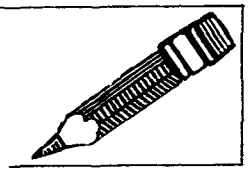
Technical News Feature



The Brazilian Soybean Situation and Its Impact on the World Oils Market[1]

ROBERT L. THOMPSON, Department of Agricultural Economics,
Purdue University, West Lafayette, Indiana 47907

ABSTRACT

Brazil has come from obscurity to become the world's second largest producer and exporter of soybeans. Internal crushing has also expanded rapidly and become more specialized in soybean crushing. In 1978 Brazilian soybean crushing capacity reached about 14 million metric tons (MT). Domestic oil and meal price ceilings and bean export restrictions have had a significant effect on the growth in Brazil's crushing capacity. Since 1975 exports of both soybean meal and oil have received favored export treatment relative to soybeans. Brazil is likely to continue restrictions on bean exports to ensure availability of beans to their crushers. Brazil's annual soybean production is likely to grow from the 12 million metric tons in 1977 to over 15 million tons by 1982, with exports of 1-2 million tons. Meal exports are expected to grow by 1-2 million tons and oil exports marginally from 1978 levels by 1982. The long run soybean production will depend on how much expansion occurs in the Central West, where the soil is less fertile and production and transport costs are much higher. Substantial expansion there will require higher world soybean prices, construction of marketing and transportation infrastructure, and subsidization of input costs.

INTRODUCTION

In 10 years Brazil has become a significant competitor of the United States in the world soybean market. Until the early 1970s, the U.S. accounted for nearly 75% of the world's soybean production. This declined to 55% by 1977. Brazil's share of world soybean production increased from 3.6% to 18% during the same period. In 1970 Brazil produced 1.5 million metric tons (M.T.) of soybeans while the U.S. produced 30.8 million M.T. The 1977 Brazil crop was about 12.2 million M.T. while the U.S. crop was about 46.8 million. In early 1978 southern Brazil's soybean area experienced a severe drought, which reduced the crop from an expected 12.5-13 million M.T. to about 10 million. This is viewed as an unusual circumstance, not as indicative of a new trend.

Brazil's crushing capacity, less than 1 million tons per year in 1969, passed 12 million tons in 1977. In 1979 Brazilian soybean crushing capacity is expected to reach about 14-15 million metric tons, more than sufficient to crush the projected 1979 crop. Until 1977 the domestic soybean crush grew about apace with capacity. Export controls have assured that a sufficient quantity of beans was available to the Brazilian crushers. At the same time, differential tax treatment of meal and oil as opposed to beans has stimulated a dramatic increase in exports of meal and oil rather than beans. Brazil's soybean exports peaked in 1975 and have declined since then, while meal and oil exports have grown – both exceeding U.S. exports in 1977. Revenue from exports of soybeans and products grew from $40 million in 1968 to $2.14 billion in 1977. These data demonstrate that Brazil has become a major force in the world soybean and soybean products market. Its impact on the world oils market has become a central issue in any careful analysis of the future world fats and oils situation. This paper reviews recent developments and discusses Brazil's likely impact on the world oils market. Soybean production is reviewed first, followed by an overview of Brazil's crushing industry and the export policies which have affected its growth. Trends in the internal soybean oil and meal markets are then examined to draw implications for the world oils market. The events in 1978 and prospects for 1979 and beyond are discussed.

Expansion of Soybean Production in Brazil

Japanese immigrant farmers introduced soybeans into Brazil over 65 years ago. However, the crop remained relatively unimportant until the late 1960s. Evolution of soybean production since 1960 is shown in Table I. Soybean area increased at a generally rising rate from 171 thousand hectares (ha.) in 1960 to 5.1 million ha. in 1974, after which continued growth has been at a decreasing rate, reaching about 7.5 million ha. in 1978. Soybean production is concentrated in the southern states where it got its start, with Rio Grande do Sul and Parana accounting for 85% of production (Table II). Sao Paulo is third with 6.3%, followed by Mato Grosso and Santa Catarina, with 3.8% each. Mato Grosso is the state with most rapid current expansion, although it is still on a relatively small base. Some expansion into the *cerrado* regions of Goias and Minas Gerais is also occurring.

The bulk of the growth in Brazilian production has come

TABLE I

Evolution of Soybean Production in Brazil, 1960-1979 (1-3)

Year	Area harvested (1000 ha)	Average yield (Kg/ha)	Production (1000 M.T.)
1960	171	1200	206
1965	432	1212	523
1970	1319	1144	1509
1973	3615	1386	5012
1974	5143	1531	7876
1975	5824	1698	9892
1976	6290	1719	10810
1977	6945	1757	12200
1978	7480	1330[a]	9950[a]
1979	7900[a]	1456[b]	11500[b]

[a]Preliminary.
[b]Projected.

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TABLE II

Brazilian Production of Soybeans by States, 1968-1977 (1,3)

State	Production (1000 Metric Tons)									
	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Rio Grande do Sul	433	745	977	1393	2496	2872	3870	4689	5000	5700
Santa Catarina	15	32	53	78	113	254	431	467	400	450
Parana	163	214	368	462	790	1326	2589	3625	4250	4500
Sao Paulo	39	61	90	86	201	330	522	678	750	760
Mato Grosso	3	3	9	16	32	103	307	273	270	450
Others	4	2	12	42	68	126	157	161	130	140
Total	654	1057	1509	2077	3700	5012	7876	9892	10800	12000

from increases in area, rather than increases in yield per ha. (Table I). For example, between 1960 and 1977 soybean production increased over 59 times. Area planted increased almost 41 times, while yield per ha. grew 46%. Soybean yields vary considerably among states. Average yields, according to the U.S. Agricultural Officer in Sao Paulo, during 1975-77 were as follows: Parana, 2.10 M.T./ha.; Sao Paulo, 1.78 M.T./ha.; Rio Grande do Sul, 1.57 M.T./ha.; Mato Grosso, 1.50 M.T./ha.; Santa Catarina, 1.28 M.T./ha.; and others, 1.23 M.T./ha. Increases in yields to date reflect use of soybean varieties adapted to local conditions, improved cultural practices, and a shift onto more fertile, virgin soils. The variability in yields among states reflects basic differences in factors such as soils and climate.

Although the opening of new land has been an important means of increasing soybean area, most expansion has been at the expense of other crops and pasture. Zockun's analysis of the period 1970-73 for the three largest producing states (Rio Grande do Sul, Parana, and Sao Paulo) shows that for these three states 88.4% of the increase in soybean area came from other crops and pasture, and only 11.6% from new land (4). Essentially all of this introduction of new land occurred in Parana and Rio Grande do Sul. Land formerly in corn was the largest source of soybean expansion in these three states, representing 37.2% of the total. Over half the soybean expansion in Parana came out of corn, as did about 30% each in Rio Grande do Sul and Sao Paulo. In the three states, 14% of the increase came from former pasture land, mainly in Rio Grande do Sul. This has been pushing beef production out of that state. In Sao Paulo, cotton and rice were the other principal sources of land for expansion, while coffee was important in Parana, as was wheat in Rio Grande do Sul.

Expansion of soybeans onto land formerly in other crops or beef production can be explained largely by its relative profitability. Neither any other crop nor beef cattle can compete with soybeans on a profit per hectare basis. Relative prices between soybeans and other crops that can be grown in the same regions have strongly favored soybeans in the past decade. Moreover, the real price of soybeans in Brazil has risen, while the real domestic prices of competing crops have fallen.

Several other factors have contributed to soybean expansion. In addition to being the second largest soybean producing state, Parana is the largest coffee producer. In the 1960s, when there was considerable excess coffee production in the world, the Brazilian government paid farmers to take out old coffee trees and plant some other crop. In Parana some of this land was put into soybeans (7.4 percent of Parana's soybean growth during 1970-73 came out of coffee). The move out of coffee also was stimulated by the fact that Parana is far enough south to get frosts that damage coffee trees several years each decade. The severe frost of July 1975 killed 10-15% and severely damaged all the rest of the coffee trees in Parana. Instead of replanting coffee, farmers put many of these hectares into soybeans, which would produce a "sure" crop the following year, instead of requiring a wait of 3-5 years for coffee trees to come into full production. In addition, where coffee was replanted, soybeans were often planted between the trees for the first few years to reap some income from the land.

Another stimulus came from Brazil's wheat policy. To a considerable extent, soybeans got their start in Rio Grande do Sul in double cropping with wheat. For many years Brazil has maintained a high support price for wheat (relative to the world market price) with the objective of becoming self-sufficient in wheat. This has been combined with subsidies for machinery acquisition and current input use (including fertilizer and lime). The same machinery can be used for wheat and soybeans, and fertilizer residual after the wheat harvest is available for the soybeans. The wheat policy, in effect, removed the risk from attempting to grow soybeans and provided a stimulus to the soybean take-off. Nevertheless, harvesting operations of each crop tend to delay planting of the other crop past optimum planting dates, except in years of ideal weather conditions. Wet weather frequently delays the wheat harvest. As a result of planting delays, soybean yields reportedly are reduced up to 25%. When one adds to this the fact that wheat production problems associated with less than ideal climatic conditions abound in southern Brazil, more and more land has ceased to produce winter wheat and only produces soybeans in the summer.

Soybean expansion also has benefitted from the policy of making liberal credit available at substantially negative real rates of interest for acquisition of machinery and current inputs. This has made it relatively easy for farmers to get into soybean production. The availability of credit for current production expenses for any given crop is tied to the minimum price for that crop. Credit is available up to 60% of the minimum price times the expected yield (as certified by extension agents). Since the minimum price of soybeans always has been below the market price, the only effect of the minimum price program on soybean production probably has been through this effect on credit availability.

While some potential exists for further soybean acreage expansion in the traditional producing states, most future growth must occur in the central west states of Mato Grosso and Goias, and perhaps Minas Gerais. This expansion is likely to be slower and more difficult than that in the southern states. While most observers expect Brazilian soybean production to reach 15 million M.T. by 1982, estimates go as high as 18 million. Whether the long run plateau is 20 million or even higher will depend on how far the expansion proceeds in the Central West. The *cerrado* soil of the Central West is much less fertile than that of Parana and southern Mato Grosso where recent expansion has occurred. The soil has a very low pH and a great capacity to tie up phosphorus in an unavailable form. Therefore, much heavier applications of fertilizer and lime will be needed to get comparable yields. Thus, production costs will be significantly higher. Government willingness to subsidize these costs will have an important effect.

In addition to their less productive cerrado soils, the

TABLE III

Soybean Crushing Capacity, by Size of Firm and State, Brazil, August 1977

State	Crushing capacity (Metric tons per day)							
	0-499		500-999		>1000		State totals	
	Number of firms	Total capacity	Number of firms	Total capacity	Number of firms	Total capacity	Number of firms	Total capacity
Rio Grande do Sul	25	3,822	6	4,320	5	7,500	36	15,642
Parana	23	4,342	4	2,600	3	5,150	30	12,092
São Paulo	51	7,345	2	1,400	1	1,350	54	10,095
Minas Gerais	3	585	0		0		3	585
Santa Catarina	8	1,520	1	600	0		9	2,120
Brazil Total	110	17,614	13	8,920	9	14,000	132	40,534

Central West states are farther from export ports and crushing facilities (discussed below) and lack the necessary infrastructure to support soybean production and marketing. As a result of this lack of infrastructure and the higher costs of production, soybean production is expected to develop less rapidly in this region.

Producers in the "traditional" areas in southern Brazil may soon confront problems in maintaining yields. Severe erosion problems are occurring in Parana where continuous soybeans are grown. Weed problems are comparable to those in the Midwest U.S., and insect control problems appear much worse. Disease problems are on the horizon. Since soybeans are still a relatively new crop in Brazil, producers probably are operating in a grace period before disease problems arise. Though the soybean research base in Brazil is rather thin, measures are rapidly being taken to correct this deficiency. A National Center for Soybean Research, established in 1976 in Londrina, Parana, is working to solve these problems as well as to breed varieties better adapted for the low latitudes farther north.

While production costs data could be cited here, they will not be as they tend to be misleading, particularly when compared among countries. Many past comparisons between Brazil and the U.S. have given Brazil a significant cost advantage. However, the prices of labor and land services (particularly land) in Brazil have been bid up rapidly in the soybean growing regions. A significant part of the profitability of soybean production is being bid into land price in the best growing regions. This illustrates that production cost calculations at any point in time are meaningless later. Finally, any international comparisons are rendered tenuous by the choice of exchange rate used. This is so because at the official exchange rate the cruzeiro is overvalued by about 25% (5). Such overvaluation has the same effect as putting an export tax of 25% on all exports, including soybeans, from Brazil.

Part of Brazil's apparent cost advantage is blunted by its relatively expensive marketing and transportation system. As a result, a much larger percent of the f.o.b. export price is absorbed by these costs in Brazil than in the United States. Farm-to-port transport often costs four times more in Brazil than in the U.S., due largely to Brazil's lack of railroad and water transportation possibilities. Most soybeans move from farm to port or crusher by truck in 25-ton lots. This lowers the farm price of soybeans and raises the price to crushers.

In addition, storage and port capacity have been constraining until recently. In the early 1970s it was necessary for all soybeans to be exported or moved to crushers before the wheat harvest started. Recognition of this problem by the Brazilian government has resulted in rapid expansion of storage facilities. By 1978 there was enough storage capacity in place to accommodate the entire expected soybean crop. While all the new storage investments have gone into the more efficient bulk facilities, a substantial fraction of the storage capacity is still the traditional, inefficient, general-purpose, bag-type. There is virtually no on-farm storage capacity.

Brazilian port facilities have been inadequate to handle the growth in soybean export volume. In 1977 it was still possible to see 10-kilometer long lines of trucks waiting to unload at the ports. However, this problem too is being rectified by investments in new and larger port storage and handling facilities.

The Soybean Crushing Industry in Brazil

The volume of soybeans crushed in Brazil has grown markedly since 1969, passing one million M.T. in 1972, four million in 1974, and eight million in 1977 (6). In general, soybean crush increased in tandem with crushing capacity with plants running around 85% of capacity (a little over 300 days per year) until 1977, when growth in new capacity exceeded growth in bean production.

Historically, the Brazilian crushing industry has been characterized by a large number of small to medium-sized family-owned plants that crush cottonseed, peanuts, and castor beans. When soybean production began its takeoff, many of these crushers began crushing soybeans as well.

Data on the number and sizes of soybean crushing firms in Brazil is fragmentary at best. Table III provides a view of the size and distribution of firms in mid-1977, based on trade sources. The total daily capacity of about 40,500 M.T. translates to a 12.2 million M.T. per year capacity assuming 300 days per year operation. Of the 132 plants listed, 110 are less than 500 tons per day. Almost half are concentrated in Sao Paulo, the center of the older, established crushing plants. Rio Grande do Sul and Parana have 25 and 23 of these smaller plants, respectively.

Recent expansion has come in the form of 1200-2000 M.T. per day plants, concentrated in Rio Grande do Sul and Parana—en route between bean producing areas and export ports. While only eight large plants show up in the 1977 data, their total capacity exceeds that of the 48 small firms (under 500 M.T. per day) in those two states.

Of the total soybean crush capacity, 93% is in Rio Grande do Sul, Parana, and Sao Paulo. Rio Grande do Sul has 39% of the total; Sao Paulo and Parana each have 25-30%. There were three new plants over 1200 M.T. per day projected to be in operation in 1978, and another six in 1979, if the projects initiated are completed.

A 1977 study by the Instituto de Pesquisas Economicas indicates the older, smaller firms tend to be relatively inefficient, operating with outdated equipment (mechanical presses) and little or no working capital. The study examined 13 Brazilian soybean processors in detail and found small and medium capacity firms halt operations up to six months each year due to a lack of capital to buy soybeans in the between-harvest period. The mortality rate of these firms has been high in recent years. The large firms, however, often halt operations no more than 30 days a year

TABLE IV

Relationship Between Soybean Production, Crush, and Exports, Brazil, 1969-77 (6)

Year	Percent of domestic production crushed	Ratio of crush to exports
1969	60.4	2.06
1970	72.9	3.79
1971	80.8	7.30
1972	64.3	2.33
1973	51.7	1.45
1974	51.3	1.41
1975	57.8	1.63
1976	61.9	2.01
1977	67.5	2.79

for equipment maintenance and repairs (7). A survey by the Rio Grande do Sul Oilseed Crusher's Association in late 1977 showed that all plants built in that state in 1977 used continuous solvent extraction. Of 20 existing firms which expanded their capacity in 1977, nine chose this system and five others went to a mixed system either with prepress followed by solvent extraction or batch expression by solvent.

International production cost comparisons are hazardous here also, particularly due to the problem of how to choose the appropriate exchange rate. However, certain qualitative comparisons between Brazil and the U.S. can be made on the basis of interviews with trade sources in Brazil. These comparisons are on the basis of official mid-1977 exchange rates. In Brazil it appears that more man hours per ton of production are required in the same capacity plant than in the U.S. Nevertheless, due to lower wage rates, the total labor bill per ton is still lower in Brazil. The solvent (hexane) cost is much higher per metric ton in Brazil than in the U.S., which is partially due to higher solvent loss due to lower quality solvent which makes its recovery more difficult. This appears to be improving now. Electricity cost per kilowatt hour is higher in Brazil than the U.S., at least partly due to the artificially cheap petroleum price policy of the U.S. For the same reason, fuel oil prices are higher in Brazil. One counter argument to this claim is the observation that the cruzeiro is overvalued by some 20-25% – providing an implicit subsidy to petroleum imports in Brazil.

Another cost disadvantage to the Brazilian crusher is that he has to absorb the cost a full staff of maintenance personnel, due to the lack of available mechanics, plumbers, electricians, etc., as a contingency for when breakdowns occur. A larger spare parts inventory reportedly must be carried in Brazil than in the U.S. All told, it appears that the variable cost of soybean crushing in the same size plant is slightly higher in Brazil than in the U.S.

The Brazilian crushing industry's growth is intimately related to the Brazilian government policies with respect to the exportation of soybeans. The rapid growth in crushing capacity since 1973, including the entrance or expansion of most of the multinational crushing firms, leaves little doubt concerning the apparent profitability of soybean crushing in Brazil. These firms' plans for continued significant expansion reflect their "bullishness" on the continued expansion of soybean production in Brazil.

Brazil's soybean exports increased from around 300,000 M.T. in 1969 to 1 million M.T. in 1972 and peaked in 1975 at 3.5 million M.T. They declined from 1975 through 1978, passing back through the 3 million ton point in 1977. Table IV provides some comparisons of soybean production, crush and exports.

In the 1960s Brazil rapidly established a reputation for exporting a high quality soybean. Once it became apparent that Brazil had become a serious and regular supplier of soybeans, a preference for Brazilian beans developed because beans grown in Parana and Sao Paulo have a higher oil and protein content than the beans exported by the U.S. For example, a meal made from Parana beans runs 46 ½-47% protein (48% profat), as opposed to only 44½-45% from Rio Grande do Sul and slightly less from U.S. beans. Similarly, the oil yield from Parana and Sao Paulo beans is over 18.5%, as opposed to about 17.7% in U.S. beans. In mid-1977 European crushers were reportedly willing to pay $3-5 per M.T. more for Brazilian then U.S. beans.

There is one negative aspect of Brazilian beans with respect to oil quality. The free fatty acid content of the crude oil is reported by European crushers to be higher than in oil from U.S. beans, resulting in larger refining losses. One Brazilian crusher suggested that due to higher humidity in Brazil, more care is required in storing beans and more drying is required there. He argued that the higher free fatty acid content was due to insufficient care in drying and storing the beans. In addition, red dust (which normal cleaning apparently fails to dislodge from Brazilian beans), often imparts a reddish color to the oil, requiring use of more bleaching clay in refining. In any case, these complaints appear not to have dampened the preference of importers for Brazilian beans.

There also appears to be a quality preference by importers for soymeal produced in Brazil over U.S. meal. Brazilian meal is generally pelleted at the crushing plant, partly as a pollution control device. European feed compounders prefer the pelleted meal over powder, other things being equal. But more importantly, the Brazilian meal is 47 to 48% protein-guaranteed, while U.S. meal is sold as 44%. European importers have complained that U.S. meal frequently contains as little as 40% due to the hulls that are filled back into the meal. European feed conpounders who use linear programming to determine the ingredient composition of their rations include separate activities for U.S. and Brazilian meal. Brazilian meal apparently is frequently chosen over U.S. on a cost per unit of protein basis.

Brazilian beans also enjoy a seasonal advantage since they are harvested around March to May, while U.S. beans are harvested in September and October. The normal fluctuation of the world market soybean price is for the seasonal peak to be reached in about August, just before the U.S. harvest. The price tends to drop from then until around February, after which it increases until August. The pattern varies from year-to-year, but this characterization can be considered "normal." Thus, Brazil harvests its crop as the price is rising towards its seasonal peak. As a result, Brazilian soybean exports slowly begin in April, quickly accelerate to July and August, the heaviest months, and then taper off again by October, when new crop U.S. beans reach the export market.

The restrictive U.S. soybean export policy in the early 1970s stimulated expansion of Brazilian soybean exports. The resulting run-up in soybean prices provided an additional incentive for expansion of soybean area in Brazil. It also may have disillusioned some traditional U.S. customers into attempting to diversify their source of supply. And Brazil was the only viable alternative.

Brazilian Export Policy

The Brazilian government's export policy has had an important effect on the expansion of the Brazilian crushing capacity, as well as on the volume of soybean exports. Since there are domestic price ceilings on soymeal and soyoil prices, established by the Comissão Interministerial de Preco (CIP). quantitative export restrictions are required to prevent meal and oil prices from moving above these ceilings. Moreover, soybean exports must also be controlled to ensure a positive crushing margin to the industry. Therefore, maximum quotas on the export of soybeans, meal and oil, occasionally adjusted up or down during the year

to adjust for changing market conditions, are established for each marketing year. These export quotas thus determine the profitability of crushing and the attractiveness of investments in crushing facilities. The effective margin, however, has been adjusted up or down by certain differential taxes and subsidies on bean, meal, and oil exports, which have varied through time. To better understand the policies behind the shifting balance between soybean exports and domestic crush since 1969, Brazil's soybean export policy is reviewed in this section.

During the 1950s and early 1960s, Brazilian exports of all goods stagnated. This stagnation appears to have been due not so much to high costs as to a restrictive government policy toward exports (8). The exchange rate was overvalued and adjusted only with a lag to compensate for the country's inflation and rising internal costs. This policy was in part an attempt to exploit the inelastic export demand for coffee. However, it was also the result of a conscious bias against exports. This was reflected in an "exportable surplus" approach to trade, in which only the "surplus" left over after the domestic market had been deemed to be "adequately" supplied was made available for export (9). Export licenses often were denied if the domestic price was rising. In a period of continuous, rapid inflation, this criterion frequently was fulfilled.

About 1958, soybean exports came under the control of CACEX, the foreign trade office of the Bank of Brazil, through a program of registration and licensing. When a sale was made in the international market, the contract had to be delivered to CACEX within three days. If CACEX believed that the price compensated farmers fairly, it registered the sale. If not, CACEX had the option of not registering the sale. The policy amounted to imposing export quotas.

Beginning in 1964, Brazil's foreign trade policy gradually shifted to one of export promotion. Licensing requirements on all goods were eliminated, and efforts were made to move the exchange rate closer to equilibrium. In late 1967, a policy of making small, more or less monthly devaluations was started, and an attempt was made to keep the official rate fairly close to equilibrium (9). Exports of many goods, including soybeans, began to increase.

In 1972 when world soybean, soymeal, and soyoil prices climbed substantially above historical levels, the Brazilian mixed feed industry demanded relief, arguing that it could no longer pay the escalating price for soybean meal while having to sell its output at the price ceiling fixed by the government (10). In response, CACEX established a retention system of quotas on soybean and soybean meal exports in early 1973. The consumer price of soybean oil in Brazil has had a price ceiling administered by the Comissão Interministerial de Preco since the revolution of 1964. As discussed in more detail below, Brazil has historically been an edible oils deficit country. Only in 1975 did soybean oil exports take-off, after the domestic market had been "adequately" supplied. For every three tons of soybeans exported, one ton had to be sold domestically – either as beans or the meal equivalent. Since it was more profitable to crush the beans and sell the meal, this provided an incentive to expand crushing capacity. In addition to the retention scheme, a 12.5% state value-added tax (ICM) was levied on soybean exports. For soymeal a retention scheme in which the sales ratio was set at four to one was established; the ICM tax was set at 5% on soymeal exports. The rate on domestic sales was zero. Before 1975, domestic soyoil production was negligible, relative to demand, and exports were essentially prohibited.

In late 1973 with the world petroleum crisis resulting in petroleum prices rising, the Brazilian balance of trade was severely affected, and 1974 saw a return to a number of pre-1968-type trade controls. In addition, the mini-devaluations of the currency slowed down, and the cruzeiro gradually became overvalued again, imposing an implicit tax on all exports, including soybeans and products. Schuh has estimated that the degree of overvaluation reached 25% (5).

In 1974, the government eliminated the retention system and began to control soybean and soymeal exports through an export licensing scheme. Soyoil exports were still banned. In addition, the ICM tax on soybean exports was lowered to 9.75%. In July 1974, soybean and soymeal exports were temporarily suspended while the government appraised the internal supply situation. A new export system for soybeans was subsequently introduced, in which the export volume in any period was not allowed to exceed the "exportable surplus," defined as total production less installed crushing capacity. Meal exports resumed when the crushing industry agreed to assure an "adequate" supply of meal for the domestic market. The criterion for "adequacy" was measured by the level of the domestic meal price. Protests by the mixed feed industry that crushers were underestimating its "needs" resulted in suspension of soymeal exports again in November 1974. Soyoil exports were prohibited until December 1974 when a small sale was authorized.

In 1975, with the growth in soybean crushing, soymeal and soyoil stocks accumulated, and export controls on these products were removed. The ICM tax on soybean exports again was raised to 12.5%, slightly below the domestic sales rate of 13-14%, depending on the state. (The ICM tax on bean exports is charged on the f.o.b. export price less port and transportation costs. The effective rate in the interior may be only about 11.6%). No ICM tax is charged on domestic sales of soybean meal, since "modern agricultural inputs" are exempt; however, 5% was charged on meal exports in 1975. The lower rate on meal than on beans provided an incentive to crush the beans in Brazil.

No ICM tax was charged on oil exports in 1975, although up to 14% was charged on domestic sales. In addition to this benefit of exports over domestic sales, a 16% subsidy was granted on soybean oil exports in the form of a tax credit against the federal value-added tax on industrial products (IPI) and the state ICM tax owed by the exporting firm (equally split). An additional incentive to soyoil exports is an exemption of pretax profits on soyoil exports from the federal income tax of 30%. In addition, soyoil and soymeal exports benefit from a special export financing scheme at 8% interest established in 1971. (The market rate was in the range of 20-30%).

While some export subsidy may have been justified to offset the implicit export tax associated with cruzeiro overvaluation during these years, the policy set was quite clearly biased in the direction of stimulating meal and oil exports and domestic crushing of the soybeans.

In 1976 the basic structure of the soybean and soymeal export policy was maintained essentially the same as in 1975. When soybean exports were slow to get under way after harvest, the ICM tax on soybean exports was reduced to 10% for April, May and June, and the government devalued the cruzeiro four times within 66 days. Once bean exports got started in June, the crushing industry was prohibited from exporting more beans. In January 1976 the oil export tax credit was reduced from 16 to 14%; however, it was raised to 20% when new crop beans became available for export. This brought threats by the United States crushing industry to take retaliatory action under Section 301 if Brazil did not cease and desist in subsidizing soybean oil exports by this means. As a result, the credit was reduced to 14% on July 1, 1976; 8% on January 1, 1977; and 4% on July 1, 1977. It was completely eliminated on December 31, 1977. Export sales of crude and refined soybean oil continued to be exempt from the 30% corporate income tax, nevertheless.

At the beginning of 1977 exports were authorized after

the government and crushers agreed that 1 million M.T. of oil and 1.2 million M.T. of meal would be retained for domestic comsumption. A system has evolved in which the export controls generally are policed by the crushers association. Once it certifies that sufficient meal and oil are available to keep the domestic prices below the ceilings imposed by CIP, CACEX authorizes the export shipment. However, as the 1977 marketing year opened and world market prices approached their historic highs, the government of Brazil first imposed an export embargo on March 11, and then on March 23 imposed an ad valorem tax of 7% on bean, meal, and oil exports to hold down their domestic prices. There also may have been some intent by the government to exploit the apparent inelastic export demand which existed in a period of low world stocks six months before the U.S. crop would be harvested. The export tax was raised to 12% on May 3. It was lowered to 7% on July 1 and 4% on July 25. The tax was eliminated altogether on Aug. 18. The mini-devaluations of the cruzeiro appear to have been slowed during this period to increase the implicit export taxation by this means as well. While the export tax was in effect in 1977, part of the tax revenue was given to crushers as a specific subsidy per quantity sold on the domestic market in a further attempt to hold domestic meal and oil prices down.

The system of export taxes in 1977 described here was superimposed upon, i.e., partially offset the ICM export incentives. In 1977 the ICM tax rate of 13% was charged on both domestic and export sales of soybeans. No ICM tax was collected on soyoil exports, while a tax of 11% was collected on interstate and 13% on intrastate domestic sales. There was still no ICM charged on domestic meal sales; however, 5% was charged on exports (7.5% from April 28-Aug. 18, 1977).

During 1977 the European Community Oilseed Crushers' Association (FEDIOL) filed an antidumping complaint against Brazilian soybean meal with the European Community Commission (11). FEDIOL protested as unfair the tax advantage of exported meal over beans which encouraged domestic crushing and meal exports at a time when the EC had substantially expanded its own crush capacity. The Brazilian government agreed to raise the taxes on exported meal. On Nov. 21, 1977, a special 3% export tax was placed on soybean meal, raising the total tax on meal exports to 8%. Under terms of the agreement, the total tax on meal was raised to 9.6% on May 1, 1978, and to 11.1% on Nov. 1, 1978. Beginning in May 1978 the entire export tax is ICM. In 1978 there was still no ICM tax on oil exports, while 13% was charged on bean exports. Therefore, with the new tax rates, the differential favoring the export of meal over beans has been narrowed substantially, but a rather large benefit still exists on the oil side.

This review of the constellation of taxes and subsidies on soybeans and soybean products suggests fairly clearly a government policy to stimulate expansion of domestic soybean crushing capacity and to export soymeal and soyoil to the extent possible instead of the raw soybeans. This would increase domestic value-added as well as foreign exchange revenue from the soybean complex.

It appears that the strong world market for soybeans and products and this incentive structure have been the principal motivating forces behind the expansion of the Brazilian crushing industry, rather than fiscal incentives or subsidized loans for the capital investment proper. Most large new plants constructed in the past five years have been built by multinational firms which brought their own capital. The Brazilian firms, and particularly cooperatives, that have expanded or established crush capacity appear to have had easy access to cheap credit for construction of their crush facilities.

Regardless of why it happened, one fact is clear. In less than a decade Brazil has changed from being a minor producer and crusher of soybeans to being the second largest producer and crusher and the largest exporter of soymeal and soyoil in the world.

The Domestic Markets for Soyoil and Soymeal

In the previous section it was argued that Brazilian export policy has had an important effect on growth in crush capacity and in soymeal and soyoil production. Ultimately what happens in domestic consumption of soymeal and soyoil will determine the course of Brazilian exports of these products.

Brazil historically has been deficient in edible oils production, relying principally on cottonseed and peanut oils and lard to satisfy internal demand. As urbanization has occurred and per capita incomes have risen, demand has shifted from lard to plant-origin edible oils, and per capita consumption of edible oils also has risen. Soyoil exports did not really get under way until 1975, when domestic soyoil production was deemed more than sufficient to satisfy domestic demand at the ceiling price fixed by CIP. Ceiling prices are maintained to slow food price inflation. The price of oil to the housewife is politically sensitive. Periodic oil shortages have occurred at the ceiling price when not enough was produced or the crushing industry refused to sell its inventory in an attempt to force CIP ro raise the ceiling. This explains why the domestic oils market had to be "adequately" supplied before soyoil exports were authorized.

Domestic demand for soyoil is now about 1.1 million M.T. per year. In recent years sales have been growing at 8-10% annually. Most consumption is in urban areas, as soyoil is still relatively unavailable in rural communities. There is no national distribution network for oil in place.

Margarine consumption also is growing rapidly, and some substitution for butter has begun. Annual production (as of 1977) is estimated to require 225,000 M.T. of oil, including, besides soyoil, some corn oil, cottonseed oil, peanut oil, and palm oil. Soyoil is the predominant component, although margarine producers in Brazil are required by law to include not less than 5% cottonseed oil in margarine. As a result, most of the relatively small cottonseed oil production in Brazil goes into margarine.

Both peanut and cotton production have declined in Brazil in recent years. This, combined with the closing of some small, general purpose oilseed crushing plants, has led to a reduced production of both cottonseed and peanut oil. In 1977 Brazilian peanut oil production was about 55,000 M.T., and exports were 48,000 M.T., leaving only 7,000 M.T. for the domestic market. Cottonseed oil production was around 100,000 M.T., but 72,000 M.T. were consumed domestically. Corn oil production and consumption were about equal at 23,000 M.T. Apparent lard consumption was 161,000 M.T. In contrast, soyoil consumption was just under 1 million M.T.

In 1977 some cottonseed oil exports were permitted due to its substantial premium over soyoil prices on the world market. By retaining more soyoil for the domestic market and exporting more cottonseed oil, total export revenue was increased. Brazilian peanut oil production, despite substantial domestic demand, has been squeezed by the smaller plantings of peanuts and also the fact that more peanuts are being exports as nuts. Due to the premium paid for peanut oil on the export market, 85-90% of Brazil's peanut oil production is also being exported.

All the large soybean crushing firms are now oil refiners and canners as well, since firms are permitted to export oil only if they also sell domestically. Therefore, they have to be refiners too. It was recently estimated that 30% of domestic oil consumption is still supplied by the small, traditional crushers. The other 70% is supplied by the large, newer plants. Two large crushing firms are also margarine manufacturers.

The demand for soymeal in Brazil is principally for use in mixed feeds. Of this, over 75% goes into poultry rations, 16% to swine, and most of the rest to dairy cattle (12,13). There is no beef cattle feeding in Brazil. Soymeal exports took off much faster than soyoil exports since the internal soymeal market had been growing more slowly and did not have the backlog of unsatisfied demand at the ceiling prices which existed in the oils market. Nevertheless, Brazilian soymeal consumption, which had been growing relatively slowly, took off in 1973. In 1973 consumption reached 1 million M.T., three times the consumption of only three years before. Consumption is growing at around 7½% annually.

Historically the principal sources of protein in rations in Brazil were cottonseed meal and peanut meal, supplemented with meat meal, bone meal, fish meal, blood meal and the like. The growth in soymeal availability and the decline in the price of soymeal relative to these other meals led to the rapid increase in soymeal consumption as the poultry industry in particular grew. Today soymeal is the preferred protein feed supplement and comprises about 25% by volume of livestock feed rations produced in Brazil.

During 1965-75 Brazil's poultry industry underwent a major transformation and modernization. As incomes and in turn demand for meat grew, the broiler industry responded. For example, Brazilian Poultry Producers Association data show that broiler production grew about 3½ times from 154,000 M.T. in 1969 to 551,000 M.T. in 1976. Egg production grew rapidly during 1969-72, but plateaued then around 500-510 million dozen per year.

As the poultry industry has grown, the demand for high protein supplement has grown as well. More recently, modernization of the Brazilian swine industry has begun, and the potential demand for swine rations is large. Given the right economic incentives, the swine and dairy industry as well could change rapidly in the next decade, substantially increasing their demand for soymeal. In addition Brazil has plans to improve human nutrition by blending 5% soybean flour with the wheat flour in bread. If and when this program begins, it could expand domestic meal usage by another 200,000 M.T. per year.

1978, 1979 and Beyond

In late 1977 Brazilian farmers increased soybean area by about 7%. A crop of about 12.5-13 million M.T. was projected to be harvested in April-May 1978. However, due to an atmospheric quirk, southern Brazil, where most of the soybeans are grown, experienced the worst drought of the century. Figure 1 shows that in January 1978 only 57-62% of normal precipitation occurred in Parana, southern Mato Grosso and parts of Rio Grande do Sul. Isolated areas received as little as 20% of normal precipitation. This condition extended into February, and as a result soybean yields were severely reduced. The 1978 Brazilian crop was only about 20% below what production was expected to be under normal rainfall.

With the Brazilian crop so severely reduced and so much new crushing capacity having come on line in the past few years, some capacity went unused in 1978. The Brazilian government limited soybean exports to keep as much of the crushing capacity running as possible, and even imported 77,000 M.T. of beans from the U.S. in addition to some 200 thousand M.T. of bean imports from neighboring producing countries in order to fulfill export commitments.

The domestic soybean crush was around 8.5-9 million M.T. This put meal production at about 7 million M.T. and oil production at about 1.8 million M.T. With domestic meal and oil consumption at about 1.25 and 1.1 million M.T., respectively, this left about 6 million M.T. of meal and 700 thousand M.T. of oil available for export. In 1977 Brazil crushed about 8.1 million M.T. of beans and exported about 5.3 million M.T. of meal and 510 thousand

FIG. 1. Percent of normal precipitation, January 1978. Shaded areas 100% or more (Environmental Data Service, NOAA).

M.T. of oil. Therefore, despite the drought of 1978, Brazilian crush and exports of meal and oil all increased in 1978. The cutback in soybean exports made up the difference.

Despite the poor 1978 crop, Brazilian soybean growers expanded their soybean area once again when they planted in late 1978 – by 4.3%, to about 7.9 million hectares. Soybeans are still the most profitable crop they can grow. Growth rates have slowed in Parana and the rest of the South, with most current expansion coming in Mato Grosso and the Central West. Because of another severe drought, expected production is between 11 and 12 million M.T. of soybeans in 1979. As far as bean exports are concerned, the Brazilian government can be expected to continue restricting soybean exports to ensure a supply of beans to the domestic crushers as long as crush capacity exceeds bean production. There is one factor which may modify this. In the European Community, there also exists excess crush capacity today, and Brazil's unwillingness to export beans forces them to rely mainly on U.S. beans. As discussed above, FEDIOL has brought complaints against Brazil's favored treatment of meal and oil exports over bean exports. The intensity with which FEDIOL pursues its complaints seems to be inversely proportional to the volume of Brazil's exports of beans. Therefore, one may reasonably expect that in normal crop years some minimum level of bean exports will be authorized to appease the EC crushers.

With continued growth in population and per capita income in Brazil, demand for both soymeal and soyoil is expected to continue their recent rapid growth. Data on domestic consumption of meal and oil are fragmentary at best. Industry sources estimate 1978 oil consumption at 1.1 million M.T. and meal consumption at 1.25 million M.T. Estimates of the current rates of growth in demand for both meal and oil cluster around 8% per year, although some observers estimate that Brazilian meal demand is growing at 15% per year. Assuming that the Brazilian government continues to hold ceilings on the consumer prices of oil and livestock products at recent real levels, it is likely that consumption of both meal and oil will continue

to grow at 8% per year. Then if Brazil crushes 10 million tons of beans (and exports 0.5 million M.T. as beans), domestic meal and oil production would be 7.6 and 1.85 million M.T., respectively. Exports of meal and oil would be 6.4 and 0.5 million M.T., respectively, in the 1979-80 Brazilian marketing year.

Extrapolation of these rates of growth through 1982 suggests bean production of 15-15.5, crush of 12-12.5, and exports of 1-2 million M.T. Meal production would be about 9.3; consumption, 1.8, and exports, 7.5 million M.T. Oil production would be about 2.25, consumption, 1.6, and exports, 0.65 million M.T. The implication of this analysis is that at the assumed rates of growth, oil exports would increase negligibly from 1978 levels. If meal consumption should grow at the 15% suggested by several observers, rather than 8%, meal exports would increase by about only 1 million M.T. instead of 2 million between now and 1983.

Some observers may consider the assumed rate of growth in Brazilian bean production of 4% per year for the next five years to be too low, giving only a 15 million M.T. crop in 1982. Some argue that an 8% rate of growth, which would put the crop at 18 million M.T. in 1982, is more likely. Whether this level is reached will depend to a great extent on how much expansion occurs in the Central West, where yields are lower and production costs higher. Unless the Brazilian government makes a major commitment to subsidizing the investment costs to bring this land into soybean production and to build the necessary marketing infrastructure, a 4% annual rate of growth appears more likely.

CONCLUSION

Brazil is here to stay as a major soybean and particularly soybean product exporting nation. Brazilian production of beans will continue to grow, but likely at a decreasing rate as the soybean assumes a mature position in the cropping system of southern Brazil's agriculture. Once the crushing plants now under construction are completed, there is likely to be a respite from the rapid growth we have seen in the past five years, at least until the crop size catches up with crushing capacity. Brazil's domestic demand for meal and oil is expected to continue to grow rapidly, with the result that meal and especially oil exports are likely to grow less rapidly in the next five years than they have in the last five years.

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