

SPECTRAL RESPONSE OF WINTER MAIZE PRODUCTION MESOREGIONS USING MODIS IMAGES

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1. EMBRAPA SATELLITE MONITORING

ABSTRACT

Maize production is fundamental for the Brazilian economy. Second-crop of maize (winter maize) has significant involvement in the production of grains and is of fundamental importance for the Brazilian agribusiness. This study analyzed the time series of the NDVI MODIS satellite to obtain the Standardized Vegetation Index (SVI) for the period, and compared it with the SVI for the current crop year. In general, the crop shows good development, as it can be seen in the evolution of the SVI mesoregions analyzed. Due to the variability of the weather conditions in these regions, the cycles of winter crops change due to the dependence on the agricultural calendar of the first crops, especially soybeans. The results of this study are preliminary and need to be validated using control points at the cultivated areas.

KEY-WORDS: maize, mesoregions, NDVI, geoprocessing

OBJECTIVE

The objective of this work was to assess the performance of the Standardized Vegetation Index (SVI) in the indicative monitoring of the development of winter maize crops in the Paraná State, in Southern Brazil. For that purpose, we standardized the MODIS NDVI images with the historical average for each pixel.

METHODOLOGY

$$SVI_{dec} = \frac{NDVI_{dec} - NDVI_{avg dec}}{\sigma_{dec}}$$

63 MODIS images, tile h3v11, MOD3Q1
Spatial resolution: 250 m
Temporal resolution: 16 days
Time: January 2006 – April 2014

Table 1 – Standard Vegetation Index (SVI) Ranges.

Values of SVI	Ranges	Legend
SVI ≤ -2.0	Far below normal	Dark Red
-2.0 < SVI ≤ -1.5	Below normal	Red
-1.5 < SVI ≤ -1.0	Somewhat below normal	Orange
-1.0 < SVI ≤ 1.0	Normal	Yellow
1.0 < SVI ≤ 1.5	Somewhat above normal	Light green
1.5 < SVI < 2.0	Above normal	Green
SVI ≥ 2.0	Far above normal	Dark green

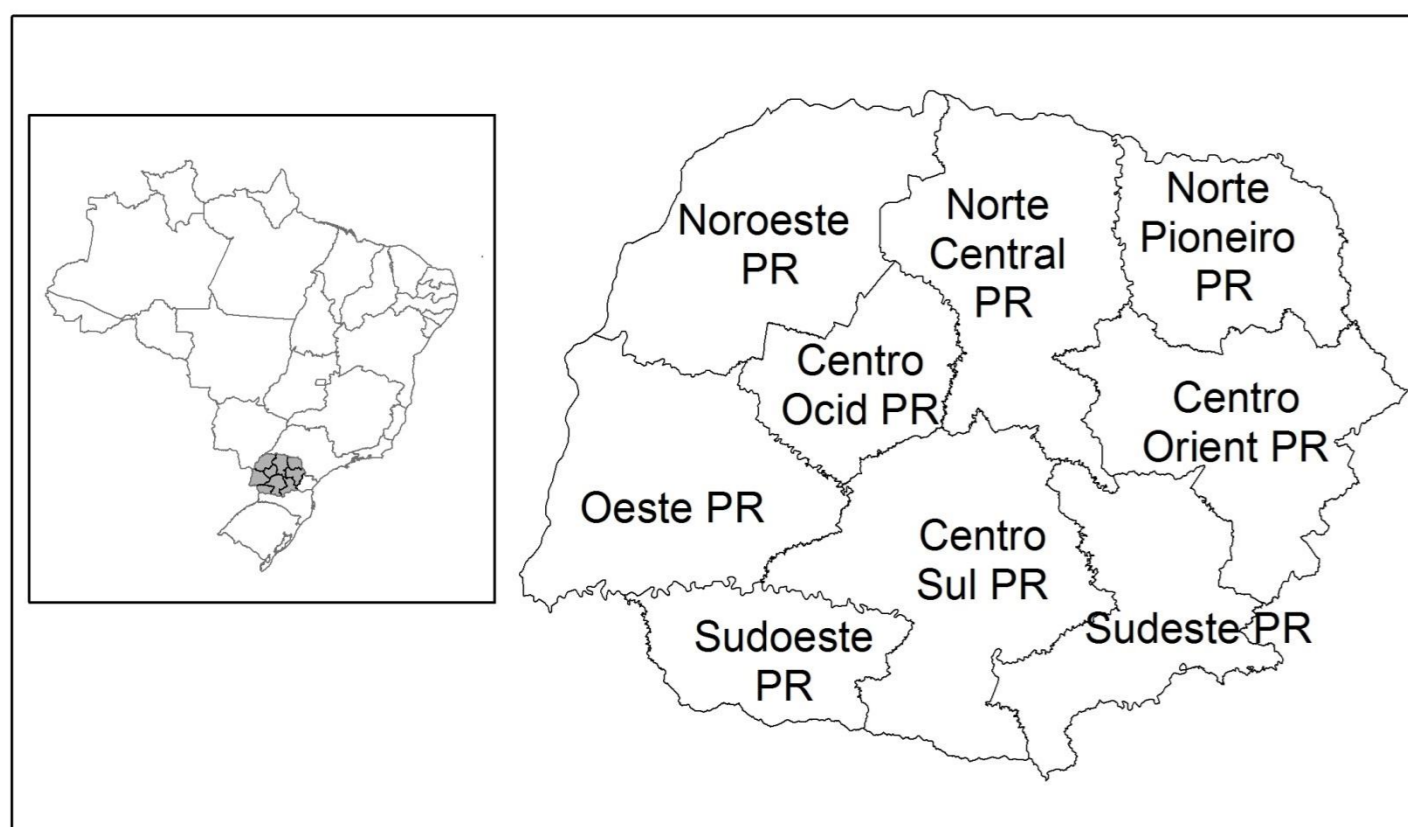


Figure 1. Study area with winter maize production mesoregions in Paraná state.

RESULTS AND DISCUSSION

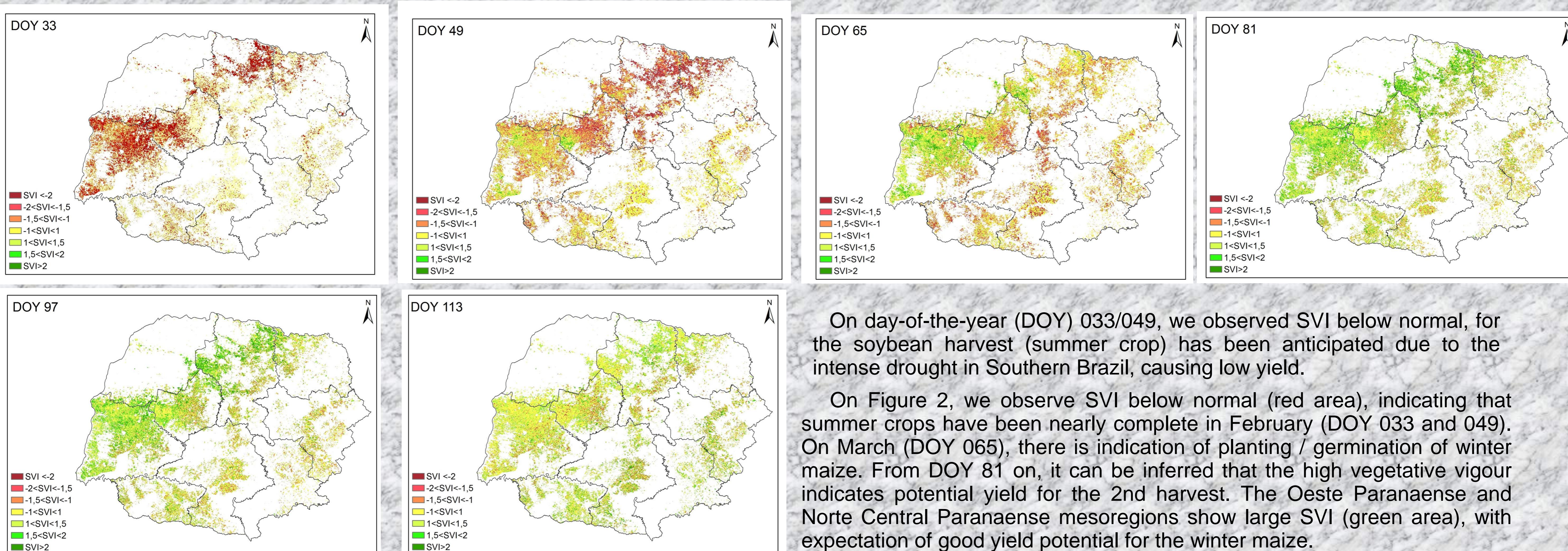


Figure 2. SVI for 16-day periods for DOY 33, 49, 65, 81, 97 and 113/2014, covering the planting, germination, vegetative development, flowering and grain-filling periods of winter maize in the mesoregions in Paraná State.

On day-of-the-year (DOY) 033/049, we observed SVI below normal, for the soybean harvest (summer crop) has been anticipated due to the intense drought in Southern Brazil, causing low yield.

On Figure 2, we observe SVI below normal (red area), indicating that summer crops have been nearly complete in February (DOY 033 and 049). On March (DOY 065), there is indication of planting / germination of winter maize. From DOY 81 on, it can be inferred that the high vegetative vigour indicates potential yield for the 2nd harvest. The Oeste Paranaense and Norte Central Paranaense mesoregions show large SVI (green area), with expectation of good yield potential for the winter maize.

A predominance of yellow and green areas (SVI normal or above normal) characterizes high vegetative development (vigour) of winter maize crops, indicating good yield potential.

CONCLUSIONS

In general, the crops showed good development, as it can be seen in the temporal evolution of the SVI for Paraná's mesoregions. In the Oeste Paranaense mesoregion, the images indicate good crop development. Due to the variability of the weather conditions in the regions, there has been variation in the planting season (for winter maize) and in the cycles of winter crops, due to their dependence on the agricultural calendar of the 1st season crops, especially soybeans. The results of this study are preliminary, and need to be validated using control points at the cultivated areas.

The results demonstrated the potential of SVI for monitoring of agricultural crops, and contributing for decision making in agriculture.