

# Sorghum in Brazil

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In Brazil sorghum is a relatively new crop that has increased significantly during the last decade. Grain sorghum accounts for about 75% of the area planted, and forage sorghum represents the remainder.

Data in Table 1 show that the area planted to grain sorghum increased rapidly during the first half of the 1970s, but has slowly declined since 1975. This decline has been caused principally by the lack of adequate drying and storage infrastructure, marketing problems, and an inadequate government policy for producing and exporting feed grains.

**Table 1. Grain sorghum production in Brazil from 1971 to 1979.**

Year	Area (1000 ha)	Production (1000 tonnes)
1971	80	170
1972	120	220
1973	210	400
1974	250	500
1975	230	483
1976	210	553
1977	178	435
1978	104	228
1979	200	450

Table 2 shows that grain-sorghum production is concentrated in the states of Rio Grande do Sul and Sao Paulo. In the semi-arid Northeast (Ceara, Rio Grande do Norte, and Pernambuco), the production is increasing. In this region sorghum is one of the best options for the farmer, as it is more drought-tolerant than

**Table 2. Grain sorghum production in Brazil (statewise) in 1977.**

State	Area (ha)	Production (tonnes)	Yield (kg/ha)
Ceará	2 000	1 600	800
Rio Grande do Norte	4 615	3 733	809
Pernambuco	106	152	1434
Minas Gerais	2 290	2 740	1200
Espirito Santo	205	615	3000
São Paulo	56 540	169 620	3000
Roraima	855	3 470	4058
Santa Catarina	450	1 320	2933
Rio Grande do Sul	91 000	214 000	2352
Mato Grosso	4 583	8 258	1802
Goíás	15 000	29 625	1975
Brazil	177 644	435 446	2444

maize and there is a large feed-grain deficit. In 1977 the average yield was 2.5 tonne/ha. In the state of Sao Paulo, where the sorghum area has been increasing rapidly, the average yield is 3 tonne/ha; while in the Northeast the average yield is much less. National trials of commercial and experimental hybrids and varieties have frequently produced more than double the state-average yield.

Nearly all the grain-sorghum acreage is planted with hybrids except in the Northeast where some varieties are used. Until now sorghum seed is imported or produced by a few commercial companies, but soon all the seed will be produced in Brazil. Most of this seed will be produced by two companies with two or three other companies producing a small percentage.

During the first Brazilian Sorghum Symposium held in 1977, it was shown that sorghum was used in the feed industry at 8% of the ration. If sorghum continues to be used at this rate, the demand for sorghum in 1980 will be 1 million tonne, corresponding to 400 000 ha. This is more than double the amount of sor-

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ghum and nearly 5% of the maize produced in 1977/1978. The 1978/1979 sorghum forecast is approximately 200 000 ha, the limiting factor being the shortage of seed.

Grain sorghum is used principally for swine and poultry feed. The National Maize and Sorghum Research Center (CNPMS) is developing a sorghum for direct human consumption and in industrialized foods. Forage sorghum is principally used for silage for dairy cattle, but is also being used increasingly in beef production.

Preliminary experimental results and economic analysis indicate that sweet sorghum can be economically cultivated to produce alcohol for mixing with gasoline, and can be planted in areas near sugar mills and distilleries. In Brazil sweet sorghum can be harvested before or after the sugarcane harvest when the mills are normally idle.

Sorghum in Brazil is subject to damage by several diseases. Surveys conducted by us at the CNPMS showed that the principal diseases are foliar anthracnose, rust, sorghum downy mildew, and grain "weathering" (Table 3). Anthracnose and rust are quite severe in nearly all the regions where sorghum is produced, principally in central and southern Brazil.

Sorghum downy mildew is a potential problem and has been observed in many areas of the states of Rio Grande do Sul, Sao Paulo, and Santa Catarina. The importance of this disease increases when we consider that these states constitute the largest maize-producing region of the country. Results from downy mildew trials have demonstrated the existence of commercial and experimental material of both maize and sorghum with good levels of resistance.

Sorghum grain produced in central and southern Brazil is damaged both internally and externally by fungi that reduce the quality of the product. We have initiated selection for resistance to this damage but have not found any material without tannin that is resistant.

The economic importance of other diseases varies from region to region and from year to year.

All sorghum research in Brazil is coordinated by the National Maize and Sorghum Research Center of Brazilian Enterprise for Agriculture Research (EMBRAPA). In addition CNPMS also conducts research of national importance. For example two subprojects, disease-control, and

**Table 3. Principal sorghum diseases and the research priority in Brazil.**

Disease	Pathogen	Research priority
Root and stalk diseases		
Red stalk rot, anthracnose	<i>Colletotrichum graminicola</i>	2
Charcoal rot	<i>Macrophomina phaseoli</i>	2
Foliage diseases		
Anthracnose	<i>Colletotrichum graminicola</i>	1
Rust	<i>Puccinia purpurea</i>	1
Downy mildew	<i>Sclerospora sorghi</i>	1
Leaf blight	<i>Helminthosporium turcicum</i>	2
Grey leaf spot	<i>Cercospora sorghi</i>	3
Zonate leaf spot	<i>Gloeocercospora sorghi</i>	3
Sooty stripe	<i>Ramulispora sorghi</i>	4
Head diseases		
Grain 'weathering'		1
Covered smut	<i>Sphacelotheca sorghi</i>	—
Head smut	<i>Sphacelotheca reiliana</i>	—
Virus diseases		
Sugarcane mosaic	virus	2

sorghum disease survey are coordinated and executed by the pathologists at CNPMS. This group also forms part of the multidisciplinary research team in other subprojects such as sorghum productivity and quality improvement, germplasm bank activities, etc. These and other research subprojects, a total of 13, are summarized in "Research Program and Activities of the National Maize and Sorghum Research Center-1978," and will not be discussed here.

In addition to conducting and coordinating research in Brazil, CNPMS also participates in furnishing technical assistance to other research programs, prepares material to support other breeding programs in Brazil, principally in the state of Rio Grande do Sul and the Northeast, and prepares and distributes a network of grain, forage, and sweet sorghum trials covering the entire country in cooperation with private firms and official institutions. Breeding for resistance to disease is also conducted by private seed companies such as AGROCERES

and CONTIBRASIL. Several thesis projects at various universities have focused on the selection of varieties for resistance to various diseases. Many of the postgraduate students working on these projects have been financed by EMBRAPA.

Most of the research in this area conducted at the National Center has been to obtain varieties resistant to anthracnose, rust, downy mildew, leaf blight, and grain "weathering." Selections are made in the field under natural epidemic conditions. Studies of the nature of inheritance for resistance to these diseases are also being initiated.

In 1977, EMBRAPA released two grain-sorghum hybrids, two forage-sorghum hybrids, and five sweet sorghum varieties with good agronomic characteristics and resistance to the principal diseases. Additional hybrids and breeding material will be released in 1979.

## Summary

The area planted to grain sorghum in Brazil has increased since 1970. The major production areas are the states of Rio Grande do Sul and Sao Paulo. Even though the national average yield is 2.5 tonne/ha, results of national trials indicate that this yield can be doubled.

The use of sorghum grain in animal feed, at the rate of 8% of the ration, will create a demand of 1 million tonnes of sorghum grown on 400 000 ha by 1980. Recent problems in seed production have restricted the expansion of sorghum. Even though the potential for 1978/1979 is in excess of 1 million ha, the area planted probably will not exceed 200 000 ha due to seed shortages. Forage sorghum is being used in some regions, and sweet sorghum appears to be excellent for the production of alcohol used as a fuel mixture with gasoline.

The principal diseases are anthracnose, rust, sorghum downy mildew, and grain "weathering."

Sorghum research in Brazil is coordinated by the National Maize and Sorghum Research Center which is a part of the Brazilian Enterprise for Agricultural Research (EMBRAPA). This research is organized in 13 subprojects. In 1977, two grain hybrids, two forage hybrids, and five sweet sorghum varieties with good agronomic characteristics and disease resistance were re-

leased to the farmer. Additional hybrids and genetic material will be released in 1979.