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Using the SPI to Monitor the 1999-2000 Drought in Northeastern Argentina

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Drought risk is a major concern across many regions of Argentina because precipitation is extremely variable. One of these regions, the Pampas, is the main agricultural and livestock production area, extending over 60 million hectares. This region was recently surveyed to detect, monitor, and assess the occurrence of drought using a network of 27 meteorological stations and the Standardized Precipitation Index (SPI), developed by McKee et al. (1993). The SPI has various categories that define drought intensities. A period is considered humid when the SPI value is greater than +1 and a period is considered dry when the value of the SPI is less than -1. The persistence of the extreme values was also analyzed temporally and spatially.

During the second half of 1999, the region most affected by drought was the agriculturally productive northeastern region of Argentina (Figure 1). The start of the normal rainy season was delayed for several months, further aggravating the problem and causing crop damage and production losses. This drought was due to the cumulative effect of inadequate rainfall during the 1999–2000 growing season. Several provinces in Argentina experienced the severe drought, with Entre Rios (Concordia and Gualeguychu), Buenos Aires (Junin, Nueve de Julio, and Bolivar), Sante Fe (Rosario and Ceres), and Córdoba (Villa María de Río Seco) being the most affected during January 2000 (Figure 1).

The drought was most severe and persistent in the area of Concordia and Gualeguaychu in the Entre Rios Province and extended to Junin in the Buenos Aires Province. Figure 2 shows the drought events observed in Concordia for the 3- and 6-month time scales. The SPIs are shown from January 1999 through August 2000, and both values are less than –1 for the period

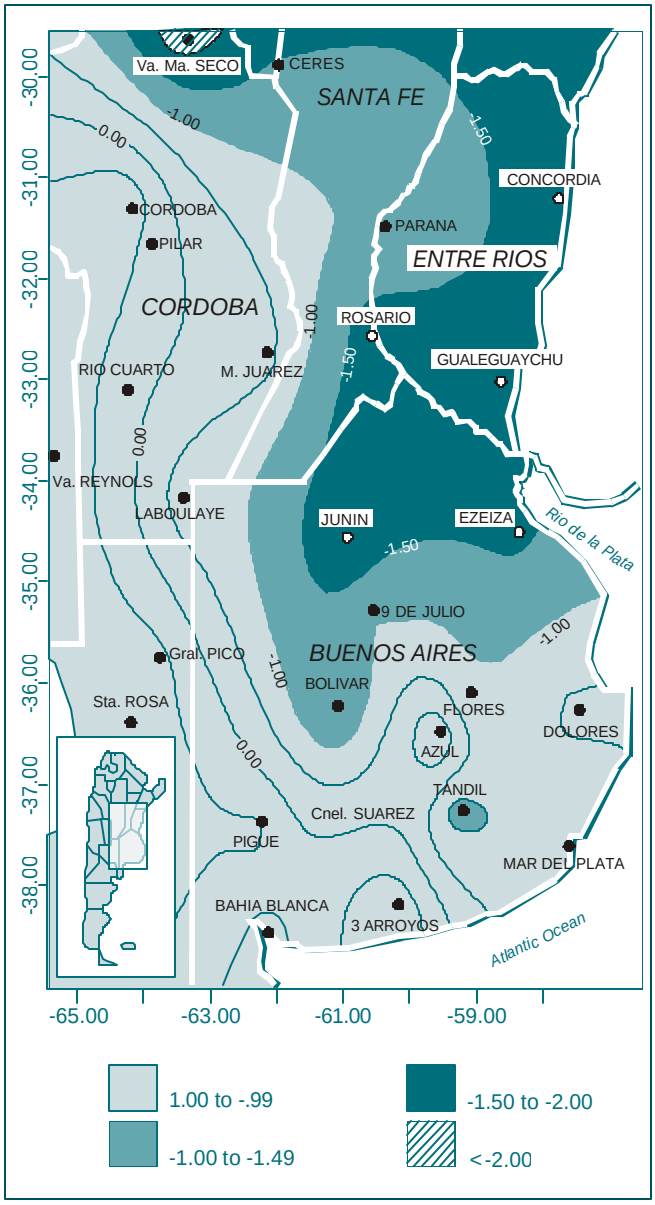

Figure 1. Areas of Argentina affected by severe drought are indicated by the Standardized Precipitation Index (SPI).

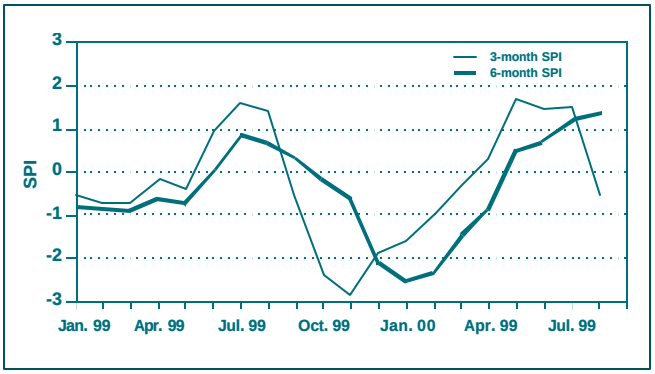

Figure 2. Time series of the Standardized Precipitation Index (SPI) for Concordia, Entre Ríos (Argentina), from January 1999 to August 2000.

from September 1999 to February 2000. Major crops were severely damaged because of this drought.

Examination of the precipitation patterns during this drought shows that precipitation over northeastern Argentina was below normal during both the critical spring (September–October–November) and summer (December–January–February) seasons. After sowing, there was a 35-day break in rainfall that caused the failure of most crops and damaged fruit trees. These conditions were thought to be the result of El Niño, which reached an acute phase during winter 1998. During September–October 1999 and February–March 2000, the change to La Niña also favored adverse environmental conditions. It was not until late March that rainfall returned to normal.

Long-term drought mitigation measures should be taken to help reduce drought impacts such as those seen during the1999–2000 drought in Argentina. Such measures should include developing an early warning and drought monitoring system as well as advising farmers and other decision makers about appropriate drought management and mitigation options.

The Center of Surveying and Analysis of Agriculture and Natural Resources (CREAN), located at the University of Córdoba in Córdoba Province, is currently keeping track of droughts through the use of several drought indices, including the SPI.

In this study, we presented a brief drought analysis using the SPI, and its potential use for drought analysis with minimal data requirements was demonstrated. It is our view that developing a drought monitoring system, based largely on meteorological and climatic information, could be a great help for the early assessment of drought impacts in the Pampas region of Argentina (Ravelo et al., 1999).

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