

## **SECTION 2**

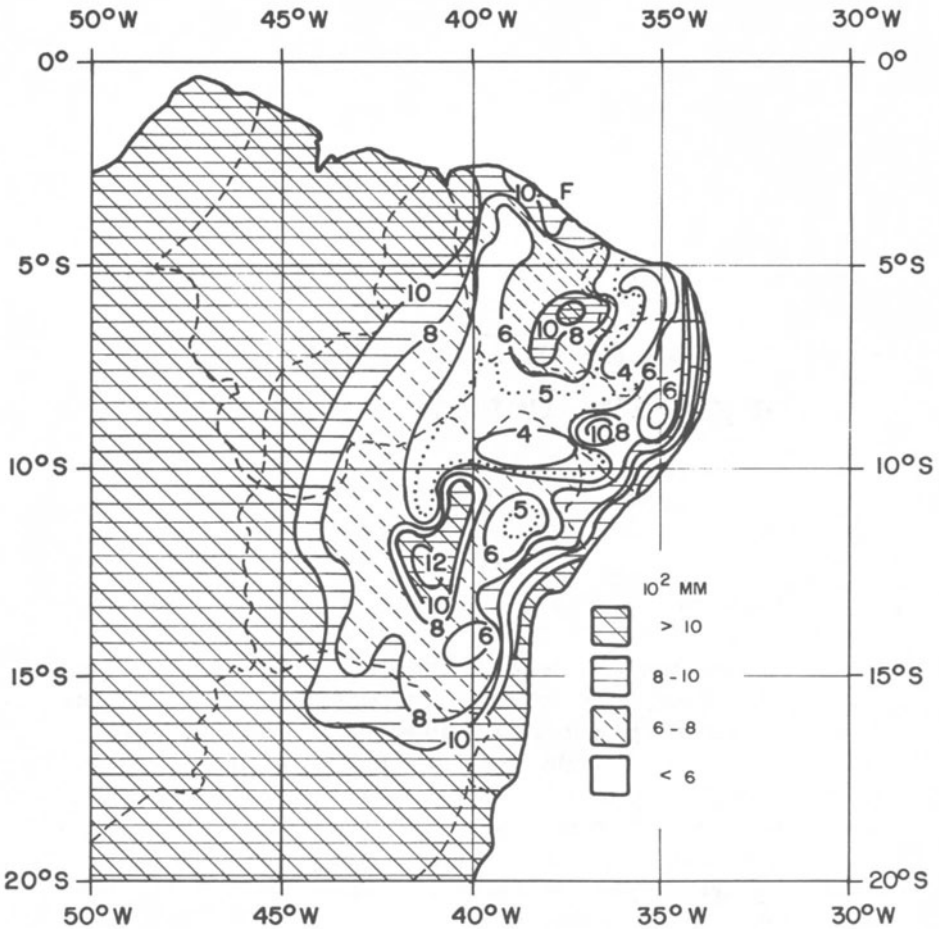
# **The Climatology of Droughts and Drought Prediction**

## **2.1. Introduction**

This section reviews some aspects of the climate of NEB (Northeast Brazil, i.e., the “Nordeste”), focusing in Subsection 2.2 on rainfall, its interannual variability and the mechanisms that produce rain. Subsection 2.3 provides a short review of the state of the art of drought prediction for NEB. It also discusses the occurrence of drought and describes the coincidence of drought episodes and the El Niño/Southern Oscillation phenomenon. A set of agroclimatic scenarios of different types of drought episode that can be used in crop production experiments and computer analyses are identified in Subsection 2.4. A summary and conclusion are given in Subsection 2.5.

The climate of any region is determined, to a large extent, by the general circulation of the atmosphere. This circulation is driven by the differential heating of the rotating globe by solar radiation and by the asymmetric distribution of oceans and continents. Circulation patterns that are generated in the atmosphere redistribute heat, moisture and momentum around the globe. However, this redistribution is an imperfect process. Sometimes it acts to diminish variations in climatic elements within a region. At other times it increases regional differences in the same climatic elements, such as temperature and rainfall, that have a significant bearing on human activities. Rainfall is one of the most critical elements affecting agricultural activities in low latitude regions, such as NEB.

NEB is located between 4° and 16° S and 33° and 46° W, i.e., just to the east of the Amazonian rainforest, with an approximate area of 1.5 million km<sup>2</sup>. It is considered an anomalous region in tropical continents because, in contrast to other regions in this latitudinal range, it has a semi-arid climate. This is due to the relatively low values of rainfall over most of the area. Although some eastern coastal areas annually receive 1600 mm or more, some interior valley areas have



**Figure 2.1.** Annual precipitation in decimeters (1 dm = 100 mm) over NEB. Source: adapted from Kousky and Chu (1978).

an annual average of less than 400 mm (*Figure 2.1*). As is typical in other semi-arid regions of the world, e.g., the Sahel, northeastern Africa and parts of India, spatial and temporal variability of rainfall are very high. *Figure 2.2* shows precipitation indices (areal averages of precipitation departures from the long-term mean standardized by the standard deviation for each station) for northern and southern NEB. The areas represented by each graph are delimited in *Figure 2.3*. The year-to-year variations are outstanding. For example, during the rainy season of 1985 in northern NEB there was a positive deviation of about 200%, while in 1983 a negative deviation of nearly 100% was observed. The spatial variability is illustrated by the year 1970, when northern NEB experienced drought, while the southern part was slightly wetter than normal.