



**RegenPGC Graduate
Education Community**

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Evaluation of Fertilizer Timing and Cereal Rye on Maize Yield and Nitrogen Recovery Using ¹⁵N Stable Isotope Labeling

Abstract: Efficient nitrogen (N) management remains crucial for sustainable maize (*Zea mays* L.) production in Illinois and the U.S. Midwest as a whole, where fall and pre-plant applications of anhydrous ammonia are common. Cereal rye (*Secale cereale* L.) is effective in enhancing nutrient cycling, improving soil health, and ameliorating environmental N losses. Different studies have reported contrasting effects of cereal rye on maize yield, with limited information on the interaction of cereal rye with fertilizer nitrogen under different N timings.

This study, conducted at Lexington, Illinois, utilized ¹⁵N-labeled fertilizer to quantify nitrogen recovery and evaluate maize yield responses under fall- and pre-plant N applications, with and without cereal rye. Treatments included fall- and pre-plant (spring) N applications with and without cereal rye in a randomized complete block design. Pre-plant N consistently increased maize grain yield compared to fall-applied N. The effect of cereal rye on maize yield was pronounced only when rye biomass exceeded 2000 kg ha⁻¹.

Despite potential N immobilization induced by cereal rye roots, maize yield was not limited under pre-plant N application. Pre-plant N consistently enhanced performance, and in the presence of cereal rye, it increased maize grain yield by 26% relative to fall-applied N. The results demonstrate that pre-plant N application is more resilient in maximizing maize yield and N recovery, even in systems incorporating cereal rye, highlighting its potential for improving nutrient use efficiency and reducing environmental N losses in Midwest maize systems.

Yakubu, Adam, **Diop, Alioune**, Ludolph, Alex, Dorissant, Larousse, Ruffatti, Michael D., Lacey, Corey, Armstrong, Shalmar D., & Roth, Richard. (2025, November 12). Evaluation of Fertilizer Timing and Cereal Rye on Maize Yield and Nitrogen Recovery Using ¹⁵N Stable Isotope Labeling [Abstract]. CANVAS 2025, Salt Lake City, UT, United States.

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