

CURRENT STATUS OF SOYBEAN PRODUCTION, PROCESSING AND UTILIZATION IN BRAZIL

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Commercial production

Soybean development in Brazil started when the first germoplasm was introduced and evaluated in the state of Bahia, at 12° S of latitude, in 1882. The germoplasm came from the United States of America (USA), was not adapted to such low latitudes and did not succeed in the area. Ten years later (1891), new varieties were introduced and tested in the state of São Paulo (SP), at 23°S, with reasonable production of hay and beans. In 1900, soybeans were tested at 30°S in Rio Grande do Sul (RS), the southernmost state of Brazil, where climatic conditions are similar to those prevalent in Southern USA, origin of the introduced varieties.

Soybean remained a marginal crop in southern Brazil until 1960. Before that, it was grown in small properties to produce hay for dairy cattle and beans to feed pigs within the properties. The first reference of commercial production in the Country was in 1941 (Bonato, E.R and Bonato, A.L.V): an area of 651 hectares, production of 457 metric tons (MT) and yield of less than 700 kg/ha. However, the real stimulus for large commercial production was in the mid 1950's, following a government decision to provide official incentives to grow wheat, aiming at self-sufficiency of this cereal. Soybean was equally benefited by the program, since it was the best option for a summer crop following wheat, under both a technical (a legume following a grass) and economical (use of same machinery and farm infrastructure) viewpoint.

In 1960, the soybean area was 177 thousand hectares and production around 206 thousand MT, with yields of less than 1.200 kg/ha. By the end of the 1960's, the area had increased to 906 thousand hectares and production reached 1.056 million MT, but no yield increase was observed during that decade. The South of Brazil, represented by the states of RS, Santa Catarina (SC), Paraná (PR) and SP claimed 99.5% of the production (respectively, 70,2%, 3.0%, 20.5% and 5.8%).

In spite of the five fold increase in production during the 1960's, the real *boom* of national production occurred during the first half of the 1970's, consolidating soybean as the lead crop of Brazilian agriculture. Production increased from 1.5 million MT in 1970, to 12.5 million MT in 1977. The increment was due to the incorporation of new areas (1.3 to 7.1 million hectares), as well as to increase in yield (1.14 to 1.77 kg/ha). In 1977, the Southern Region was still responsible for 93% of the total Brazilian production.

The good profits obtained by farmers growing soybean in the South during the 1970's, turned cropland very expensive and unavailable in the region. Excited about the possibility of making more money by planting larger areas, many soybean growers made good profit by selling their small properties in the South and buying larger areas in the Cerrado (a special kind of savanna that covers almost one third of the Brazilian territory) of central Brazil (Fig.1), where land was cheap and plenty, but non fertile. Existing varieties grown in the South were not adapted to the lower latitudes of Midwest Brazil and research organizations had to go after those pioneers, looking for the technologies they were demanding to farm the new soybean frontier. The initiative was successful, turning the cheap, unproductive and unpopulated Cerrado land, into the most important cropping area of present Brazilian agriculture. Despite being chemically poor, the soils have very good physical characteristics, flat topography and good rainfall distribution during the soybean growing season.

The Cerrado region is still drawing new farmers into the area. Land is no longer cheap, but still cheaper than in the South. As a result, soybean production in Cerrado increased from 2% in 1970, to 20% in 1980, to 40% in 1990, and claimed more than 60% of the 52,2 million MT harvested in 2003, despite the simultaneous increase in the traditional producing zone (Fig 2).

Reasons for the expansion

Several factors contributed to promote soybean expansion in the South during 1960's and 1970's and on the savannas of central Brazil from mid 1970's. Among those factors, a few deserve to be pointed out:

- similarity of the Southern USA climate and that of the Southern Brazil, enabling Southern Brazilian farmers to succeed in the establishment of soybeans in the 1950's and 1960's, using American technologies, particularly varieties;
- fiscal incentives, beginning in mid 1950's until the late 1970's, to promote wheat production, that also helped promote soybean;
- increased market demands for soybean as a protein component for animal feed and human food;
- high market prices, particularly during the early 1970's;
- establishment of an important industrial park, including processing, farm machinery and agricultural supplies;
- improvements in the transport, export and communication systems;
- construction of Brasília, the new Brazilian Capital, in the center of the Cerrados, improving the regional infra-structure, thus facilitating access and communication;
- low value of Cerrado lands, compared to prices in the South;
- development of proper technologies for the Cerrados, particularly varieties adapted to low latitudes; and,
- good economic and technology levels of farmers migrating from the South to central Brazil, as well as the previously mentioned good soil physical characteristics, flat topography and rainfall regime.

Soybean processing

In 1977, Brazilian soybean processing capacity was 12 million MT, similar to the Country's production. Crushing plants were concentrated in South Brazil, and small plants, processing up to 600t/day were responsible for more than half of the crushed beans. Five years later (1982), following government incentives given to the processing industry, capacity increased to 27 million MT and more than 70% of the beans were processed by plants larger than 600t/day (Fig 3). The Country's present crushing capacity is around 40 million MT, but beans processed do not exceed 30 million MT and more than 40% is being crushed in plants located in the new soybean frontier.

Soybean impacts in Brazil

The explosive increment of soybean production since 1960, of about 260 times in four decades (Fig 4), determined paramount positive transformations in the Brazilian agribusiness. Soybean was responsible for or was a main driving force in the development of commercial agriculture in the Country. They, also, accelerated farm mechanization, increased technification of other crops (mainly corn), supported modernization of ports and transport systems, expanded the international trade and the agricultural frontier, supported Brazilian authorities in the effort to move population to the west, as well as decentralized the agro-industry, sponsoring the expansion of poultry and swine industries.

Total exports of beans (22 million MT), cake (14,5 million MT) and oil (2,4 million MT) represented 77% of soybean produced in Brazil in 2003 (Fig 5), responsible for US\$ 8.4 billions of direct external revenues (Fig 6) and 12% of total Brazilian income from exports (Fig 7). Along the last 30 years, as the leading crop of Brazilian agriculture, soybean commanded the implementation of a new civilization in Midwest Brazil, carrying the progress and the development to the Cerrados, thought to be wastelands before soybean development took over the area. The regional economy is based on the soybean complex, that greatly improved regional infra-structure. Mato Grosso, presently the leading soybean producing state in Brazil (13,5 million MT in 2003), was a marginal producer 23 years ago (117,000 MT in 1980). Similar developments were also seen in other Midwestern states (Fig 8).

Perspectives of Brazilian soybeans

We see clear skies for soybean in this country, because:

- world demand and consumption will continue to expand, since human population will continue to increase;
- average income is expected to increase, particularly in Asian countries, where soybean is largely consumed;
- new industrial uses of soybean will increase global demands;
- fears to consume beef, due to the Mad Cow disease, will continue to promote the consumption of pork and chicken, fed mainly with soybean proteins;

- internal consumption in Brazil shall increase, due to the increase in poultry and swine industries, as well as to expected governmental policies promoting soybean as a human food;
- subsidies provided to growers of Developed Countries and the heavy taxes falling on the soybean chain in Brazil are expected to decrease, promoting more internal production due to better market prices, and
- new areas of major soybean producers, except Brazil, (USA, Argentina, China and India) are restricted, giving Brazil the opportunity to supply future additional demands, by easily incorporating large uncultivated Cerrado areas, into crop lands. Less than 10% of the total of 207 million hectares of Cerrados are under cultivation with annual crops. At least 50 million hectares of wild Cerrados are suitable and available for soybean production and could be easily transformed into croplands, in case market demands so require. Keeping up with the present pace of world consumption, Brazil is expected to respond with more production, becoming the leader in soybean production by the end of the present decade.

Trends also indicate that Brazilian soybean will concentrate on more competitive large commercial operations in the Midwest, leaving to the southern small family farms the option of migrating to other profitable activities such as milk, poultry, swine, fruits and vegetables, that are ideal for smaller areas with abundant labor force, as typical of family operations, and where land is scarce. Small to medium soybean farms may also be viable if they grow soybean along with other economical farm activities, where soybean is one component of a complex farm producing system.

To guaranty future competitiveness of Brazilian soybean in the global market, farmers will need to keep on investing in modern technologies to increase yields. Governmental support is also needed to reduce transportation costs, much higher than those of our competitors, due to the predominance of truck transportation (67% in Brazil and 16% in USA).

Research and development in Brazil

The increase in production and competitiveness of Brazilian soybean was always associated with scientific advances and the adaptation of modern technologies by farmers. Soybean research was poor and concentrated in the South until the late

1960's, operating by introducing and adapting American technologies.

The rapid development of soybean begun in the 1960's, gave rise to an aggressive soybean producing sector demanding technologies that research programs were not prepared to offer, thus urging government research organizations to increase research activities, particularly in the latitudes below 20°S. The establishment of Embrapa Soybean in 1975, was a result of such an effort, complemented with new public and private programs located, mainly, in the new soybean producing states of central Brazil.

As main achievements of soybean research programs, it is worthwhile to point out the development of soybean varieties adapted to low latitudes (up to 0°), the incorporation into commercial varieties of resistance to main soybean diseases, the implementation of an Integrated Pest Management Program, the development of biological control for the velvetbean caterpillars and stink bugs, the improvement in soybean fertilization and inoculation management, the promotion of crop rotation and no till practices (greatly supporting sustainability of production systems) and the agroclimatic zoning of the Brazilian territory, that indicated the more adapted cropping areas for soybean production.

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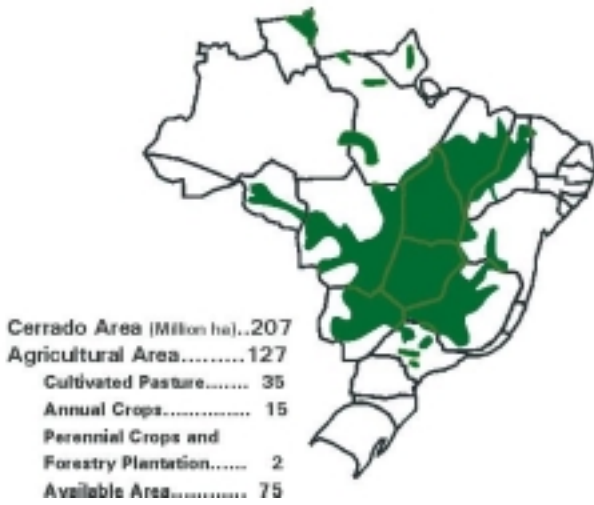


Figure 1 – Brazilian Cerrados

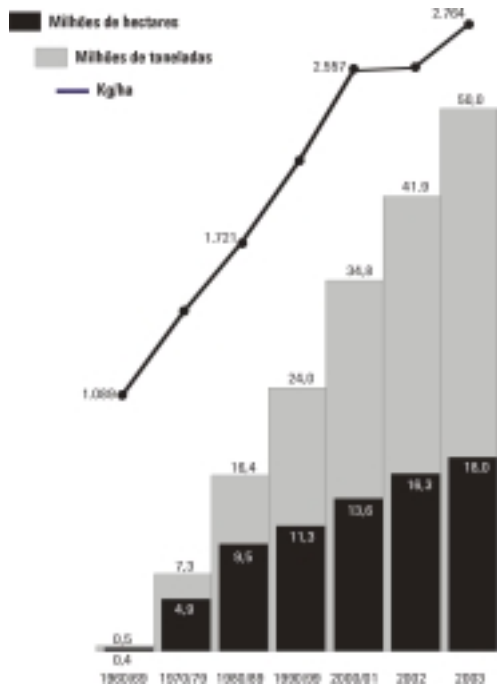


Figure 2 – Evolution of Soybean Production in Brazil

Figure 3 – Evolution by Plant Size

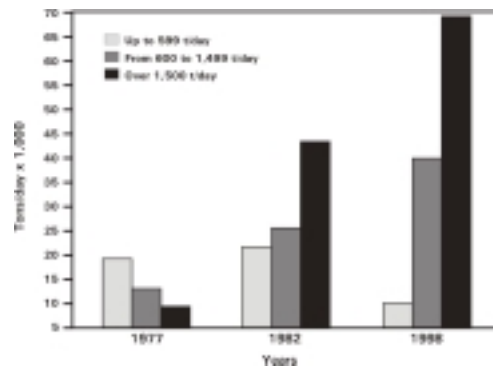


Figure 4 – Evolution of Soybean Production in Brazil

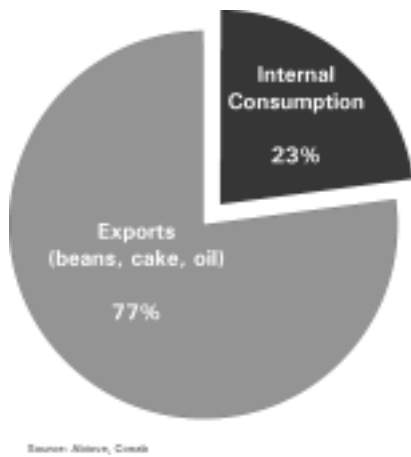


Figure 5 – Total Exports of Beans, Cake and Oil

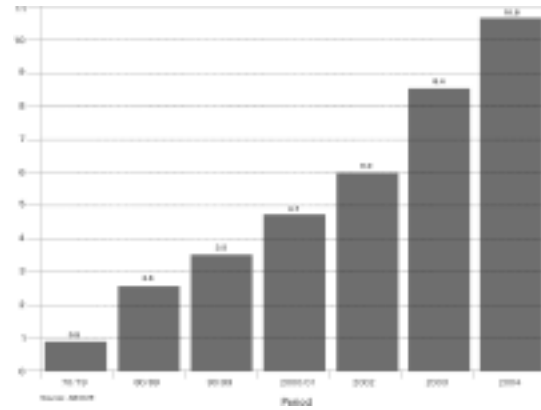


Figure 6 – Soybean Complex – External Revenues in US\$

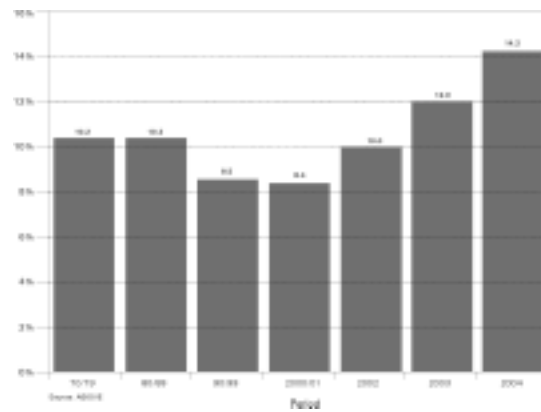


Figure 7 – Soybean Complex – Participation over total Brazilian Exports



Figure 8 – Evolution of
soybean production by state