

## Nitrogen fertilization in Maize under Irrigated and Rainfed Conditions

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### Abstract

Crop production in Uruguay has changed significantly in recent years, not only in terms of expansion of cultivated area but in its main features. These changes came along with significant increase in land prices and agricultural inputs causing intensification on land use. In order to get high profits the traditional crop-pasture rotations should be strongly oriented to a continuous cropping system and strengthened on grain crops. The potential of agricultural systems is highly dependent on rainfall, therefore, the adoption of irrigation represents an attractive alternative to increase productivity and reduce vulnerability of productive systems. Maize performance and its C4 metabolism enhancing water use efficiency represent an excellent choice for farmers. Nitrogen (N) is one of the main nutrients affecting plant growth and maize grain yield response to N application is well known. In order to reduce N losses, increase uptakes and improve N use efficiency, optimum amount of water and N should be applied. The objective of this study was to assess the interaction between irrigation and N application rates and its effect upon yield. A three year field experiment was carried out in Colonia, Uruguay (34°25'S, 58°0'W), at the Experimental Station of the National Agricultural Research Institute (INIA) "La Estanzuela", in three growing seasons (2011-2014), under a Vertic Argiudoll soil. The experimental treatments consisted in eight urea treatments with four levels of N application (0, 50, 100, 150 and 200 KgN/ha) at three different phenological moments (V6, V10 and V14) under rainfed and supplementary irrigated conditions. The study showed that the average grain yield on irrigated conditions was  $12.060 \pm 2282$  kg/ha for all treatments and  $7.089 \pm 1615$  kg/ha under rainfed conditions. Results indicated that due to the strategies of N application and irrigation water application, yields increased as N rate application increased. Furthermore, results showed that under rainfed conditions N treatments did not translated in significantly increased grain yields, indicating that when water is scarce, the effect of nutrients are scattered, and the achievable grain yields are not reached. The maximum grain yield was obtained for 200 kgN/ha application treatments, showing an increase of 5.337 kg/ha under irrigated conditions, while on rainfed conditions was only 1.500 kg/ha. However, in order to avoid N losses and improve N use efficiency, the amount of N fertilizer should not be applied at one time. It can be concluded that supplementary irrigation is a fundamental technology not only to maximize and stabilize grain yields but to enhance N use efficiency.

**Keywords:** urea, supplementary irrigation, N use efficiency