Drought and Low N Status Limiting Maize Production in Brazil

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Abstract

The Brazilian territory has an area of approximately 8.5 million km², which is divided into five main regions with particular characteristics related to average climatic conditions and natural soil fertility. Climatic variations may be very accentuated within each particular region, but a common feature is the irregular distribution of rains, which causes droughts of variable intensities. Maize is an important crop in most Brazilian regions, occupying approximately 13 million ha and producing annually 28-30 million tons of grain. It has been estimated that drought problems, depending on year and intensity, reduce maize production by 14% to 28%. Another limiting factor for maize production in Brazil is the low natural fertility of the soils, especially in nutrients like phosphorus and nitrogen (N). It has been estimated that 80% of the soils in Brazil are deficient in N. Although fertilization is a common solution to this problem, its high costs make this option inaccessible to many farmers. The amount of supplemental N applied to maize in Brazil is low (36 kg N/ha), and of this only 50% to 60% is utilized by the crop. Considering that low N availability and drought are severe constraints to maize crops in Brazil, the National Maize and Sorghum Research Center (CNPMS/EMBRAPA) has initiated breeding programs aimed at the development of germplasm that performs more efficienctly under these two limiting conditions. Several genotypes have been developed on the basis of anthesis-silking interval selection for drought tolerance, and a variety is being developed for soils with low fertility where N is the most limiting nutrient.

Tropical regions are usually affected by marked climatic variations, with frequent periods of no or irregularly distributed rainfall, causing serious crop losses. Drought effects are exacerbated by several effects, including low natural soil fertility, inefficient crop management practices, biotic stresses and lack of government programs to financially support farmers.

Brazil has an area of 8,547,407 km², which is divided into five distinct regions. Maize is cultivated and considered a socially and economically important crop in all of them. Table 1 shows the size of each region and portion of total maize production. The characteristics of each region are briefly summarized below.

Northern Region

The northern region covers seven states in the Amazon basin and is dominated by lowlands (0-200 masl), with abundant and well distributed rains (1300 to 3000 mm). Temperatures and relative humidity are commonly high throughout the year. Natural soil fertility is usually low and farmers use low levels of fertilizer and other inputs on their

Table 1. Brazil's geographical regions, their areas, and their respective contributions to national maize production.

Regions	Area (km²)	% of total area	% national maize production†
Northern	3,869,638	45.27	2.35
Northeastern	1,561,178	18.26	5.32
Southeastern	927,286	10.86	28.43
Southern	577,224	6.76	46.86
Central Western	1,612,077	18.85	17.04
Total	8,547,403	—	—

† Estimate from 6 years (1987-1992).