

## ACCURACY OF CREDITS AND SOIL INDICIES FOR PREDICTING NITROGEN RESPONSE IN CORN FOLLOWING ALFALFA

Zane T. Walker<sup>1</sup>, Matt A. Yost<sup>1</sup>, Jeffrey A. Coulter<sup>1</sup> and Michael P. Russelle<sup>2</sup>  
University of Minnesota<sup>1</sup> and USDA-ARS<sup>2</sup>

### Abstract

Corn is the most frequent first- and second-year crop following alfalfa in the upper midwestern United States. In the majority of reported cases, there is little need for additional fertilizer N to optimize yield of first-year corn following alfalfa. For second-year corn following alfalfa, fertilizer N is needed in about one-half of cases and the economically optimum N rate (EONR) has varied greatly in responsive fields. The objective of this research was to use literature data to evaluate the accuracy of book value N credits (BVNC), the presidedress soil NO<sub>3</sub>-N test (PSNT), and the Illinois soil N test (ISNT) for predicting yield response to N in corn following alfalfa. To evaluate BVNCs, credits of 50, 100, or 150 lb N/acre were subtracted from an EONR of 160 lb N/acre for corn when it followed poor ( $\leq 1$  alfalfa plants/sq ft or 33% alfalfa in the stand), fair (2-3 plants/sq ft or 34-66%), or good stands ( $\geq 4$  plants/sq ft or  $\geq 67\%$ ), respectively. The BVNCs were considered accurate when the guideline rate was within 30 lb N/acre of the actual EONR. For first-year corn following poor (20 site-years), fair (40 site-years), and good (168 site-years) stands of alfalfa, guidelines were accurate 5, 8, and 78% of the time, respectively. For second-year corn following the same stand categories with 4, 11, 20 site-years, guidelines were correct 0, 18, and 45% of the time, respectively. To evaluate the accuracy of the PSNT, which is soil NO<sub>3</sub>-N concentration in the 0- to 12-inch depth at the V6 corn stage, the widely accepted critical concentration of 21 ppm NO<sub>3</sub>-N was used to predict response or nonresponse to N. Fertilizer N response in both first- and second-year corn (107 and 45 site-years, respectively) was accurately predicted using the PSNT in two-thirds of the cases. The majority of prediction errors were false prediction of N response. To evaluate the accuracy of the ISNT, which is a measure of soil amino sugar N and exchangeable NH<sub>4</sub>-N in the 0- to 6-inch or 0- to 12-inch depth between planting and the V6 corn stage, the critical concentration of 230 ppm was used to predict response or nonresponse to N. The ISNT correctly identified corn response to fertilizer N three-fourths of the time in 22 and 18 site-years of first- and second-year corn, respectively. Results indicate that BVNCs are rarely accurate for corn following poor or average stands and are less accurate for second- than first-year corn. The accuracy of the PSNT and ISNT were similar for first- and second-year corn and were much higher for second-year corn following alfalfa than BVNCs. These results indicate that opportunities remain to improve site-specific prediction of N response in first- and second-year corn following alfalfa.

**PROCEEDINGS OF THE**

**44<sup>th</sup>**

**NORTH CENTRAL**

**EXTENSION-INDUSTRY**

**SOIL FERTILITY CONFERENCE**

**Volume 30**

**November 19-20, 2014**  
**Holiday Inn Airport**  
**Des Moines, IA**

**PROGRAM CHAIR:**

**James L Camberato**  
**Purdue University**  
**915 W State St.**  
**West Lafayette, IN 47907**  
**(765) 496-9338**  
**jcamberra@purdue.edu**

**PUBLISHED BY:**

**International Plant Nutrition Institute**  
**2301 Research Park Way, Suite 126**  
**Brookings, SD 57006**  
**(605) 692-6280**  
**Web page: [www.IPNI.net](http://www.IPNI.net)**

**ON-LINE PROCEEDINGS:**

**<http://extension.agron.iastate.edu/NCE/>**