

# Do maize-year N rate and cover crops affect N<sub>2</sub>O emissions from soybean?

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## Introduction

Nitrogen fertilizer rate is a major factor controlling N<sub>2</sub>O emissions from agricultural land. However, few studies have measured the effect of maize-year N rate on N<sub>2</sub>O emissions from the following soybean year in a 2-yr maize-soybean rotation.

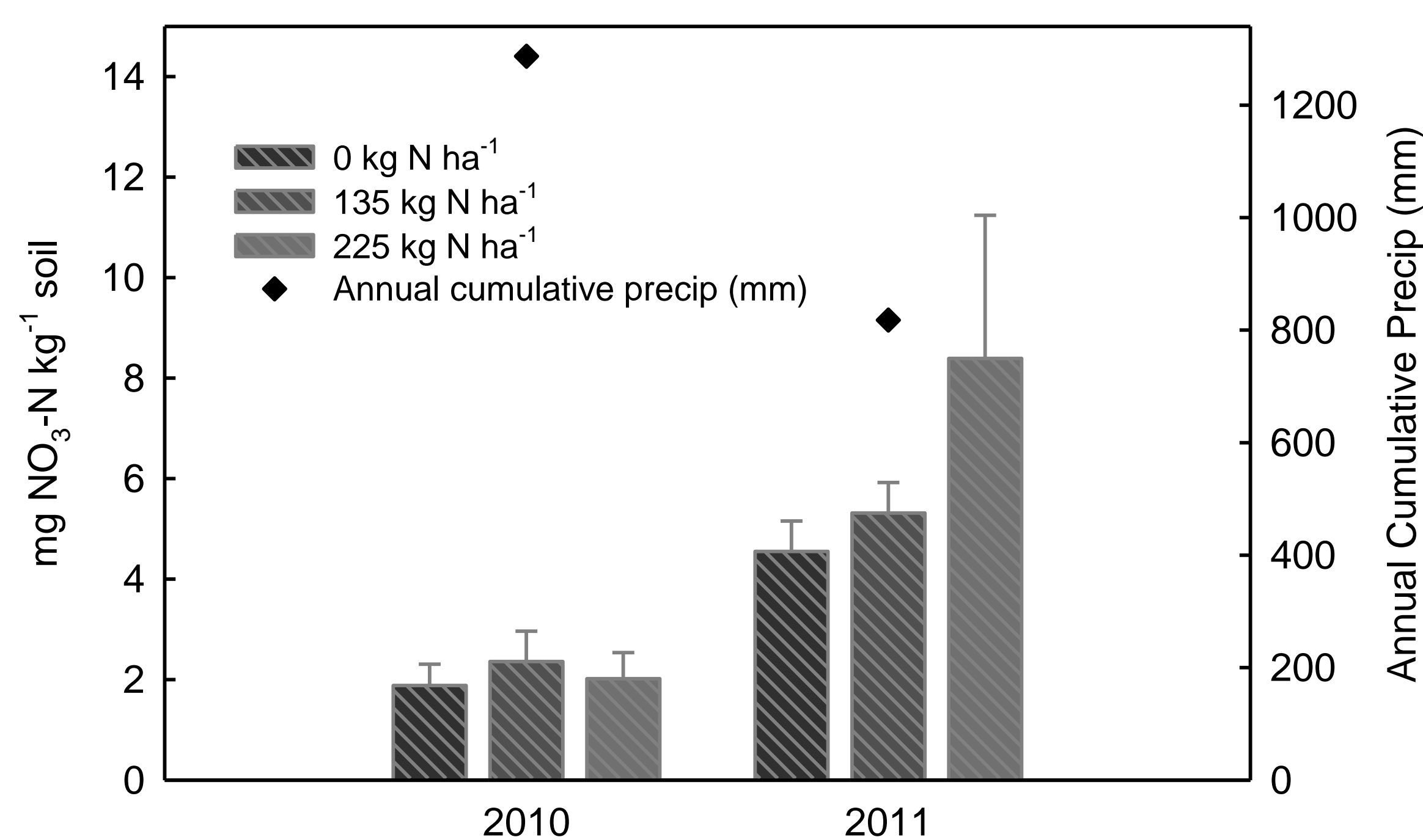


Fig. 1. Soil NO<sub>3</sub> concentrations (top 30 cm) at three N fertilizer rates after maize harvest and cumulative annual precipitation in 2010 and 2011.

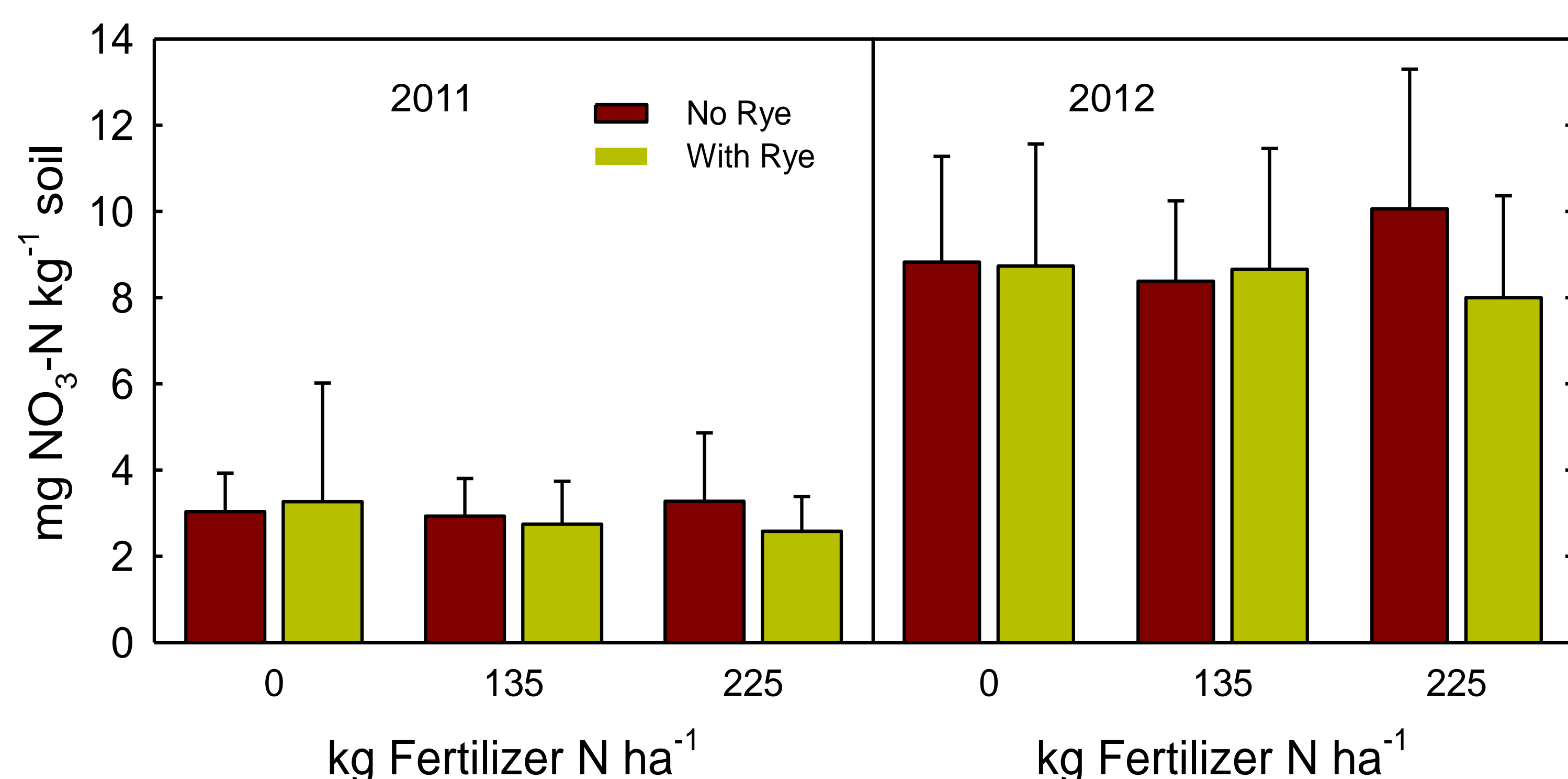


Fig. 3. Mean soil NO<sub>3</sub> concentrations (top 10 cm) during study period in 2011 and 2012. Error bars are standard error of means of 4 (2011) or 3 (2012) replicates.

## Methods

We measured soil surface N<sub>2</sub>O emissions from no-till soybean following maize fertilized at three N rates (0, 135, and 225 kg N ha<sup>-1</sup>) with and without a winter rye cover crop Apr - Sept 2011 and 2012. Soil NO<sub>3</sub> concentrations were measured during each N<sub>2</sub>O flux measurement.

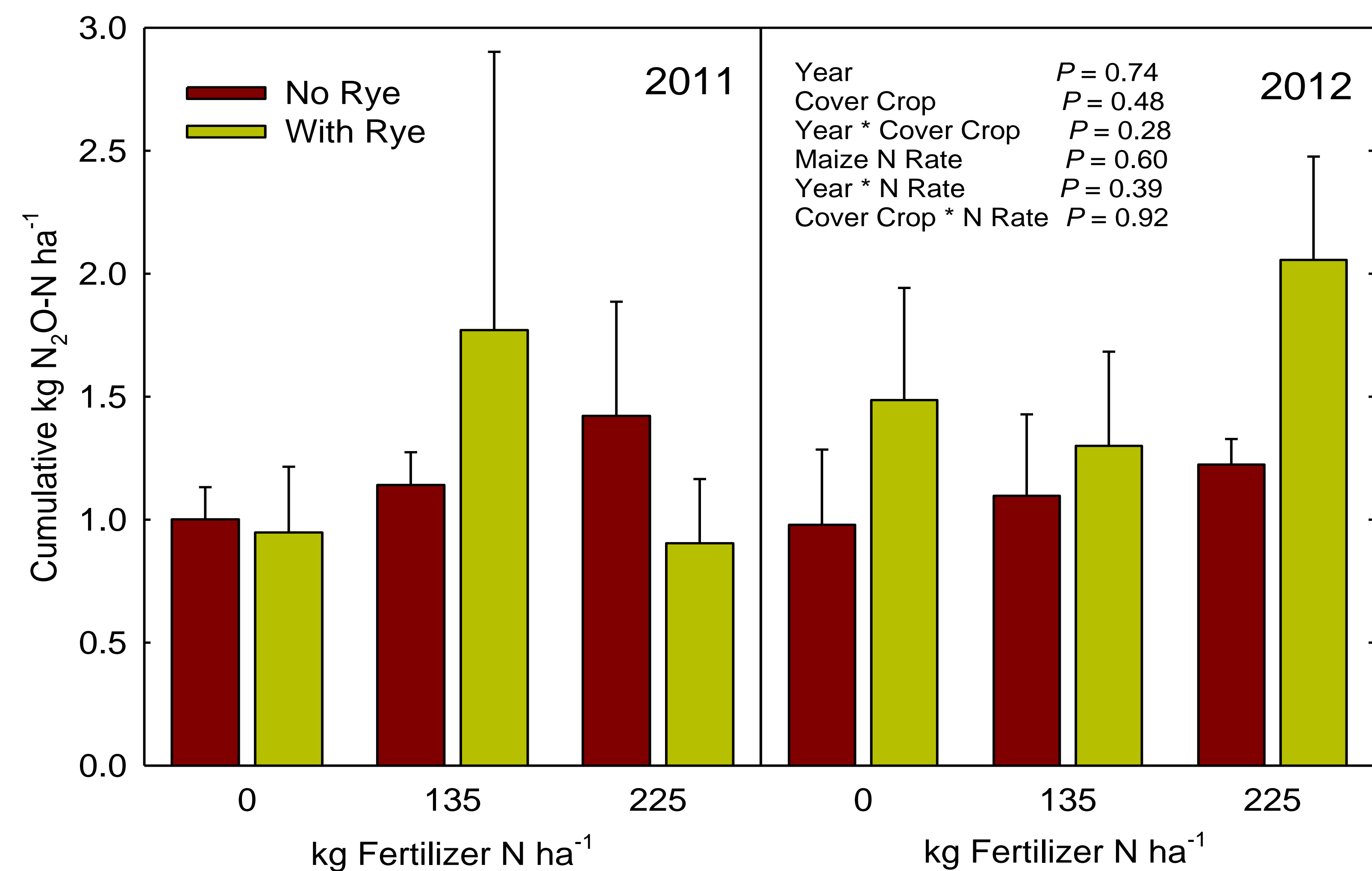


Fig. 2. Cumulative N<sub>2</sub>O emissions from soybean soils by N rate for previous (maize) year with and without winter rye as a cover crop. Error bars are standard error of means of 4 (2011) or 3 (2012) replicates.

## Results & Discussion

Annual precipitation was greater in 2010 than 2011, and soil profile NO<sub>3</sub> concentrations following maize harvest were consistently greater in 2011 (Fig. 1). Cumulative precipitation during the study period was greater in 2011 (565 mm) than 2012 (481 mm).

Surface (top 10 cm) soil NO<sub>3</sub> concentrations did not differ between treatments, but were greater in 2012 than 2011. However, N<sub>2</sub>O emissions did not differ between 2011 and 2012. Nitrous oxide emissions did not differ between maize-year N rate and cover crop treatments in the two years of measurement.

Nitrogen fertilizer rate can greatly influence N<sub>2</sub>O emissions from maize and other crops receiving N fertilizer. However, these results indicate that maize-year N rate may not affect N<sub>2</sub>O emissions in the following soybean year. Decreased precipitation in 2012 did not correspond to decreased N<sub>2</sub>O emissions, possibly because NO<sub>3</sub> availability was greater in 2012.

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