

Variability of nitrogen use efficiency of urea in Réunion

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Abstract

In Reunion, sugarcane covers more than half of the cultivated area. Its production is highly dependent on the importation of mineral fertilisers such as nitrogen (N), a major driver for yield. Fertiliser materials from agro-industrial, urban and farming waste products (MAFOR) are locally available. Although these are important sources of nutrients, their fertiliser value, particularly N, remains unknown. The TERO project was launched in 2014 for this purpose. The behaviour of eight "MAFOR" products are being compared with urea (the most commonly used mineral fertiliser) via response curves.

TERO has implemented four trials in sites in high-contrast production areas - an altitude gradient of more than 500 m, average minimum temperatures between 15.6 and 20.8 °C and maximum temperatures between 22.7 and 28.7 °C, rainfall variation of 3,500 mm and soils with variable physico-chemical properties.

In each trial, the N requirements (X) were calculated from soil analysis results and based on the expected cane yield. Response curves were obtained from five treatments (0X, 0.5X, 0.75X, 0.9X, 1.5X) replicated three times. In the plant crop, half of the urea was buried at planting and the other half was spread on the soil surface four months later. Cane (including trash and tops) was harvested and weighed. The N content (N_{Dumas}) and N recovery was determined. Nitrogen use efficiency (NUE) values were calculated from the N response curves.

Data from three trials were available for this poster. Nitrogen response curves and NUE were very different from site to site. The trial conducted in the north of the island, on a Nitisol at an altitude of 50 m, resulted in a response curve that was sigmoidal, with an NUE of 0.35. The trial in the west, on a brown Dystric Cambisol (Humic) at an altitude of 570 m, resulted in a response curve that was also sigmoidal, but with an NUE of only 0.12. In contrast, the trial conducted on the eastern side of the island, on an Haplic Umbrisols at an altitude of 330 m, resulted in a linear response between 0X and 0.9X. The calculated NUE was 0.92, highlighting better recovery of urea.

The variability in the responses to N, from one production area to another, justifies the diversity of trial sites in order to evaluate the NUE of the available MAFOR. The study will be conducted over two seven-year cane cycles to assess the direct and indirect effects of eight MAFOR products.

Keywords: sugarcane, MAFOR, nitrogen, response curves, NUE, Réunion Island.