viable to increase domestic consumption at the rate necessary to balance the supply of and demand for the product. The idea, therefore, was to expand a line of production from the same raw material that could perfectly replace sugar. Consequently, by 1932 there were already fiscal and customs incentives for the installation of anhydrous alcohol distilleries.

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<sup>5/</sup> See: Szymrecsányi, T. O Planejamento da agricultura canavieira no Brasil, 1930-1975, Hucitec-Unicamp, São Paulo, 1975.

<sup>6/</sup> See: Furtado, C. Formação Econômica do Brasil, Ed. Fundo de Cultura Rio, 1963.

The main measures aimed at increasing the use of alcohol were the requirement that all imported gasoline should be mixed with at least 5% alcohol and that the mix should be a 10% one in the case of gasoline for use in official vehicles. These measures remained in force until the Second World War.

In 1933, the Government created the Sugar and Alcohol Institute (Instituto del Azúcar y del Alcohol-IAA), which replaced the former commissions, to direct, promote and control the production of sugar and alcohol throughout the country. Its stated objectives included the promotion of a resurgence of sugar cane growing by eliminating overproduction and the solution of the fuel alcohol problem. To that end, the IAA was allowed to set up its own distilleries (it did set up several, all but one of which were subsequently sold to the private sector) and to market alcohol at the service stations it owned.

The Institute was directed by equal numbers of representatives of the Government and of the mill owners, who made up the executive committee. This composition was later modified, with the private sector increasing its participation in the management of the Institute. The Institute is a public agency having broad powers to intervene in the market but designed to serve the interests of the producers of the sector; this was guaranteed by the composition of its board of directors.

Historically, one of the most important tasks of the IAA has been to set sugar cane production quotas for each mill and to regulate the supply of mills with sugar cane from their own crops and from independent producers.

Production quotas were set annually on the basis of limits equivalent to the average production of the last five years. Occasional variations in a mill's quotas could be compensated by others, although within the limits set for the state concerned. In a context of overproduction, the quotas meant that limits were placed on the expansion of production.

The first quotas were established during the 1934-1935 harvest; the Northeast was assigned a share of around 63%, the Centre-South was assigned 37% (see table 3). In practice, the setting of quotas at the state level served the purpose of protecting the industry of the Northeast from competition from the Centre-South. The division of regional production with 60% for the Northeast and 40% for the Centre-South continued up to the Second World War, when circumstances made it necessary to change this situation.

Table 3

BRAZIL: STATE SUGAR PRODUCTION QUOTAS SET BY THE IAA SINCE 1935  
(Percentages)

|                       | 1935         | 1944         | 1946         | 1957         | 1968         |
|-----------------------|--------------|--------------|--------------|--------------|--------------|
| Pernambuco            | 37.6         | 37.7         | 28.9         | 26.6         | 22.7         |
| Alagoas               | 11.0         | 12.3         | 10.3         | 8.7          | 8.4          |
| Others - Northeast    | 14.2         | 10.0         | 14.0         | 11.0         | 7.9          |
| Subtotal - Northeast  | 62.8         | 60.0         | 53.2         | 46.3         | 39.0         |
| Rio de Janeiro        | 16.9         | 16.8         | 16.6         | 13.1         | 11.9         |
| São Paulo             | 17.4         | 17.6         | 22.2         | 31.6         | 40.8         |
| Other Centre-South    | 2.9          | 5.6          | 8.0          | 9.0          | 8.3          |
| Subtotal Centre-South | 37.2         | 40.0         | 46.8         | 53.7         | 61.0         |
| <u>Total</u>          | <u>100.0</u> | <u>100.0</u> | <u>100.0</u> | <u>100.0</u> | <u>100.0</u> |

Source: Szmrecsányi, T., O Planejamento da Agricultura Canavieira do Brasil, 1930-1975. Hucitec-Unicamp, Sao Paulo, 1979.

Contrary to what happened during the First World War, the international sugar market did not grow during the Second World War, but rather remained depressed because of transport problems and the lack of purchasing power per se. Domestic production of alcohol has to be accelerated and encouraged and the market was larger in the Centre-South region. Finally, the widespread presence of submarines in the South Atlantic made it very difficult to transport sugar from the Northeast to the Centre-South. Consequently, the unsatisfied demand in the main consumer centres of the country finally made it necessary to expand the stock of sugar and the growing of sugar cane to areas which before the Second World War had imported most of the sugar they used. The main and most lasting consequence of that process was the transfer of the axis of the sugar cane agro-industry of Brazil from the Northeast region towards the Centre-South.<sup>7/</sup> In 1946, the share of the Northeast had dropped to 53% and was under 50% by the 1950s (see again table 3). These changes in the quotas were made as the result of direct pressure from the mill owners of São Paulo, who even asked for the

<sup>7/</sup> Szmrecsányi, T., op.cit., p. 205.

elimination of the IAA immediately after the War, because of its policy of restricting increases in production. By the early 1950s, São Paulo was the main sugar producer in the country.

From the standpoint of industry-agriculture relations in the sector, the Sugar Cane Growing Statute (1941) was designed to establish discipline in the relations between mill owners and suppliers. It established limits on increases in the amount of sugar cane owned by the mills, setting quotas for the amounts to be purchased from suppliers. This measure was designed to check the trend towards total vertical integration, which would have made the mills self-sufficient. The suppliers were actually the former owners of ingenios -rural units producing unrefined sugar- who with the growth of the large mills, tended to limit themselves to agricultural production or to become owners of large mills. At any rate, the trend towards unification and verticalization in the sector continues today, as we will see in chapter IV.



### III. THE SUGAR CANE PRODUCING SECTOR IN BRAZIL

#### (a) Sugar production and exports up to 1973

The area planted in sugar cane in Brazil expanded from 433 000 hectares in 1933 to 2.2 million hectares in 1973 (before PROALCOOL). Production rose from 15 000 tons to 102 million, with yields increasing by around 30% (see table 4).

The more significant increases, both in production area and in volume harvested took place beginning in the 1950s, when the Centre-South also began to be predominant in production. The growth that took place during this period was influenced to a large extent by the accelerated industrialization and urbanization process. Nevertheless, there was a far from negligible potential for exports, which clearly increased during that period. In regulating production, the IAA leaned on the side of growth, while at the same time fulfilling an important role in exports, it being the only agency that was competent to do so.

In July 1953, at the initiative of the United Nations, a conference was held in London at which over 50 countries met to renegotiate the 1937 Agreement. At that conference, the Brazilian quota of 60 000 tons was increased to 175 000. The problems of overproduction in Brazil, the low quota and low prices led the country to leave the Agreement in 1955. During the second half of the 1950s, the international market for sugar again became favourable because of the breakdown of European production.

The incentive to national production and the resulting overproduction at the end of the 1950s forced the Government to intensify its presence on the external market, despite the new drop in prices. In 1957, for the first time in the twentieth century sugar again represented 5% of total exports. In 1958, Brazil rejoined the Agreement and was allotted a quota of 550 000 tons.

The Cuban revolution opened up new prospects for Brazilian exports, particularly in view of the possibility of participating in the United States preferential market. By 1963, sugar was the third-ranking export of Brazil, next to coffee and cotton. The IAA began to play an important role in export financing and at the same time tried to plan all its action with a view to achieving a production of 6 million tons towards 1971 (100 million bags).

Sugar exports rapidly grew to 16 million sacks (960 000 tons) and were over 1 million tons in 1968 (see table 5). The IAA goal was to sell 80 million bags on the domestic market and to export 20 million sacks in 1971. To this end, it authorized the installation of 50 additional mills, in addition to establishing a plan for modernizing and merging the sector.

Table 4

TRENDS IN SUGAR CANE PRODUCTION IN BRAZIL: 1933-1973

| Year               | Area<br>(1 000 ha) <u>a/</u> | Production<br>(1 000 tons) | Yield<br>(tons/ha) |
|--------------------|------------------------------|----------------------------|--------------------|
| 1933               | 430                          | 15 523                     | 36                 |
| 1934               | 473                          | 17 793                     | 38                 |
| 1935               | 437                          | 16 681                     | 38                 |
| 1936               | 461                          | 18 496                     | 40                 |
| 1937               | 395                          | 15 737                     | 40                 |
| 1938               | 394                          | 16 409                     | 43                 |
| 1939               | 482                          | 19 514                     | 41                 |
| 1940               | 515                          | 21 475                     | 42                 |
| 1941               | 560                          | 21 463                     | 38                 |
| 1942               | 559                          | 21 574                     | 39                 |
| 1943               | 577                          | 22 051                     | 38                 |
| 1944               | 676                          | 25 149                     | 37                 |
| 1945               | 657                          | 25 179                     | 38                 |
| 1946               | 758                          | 28 069                     | 37                 |
| 1947               | 773                          | 28 990                     | 38                 |
| 1948               | 819                          | 30 893                     | 38                 |
| 1949               | 797                          | 30 929                     | 39                 |
| 1950               | 828                          | 32 671                     | 39                 |
| 1951               | 874                          | 33 653                     | 38                 |
| 1952               | 920                          | 36 041                     | 39                 |
| 1953               | 991                          | 38 337                     | 39                 |
| 1954               | 1 027                        | 40 302                     | 39                 |
| 1955               | 1 073                        | 40 946                     | 38                 |
| 1956               | 1 124                        | 43 976                     | 39                 |
| 1957               | 1 172                        | 47 703                     | 41                 |
| 1958               | 1 208                        | 50 019                     | 41                 |
| 1959               | 1 291                        | 53 477                     | 41                 |
| 1960               | 1 361                        | 57 178                     | 42                 |
| 1961               | 1 367                        | 59 378                     | 43                 |
| 1962               | 1 467                        | 62 535                     | 43                 |
| 1963               | 1 509                        | 63 723                     | 42                 |
| 1964               | 1 519                        | 66 399                     | 44                 |
| 1965               | 1 705                        | 75 853                     | 44                 |
| 1966               | 1 636                        | 75 788                     | 46                 |
| 1967               | 1 681                        | 77 037                     | 46                 |
| 1968               | 1 687                        | 76 620                     | 45                 |
| 1969               | 1 672                        | 75 247                     | 45                 |
| 1970               | 1 725                        | 79 753                     | 46                 |
| 1971               | 1 692                        | 79 595                     | 47                 |
| 1972 <sup>b/</sup> | 1 951                        | 90 941                     | 47                 |
| 1973               | 2 210 <sup>c/</sup>          | 102 287 <sup>c/</sup>      | 46                 |

Source: Szmrecsányi, T., *op.cit.* Basic data: IAA (Annuários açucareiros) até 1965; IBGE (Annuários Estatísticos) 1966-1970 and 1973; FVG (Conj. Econ., December 1973), 1971.

<sup>a/</sup> Up to 1965, area cultivated: after that, area harvested. <sup>b/</sup> Estimated by lineal interpolation. <sup>c/</sup> Including forage cane.

Table 5

## BRAZIL: EXPORT AND DOMESTIC CONSUMPTION OF SUGAR

| Year | Available<br>in thousands<br>of 60 kg<br>sacks | Exports           |       |      | Total apparent<br>consumption |       |       | Per capita apparent<br>consumption |       |
|------|--|-------------------|-------|------|-------------------------------|-------|-------|------------------------------------|-------|
|      |  | Thousand<br>sacks | Index | %    | Thousand<br>sacks             | Index | %     | kg/per<br>capita/<br>year          | Index |
| 1935 | 15 727   | 1 440             | 100   | 9.1  | 10 174                        | 100   | 90.9  | 15.9                               | 100   |
| 1936 | 15 310   | 1 318             | 91    | 8.6  | 10 074                        | 99    | 91.4  | 15.5                               | 97    |
| 1937 | 13 993   | 2                 | -     | -    | 10 075                        | 99    | 100.0 | 15.3                               | 96    |
| 1938 | 14 841   | 129               | 9     | 0.8  | 10 790                        | 106   | 99.2  | 16.1                               | 101   |
| 1939 | 16 816   | 782               | 54    | 4.6  | 11 552                        | 113   | 95.4  | 16.9                               | 106   |
| 1940 | 19 079   | 1 100             | 76    | 5.7  | 12 660                        | 124   | 94.3  | 18.2                               | 114   |
| 1941 | 19 142   | 414               | 29    | 2.7  | 13 195                        | 129   | 97.3  | 18.6                               | 117   |
| 1942 | 19 128   | 165               | 53    | 4.0  | 13 471                        | 132   | 96.0  | 18.6                               | 117   |
| 1943 | 119 230  | 386               | 27    | 2.0  | 14 001                        | 137   | 98.0  | 18.9                               | 119   |
| 1944 | 20 356   | 963               | 67    | 4.7  | 14 537                        | 143   | 95.3  | 19.3                               | 121   |
| 1945 | 20 190   | 313               | 22    | 1.5  | 15 742                        | 154   | 98.5  | 20.5                               | 129   |
| 1946 | 22 075   | 171               | 12    | 0.8  | 16 181                        | 159   | 98.2  | 20.6                               | 129   |
| 1947 | 26 149   | 1 020             | 71    | 3.9  | 17 581                        | 173   | 96.1  | 22.0                               | 139   |
| 1948 | 31 050   | 5 693             | 395   | 18.3 | 20 195                        | 198   | 81.7  | 24.0                               | 150   |
| 1949 | 28 343   | 942               | 65    | 3.3  | 21 962                        | 216   | 96.7  | 26.5                               | 166   |
| 1950 | 28 810   | 400               | 28    | 1.4  | 23 230                        | 228   | 98.6  | 26.5                               | 166   |
| 1951 | 31 958   | 306               | 21    | 0.9  | 25 929                        | 255   | 99.1  | 28.9                               | 173   |
| 1952 | 35 474   | 722               | 50    | 2.0  | 24 906                        | 244   | 98.0  | 27.1                               | 170   |
| 1953 | 43 207   | 4 109             | 285   | 9.5  | 28 751                        | 282   | 90.5  | 30.5                               | 192   |
| 1954 | 45 654   | 2 509             | 174   | 5.5  | 29 097                        | 286   | 94.5  | 30.1                               | 189   |
| 1955 | 48 597   | 9 683             | 672   | 19.9 | 32 504                        | 319   | 80.1  | 32.9                               | 207   |
| 1956 | 44 213   | 390               | 27    | 0.9  | 33 559                        | 329   | 99.1  | 33.1                               | 214   |
| 1957 | 55 500   | 6 816             | 473   | 12.3 | 31 752                        | 312   | 87.7  | 30.6                               | 192   |
| 1958 | 66 992   | 12 930            | 898   | 19.3 | 37 570                        | 369   | 80.7  | 35.3                               | 222   |
| 1959 | 68 296   | 10 098            | 701   | 14.6 | 37 211                        | 365   | 85.4  | 32.2                               | 202   |
| 1960 | 76 299   | 14 246            | 989   | 18.6 | 41 323                        | 406   | 81.4  | 35.0                               | 220   |
| 1961 | 76 632   | 12 414            | 862   | 16.2 | 44 249                        | 435   | 83.8  | 36.0                               | 226   |
| 1962 | 73 936   | 7 976             | 554   | 10.8 | 46 768                        | 459   | 89.2  | 36.9                               | 232   |
| 1963 | 70 322   | 8 193             | 569   | 11.6 | 46 064                        | 453   | 88.4  | 35.1                               | 221   |
| 1964 | 73 152   | 4 471             | 310   | 6.1  | 44 526                        | 437   | 93.9  | 33.1                               | 208   |
| 1965 | 101 829  | 13 779            | 957   | 13.0 | 49 645                        | 489   | 87.0  | 35.9                               | 226   |
| 1966 | 103 090  | 16 959            | 1 178 | 16.4 | 46 043                        | 452   | 83.6  | 32.2                               | 202   |
| 1967 | 112 059  | 16 848            | 1 170 | 15.0 | 48 809                        | 479   | 85.0  | 33.1                               | 208   |
| 1968 | 116 473  | 18 257            | 1 268 | 15.7 | 55 309                        | 543   | 84.3  | 37.2                               | 234   |
| 1969 | 113 173  | 18 045            | 1 258 | 16.8 | 56 679                        | 557   | 83.2  | 36.2                               | 228   |
| 1970 | 122 949  | 19 165            | 1 331 | 15.6 | 58 841                        | 578   | 84.4  | 36.5                               | 229   |
| 1971 | 129 633  | 20 715            | 1 439 | 15.9 | 59 601                        | 586   | 84.1  | 36.0                               | 226   |
| 1972 | 138 078  | 43 917            | 3 048 | 31.8 | 63 603                        | 625   | 68.2  | 37.7                               | 237   |
| 1973 | 151 888  | 49 510            | 3 438 | 32.6 | 68 198                        | 670   | 57.4  | 39.2                               | 247   |
| 1974 | 149 726  | 38 371            | 2 665 | 29.8 | 72 052                        | 708   | 70.2  | 40.5                               | 255   |

Source: SEC/IAA, quoted by Szekacsany, *ibid.*, op.cit.

(b) Modernization and concentration in the sector during the period 1965-1974

Beginning in 1965, the regulatory and interventionist role of IAA was reinforced with the extension of the criteria for setting quotas, the establishment of regulatory stocks and the establishment of regional criteria for supplying the external market (Act No 4870). Essentially, this meant that the external market was explicitly included as an aim and an objective of the sugar policy. The Special Export Fund was created; it subsequently played an important role in financing the modernization of the sector.

In 1967, new measures were taken which were aimed at giving the IAA flexibility while at the same time establishing a minimum production of 200 000 sacks per mill. Beginning in 1969, the IAA began to take decisive action in agronomic research and experiments by setting up laboratories and experimental stations. However, it was not until 1971 that the more important measures aimed at modernizing the sector were adopted.

The first one was the implementation of the National Sugar Cane Improvement Programme (PLANALSUCAR). This was the result of a serious effort, initiated in the mid-1960s, to make the national sugar industry competitive on the external market. Around 1975, the entity created under the Programme had a large corps of specialists working on over 100 research projects.

This Programme was carried out simultaneously and in connexion with the Sugar Agroindustry Rationalization Programme, also initiated in 1971. Thus, the process of merging, incorporating, rationalizing and relocating the enterprises of the sector was financed and infrastructure facilities were made available for the marketing of sugar. The most important measure adopted consisted of doing away with the mill production quotas at the state level. The quotas could be acquired and transferred from one mill to another within the limits of the two administrative regions of the IAA, i.e., the North-Northeast and the Centre-South. Provision was made for financial incentives for factories that incorporated or merged with others or relocated in more suitable regions; likewise, those benefits were granted to suppliers who took on additional quotas for supplying the mills. These benefits were only granted to mills having official quotas of over 400 000 sacks of sugar and the programme was financed by the Special Export Fund. In many cases, where a factory was not in operation, its quotas were cancelled; this happened particularly

/in the

in the North and Northeast. The President of the IAA was allowed to alter quotas within the previous overall ceiling of 100 million sacks (6 million tons). Consequently, the average production of the mills rose from 186 200 sacks in 1964-1965 to 317 700 in 1971-1972 in the Northeast, and from 215 300 to 359 100 bags in the Centre-South during the same period.<sup>8/</sup>

These circumstances, together with the favourable conjuncture of the external market, led to a large increase in Brazilian exports at the beginning of the 1970s (see again table 5). By 1971, Brazil was supplying 6% of all sugar sold on the international market. After 1971-1972, it became the top-ranking world producer of refined cane sugar and the second-ranking exporter.

All external marketing of sugar was (and still is) carried out by the IAA, which means that when prices were favourable in the early 1970s, it made substantial profits; these were put into the Special Export Fund, thus enabling it to be more effective in modernizing the sector. IAA financing for the sector became extremely generous, with the real interest being negative. These resources were also used in directly subsidising the sector and its modernization, as in the case of fertilizers, the prices of which rose considerably after 1973.

It is in that context that the crisis of the sugar-exporting sector occurred, with the breakdown of prices in 1974; this will be analysed later on in the chapter on PROALCOOL. The creation of PROALCOOL can only be understood in the context of the historical development of the sector, the association of public and private national interests in this sector, the intense process of modernization that took place in the late 1970s and the appearance of problems on the external sugar market beginning in 1974.

(c) The foreign presence in the sector

At the beginning of the century, there was a certain amount of foreign involvement in the production of sugar. The data for the period 1860-1902 show that 13 enterprises were set up and that three more were added during the period 1903-1913. During the first period, that represented almost 3% of all capital coming in, whereas during the second, the volume was negligible. Thus, it appears that foreign involvement was limited to setting up trade offices.

In general, the foreign enterprises operated engenhos centrais, i.e., industrial production units not involved in agricultural production. Consequently the sugar

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<sup>8/</sup> See: Szmeccsányi, T., op.cit., p. 458 ff.

cane was purchased from growers. This was probably the main reason for the disappearance of foreign involvement, even before 1930. Indeed, in 1930 there was only one foreign enterprise in Piracicaba, S.P., and it was later sold to nationals.

The lack of foreign interest in the sector during that period was most likely related to the crisis in the sector in the late nineteenth and early twentieth century, discussed above. The only way to survive during the crisis was to integrate vertically by merging agricultural and industrial production into a single enterprise. This was not a very attractive option for the foreign enterprises, which chose to sell their facilities or close down.

From the beginning, close collaboration between sugar entrepreneurs and the State involved a sector that was entirely national, which in fact took over policy-making in that area of the economy. It is understandable, therefore, that they should have been successful up to now in preventing outside groups from entering this activity despite its great profitability and exceptional growth over the past 15 years. As we have noted in this chapter, the large groups involved in cane and sugar production have managed entirely to dominate the economic policies of the sector, which consequently faithfully reflect their interests.

#### IV. THE SUGAR MARKET IN BRAZIL

(a) The domestic market and the participation of the transnationals

The bulk of Brazilian sugar production goes to supply the domestic market, as may be seen in table 6. During the past two years, exports represented approximately 30% of production, with the remaining 70% going for domestic consumption.

On the domestic market, the product is used mainly for two purposes: final consumption and industrial use in the production of foodstuffs and beverages. In the case of Brazil, the food industry is quite unique, the market being divided between domestic and foreign enterprises, in some cases, and shared by both in others. Table 7 shows that the sugar, alcohol, fishery and pasta sectors are domestically owned and that domestic enterprises are predominant in the area of meat-packing, coffee, chocolates and preserves. On the other hand, the vegetable oil, dairy products, flour mills, animal feed and particularly the miscellaneous food industries are largely in foreign hands.

A similar situation may be observed in the beverage industry, where the production of beer, juices and wines is basically in national hands and ownership of soft drinks and alcoholic beverages in general is mixed.

From the standpoint of sugar consumption, the main sectors are the chocolate industry and the "miscellaneous" branch of the food industry and the soft drink and general alcoholic beverages branches of the beverage industry. Table 8 summarizes the data on the structure of the sector as regards the participation of foreign and domestic enterprises in total sales of the ten major corporations. In all cases, there is significant foreign participation and it is frankly dominant in the miscellaneous foods industry, where the foreign corporation Nestlé is particularly important, with a higher volume of sales than any other enterprise in the food industry in general.

(b) The international market for Brazilian sugar

During a large part of the 1970s, Brazil ranked second worldwide as an exporter of sugar, a position it lost to Australia in 1979 (see table 9). Contrary to the case of Cuba, where most exports are subject to special contracts, all Brazilian exports are sent to the so-called "free market".

Table 6

BRAZIL: SUGAR PRODUCTION, EXPORT, APPARENT CONSUMPTION AND STOCKS  
(1 000 tons (unrefined value))

| Year | Production | Export | Apparent consumption | Stocks |
|------|------------|--------|----------------------|--------|
| 1972 | 6 151      | 2 638  | 4 125                | 2 465  |
| 1973 | 6 937      | 2 975  | 4 266                | 2 160  |
| 1974 | 6 931      | 2 303  | 4 577                | 2 211  |
| 1975 | 6 299      | 1 730  | 4 990                | 1 790  |
| 1976 | 7 236      | 1 252  | 5 091                | 2 683  |
| 1977 | 8 759      | 2 487  | 5 060                | 3 895  |
| 1978 | 7 913      | 1 925  | 5 289                | 4 594  |
| 1979 | 7 362      | 1 942  | 6 009                | 4 005  |
| 1980 | 8 270      | 2 661  | 6 264                | 3 350  |
| 1981 | 8 720      | 2 671  | 5 871                | 3 534  |

Source: Instituto do Açúcar e do Alcool and International Sugar Organization.



Table 7

BRAZIL: CONTROL OF FOOD AND BEVERAGE INDUSTRIES BY FOREIGN  
OR DOMESTIC ENTERPRISE

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| Sector                         | Dominant enterprises in the sector                          |
|--------------------------------|---|
| <u>Foods</u>                   |   |
| Sugar and alcohol              | Domestic  |
| Soluble coffee                 | Domestic, with some foreign participation                   |
| Vegetable oils                 | Foreign, with some domestic participation                   |
| Meat packing                   | Domestic, with some foreign participation<br>(longstanding) |
| Dairy products                 | Foreign and domestic  |
| Flour mills                    | Foreign and domestic  |
| Animal feed                    | Foreign and domestic  |
| Chocolates                     | Domestic and foreign  |
| Preserves                      | Domestic and foreign  |
| Pastas                         | Domestic  |
| Fishery products               | Domestic  |
| Miscellaneous                  | Foreign, with some domestic participation                   |
| <u>Beverages</u>               |   |
| Wines                          | Domestic, with some foreign participation<br>(recent)       |
| Alcoholic beverages in general | Foreign and domestic  |
| Beer                           | Domestic  |
| Soft drinks                    | Foreign and domestic  |
| Juices                         | Domestic  |

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Table 8

BRAZIL: FOREIGN PARTICIPATION IN MAJOR SUGAR-CONSUMING INDUSTRIES - 1980

(Number of corporations and percentage)

|                                | Share in total sales of the ten major corporations |            |                    |            |
|--------------------------------|--|------------|--------------------|------------|
|                                | Transnational                                      |            | Domestic           |            |
|                                | No of corporations                                 | Percentage | No of corporations | Percentage |
| <b>Food industries</b>         |  |            |                    |            |
| Chocolates                     | 2  | 18         | 8                  | 82         |
| Miscellaneous                  | 4  | 82         | 6                  | 18         |
| <b>Beverage industries</b>     |  |            |                    |            |
| Soft drinks                    | 6  | 55         | 4                  | 45         |
| Alcoholic beverages in general | 6  | 66         | 4                  | 34         |

Source: Gazeta Mercantil, Balanço Anual, 1980, and Visão magazine, "Quem é Quem na Economia Brasileira", 1981 edition.

Table 9

MAJOR SUGAR EXPORTERS: 1973 AND 1979

(1 000 tons (unrefined value))

|                    | 1973          | 1979          |
|--------------------|---------------|---------------|
| Cuba               | 4 797         | 7 269         |
| Brazil             | 2 975         | 1 942         |
| Australia          | 2 124         | 2 002         |
| Philippines        | 1 455         | 1 157         |
| Dominican Republic | 1 070         | 1 035         |
| Thailand           | 258           | 1 210         |
| <u>World total</u> | <u>22 477</u> | <u>25 937</u> |

Source: International Sugar Organization.

/The composition

The composition of Brazilian sugar exports changed considerably throughout the 1970s, particularly after the market crisis of the mid-1970s. In 1974, 75% of exports consisted of unrefined sugar, for as only 5% were refined sugar (see table 10). The share of fully processed sugar grew rapidly, to around 30% during the triennium 1979-1981, whereas unrefined sugar exports varied significantly with 50% being the norm in recent years.

This change in the structure of external sales reflects an increase in the domestic share of the value added generated by sugar, resulting from the fact the sector is in domestic hands, both as regards industrial production and as regards export channels.

The United States is the main buyer of Brazilian sugar and this position seems to have been reinforced towards the end of the 1970s. In 1979, 54% of Brazilian exports were sent to the United States, as opposed to only 15% in 1973 (see table 11). In this regard, it should be noted that the crisis on the international market was associated with the fact that the major socialist countries (USSR and China) stopped importing sugar.

Table 10  
BRAZIL: STRUCTURE OF SUGAR EXPORTS: 1974-1981  
(Percentages)

|      | Unrefined | Crystal | Refined | Total |
|------|-----------|---------|---------|-------|
| 1974 | 74        | 21      | 5       | 100   |
| 1975 | 70        | 19      | 11      | 100   |
| 1976 | 50        | 17      | 33      | 100   |
| 1977 | 60        | 12      | 28      | 100   |
| 1978 | 56        | 9       | 35      | 100   |
| 1979 | 68        | 6       | 26      | 100   |
| 1980 | 48        | 25      | 27      | 100   |
| 1981 | 55        | 8       | 37      | 100   |

Source: Cartera de Comercio Exterior - CACEX.

/Table 11

Table 11

BRAZIL: SUGAR EXPORTS BY MAIN COUNTRIES OF DESTINATION: 1973 AND 1979  
(1 000 tons (unrefined value))

|                        | 1973         | 1979         |
|------------------------|--------------|--------------|
| United States          | 446          | 1 053        |
| USSR                   | 438          | 99           |
| China                  | 366          | 42           |
| European Common Market | 116          | 56           |
| Irak                   | 221          | 122          |
| Iran                   | 190          | 132          |
| Jápan                  | 129          | -            |
| Sri Lanka              | 112          | -            |
| Morocco                | 105          | 21           |
| Sudan                  | 104          | 35           |
| Others                 | 748          | 382          |
| <u>Total</u>           | <u>2 975</u> | <u>1 942</u> |

Source: International Sugar Organization.

## V. PROALCOOL

### (a) Policy-making and the agents concerned

The Brazilian policy with regard to the production of fuel alcohol can only be understood in the context of the evolution of the sugar production sector, as we have noted above. The creation of PROALCOOL may be explained, more than as part of an overall energy policy, as a response to pressures exerted by sugar entrepreneurs. As mentioned before, in the early 1970s, the entrepreneurs had launched a large-scale modernization and export programme which had enabled them to take advantage of the boom on the world market in 1974 and early 1975. After 1975, however, the international crisis of the sugar market led to the collapse of production in Brazil. Hence, the pressure for the creation of PROALCOOL was a result of the sugar entrepreneurs' desire to find an alternative market for their production.

Table 12 summarizes the behaviour of Brazilian sugar exports during the 1970s. As will be noted, the average price per ton exported by Brazil jumped from 113 dollars to 635 between 1970 and 1975, and then dropped to 262 in 1976 and to 179 in 1978. The volume exported was 2.8 million tons in 1973, which then dropped to 1.2 million tons in 1976. Obviously, these average values cover up large price fluctuations. In 1974, the price per ton was 1 400 dollars; in 1976, it dropped to 150 dollars. Consequently, the IAA decided to suspend all sales and fulfil only its long-term contracts.

Obviously, this does not mean that the only reason for creating PROALCOOL was the pressure of mill owners and that they were the only beneficiaries of this measure. Naturally, it must be acknowledged that such a programme is entirely relevant within the spectrum of a broader energy policy for countries such as Brazil. Likewise, it would be unthinkable that a crisis in the sugar sector should lead the Government to set up such a wide-ranging programme unless there were, objectively, an energy problem and a need for substituting oil. We only wish to stress that it was the mill owners who most directly (and successfully) exerted pressure for the creation of PROALCOOL.

/Table 12

Table 12

BRAZIL: SUGAR EXPORTS  
(1970-1979)

| Year | Quantity<br>(thousands of tons) | Value<br>(millions of US dollars) | Average value<br>(US\$/ton) |
|------|---------------------------------|-----------------------------------|-----------------------------|
| 1970 | 1 126.2                         | 127.6                             | 113.4                       |
| 1971 | 1 261.3                         | 153.0                             | 121.3                       |
| 1972 | 2 534.9                         | 403.5                             | 159.2                       |
| 1973 | 2 798.0                         | 552.7                             | 197.5                       |
| 1974 | 2 254.5                         | 1 261.6                           | 559.6                       |
| 1975 | 1 730.8                         | 1 099.7                           | 635.4                       |
| 1976 | 1 167.3                         | 306.5                             | 262.6                       |
| 1977 | 2 454.7                         | 462.6                             | 188.5                       |
| 1978 | 1 961.5                         | 350.1                             | 178.5                       |
| 1979 | 1 829.3                         | 363.8                             | 198.9                       |

Source: CACEX.

The creation of PROALCOOL cannot be considered in isolation from the all-powerful COPERSUCAR-Central Co-operative of Sugar and Alcohol Producers of the State of São Paulo. Its strategic role in the structure of the sector will be analysed in greater detail later on. Created in 1959, this sui-generis co-operative became a vehicle for expressing the interests of the large landowners of the sugar sector in the State of São Paulo. Today, it is one of the largest private organizations in the country. In political terms, it carries more weight even than the IAA, as a result of which it may be said that the IAA implements the policies that have previously been set by the co-operative.<sup>9/</sup> Along with several studies made by research agencies on the use of alcohol in "otto" cycle engines (several universities and the Aerospace Technical Centre - CTA), the sugar mill owners had already, in 1974, expressed their interest in having the Government set its policies. In mid-1975, the factory owners succeeded in obtaining parity between sugar and alcohol prices at a ratio of 44 litres alcohol for 60 kilos sugar. Finally, in November 1975, the President of the Republic enacted the National Alcohol Plan.

<sup>9/</sup> See, Barzelay, M., The Political Economy of Alcohol Energy in Brazil, Institute for Energy Studies, Stanford University, December 1980, mimeo, pp. 50 ff.

This came about as a result of debates carried out during the second half of 1975 in connexion with three basic points: resources and incentives; degree of state control, especially in distribution, and sources of raw materials. The latter aspect provides a very good illustration of the existence of other interests favouring PROALCOOL which, in last analysis, have not had the opportunity objectively to implement their proposals. In general, the Government technocracy, including those at the first stage, advocated that the programme should be based on manioc, at least to a substantial extent. Despite the fact that additional incentives were granted for the use of manioc, so far its role has been negligible. In fact, contrary to what the Government wanted, an entire sector of production was already set up on the basis of sugar cane and it was the one which forged ahead and, in practice, enjoyed exclusive rights. This was despite the fact that even PETROBRAS was interested in manioc, and had set up a trouble-ridden (up to now) industrial unit in Survelo, MG. The solution to the problem, with several raw materials being admitted, turned out to be some sort of compromise, as the sugar mill owners had wanted sugar cane to be established as the only source of alcohol.

This and other controversies involving the producers, through COPERSUCAR, the IAA, PETROBRAS and the State bureaucracy pointed to the advisability of establishing effective control over the programme at a higher level than the IAA; thus, the National Alcohol Commission, made up of representatives of several ministries and the IAA, was created. The overall goal of the programme was to produce 3 000 million litres in 1980, the equivalent of 20% of estimated gasoline consumption.

Up to 1976, auto manufacturers had had a cautious, if not slightly hostile, attitude. The confirmation of technical studies on the viability of using alcohol alone led some of the industries to put out experimental test models. In September 1976, Volkswagen introduced three models, while Fiat, Ford, GM and Chrysler indicated that they were studying the possibility. Thus, there was a change in attitude in the automobile industry, which up to then had only stressed the technical difficulties of the alcohol engine. The discussion then centred on how to guarantee a permanent supply of alcohol so that a market could be created for alcohol-powered vehicles.

/The definition

The definition of incentives for alcohol concentrated on the establishment of parity prices for sugar and alcohol and of terms for financing the building or expansion of mills and distilleries. Initially, the interest rates for industrial financing were set at between 15% and 17%, with a twelve-year repayment period, three years of which were a grace period. The terms for loans for sugar cane growing were: 7% interest and a five-year repayment period, two years of which were the grace period. With inflation at 41% (in 1976) and 43% (in 1977), there is no doubt about the large subsidy granted to the Programme.

(b) Stages of the programme

The period between 1976 and 1978 was one of uncertainty and slow growth for the Programme. The central point that was still unsettled in 1975 was that of the role of PROALCOOL within the Brazilian energy policy. Since oil prices actually remained at a standstill during this time, nothing was done specifically to provide for oil substitutes.

Thus, the problem of producing alcohol-powered vehicles was not dealt with, nor was the question of the large-scale distribution of alcohol. The only thing that was really done was to produce alcohol and mix it with gasoline at a ratio of less than 20% in order not to have to make repairs and adjustments in the vehicles.

By 1978 it was already clear that certain large segments were against the Programme. The action of the Minister of Mines and Energy and of PETROBRAS were particularly important. PROALCOOL was especially inefficient in providing a substitute for petroleum, since alcohol could only be used as a substitute for gasoline and had little effect in reducing imports. It was suggested that a better alternative would be to invest in exploring for oil on the national territory. The search for alternative solutions, such as the production of gas from coal and others, was endorsed even by World Bank experts.

Nevertheless, during this period the National Sugar and Alcohol Commission -CENAL- approved around 200 projects; these, however, had to go through a lot of red tape. As criticism of the programme grew, it became increasingly difficult to obtain final approval and the freeing of resources on the part of the financial agents, particularly the Banco do Brasil.

/In this



In this atmosphere of uncertainty, the "second oil crisis" occurred, at the end of 1978. Clearly, this marked the beginning of a new stage for PROALCOOL, particularly since in 1979 alcohol was being produced in significant amounts and it was inevitable that a decision must be made regarding the use of alcohol alone in vehicles in order to give continuity to the programme.

During 1979, a series of measures were taken to make the programme more viable as an effective energy programme. The main ones were:

- modification of the parity ratio of the price of alcohol to the producer, which was reduced from 44 litres of alcohol for about 60 kg of sugar to 42 litres (8/6/78); 40 litres (31/1/79) and 39 litres (9/10/79);

- definition of a policy on prices of alcohol to the consumer, according to which the price of alcohol would never be more than 65% of the price of gasoline;

- streamlining of bureaucratic procedures in the approval of projects, the maximum time limit for which was set at two months. This went hand in hand with the institutional transformation of the sector brought about by the elimination of CNAL and the creation of the National Alcohol Council (regulatory) and of the National Executive Commission on Alcohol -CENAL- on 5 July 1979;

- negotiation with the automobile industry with a view to producing alcohol-powered vehicles and with representatives of authorized auto-repair shops for purposes of converting vehicles to alcohol. According to the Protocol signed at the time (second half of 1979), 1.95 million new alcohol-powered vehicles should be produced between 1980 and 1985 and 570 000 vehicles should be modified during the same period. At the same time, fiscal facilities were granted for use of alcohol-power automobiles, as were special financing terms for consumers;

- establishment of a production goal of 10 700 million litres by 1985.

An overall valuation of this new stage, compared with the previous one, leads to the conclusion that now there is indeed a programme designed to deal with the energy problem and not only at solving the crisis of the sugar sector.

In the context of this reactivation of the Programme, at the beginning of the current Government's term, PETROBRAS undertook to create a subsidiary, ALCOOLBRAS, which would be devoted to the production of alcohol from sugar cane and manioc and would monopolize distribution. The private sector reacted violently and succeeded in preventing the creation of the State agency. Once again, the debate on the question of a State takeover of the economy arose in Brazil.

As a countermeasure, and in an effort to contribute to the development of the sector, the domestic private enterprises concerned, particularly Dedini and Zanini, which control 70% of the market for sugar mill and distillery equipment, organized INVESTALCOOL, which was subsequently transformed into BRASALCOOL and received official support and capital from PETROBRAS. This body was controlled by the equipment manufacturers. Its objective is not to produce alcohol but rather to encourage the private sector by contributing up to 30% of resources in joint ventures.

The problems encountered in the Brazilian economy in 1980-1981 eventually had an impact, especially on energy substitution programmes. The Government drastically reduced funds for energy programmes, including PROALCOOL. An effort was made to discourage the demand for resources by raising the interest rate (in late 1980), and in public statements the Minister of Planning attributed to PROALCOOL part of the blame for the inflationary acceleration which took place from 1979 on.

At the same time, in mid-1981, a large-scale campaign against alcohol-powered vehicles was launched by the press, which pointed out the problems of fuel consumption and corrosion of parts.

In brief, PROALCOOL is once again at a very important crossroads. Its success depends on the policies set and the resources made available by the Government. The great problem is that it is the international situation with regard to oil -with prices stable or dropping because of the world recession- means that the Government does not feel pressed to solve the impasse.

(c) Foreign capital in PROALCOOL?

From the beginning, the financing of PROALCOOL was limited to enterprises having 100% domestic capital. This was the explicit wish of the entrepreneurial sectors who were most active in pressing for the creation of the programme and in defending it -the sugar mill owners and manufacturers of capital goods for the industry- which were clearly opposed to the participation both of foreign enterprise and of the State in alcohol production. They held the same position with regard to any foreign or State participation in the capital goods sector, but were not so successful in this case, because of the existing technology agreements and those made necessary by the technical lag in the industry and the presence of foreign interests in the manufacture of parts for the industry (pumps, monitoring equipment, etc.).

/Obviously, there

Obviously, there is no prohibition against foreign participation in the production of alcohol. As long as they are investing their own resources, foreigners are allowed to enter the sector. The main question that had discouraged them so far is that of the advantages enjoyed by the domestic enterprises as a result of the subsidies granted by the Government to investments in the industry.

The terms for industrial loans for alcohol production, summarized in table 13, by definition guarantee a negative interest rate of a significant amount: the monetary correction -under the terms granted up to 1980 and after the modification made at the end of that year- is always defined as a percentage of the variation in the readjustable commitments of the National Treasury -ORTN- which at the most go hand in hand with the variation in the general price index. Even the analysis of the rates of return on investment made by the financial agents of the Programme explicitly consider this subsidy in the payment of amortizations on the loans.

Actually, the private profitability of investments in alcohol is quite good, but this to a large extent is due to these very subsidies. Economists working with the entrepreneurs in the sector have stated, on several occasions, that alcohol is not an attractive investment without the subsidy.<sup>10/</sup> Allowing for the fact that their position is more a defence of subsidies than an objective analysis, there is no doubt that an enterprise not enjoying the subsidy would scarcely be able to compete in the sector.<sup>11/</sup>

Because of that situation, the Government has on countless occasions argued in favour of allowing the entry of foreign capital in PROALCOOL as an important element in negotiations with the private sector. The acceptance or rejection of the entry of those enterprises was subject to the capacity for mobilization and the response of the domestic private sector in dealing with the exigencies of the programme.

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<sup>10/</sup> Quoted by Barzelay, M., *op. cit.*, p. 87.

<sup>11/</sup> The high profitability may be deduced from the fact that new investments are subsidized and that this subsidy cannot be considered in setting the price of alcohol, so that there is also a positive profitability in the older and more technologically backward units, which do not enjoy the subsidy.

Table 13

BRAZIL: TERMS OF INDUSTRIAL LOANS FOR THE ESTABLISHMENT OF ALCOHOL DISTILLERIES

|                                    | Limit of financing                          | Repayment period |         | Interest   | Monetary correction                                      |
|------------------------------------|---|------------------|---------|--|--|
|                                    |   | Total            | Grace   |  |  |
| Terms in force up to December 1980 | 80% for sugar cane                          | 12 years         | 3 years | 2 to 5% for autonomous plants and 4 to 6% for annexes depending on the raw material and the region | 40% of the variation in the ORTN                         |
|                                    | 90% for other raw materials                 |                  |         |  |  |
| Conditions in force after 1981     | 70% for distilleries annexed to sugar mills | 12 years         | 4 years | 5%   | 55% of the variation in the ORTN for the North-Northeast |
|                                    | 80% for autonomous plants                   |                  |         |  | 65% for the rest of the country                          |
|                                    | 90% for co-operatives                       |                  |         |  |  |

The transnational groups have shown their interest in the programme on several occasions. In 1978, members of a Japanese international co-operation agency visited large areas of the northern part of the country (Amapá) in their search for an area that would be suitable for the large-scale production of alcohol from manioc.<sup>12/</sup> In 1979, the Government authorities repeatedly expressed their willingness to allow a foreign presence in the sector, provided it was oriented towards the export of alcohol. There would thus be a new articulation between the domestic private sector and the transnationals specializing in

<sup>12/</sup> Quoted by IPT in Energia de Biomassa e substituição do Petróleo: Mediação Político-Institucional e Organização de Produção, Monografia No. 56, Sao Paulo, 1980, mimeo.

marketing. In the final analysis, it has all come down to mere intentions, since nothing concrete has happened up to now. At the same time, the press has on several occasions denounced the existence of a foreign presence in the large new alcohol projects ("Bodoquena", "Jaiba", and others), in disguised association with domestic groups. This, however, has never actually been proven.

The only recent development that entails an actual expansion of the foreign presence in the programme is the acceptance by the Brazilian Government of the terms of a 250 million dollar World Bank loan to PROALCOOL. Under the terms of the loan, which gave rise to a lengthy controversy, capital goods are to be supplied on the basis of international bidding in which enterprises from other countries may take part, by importing the equipment. This sector is controlled by certain domestic enterprises, which because of their oligopolistic nature and the prohibition against importing "similar" goods, are not entirely up to date technologically, especially as regards the extraction of juice from sugar cane and the distillation of alcohol. This opening up to the external market will surely tend to encourage these enterprises to become associated with foreign enterprises, at least through licensing agreements.

VI. STRUCTURE OF THE ALCOHOL PRODUCTION SECTOR  
AND ITS RECENT EVOLUTION

As we have said before, the recent expansion of alcohol production should be viewed as an extension and dismemberment of the sugar agroindustry. The push for the programme came from those entrepreneurial groups, especially in the Centre-South, where 66% of domestic sugar production was already concentrated by 1974. In this chapter we shall briefly analyse the main data pertaining to the evolution of the sugar cane sector during the period 1974-1980, in order to enable us to evaluate the structure of the sector and the effect of the expansion of alcohol in both the agricultural and the industrial sectors.

(a) The growth of sugar cane and alcohol production in recent years

Between 1965 and 1979, the area planted in sugar cane in Brazil rose from 1.7 million hectares to 2.5 million (see table 14). In 1980, the area again increased, with São Paulo moving up to a leading position, as it had more than one million hectares planted in sugar cane (see table 15).

Table 15 also shows that over 50% of the 700 000 hectare increase in the area planted in sugar cane between 1974 and 1980 was concentrated in São Paulo and that another 21% of the increase was in Alagoas. These two states, plus Pernambuco, now account for two thirds of all sugar cane planted in Brazil.

Table 14  
BRAZIL: EVOLUTION OF HARVESTED AREA OF MAJOR CROPS (1975/1979)  
(Thousands of hectares)

| Crop       | 1965  | 1970  | 1975   | 1979   |
|------------|-------|-------|--------|--------|
| Cotton     | 4 004 | 4 299 | 2 330  | 3 646  |
| Peanuts    | 544   | 667   | 345    | 288    |
| Rice       | 4 619 | 4 979 | 5 306  | 5 452  |
| Coffee     | 3 673 | 2 403 | 2 217  | 2 406  |
| Sugar cane | 1 705 | 1 725 | 1 969  | 2 541  |
| Beans      | 3 273 | 3 485 | 4 146  | 4 212  |
| Oranges    | 150   | 202   | 403    | 475    |
| Manioc     | 1 750 | 2 025 | 2 041  | 2 111  |
| Maize      | 8 771 | 9 858 | 10 855 | 11 319 |
| Wheat      | 766   | 1 895 | 2 932  | 3 831  |
| Soybeans   | 432   | 1 319 | 5 824  | 8 256  |

Source: FIBGE, Anuarios Estadísticos, several volumes.

Table 15  
 AREA PLANTED IN SUGAR CANE, BY STATES (1974/1980)  
 (Thousands of hectares)

| State          | 1974         | 1975         | 1976         | 1977         | 1978         | 1979         | 1980         |
|----------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| São Paulo      | 720          | 621          | 723          | 791          | 871          | 945          | 1 060        |
| Pernambuco     | 303          | 267          | 329          | 350          | 353          | 366          | 365          |
| Alagoas        | 195          | 228          | 230          | 290          | 309          | 330          | 357          |
| Rio de Janeiro | 163          | 162          | 162          | 192          | 180          | 194          | 198          |
| Minas Gerais   | 240          | 255          | 190          | 183          | 180          | 181          | 186          |
| Paraíba        | 52           | 60           | 70           | 80           | 92           | 101          | 110          |
| Bahia          | 78           | 77           | 69           | 78           | 83           | 75           | 73           |
| Paraná         | 40           | 46           | 52           | 43           | 47           | 60           | 65           |
| Others         | 266          | 253          | 268          | 263          | 273          | 289          | 287          |
| <u>Total</u>   | <u>2 057</u> | <u>1 969</u> | <u>2 093</u> | <u>2 270</u> | <u>2 388</u> | <u>2 541</u> | <u>2 701</u> |

Source: FIBGE, Fundação Instituto Brasileiro de Geografia e Estatística, quoted by Homem de Melo, F. e Fonseca, E.G., Proalcool. Energia y Transporte, FIPE, PIONEIRA, São APaulo, 1981, p. 9.

During the existence of PROALCOOL, the yield per hectare rose by 15% on average for the whole country (triennial mean) with more or less similar results being noted in São Paulo, Alagoas and other states such as Rio de Janeiro, Minas Gerais and Paraná. In Pernambuco and Bahia, however, there were no significant improvements (see table 16).

The increase in area and yield during the period 1974-1980 brought the physical increase in production to over 50%; this went almost entirely towards an increase in the production of alcohol. In effect, after five years in which alcohol production in Brazil remained at a standstill, at a little over 600 million litres per year, with the agricultural year 1975-1976 there was a spectacular increase in production, which rose from slightly over 550 million litres to 3 700 million in 1980-1981 (see table 17). Meanwhile, sugar production fluctuated considerably, between 6 and 8 million tons.

Table 16  
SUGAR CANE: EVOLUTION OF YIELDS PER UNIT OF LAND PLANTED,  
BY STATES (1974/1980)

| State          | 1974        | 1975        | 1976        | 1977        | 1978        | 1979        | 1980        |
|----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| São Paulo      | 54.8        | 57.3        | 63.5        | 65.5        | 66.9        | 67.1        | 66.0        |
| Pernambuco     | 48.0        | 48.0        | 46.9        | 48.0        | 48.0        | 48.4        | 47.5        |
| Alagoas        | 45.2        | 46.1        | 46.1        | 50.2        | 50.5        | 52.5        | 52.0        |
| Rio de Janeiro | 35.2        | 45.0        | 39.6        | 47.0        | 48.4        | 48.4        | 48.5        |
| Minas Gerais   | 38.0        | 32.6        | 36.2        | 40.6        | 40.1        | 40.9        | 43.0        |
| Paraíba        | 56.7        | 40.9        | 43.5        | 53.1        | 46.5        | 51.3        | 49.3        |
| Bahia          | 42.0        | 42.0        | 38.0        | 38.0        | 38.0        | 40.4        | 40.0        |
| Paraná         | 57.0        | 50.1        | 50.1        | 70.1        | 63.0        | 68.8        | 70.0        |
| <u>Brazil</u>  | <u>46.5</u> | <u>46.5</u> | <u>49.3</u> | <u>52.9</u> | <u>54.1</u> | <u>55.1</u> | <u>54.9</u> |

Source: FIBGE - Fundação Instituto Brasileiro de Geografia e Estatística, quoted by Homen de Melo, F., and Fonseca, E.G., op. cit., p. 10.

Table 17  
BRAZIL: PRODUCTION OF ALCOHOL AND SUGAR (1974/1981)

| Crop year           | Alcohol<br>(millions of litres) | Sugar<br>(thousands of tons) |
|---------------------|---------------------------------|------------------------------|
| 1974/1975           | 625                             | 6 721                        |
| 1975/1976           | 556                             | 5 888                        |
| 1976/1977           | 643                             | 7 208                        |
| 1977/1978           | 1 470                           | 8 308                        |
| 1978/1979           | 2 452                           | 7 342                        |
| 1979/1980           | 3 390                           | 6 645                        |
| 1980/1981           | 3 704                           | 8 107                        |
| 1981/1982 <u>a/</u> | 4 300                           | 8 200                        |

Source: Instituto do Açúcar e do Alcool.

a/ Estimates.

/This process



This process of increased alcohol production and stagnation of sugar production was not, as might be expected, a result of the establishment of new units designed solely for the production of alcohol. On the contrary, it was almost entirely due to the building of "annexes" to the old sugar mills. Thus, in 1979, 91% of all the capacity for producing alcohol from sugar cane in Brazil was concentrated in "annexed" distilleries and only 9% was in the "autonomous" ones (distilleries designed solely for the production of alcohol).

Thus, almost all the increase in alcohol production originated within the same enterprises and groups that had been engaged in sugar production before PROALCOOL, in as much as they added distillery equipment to their sugar mills. Alcohol production is even more concentrated spatially than sugar production. In 1980, São Paulo produced 74% of all alcohol in Brazil, with Pernambuco and Alagoas producing 12%.

This situation will change significantly in the next few years. Indeed, the addition of distilleries to old sugar plants has almost reached the saturation point and from now on it will be necessary to set up new, autonomous production units. In addition, the Government is clearly in favour of granting priority in financing to the autonomous distilleries, in order to prevent a possible "transformation" of alcohol production into sugar should the international market for sugar become more favourable.

Thus, the projects that have been approved in the context of PROALCOOL for entry into operation in the next few years will mostly consist of autonomous distilleries, as may be seen in table 18.

On the other hand, there was a large and growing integration of ownership of industry and agriculture in the sugar cane production and processing sector. By law, the sugar mills must purchase at least 30% of the cane they produce. During the 1979 season, of the total amount of cane the mills and distilleries of São Paulo processed, 64% was their own and 36% was purchased from suppliers.

Nevertheless, there was a growing tendency to get around the legal restraints by means of fictitious contracts for the purchase of cane which are really contracts for the lease of lands belonging to medium-sized rural landowners. The mill takes care of everything -planting, harvesting, transport, etc.- and pays an annual rent to the owner of the land. The gains in productivity make this procedure worthwhile.

/In the

In the cases when cane really is obtained from suppliers, sales are carried out directly between the mill and the supplier and there is no significant intermediation.

Table 18

BRAZIL: INSTALLED CAPACITY AND POTENTIAL PRODUCTION OF ALCOHOL (1980/1989)

| Year      | Installed capacity <u>a/</u> |    |                       |    | Total   | Potential<br>production<br><u>b/</u> |
|-----------|------------------------------|----|-----------------------|----|---------|--------------------------------------|
|           | Autonomous                   |    | Annexed               |    |         |                                      |
|           | Millions of<br>litres        | %  | Millions of<br>litres | %  |         |                                      |
| 1980/1981 | 3 639.9                      | 85 | 652.5                 | 15 | 4 289.4 | 4 289.4                              |
| 1981/1982 | 4 202.3                      | 76 | 1 359.1               | 24 | 5 561.4 | 5 208.2                              |
| 1982/1983 | 4 544.8                      | 71 | 1 827.8               | 29 | 6 372.6 | 6 138.3                              |
| 1983/1984 | 4 738.8                      | 64 | 2 640.9               | 36 | 7 379.7 | 6 973.2                              |
| 1984/1985 | 4 810.5                      | 58 | 3 517.8               | 42 | 8 328.3 | 7 889.9                              |
| 1985/1986 | 4 837.7                      | 52 | 4 467.5               | 48 | 9 305.2 | 8 830.4                              |
| 1986/1987 | 4 837.7                      | 51 | 4 730.9               | 49 | 9 568.6 | 9 437.0                              |
| 1987/1988 | 4 837.7                      | 51 | 4 730.9               | 49 | 9 568.6 | 9 568.7                              |
| 1988/1989 | 4 837.7                      | 50 | 4 757.9               | 50 | 9 595.6 | 9 595.6                              |

Source: Prepared by COALBRA on the basis of original data from IAA.

a/ Projects already approved under PROALCOOL (March 1981). This estimate is based on the assumption that installed capacity for the 1977/1978 harvest was fully utilized.

b/ Potential production: It was estimated that the additional capacity for each year is the potential production for that same year, in the case of annexed plants. In the case of autonomous plants, it is considered that the production during the year of installation would be equal to 50% of total capacity, with the other 50% being filled during the following year.

VII. FRUSTRATION OF OFFICIAL EXPECTATIONS AND BENEFITS  
OF THE TRANSNATIONALS

The Government authorities had high expectations when PROALCOOL was created in 1975. The decree by which it was established justified it as a programme which: "Efficiently co-ordinated, should contribute significantly towards:

- (i) saving foreign exchange, which is one of its main objectives, through the substitution of imports of oil, currently used by our vehicle fleet, and of raw materials for the chemical industry;
- (ii) reducing regional income disparities, since the entire country -including the low-income regions- has the minimum conditions necessary to produce raw materials in sufficient quantities, particularly manioc;
- (iii) reducing individual income disparities, since its greatest effect will be on the agricultural sector and, within it, on highly labour-intensive commodities;
- (iv) increasing the domestic income, by using factors of production that are either idle or in a situation of disguised unemployment -mainly land and labour- considering that the crops can be located in areas where these resources are available;
- (v) expanding the production of capital goods through an increase in orders for equipment, with a high nationalization index, to be used for the expansion, modernization and setting up of distilleries." 13/

Considering these objectives, it is quite clear that the main disappointment with the programme concerns its social objective of improving the distribution of income regionally and individually. Although this study is not aimed at analysing the causes of this frustration, we may, on the basis of our discussion of the evolution of the programme in recent years, point out certain facts that have to do with the concentration of regional and personal income:

- (a) production is based almost entirely on sugar cane, with very little use of other raw materials;
- (b) the modernization of sugar cane growing has been accelerated and specialization and concentration of production on large properties is encouraged;

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13/ Conselho de Desenvolvimento Economico, Exposição de Motivos, No. 21/75 of 5 November 1975.

(c) there has been an alteration of the relations of production, as a result of the same phenomena noted in (b), which has led to the destruction of small-scale production and an increase in migrant labour.

This is not the place to discuss whether other alternatives were or were not viable, technically and economically. It should be noted, however, that these negative aspects were in fact the counterpart of a significant part of the benefits that PROALCOOL brought to the transnationals. Obviously, we do not wish to make connexions between the two phenomena as if there had been something intentional in the situation. On the contrary, it is important only to note the fact that, although they are not linked directly to the production of sugar cane or of alcohol, the transnationals in Brazil nevertheless control the sectors concerned with agricultural machinery and modern inputs -especially fertilizers and herbicides.<sup>14/</sup> These were the sectors that benefited from the programme's trend towards the increased concentration of incomes noted at present.

It should be borne in mind, however, that this was not characteristic of the actions of the transnationals in the specific case of PROALCOOL. On the contrary, the same thing happened (and continues to happen) everytime there is rapid modernization, as in the cases of soybeans and wheat. What is always strongly vindicated by the sectors producing agricultural machinery and inputs are the subsidized loans designed to enable agriculture to purchase large quantities of goods without problems. They are not so concerned, however, with whether these loans are applied to the production of alcohol or of foods. The Government's choice of energy agriculture, therefore, worked strongly in their favour, even though they could have obtained the same benefits from a different policy option.

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<sup>14/</sup> This point will be discussed in detail later on.

## VIII. PRODUCTIVE STRUCTURE OF THE SUGAR AND ALCOHOL INDUSTRY

### (a) Industrial structure

As we have mentioned before, the sugar sector has been the foundation on which the alcohol sector has developed in Brazil, so that today a sugar and an alcohol enterprise are very often one and the same. A relatively small amount of alcohol is produced in autonomous distilleries and these belong almost entirely to the sugar groups; thus, we may speak of a single economic sector.

Another characteristic that is revealed by the above analysis is the scale of production of the sector. Promoted partly by the same factors that favoured the large-scale agricultural operations, the industrial sector tended to organize on the basis of medium-sized and large units. This trend was also substantially reinforced by the undeniable economies of scale in the industrial process. Thus, for example, in the juice extraction stage alone, the processes used in the medium-sized and large plants made it possible to achieve an index of fermentable sugars of 96%, whereas with the more rudimentary process used in the small and very small plants it is difficult to obtain more than 85%. There are similar differences at other stages, particularly as regards the higher degree of instrumentation and control of the process.<sup>15/</sup>

In brief, from the beginning of the 1970s, the large-scale plants have definitely become typical. In orienting entrepreneurs, CENAL considers a daily production capacity of 120 000 litres of alcohol to be typical for autonomous distilleries. This would require an investment in the order of 14.4 million dollars and a sugar cane area of seven to eight thousand hectares to supply the raw material, with a daily consumption of 1 800 tons of cane.

The economic units that have become established in the sector are usually highly capitalized and mechanized and extremely dynamic in developing and absorbing new techniques, especially as regards agricultural production.

The economic structure of the sector, however, can only be fully understood by taking into account the important role played by the Central Co-operative of

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<sup>15/</sup> Nevertheless, advocates of small units argue that the cost of alcohol would be lower in the "small" and "very small" distilleries, especially because of the lower cost of capital. It is difficult to prove this, except through a comparative case study. There is no doubt, however, that the physical yield of sugar or alcohol is much greater in the large units.

Sugar and Alcohol Producers of the State of São Paulo -COPERSUCAR. This is a co-operative of the major plant owners of the state which provides marketing and advisory services and also owns some sugar mills and distilleries of its own.

The plants affiliated with COPERSUCAR accounted for almost three-fourths of the total production of the sector in the state of São Paulo -measured by the amount of cane milled per plant- for the 1980-1981 harvest. These plants had had a share of nearly 80% four years before (see table 19). Thus, despite the fact that in 1980-1981 there were 100 mills and distilleries in São Paulo, 75% of production was marketed by one "enterprise" organized as a co-operative. Its economic power in official price-setting policy is of course unquestionable.

Nevertheless, the power which COPERSUCAR exercises directly over the sugar and alcohol market is only part of its great economic and political power. Indeed, as we have mentioned before, all economic policies relating to sugar and alcohol originate with or at some point are filtered through COPERSUCAR.

In São Paulo there is also the Society of Sugar and Alcohol Producers -SOPRAL- an institution designed to protect the interests of the sector which brings together 26 plants and distilleries that do not belong to COPERSUCAR (having broken off with it because of disagreements), which were responsible for processing 23.6% of the cane harvested in 1980-1981. This means that the mills or distilleries that are truly independent represent only 3.2% of the physical production of the sector in the state of São Paulo.

The structure of plant ownership is not so concentrated, but even so there is clearly a trend towards concentration. Table 20 shows the situation from the standpoint of the structure of net patrimony and of income from sales of the main plants belonging to economic groups in the country in 1980.<sup>16/</sup>

The first feature that should be noted is the total regional "specialization" of the economic groups of the sector. With the sole exception of the Othon group (which actually could have been classified as a diversified domestic group and not as a group of the Northeast), which owns plants in Pernambuco, Alagoas and in Rio de Janeiro, all have units either in the Centre-South (especially São Paulo) or in the Northeast (Pernambuco and Alagoas).

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<sup>16/</sup> The information is based on 190 plants and distilleries having one million dollars worth of "net patrimony" (a concept which refers to the book value of capital plus reserves and accumulated profits).

Table 19

SHARE OF COPERSUCAR PLANTS IN TOTAL SUGAR CANE MILLING  
IN THE STATE OF SAO PAULO: 1977-1981

(Percentages)

| Season    | Co-operatives | Other than co-operatives |
|-----------|---------------|--------------------------|
| 1977/1978 | 79.7          | 20.3                     |
| 1978/1979 | 79.4          | 20.6                     |
| 1979/1980 | 75.2          | 24.8                     |
| 1980/1981 | 73.2          | 26.8                     |

Source: IAA, Bulletins, several years.

There is also a high degree of economic concentration, both as regards participation in the net patrimony of the sector and in total income from sales.<sup>17/</sup> Thus, the "Ometto group" alone has 19% of all the patrimony of the sector at the national level and obtains 13% of all income from sales, without considering COPERSUCAR's sales. If we add to this the mills belonging to COPERSUCAR plus those belonging to the Atalla, Biagi, Dedini (which has relations with Ometto), Ruete Oliveira and Zillo Lorenzetti groups, we will see that seven groups control 34% of the patrimony and 38% of the income of the sector. It should be noted that these groups are all in the Centre-South and mostly specialize in this sector (even though they have some interests in other activities).

The real significance of these figures on concentration cannot be understood unless one bears in mind that this is an agroindustry where industrial and agricultural property are integrated. Evidently, these figures would represent a low concentration in industrial sectors such as automobile manufacturing or even in agroindustries that are not integrated vertically with agricultural production, as in the case of the vegetable oil industry. However, in a sector that is both

<sup>17/</sup> These data are based on accounting statements, and thus are not always the same for the enterprise and for the distilleries or sugar mills. Moreover, the patrimony and direct income of COPERSUCAR were excluded from the total patrimony in order to avoid duplicating information. Only plants and distilleries belonging to COPERSUCAR were considered.

Table 20

## BRAZIL: ECONOMIC STRUCTURE OF THE SUGAR AND ALCOHOL SECTOR, BY MAJOR GROUPS, 1980

| Group  | Activity  | Enterprise,<br>plant or<br>distillery | State | Net patrimony    |      | Income from sales |      |
|--|---|---------------------------------------|-------|------------------|------|-------------------|------|
|  |   |                                       |       | Cr\$<br>millions | %    | Cr\$<br>millions  | %    |
| <b>1. GROUPS IN THE CENTRE-SOUTH</b>   |   |                                       |       | 47 929.1         | 41.2 | 64 577.4          | 43.9 |
| 1.1 COPERSUCAR (Includes only plants and distilleries belonging to COPERSUCAR) | Sugar and alcohol<br>- Coffee   | -                                     | -     | 3 527.7          | 3.0  | 22 083.1          | 15.0 |
|  |   | União dos Refinadores                 | SP    | 2 705.4          | 3.0  | 14 480.7          | 15.0 |
|  |   | Açúcar União                          | RJ    | 409.7            |      | 3 802.7           |      |
|  |   | Piedade                               | RJ    | 412.6            |      | 3 799.7           |      |
| 1.2 ATALLA   | Sugar and alcohol<br>- Coffee   | -                                     | -     | 5 248.9          | 4.5  | 1 124.3           | 0.8  |
|  |   | Central do Paraná                     | PR    | 5 063.2          |      | 579.9             |      |
|  |   | Malvina                               | MG    | 185.7            |      | 544.4             |      |
| 1.3 SILVA GORDO - QUATAPARA  | Sugar and alcohol,<br>forests, paper, real<br>estate                                  | Tamoios                               | SP    | 2 656.0          | 2.3  | 925.4             | 0.6  |
| 1.4 OMETTO   | Sugar and alcohol,<br>agriculture and live-<br>stock, com., vehicles,<br>construction | -                                     | -     | 22 406.3         | 19.3 | 19 424.4          | 13.2 |
|  |   | São João                              | SP    | 3 222.7          |      | 3 949.0           |      |
|  |   | São Martinho                          | SP    | 3 140.2          |      | 4 599.6           |      |
|  |   | Ometto                                | SP    | 2 697.4          |      | 2 558.1           |      |
|  |   | Usina da Barra                        | SP    | 1 810.3          |      | 5 273.4           |      |
|  |   | Santa Bárbara                         | SP    | 836.0            |      | 654.4             |      |
|  |   | Boa Vista                             | SP    | 453.3            |      | 226.2             |      |
|  |   | Costa Pinto                           | SP    | 307.1            |      | 1 020.0           |      |
|  |   | Brasileiras                           | SP    | 3 403.2          |      | 103.8             |      |
|  |   | Monte Belo                            | SP    | 163.9            |      | 308.5             |      |
|  |   | Paulistas                             | SP    | 6 253.6          |      | 217.0             |      |
| Santa Ana  | SP  | 118.6                                 |       | 514.4            |      |                   |      |
| 1.5 DEDINE   | Sugar and alcohol,<br>sugar and alcohol<br>equipment, metallur-<br>gy, engineering    | -                                     | -     | 1 034.8          | 0.9  | 1 315.5           | 0.9  |
|  |   | Delta                                 | MG    | 124.8            |      | 19.4              |      |
|  |   | São Luiz                              | SP    | 910.0            |      | 1 296.1           |      |
| 1.6 BIAGI  | Sugar and alcohol,<br>agriculture and<br>livestock, beverages,<br>transport           | -                                     | -     | 2 817.7          | 2.4  | 5 215.6           | 3.5  |
|  |   | Biagi                                 | SP    | 1 637.4          |      | 2 281.5           |      |
|  |   | Santa Elisa                           | SP    | 643.8            |      | 1 410.1           |      |
|  |   | Vale Rosana                           | SP    | 417.7            |      | 902.0             |      |
| 1.7 RUETE OLIVEIRA   | Sugar and alcohol   | -                                     | -     | 118.8            |      | 622.0             |      |
|  |   | Sev                                   | SP    | 118.8            |      | 622.0             |      |
|  |   | -                                     | -     | 2 537.1          | 2.2  | 2 481.3           | 1.7  |
|  |   | Virgulino de Oliveira                 | SP    | 1 510.7          |      | 963.6             |      |
|  |   | Catanduva                             | SP    | 1 026.4          |      | 1 517.7           |      |



Table 20 (cont.1)

| Group                             | Activity   | Enterprise,<br>plant or<br>distillery | State | Net patrimony    |     | Income from sales |     |
|-----------------------------------|--|---------------------------------------|-------|------------------|-----|-------------------|-----|
|                                   |  |                                       |       | Cr\$<br>millions | %   | Cr\$<br>millions  | %   |
| 1.8 IRMAOS FRANCESCHI             | Sugar and alcohol  | -                                     | -     | 1 722.1          | 1.5 | 1 466.2           | 1.0 |
|                                   |  | Franceschi                            | SP    | 1 245.0          |     | 1 022.0           |     |
|                                   |  | Arapua                                | MG    | 477.1            |     | 444.2             |     |
| 1.9 ZILLO LORENZETTI              | Sugar and alcohol,<br>agriculture and<br>livestock   |                                       |       | 1 943.5          | 1.7 | 4 077.9           | 2.8 |
|                                   |  | Zillo Lorenzetti                      | SP    | 1 083.2          |     | 2 193.9           |     |
|                                   |  | Barra Gde. Lençóis                    | SP    | 735.6            |     | 1 544.4           |     |
|                                   |  | São José                              | SP    | 124.7            |     | 339.6             |     |
| 1.10 RESENDE BARBOSA              | Sugar and alcohol,<br>agriculture and<br>livestock   |                                       |       | 1 091.0          | 0.9 | 2 541.8           | 1.7 |
|                                   |  | Nova América                          | SP    | 752.8            |     | 1 338.9           |     |
|                                   |  | Maracai                               | SP    | 338.2            |     | 1 202.9           |     |
| 1.11 RIBEIRO PINTO                | Sugar and alcohol,<br>equipment  | Santa Lygia                           | SP    | 413.0            | 0.4 | 769.1             | 0.5 |
| 1.12 MARCHESI                     | Sugar and alcohol,<br>agriculture and<br>livestock   |                                       |       | 279.8            | 0.2 | 604.6             | 0.4 |
|                                   |  | Albertina                             | SP    | 194.8            |     | 329.7             |     |
|                                   |  | Rio Grande                            | MG    | 85.0             |     | 274.9             |     |
| 1.13 FURLAN - BARRICHECCO - COURT | Sugar and alcohol  |                                       |       | 1 913.0          | 1.6 | 1 345.4           | 0.9 |
|                                   |  | Bom Jesus                             | SP    | 997.7            |     | 635.8             |     |
|                                   |  | São Jorge                             | SP    | 475.1            |     | 69.7              |     |
|                                   |  | Santa Helena                          | SP    | 440.2            |     | 639.9             |     |
| <b>2. DIVERSIFIED GROUPS</b>      |  |                                       |       |                  |     |                   |     |
| 2.1 MATARAZZO                     | Aluminium, cement,<br>coffee, textiles,<br>foodstuffs, chemicals,<br>minerals, etc.                | Amélia                                | SP    | 1 419.5          | 5.5 | 4 271.2           | 2.9 |
| 2.2 VIDIGAL                       | Insurance, banks,<br>metal mechanics,<br>cement, reforesta-<br>tion, agriculture and<br>livestock  | Jacarezinho                           | SP    | 3 715.1          | 3.2 | 1 531.6           | 1.0 |
| 2.3 VOTANRANTIN                   | Cement, aluminium,<br>steel, equipment,<br>weighing equipment,<br>chemicals, textiles,<br>minerals |                                       |       | 909.8            | 0.8 | 957.8             | 0.7 |
|                                   |  | São José                              | PE    | 901.1            | 0.8 | 727.5             | 0.5 |
|                                   |  | Tiuna                                 | PE    | 749.5            |     | 583.2             |     |
| 2.4 SCARPA                        | Textiles, sugar and<br>alcohol   | São Francisco                         | SP    | 151.6            |     | 144.3             |     |
|                                   |  |                                       |       | 562.6            | 0.5 | 691.3             | 0.5 |

Table 20 (cont.2)

| Group                             | Activity   | Enterprise,<br>plant or<br>distillery | State | Net patrimony    |      | Income from sales |     |
|-----------------------------------|--|---------------------------------------|-------|------------------|------|-------------------|-----|
|                                   |  |                                       |       | Cr\$<br>millions | %    | Cr\$<br>millions  | %   |
| 2.5 GOMES DE ALMEIDA              | Real estate, develop-<br>ments, agriculture<br>and livestock             | Guarani                               | ...   | 331.0            | ...  | ...               | ... |
| <b>3. GROUPS IN THE NORTHEAST</b> |  |                                       |       | 11 661.8         | 10.3 | 12 491.9          |     |
| 3.1 OTHON                         | Hotels, sugar and<br>alcohol, textiles                                   | Central Barreiros                     | PE    | 2 981.2          | 2.6  | 1 829.9           | 1.2 |
|                                   |  | Sto. André Rio Una                    | PE    | 921.2            |      | 601.1             |     |
|                                   |  | Barcelos                              | (RJ)  | 848.9            |      | 286.2             |     |
|                                   |  | Monte de Alagoas                      | AL    | 499.1            |      | 388.4             |     |
|                                   |  | Carapeboas                            | (RJ)  | 358.4            |      | 243.9             |     |
|                                   |  |                                       |       | 353.6            |      | 310.3             |     |
| 3.2 WANDERLEY                     | Sugar and alcohol  | Coruripe                              | AL    | 938.6            | 0.8  | 1 008.0           | 0.7 |
| 3.3 ARMANDO QUEIROZ               | Banks, textiles,<br>equipment (F. Lille),<br>mechanics, Com.<br>vehicles | Melhoramentos                         | PE    | 893.3            | 0.8  | 1 239.4           | 0.8 |
| 3.4 JOAO SANTOS                   | Agriculture and live-<br>stock, cement, paper,<br>transport              | Goiania                               | PE    | 886.1            | 0.8  | 877.2             | ... |
| 3.5 TAVARES DE MELLO              | Sugar and alcohol,<br>foodstuffs   | Olho d'Agua                           | PE    | 1 273.4          | 1.1  | 1 366.8           | 0.9 |
|                                   |  | Estivas                               | RN    | 715.2            |      | 664.9             |     |
|                                   |  | Gramame                               | PB    | 437.0            |      | 512.6             |     |
|                                   |  |                                       |       | 121.2            |      | 188.8             |     |
| 3.6 JOSE MARANHO                  | Sugar and alcohol,<br>agriculture and<br>livestock                       | Matany                                | PE    | 420.3            | 0.4  | 524.1             | 0.4 |
| 3.7 ALBUQUERQUE QUEIROZ           | Agriculture and<br>livestock, textiles                                   | Salgado                               | PE    | 121.6            | 0.1  | 638.5             | 0.4 |
| 3.8 CARNEIRO DA CUNHA             | Sugar and alcohol  | Massanassu                            | PE    | 1 203.7          | 1.0  | 1 623.0           | 1.1 |
|                                   |  | Catenda                               | PE    | 665.9            |      | 679.7             |     |
|                                   |  |                                       |       | 537.8            |      | 943.1             |     |
| 3.9 PESSOA DE MELLO               | Sugar and alcohol  | Agua Branca                           | PE    | 959.3            | 0.8  | 931.8             | 0.6 |
|                                   |  | Pessoa de Mello                       | PE    | 194.2            |      | 267.6             |     |
|                                   |  |                                       |       | 765.1            |      | 664.2             |     |
| 3.10 PEREIRA DE LYRA              | Sugar and alcohol  | Leginha                               | AL    | 1 171.5          | 1.0  | 962.9             | 0.7 |
|                                   |  | Unisa                                 | AL    | 696.1            |      | 619.9             |     |
|                                   |  |                                       |       | 475.4            |      | 343.0             |     |

Table 20 (concl.)

| Group   | Activity          | Enterprise,<br>plant or<br>distillery | State | Net patrimony    |       | Income from sales |       |
|---|-------------------|---------------------------------------|-------|------------------|-------|-------------------|-------|
|   |                   |                                       |       | Cr\$<br>millions | %     | Cr\$<br>millions  | %     |
| 3.11 RIBEIRO TOLEDO                                   | Sugar and alcohol |                                       |       | 530.3            | 0.5   | 995.1             | 0.7   |
|   |                   | Capricho                              | AL    | 254.5            |       | 372.6             |       |
|   |                   | Sumama                                | AL    | 166.7            |       | 409.8             |       |
|   |                   | Penedo                                | AL    | 109.1            |       | 212.1             |       |
| 3.12 RIBEIRO COUTINHO                                 | Sugar and alcohol |                                       |       | 282.5            | 0.2   | 495.7             | 0.3   |
|   |                   | São João                              | PB    | 147.2            |       | 215.8             |       |
|   |                   | Santana                               | PB    | 135.3            |       | 279.9             |       |
| 4. INDEPENDENT UNITS<br>(121 plants and distilleries) |                   |                                       |       | 50 331.6         | 43.2  | 65 922.5          | 44.7  |
| OVERALL TOTAL FOR THE SECTOR                          |                   |                                       |       | -                | -     | -                 | -     |
|   |                   |                                       |       | 116 342.5        | 100.0 | 147 263.2         | 100.0 |

Source: Revista Visão: Quem é Quem na Economia Brasileira: São Paulo, 29/08/81. Gazeta Mercantil: Balanço Anual, 1981, São Paulo, 30/09/81.

Note: An effort was made to make information from the two sources compatible.

- SP - São Paulo
- PR - Paraná
- RJ - Rio de Janeiro
- MG - Minas Gerais
- PE - Pernambuco
- AL - Alagoas
- PB - Paraíba
- RN - Rio Grande do Norte

agricultural and industrial, the percentages of participation in the assets and income of the sector by a few economic groups are very high, since the agricultural production structure is usually not very concentrated.<sup>18/</sup> Another feature that is due to its being a sector with an integrated agricultural base is the large number of establishments within the sector that belong to the seven groups (or six, since the "Dedini group" has close ties with Ometto): 29 mills and distilleries, with an average of more than 4 establishments per group.

In general, these groups in the Centre-South are mainly interested in the sugar and alcohol sector, although this does not mean that is their only interest, as will be seen in table 20. Of the seven groups mentioned, only the Dedini group is mainly interested in other sectors -the production of capital goods and metallurgy- although it also has indirect ties with alcohol and sugar, since it is the main producer of equipment for these industries in the country.

There are 5 or 6 diversified groups having sugar and alcohol interests; the number depends on how the Othon group is considered. Their share in the total assets and income of the sector is not to be underestimated, considering that they only have a few units of production, their main characteristic being that they only own one or two plants, usually medium or large in size. It should be noted that they include some of the largest national groups. Votanrantim is the largest in the country; Matarazzo, the tenth; Vidigal, the seventeenth; and Gomes de Almeida, the sixty-seventh, according to the value of their assets. Thus, we have a situation where large groups whose interests in the sector may seem small from the standpoint of their overall activities but are materialized through large establishments in the sugar cane industry.

Finally, as regards the largest groups in the Northeast, it is clear that, with the exception of Othon, they are essentially family enterprises that are mainly concerned with the sugar mills, of which they own two or three. Actually, except in a few cases, they could hardly be characterized as real "economic groups". They play a much less important role in the sector than the groups of the Centre-South. The eleven groups that were identified in the Northeast (leaving out the Othon group) represented 7.5% of the net assets and 7.2% of the total income of the sector in 1980; these figures cover 19 sugar mills and distilleries.

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<sup>18/</sup> Even in abstract economic models, it is always assumed that the agricultural structure almost meets the requirements for perfect competition. The most obvious example may be seen in the dynamic model of Kaleki (see "Theory of Economic Dynamics").

(b) Ownership of the sector

Up to now, the sugar and alcohol sector has been wholly domestically owned. As we mentioned above, its recent growth and modernization was promoted and directed in the interest of the main groups in the sector. This made it possible not only to consolidate the enterprises and groups but also to promote a rapid process of capitalization of the enterprises and concentration in the sector. In other words, these groups have clearly defined interests of their own and considerable economic and political power.

The absence of direct foreign interests was achieved through the establishment of standards by PROALCOOL, which restricted the attractive financing terms to the domestic groups. Thus, the setting up of plants or distilleries by transnational corporations is not formally prohibited, but they do not receive the generous subsidized loans mentioned above. Consequently, they virtually lose any potential competitiveness within the sector.

Although the great majority of the groups in the sector have their main interests or activities in it, the penetration of outside groups, mainly in association with traditional groups, has recently become quite visible. The largest alcohol project -Bodoque, with a daily production of 1.5 million litres- to be set up in Mato Grosso is a joint undertaking by a national consortium made up of the Onetto group, the Dedini group and the Banco Itaú, which would thus join the Banco Mercantil (Vidigal group) as cases of the penetration of banking capital in the production of alcohol.

Up to now, the association of capitals takes place mainly between traditional sugar cane groups and producers of capital goods for the alcohol and sugar industry. The ties between the Dedini group and the Pedro Onetto group (a sub-branch of the Onetto group) and between the Zanini the Bagi groups are well known. Dedini and Zanini are the two largest manufacturers of equipment for the industry. As we will see below, although the fact the equipment industry is also an essentially domestic sector, the enterprises in it have some type of relationship and association with transnationals, especially through technology licencing contracts. These relationships tend to become increasingly close and frequent, since the Government's agreement with the World Bank regarding a US\$ 250 million loan to PROALCOOL made it necessary to have foreign enterprises participate in the bids for the purchase of capital goods for the sector. Since the industry in Brazil is somewhat behind

/its counterparts

its counterparts in Europe and in the United States, in various stages of the productive process, these agreements will become increasingly important. This could open the door to the establishment of direct interests of transnationals in the production of alcohol in Brazil. For the time being, however, that is only a possibility.

IX. ALCOHOL PRODUCTION TECHNOLOGY: OUTSIDE OWNERSHIP  
AND INTERESTS

(a) Agricultural technology

We have already mentioned the significant increases in yield per hectare of sugar cane noted in the country over the past 40 years, especially in the state of São Paulo. Despite this, the yields in tons per hectare are substantially lower in Brazil than in other countries. PLANALSUCAR estimates show that around the mid-1970s, whereas the average yield per hectare in Brazil was 60 tons, in South Africa it was 89 and in Colombia, 110.<sup>19/</sup> Soil and climate conditions undoubtedly contribute to these differences.

In fact, sugar cane growing is very demanding in terms of soil, fertilizers and protective products. Table 21 shows that in 1977, sugar cane ranked second among all crops in the country in the use of these elements. In São Paulo, 77% of producers accounting for 98% of the area planted, used fertilizers in 1975 and 38% of these, accounting for 79% of the area, used agricultural protection products.<sup>20/</sup>

According to technical recommendations, in the Northeast the nitrogen requirement is 100 kg per hectare and in the Centre-South it is 46 kg per hectare. Phosphorus requirements are 141 kg in the Northeast and 96 kg in the Centre-South and potassium requirements are 119 kg in the Northeast and 65 kg in the Centre-South. These nutrients are used especially in the form of ammonium sulphate, urea, triple superphosphate and potassium chloride, which are either imported or produced domestically with imported raw materials.

Sugar cane also ranks high in Brazil in the use of agricultural protection products -especially herbicides. Table 22 shows that the amount sold to the sector was lower only than the amounts purchased by soybeans and rice producers. Sugar cane alone represented 15% of the sales of the herbicide industry throughout the country.

As regards the stages in the agricultural production cycle, the techniques used in the large areas of the Centre-South require large-scale use of modern equipment and instruments. At the present time, the following machinery and equipment are used:

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<sup>19/</sup> Quoted by CNPq, Avaliação Tecnológica do Alcool Etílico, second edition, Brasília, D.F., 1980.

<sup>20/</sup> Census data quoted by DEPE/UNICAMP, Evolução da Técnica do Emprego a nível de culturas, Relatório de Pesquisa, September 1981, mimeographed.

Table 21

BRAZIL: ESTIMATED TOTAL NEED FOR FERTILIZERS FOR SELECTED CROPS, 1977

(Thousands of tons of nutrients)

| Crop       | Nitrogen | Phosphorus | Potassium | Total |
|------------|----------|------------|-----------|-------|
| Cotton     | 18.2     | 42.1       | 26.3      | 86.6  |
| Garlic     | 0.1      | 0.4        | 0.2       | 0.7   |
| Peanuts    | 1.1      | 4.0        | 2.3       | 7.4   |
| Rice       | 40.5     | 116.5      | 59.5      | 216.5 |
| Bananas    | 2.1      | 1.9        | 3.7       | 7.7   |
| Potatoes   | 17.1     | 42.6       | 24.1      | 83.8  |
| Cocoa      | 11.7     | 23.8       | 10.1      | 45.6  |
| Coffee     | 167.8    | 34.0       | 119.3     | 321.1 |
| Sugar cane | 129.0    | 131.1      | 146.0     | 406.1 |
| Onions     | 1.8      | 5.2        | 2.9       | 9.9   |
| Beans      | 2.7      | 13.8       | 6.5       | 23.0  |
| Oranges    | 21.7     | 21.1       | 22.3      | 65.1  |
| Manioc     | 0.3      | 1.8        | 2.3       | 4.4   |
| Maize      | 45.7     | 114.9      | 53.4      | 214.0 |
| Soybeans   | 38.5     | 420.7      | 134.3     | 593.5 |
| Tomatoes   | 10.9     | 15.9       | 14.3      | 40.9  |
| Wheat      | 40.2     | 192.5      | 61.5      | 294.2 |

Source: CNPq, Avaliação..., op.cit., p. 247.

/Table 22



Table 22

BRAZIL: HERBICIDE SALES BY MAJOR CROPS  
(1977-1980)

| Crop         | Physical volume (t) |               | Value (Cr\$ 1 000) |                   |
|--------------|---------------------|---------------|--------------------|-------------------|
|              | 1979                | 1980          | 1979               | 1980              |
| <u>Total</u> | <u>40 125</u>       | <u>44 432</u> | <u>6 578 999</u>   | <u>18 408 905</u> |
| Cotton       | 973                 | 979           | 153 161            | 318 131           |
| Rice         | 8 265               | 8 201         | 1 016 958          | 2 893 725         |
| Coffee       | 2 100               | 2 442         | 568 158            | 1 279 258         |
| Sugar cane   | 7 549               | 7 963         | 908 258            | 2 755 745         |
| Citrus       | 627                 | 683           | 211 624            | 417 191           |
| Maize        | 1 336               | 3 796         | 226 793            | 1 185 511         |
| Pastures     | 3 916               | 3 490         | 432 634            | 1 049 473         |
| Soybeans     | 12 643              | 12 927        | 2 670 065          | 6 983 201         |
| Wheat        | 988                 | 1 411         | 69 045             | 276 242           |
| Others       | 1 728               | 2 540         | 322 203            | 1 249 828         |

Source: ABIQUIM, Sumario da Industria Quimica Brasileira, 1981.

(a) Clearing and preparation of land. High-powered caterpillar tractors.

(b) Correction of the soil: trucks.

(c) Planting: low-powered tractors.

(d) Covering of plants and application of herbicides: low-power tractors and sprayer.

(e) Cutting: manual in 90% of the sugar mills and mechanical in 10%.

(f) Loading: mechanical, in medium-powered trucks.

The mechanization and modernization of agricultural tasks is closely related to the level of the farms.<sup>21/</sup> This suggests that there is a large nucleus of interests in PROALCOOL that has been linked to outside capital from the beginning of the modernization of the sector and the expansion of production scales, as suggested in the previous chapter. In chapter X we will discuss the productive structures of the agricultural input and capital goods sectors.

<sup>21/</sup> See: DEPE/UNICAMP, op.cit., pp. 88 et seq.

(b) Industrial technology

The process of obtaining alcohol from a biomass may be divided into three major stages: preparation of the raw material, production of the juice to be fermented, and distillation.

In sugar cane, the juice is obtained either by milling or by diffusion. The pH of the juice must be corrected with sulphuric acid; nutrients are added to produce the must, which goes to the fermentation domes where the yeast is added. Distillation is performed in two columns, the first of which produces an impure alcohol and the second of which purifies the product. In general, the energy source used in Brazil is the bagasse remaining after the juice is extracted from the sugar cane, the cost of which has so far been almost nil, since there are no alternative uses for the bagasse. Also, there is a considerable surplus of bagasse even after it has been used as fuel in the furnaces.

There has been considerable controversy in Brazil with regard to how up-to-date the production techniques used as compared with what is available worldwide. It is often stressed that in the juice extraction stage and in the distilling stage, advances have been made which would make it possible to reduce the cost of energy and increase the yield of alcohol. In the juice extraction stage, the advantages of diffusion over grinding is stressed and in the distilling stage, it is argued that more sophisticated columns, with a greater number of plates should be used or even that an additional column should be installed so as to make it possible to obtain a better quality product and reducing the energy consumption.<sup>22/</sup>

These statements cannot be confirmed on the basis of the opinions of technicians and engineers working in the industrial operation who are familiar with the latest advances in the industry. According to them, the techniques currently used in Brazil are the most appropriate for Brazilian conditions as regards cost and quality required for the product. The argument about energy savings does not make sense because the energy has no cost. A better quality of product is not required by the technical standards for fuel alcohol, although obviously it would be advantageous from the standpoint of engine performance and reduction of corrosion.

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<sup>22/</sup> See: CNPq, Avaliação..., op.cit.

At the present time, most of the technology used is domestically owned or is in the public domain. The exceptions are furnace equipment and electrical generators and milling equipment, in the case of one of the two existing producers. The technology of the equipment (especially the distilling equipment) has been developed or appropriated by the two major enterprises in the sector, on the basis of long-standing technology contracts with foreign enterprises; in many cases, this technology is in the public domain.<sup>23/</sup>

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<sup>23/</sup> See: B. Negri, Estudo de caso da Industria Nacional de Equipamentos, Analise do grupo Dedini (1920-1975). Master's thesis, UNICAMP, Campinas, 1977 (mimeo).

## X. THE INTERRELATED PRODUCTIVE SECTORS

This chapter analyses the structure of the productive sectors directly or indirectly related to the production of alcohol. For their participation in the cost structure of sugar cane and alcohol, and/or for the importance of the alcohol sector from the point of view of the respective sector, it is interesting to look at the agricultural machinery and equipment sector, as well as those of fertilizer and herbicide production and capital goods for plants and distilleries.

### (a) Agricultural machinery and equipment

The agricultural machinery and equipment sector has a mixed structure, with a significant number of national and transnational corporations (see table 23). In 1975, of a total of 29 corporations considered in the sample, 11 were foreign, held 65% of the assets and had a 74% share of the market. In 1980, 40 corporations were included in the sample, including eight foreign firms.<sup>24/</sup> It is more important to indicate the significant presence of the two types of corporations than to note the differences in approaches or participation in the two years.

However, the mixture of foreign and domestic firms does not mean a balance in the leadership of the sector. In fact, in the two years in question, three of the four largest firms in the sector were foreign, accounting for percentages varying between 84 and 88% of the total sales or assets of the four largest companies. In other words, it is a sector dominated by transnational corporations.

The actual structure of the sector corresponds to a certain specialization by product or line of production. The big foreign companies are generally dedicated to producing basic heavy equipment (tractors, harvesters, loaders, graders, etc.), leaving the production of accessories and tools (plows, sowers, wagons, etc.) to the medium-sized companies, with a substantial amount of national participation.

### (b) The agricultural inputs production sector

Agricultural inputs include protective products (herbicides) and fertilizers.

The agricultural protection industry in Brazil obtains more than 40% of its income from sales of herbicides (see table 24). Since sugar cane used 15% of the herbicides sold in 1980, it may be concluded that this crop alone represented 6%

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<sup>24/</sup> There is no guarantee that the sample has the same degree of representativity for the two years, so it is impossible to establish a trend from the data cited. The only assurance is that in general the sample includes the most important firms in the sector.

Table 23

BRAZIL: TRACTORS, GRADERS AND AGRICULTURAL TOOLS SECTOR. SHARE OF  
FOREIGN AND NATIONAL COMPANIES IN ASSETS AND  
SALES: 1975-1980 a/

(Number of companies and percentages)

|                    | Number of companies |           | Share in assets |            | Share in sales |            |
|--------------------|---------------------|-----------|-----------------|------------|----------------|------------|
|                    | 1975                | 1980      | 1975            | 1980       | 1975           | 1980       |
| Foreign companies  | 11                  | 8         | 65              | 45         | 74             | 57         |
| National companies | 18                  | 32        | 35              | 55         | 26             | 43         |
| <u>Total</u>       | <u>29</u>           | <u>40</u> | <u>100</u>      | <u>100</u> | <u>100</u>     | <u>100</u> |

Source: Revista Visão, "Quem é quem na economia brasileira", 31-08-76 and 29-08-81.

a/ Including only companies with more than one million dollars in net assets.

Table 24

BRAZIL: SALES OF AGRICULTURAL PROTECTIVE PRODUCTS: 1979-1980

| Classes              | Quantity (t)   |                | Value Cr\$ 1 000  |                   |
|----------------------|----------------|----------------|-------------------|-------------------|
|                      | 1979           | 1980           | 1979              | 1980              |
| <u>Total general</u> | <u>222 890</u> | <u>198 600</u> | <u>18 092 204</u> | <u>43 261 929</u> |
| Insecticides         | 129 166        | 100 805        | 7 846 548         | 14 741 822        |
| Acaricides           | 5 412          | 4 295          | 475 661           | 1 029 707         |
| Formicides           | 12 251         | 12 395         | 330 035           | 866 960           |
| Fungicides           | 35 936         | 36 673         | 2 860 961         | 8 214 535         |
| Herbicides           | 40 125         | 44 432         | 6 578 999         | 18 408 905        |

Source: ARIQUIM, op. cit.

Table 25

BRAZIL: HERBICIDE PRODUCERS: 1980

| Products   | Producing companies | Installed capacity (E) |
|--|---------------------|------------------------|
| Bromacil   | Formiquimica        | -                      |
| 2,4-D  | Dow Chemical        | 9 000                  |
| Diuron   | CNDA                | -                      |
|  | Du Pont             | 2 900                  |
|  | Formiquimica        | -                      |
|  | Nortox              | -                      |
| Glyphosate                                       | Monsanto            | 3 932                  |
| Paraquat   | ICI                 | 1 000                  |
| Propanil   | Bayer               | 160                    |
|  | CNDA                | 700                    |
|  | Rohm and Naas       | 1 200                  |
| Tiocarbamatos (Putylate, Molinate and Verpolate) | Stauffer            | 1 800                  |
| Triazinas (clorotrizinas)                        | Ciba-Geigy          | 1 000                  |
|  | CNDA                | 3 500                  |
|  | Formiquimica        | -                      |
| Trifluralina                                     | Defensa             | 2 400                  |
|  | Elanco              | 6 930                  |
|  | Nortox              | 6 000                  |

Source: ARIQUIM, op. cit.

of the sales of the entire agricultural protection industry, which includes insecticides, ant killers, etc. This sector is almost completely dominated by transnational corporations, especially in the herbicide line of production; this may be seen in table 25, which relates the products used with their producers. Of those appearing in the table, the only ones about which we do not have definite information with respect to foreign participation are Formiquimica, CNDA, Mortax and Defensa. All the rest are subsidiaries of transnational corporations.

The main fertilizers used are potassium chlorate, ammonium sulphate, urea and the superphosphates (simple and triple). Potassium chlorate is mainly imported, since there is no significant national production. The apparent consumption of the other products is summarized in table 26. Ammonium sulphate is produced in the country in an amount less than 20% of consumption, and urea in a proportion equivalent to 32%. In both cases domestic production is divided between state enterprises -subsidiaries or connected with PETROBRAS- and foreign corporations (Rhodia). Domestic production is significant in the case of the superphosphates -simple and triple- where it accounts for between 73% and 94% of national consumption.

The companies which produce the two superphosphates are basically the same ones, with two major transnationals (Quimbrasil and Fosfanil) accounting for 24% of the installed capacity of this sector, while the other companies belong mainly to national private groups.

Table 26

BRAZIL: APPARENT CONSUMPTION OF SOME FERTILIZERS: 1980  
(Thousand tons)

| Products              | Production | Imports | Exports | Total |
|-----------------------|------------|---------|---------|-------|
| Ammonium sulphate     | 164        | 832     | -       | 995   |
| Urea                  | 273        | 579     | 0       | 852   |
| Simple Superphosphate | 1 572      | 109     | 0       | 1 681 |
| Triple Superphosphate | 781        | 292     | 3       | 1 070 |

Source: ARIQUIM, op.cit.

In the fertilizer sector in general -including the production of "N-P-K", which has all the nutrients necessary to sugar cane- the presence of state enterprises, especially Ultrafértil and Valefértil, subsidiaries of PETROBRAS, should be mentioned.

(c) The industrial equipment-producing sector

The production of equipment for the sugar and alcohol industries in Brazil began in the 1920s with the establishment of M. Dedini S.A.- Metalúrgica. By the end of the 1950s, another seven companies had been set up, two of them belonging to the same Dedini group (see table 27).

Without exception, all these companies originated in small machine and boiler shops. The technology used in the setting up of their industrial operation was in the public domain. In 1953 the national industry became the producer of all the equipment for the sugar and alcohol sector.

The companies of the Dedini -M. Dedini Metalúrgica group, CODISTIL and Mausatotally dominated the sector during the 1960s, accounting for 95% of the market at the beginning of the decade.<sup>25/</sup> This was based on the control of technology and the financing provided by the group itself.

In spatial terms, the sector has concentrated on the sugar cane-producing region of the State of São Paulo and Rio de Janeiro (Piracicaba, Sertãozinho and Campos).

The only exception was also the only multinational in the sector -Fives-Lille do Nordeste- of French origin.

After 1965 the quasi-monopolistic position of the Dedini group was weakened with the creation of official mechanisms for financing the purchase of equipment produced in the country (establishment of FINAME). Of the 18 companies mentioned in table 27, 13 had between 100 and 500 employees in 1975, two had between 500 and 1 000, and three had more than 1 000 workers.

Table 28 shows the shrinking of the Dedini group's share in the market in the 1970s, but it still clearly maintained its top position: in 1975 it accounted for 55% of sales. The Zanini group is in second place with nearly 18% of the market in the 1970s, and, in third place, the only foreign firm appears -La Fives-Lille- in 1975, later bought by Northwestern economic groups in 1977.

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<sup>25/</sup> Negri, B., op.cit., p. 186.



Table 27

BRAZIL: COMPANIES PRODUCING EQUIPMENT FOR THE SUGAR AND ALCOHOL SECTOR

| Name   | City            | Year of establishment |
|--|-----------------|-----------------------|
| M. DEDINI - Metalurgica                                    | Piracicaba SP.  | 1920                  |
| MORLET S.A.-Equip. p/usinas de açucar e alcohol <u>a/</u>  | Piracicaba SP.  | 1936                  |
| CODIO S.A.-Constructora de equip. p/ind. Quimica <u>b/</u> | San Pablo SP.   | 1941                  |
| CODISTIL-Constructora de destilerias Dedini S.A.           | Piracicaba SP.  | 1943                  |
| MAUCA-Metalurgica de aces. p/usinas de açucar S.A.         | Piracicaba SP.  | 1948                  |
| SANTIN S.A.-Industria metalurgica                          | Piracicaba SP.  | 1948                  |
| ZANINI S.A.-Equipamentos pesados                           | Sertaozinho SP. | 1950                  |
| MEPIR-Metalurgica Piracicabana S.A. <u>c/</u>              | Piracicaba SP.  | 1950                  |
| FUNDIÇÃO GOYTACAZ S.A.                                     | Campos RJ.      | 1953                  |
| MESOLI-Metalurgica Santa Cruz S.A. <u>d/</u>               | Piracicaba SP.  | 1953                  |
| FAZANARO S.A.-Industrial e comercial                       | Piracicaba SP.  | 1954                  |
| MARIO MATONI Metalurgica Ltda.                             | Piracicaba SP.  | 1956                  |
| METALURGICA CONGER S.A.                                    | Piracicaba SP.  | 1962                  |
| TECOMIL-Tecnica constr. maq. industriais Ltda.             | Sertaozinho SP. | 1964                  |
| FIVES-LILLE DO NORDESTE <u>e/</u>                          | Maceio AL.      | 1967                  |
| NEFSA-Mecanica e Fundição Sto. Antonio Ltda.               | Piracicaba SP.  | 1968                  |
| METALURGICA BARBOSA LTDA.                                  | Piracicaba SP.  | 1970                  |
| COSINOR-Cia Siderurgica do Nordeste <u>f/</u>              | Recife PE.      | 1970                  |
| AZF-Semca metalurgica Ltda.                                | Piracicaba SP.  | 1972                  |
| SIDEL-Comercial e industrial S.A.                          | Campos RJ.      | 1972                  |

Source: Negri, E., op.cit., p. 165.

a/ In 1956 it was bought by the Dedini group and in 1969 was incorporated into Codistil.

b/ Produced only alcohol distilleries and closed down in the sector in 1947.

c/ Incorporated into the Dedini group in 1969, when it began to operate significantly in the sugar sector.

d/ Closed down in 1966.

e/ Subsidiary of the French company.

f/ Old company which began to operate in the sector only in 1970.

Table 28

BRAZIL: SHARE OF PRODUCER COMPANIES IN THE SALES OF THE SUGAR AND ALCOHOL EQUIPMENT SECTOR: 1970-1975

(Percentages)

| Companies          | 1970        | 1971        | 1972        | 1973        | 1974        | 1975        | Average     |
|--------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| MET. DEDINI        | 44.6        | 39.2        | 41.4        | 35.7        | 32.7        | 33.4        | 37.8        |
| MAUSA              | 16.5        | 17.0        | 15.6        | 14.3        | 11.2        | 11.1        | 14.3        |
| CODISTIL           | 8.4         | 10.3        | 8.6         | 7.9         | 9.6         | 10.0        | 9.2         |
| <u>Subtotal</u>    | <u>69.5</u> | <u>66.5</u> | <u>65.6</u> | <u>57.9</u> | <u>53.5</u> | <u>54.5</u> | <u>61.3</u> |
| ZANINI             | 18.6        | 18.2        | 18.3        | 19.3        | 18.0        | 14.0        | 17.8        |
| FIVES-LILLE        | 0.6         | 0.6         | 0.7         | 1.7         | 4.9         | 8.1         | 2.8         |
| TECOMIL            | 3.3         | 4.9         | 3.7         | 5.5         | 4.5         | 4.1         | 4.3         |
| SANTIN             | 0.8         | 1.9         | 1.3         | 3.0         | 4.1         | 3.5         | 2.4         |
| FAZANARO           | 0.7         | 0.7         | 1.3         | 3.2         | 4.3         | 3.2         | 2.2         |
| CONGER             | 0.8         | 1.9         | 1.3         | 1.2         | 2.3         | 2.7         | 1.7         |
| Top nine companies | 94.3        | 94.7        | 92.2        | 91.8        | 91.6        | 90.1        | 92.5        |
| Nine other firms   | 5.7         | 5.3         | 7.8         | 8.2         | 8.4         | 9.9         | 7.5         |
| <u>Total</u>       | <u>100</u>  | <u>100</u>  | <u>100</u>  | <u>100</u>  | <u>100</u>  | <u>100</u>  | <u>100</u>  |

Source: Negri, B., op.cit., p. 186.

Basic data: 1. Quem é quem na economia brasileira (various years).  
 2. Data supplied by the companies.  
 3. Balances published in the official press.

The sugar and alcohol equipment sector's great expansion in the market may be seen in table 29. Sales, at constant prices, have increased by 6.5 times in only five years.

Table 29

BRAZIL: EVOLUTION OF REAL SALES a/ OF THE SUGAR AND  
ALCOHOL EQUIPMENT PRODUCING SECTOR: 1970-1975

(Indexes, base 1970 = 100)

| Year | Dedini group <u>b/</u> | Other companies | Total <u>c/</u> |
|------|------------------------|-----------------|-----------------|
| 1970 | 100.0                  | 100.0           | 100.0           |
| 1971 | 119.1                  | 136.7           | 124.4           |
| 1972 | 192.4                  | 229.9           | 203.8           |
| 1973 | 224.0                  | 371.2           | 268.9           |
| 1974 | 314.2                  | 622.3           | 408.2           |
| 1975 | 511.6                  | 973.3           | 652.4           |

Source: Negri, B., op.cit., p. 189.

Basic data: a/ Deflated by the equipment price index, FGV.

b/ Including three companies: M. Dedini S.A., METALURGICA MAUSA and CODISTIL.

d/ 18 companies.

The technology used in the sector is generally in the public domain or national. The Dedini group uses foreign technology only for the production of generators (Germany), centrifuges (France and Germany) and agricultural fertilizing equipment (USA). The Zanini group produces mills using Dutch technology, turbines with a Danish license and centrifuges with a German licence. The Fives-Lille company produces using French technology.

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