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INTRODUCTION

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 no need for fertilizer N to first-year corn following alfalfa. Second-year corn required fertilizer N in about one-half of cases and the economically optimum N rate (EONR) varied greatly in responsive fields. Data from the literature were used to evaluate the accuracy of book value N credits (BVNC), applying starter N only (<34 kg N ha⁻¹), the pre-sidedress soil NO₃-N test (PSNT), and the Illinois soil N test (ISNT) for predicting N response in corn following alfalfa.

MATERIALS AND METHODS

- To evaluate BVNCs, credits of 56, 112, or 168 kg N ha⁻¹ and 0, 56, or 84 kg N ha⁻¹ for first- or second-year corn, respectively, were subtracted from an EONR of 179 kg N ha⁻¹ for corn when it followed poor (≤16 alfalfa plants m⁻² or 33% alfalfa in the stand), fair (16-37 plants m⁻² or 34-66%), or good stands (≥38 plants m⁻² or ≥67%), respectively. Predicted rates within 34 kg N ha⁻¹ of the guideline were considered accurate.
- The PSNT was evaluated using the widely accepted critical concentration of 21 mg NO₃-N kg⁻¹ to predict response or nonresponse to N.
- The ISNT was evaluated using the critical concentration of 230 mg kg⁻¹ and using the ISNT x loss on ignition (LOI) organic matter curve developed by Klapwyk and Ketterings (2006) to predict response or nonresponse to N.

First-Year Corn Following Alfalfa

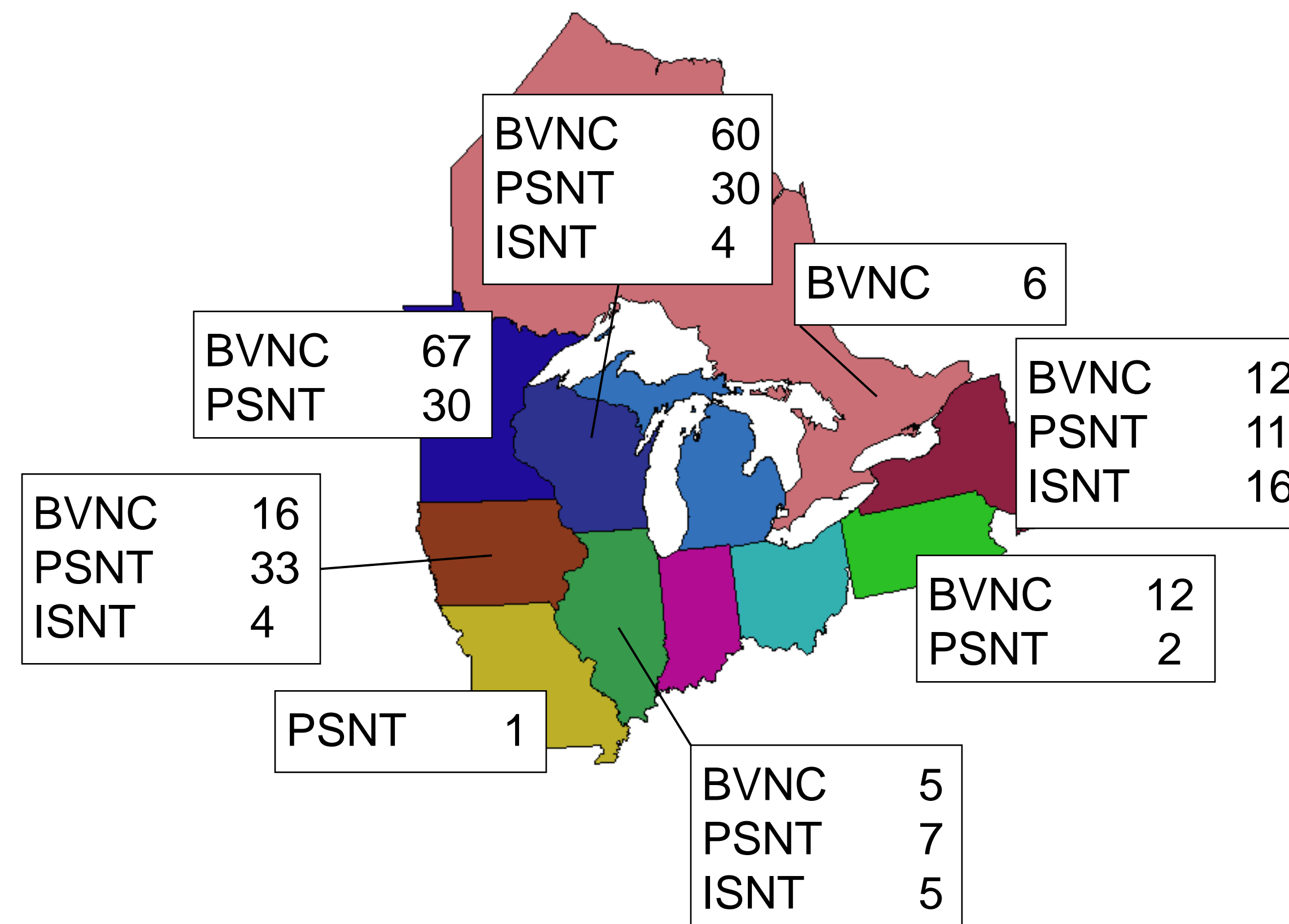


Fig. 1. Number of BVNC, PSNT, and ISNT site-years ($n = 325$).

Second-Year Corn Following Alfalfa

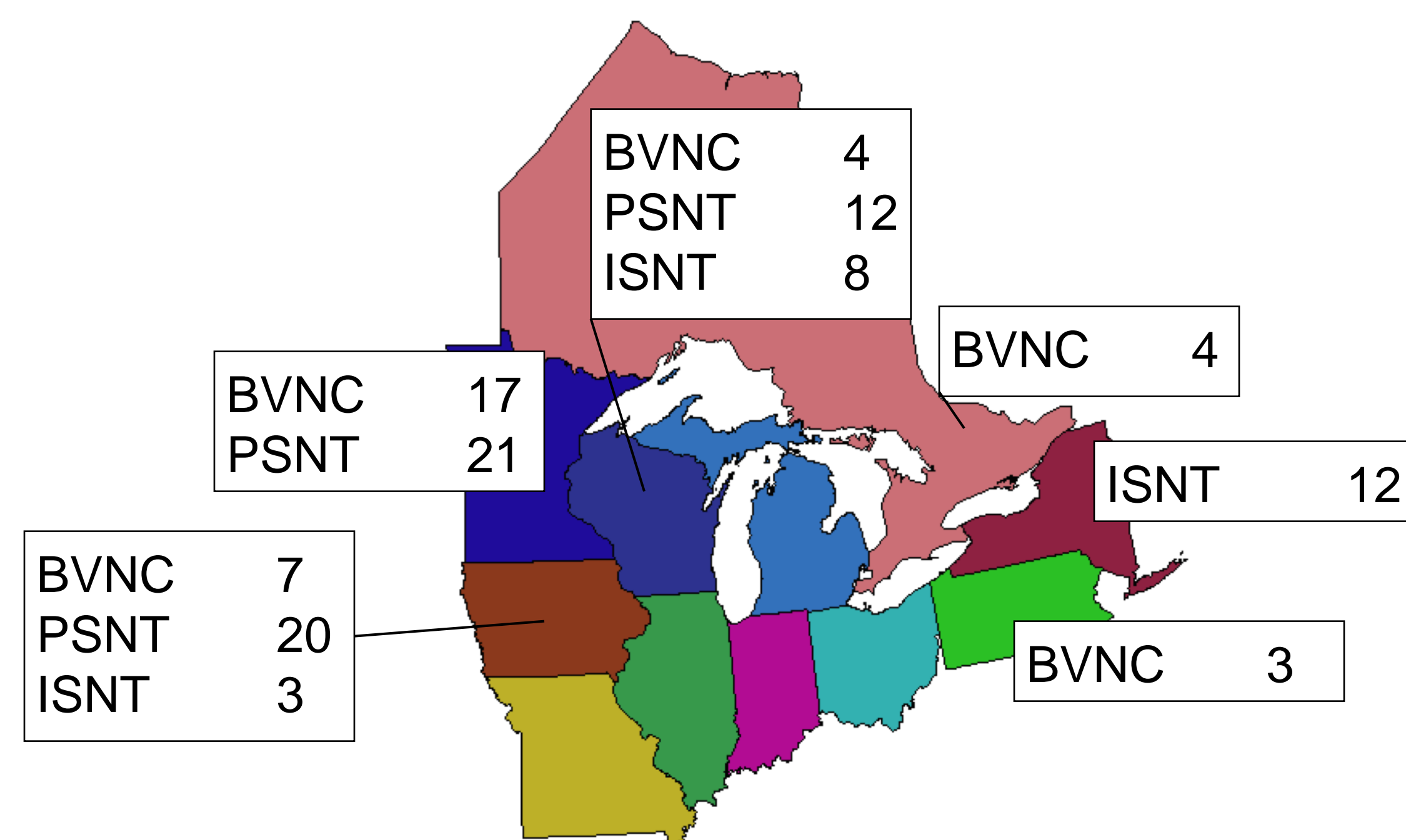


Fig. 2. Number of BVNC, PSNT, and ISNT site-years ($n = 111$).

RESULTS AND CONCLUSIONS

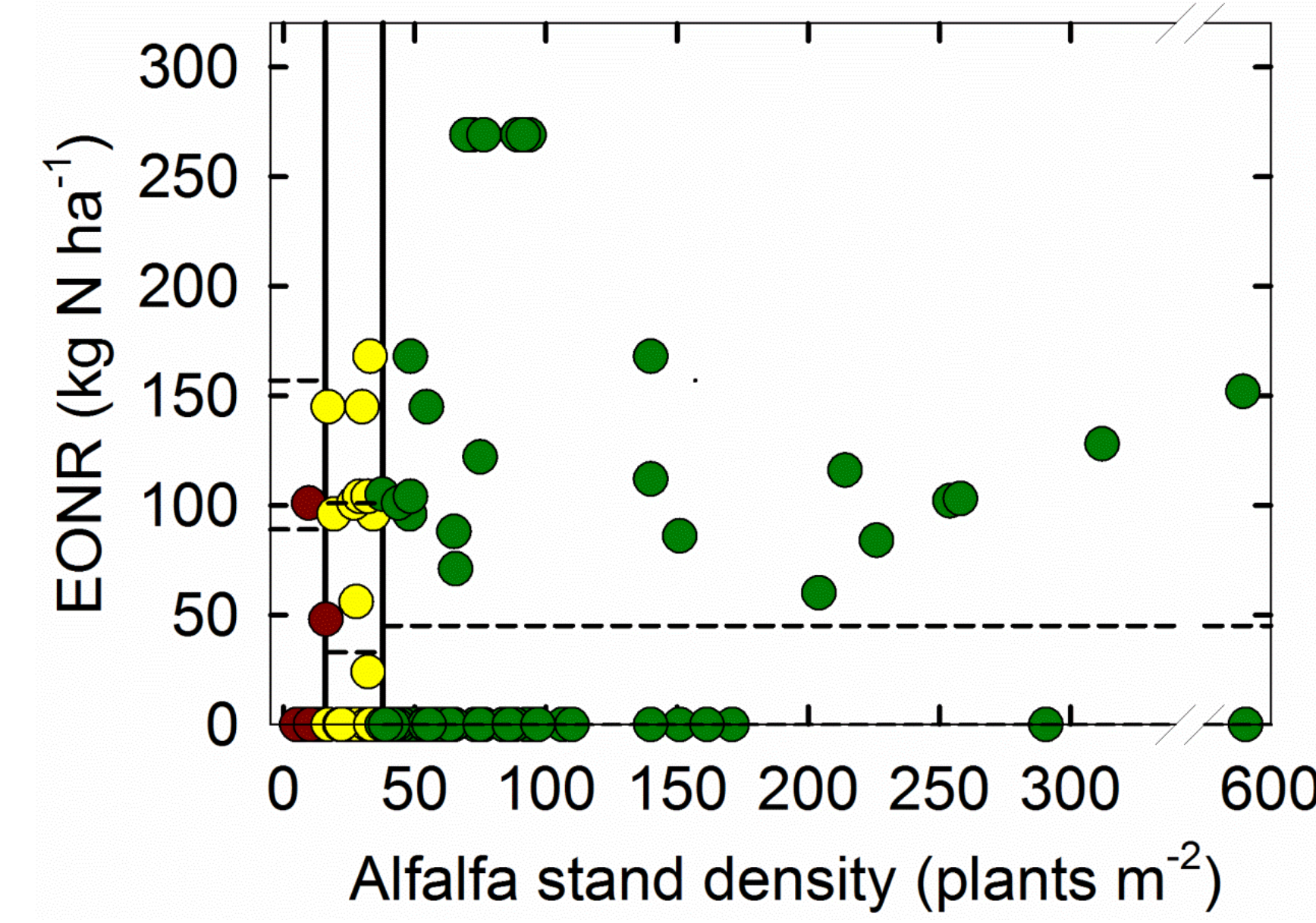
ACCURACY

BVNC
52% ($n = 182$)

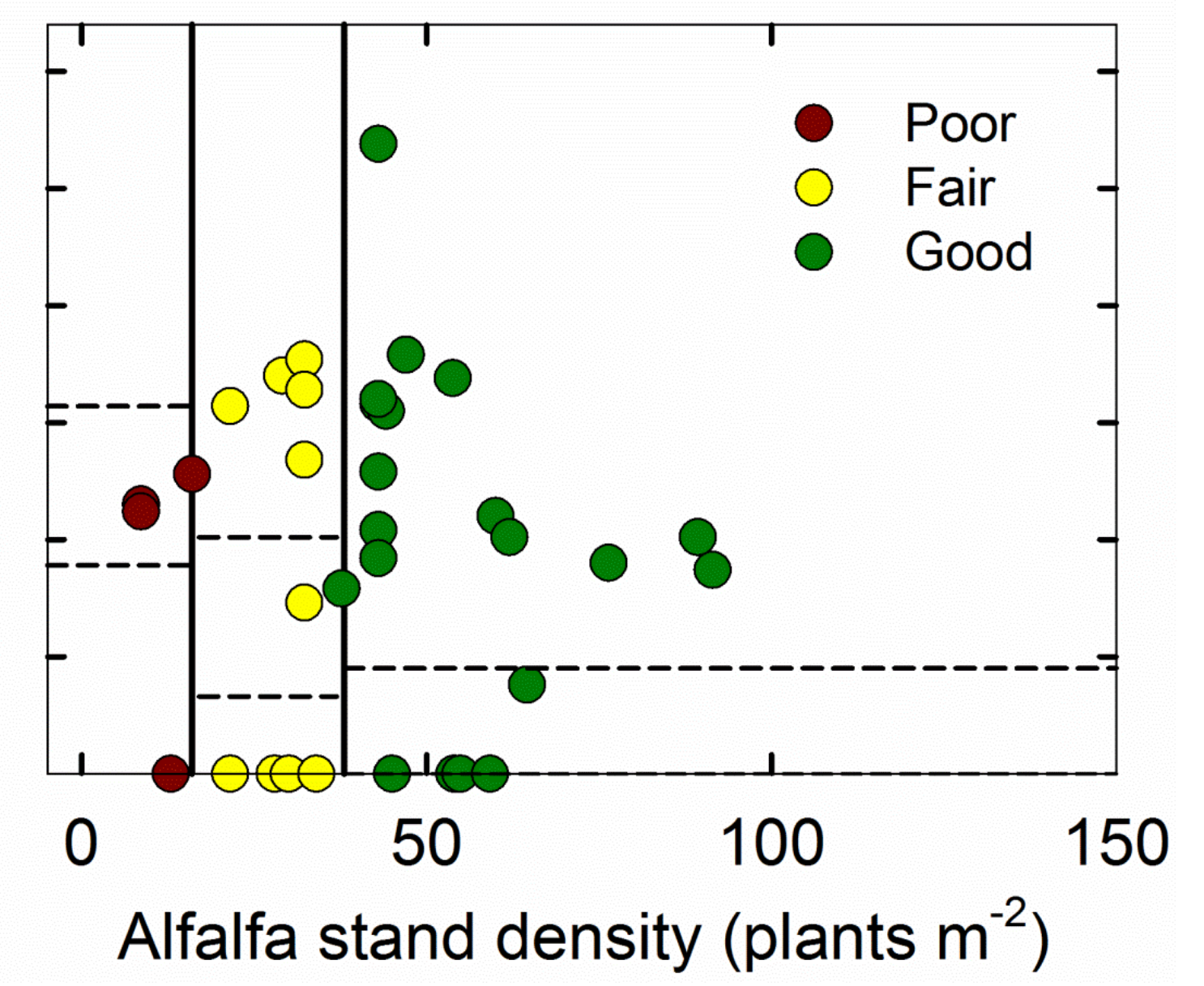
Starter N
77% ($n = 182$)

First-Year Corn

Book value N credits (BVNC) and starter N only



Second-Year Corn



ACCURACY

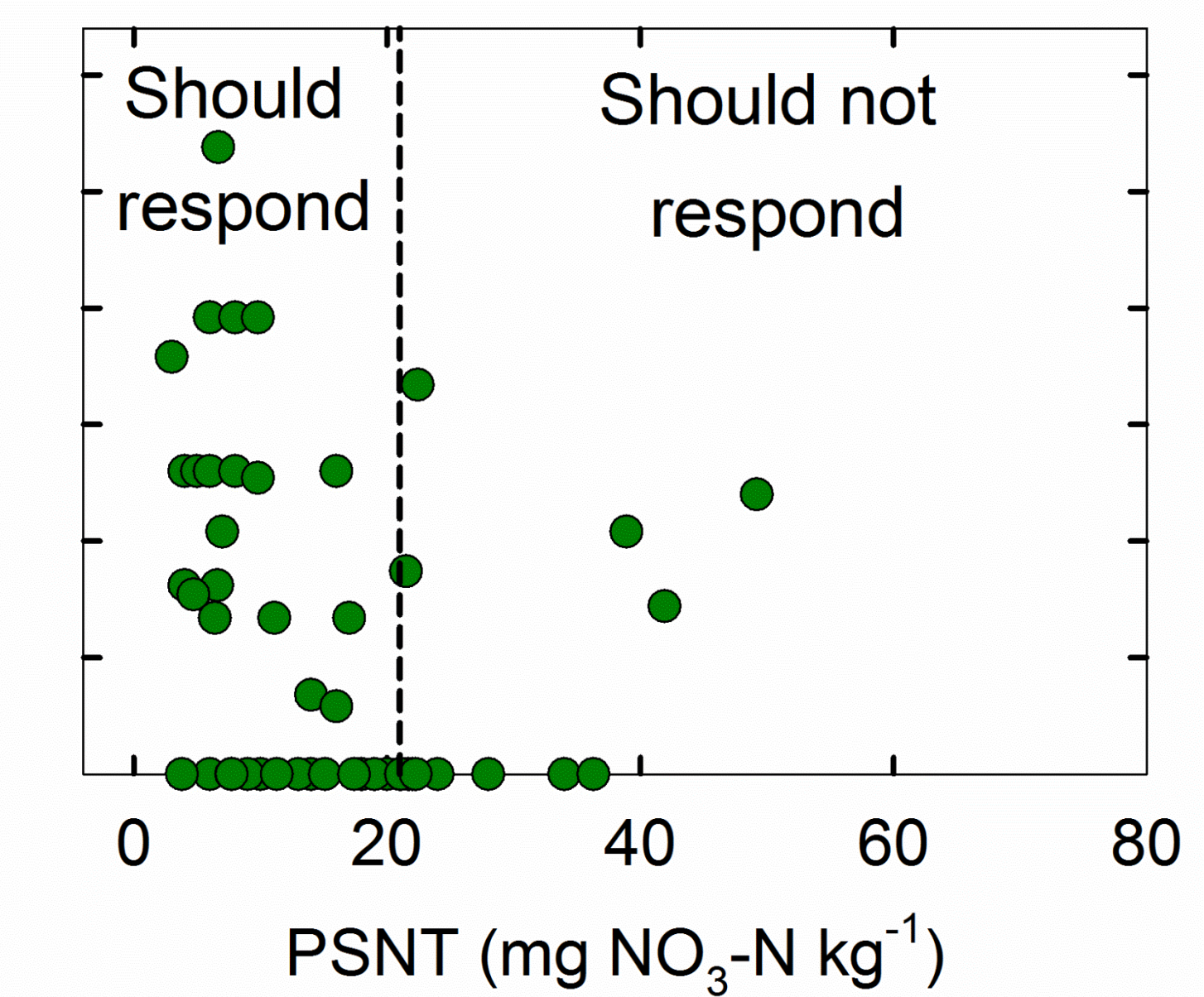
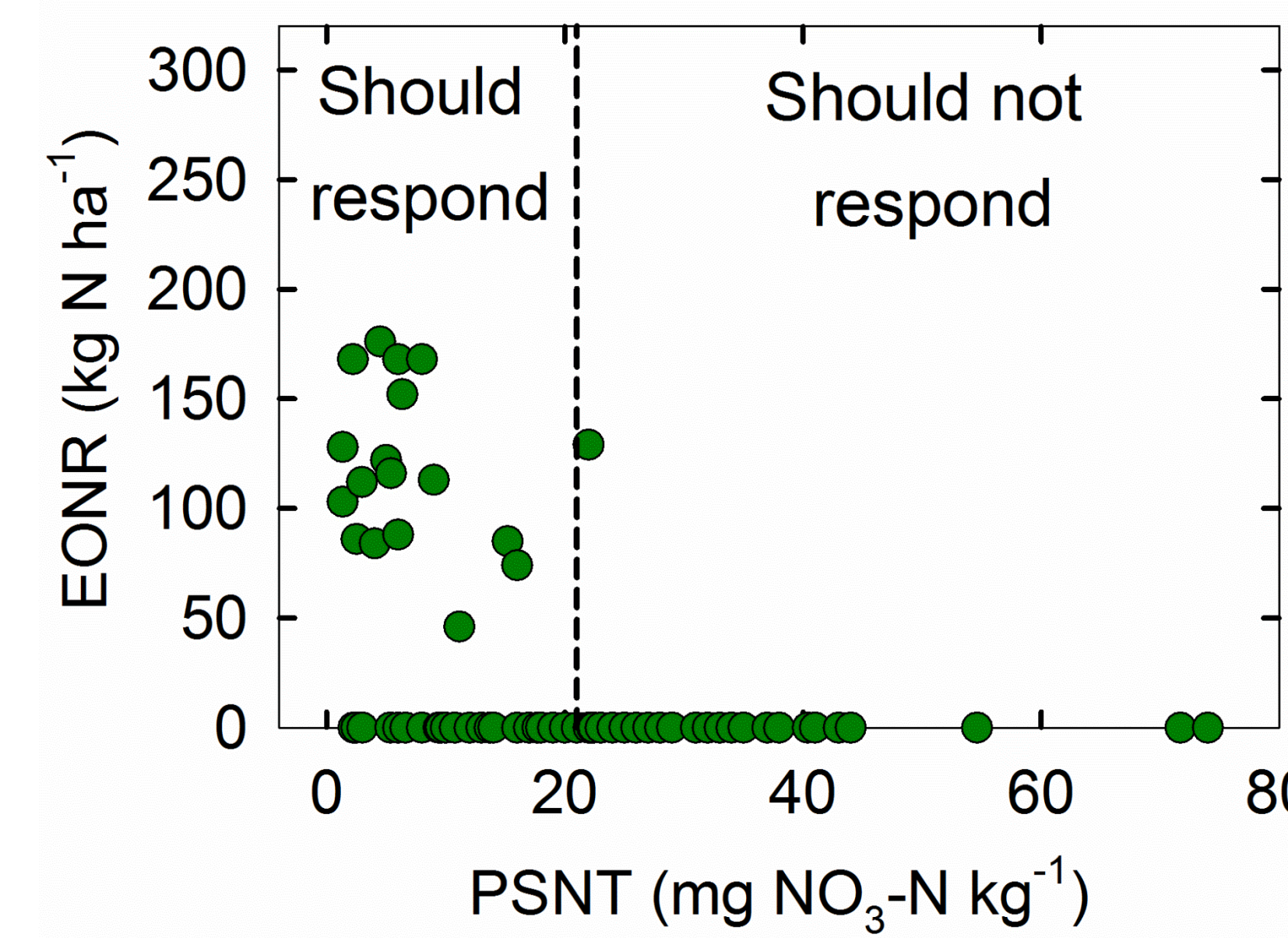
BVNC
31% ($n = 35$)

Starter N
26% ($n = 35$)

BVNCs were rarely accurate for corn following poor and average stands and were much more accurate for first- than second-year corn. Starter N only was equally or more accurate than BVNCs.

Pre-sidedress soil NO₃-N test (PSNT)

60% ($n = 114$)

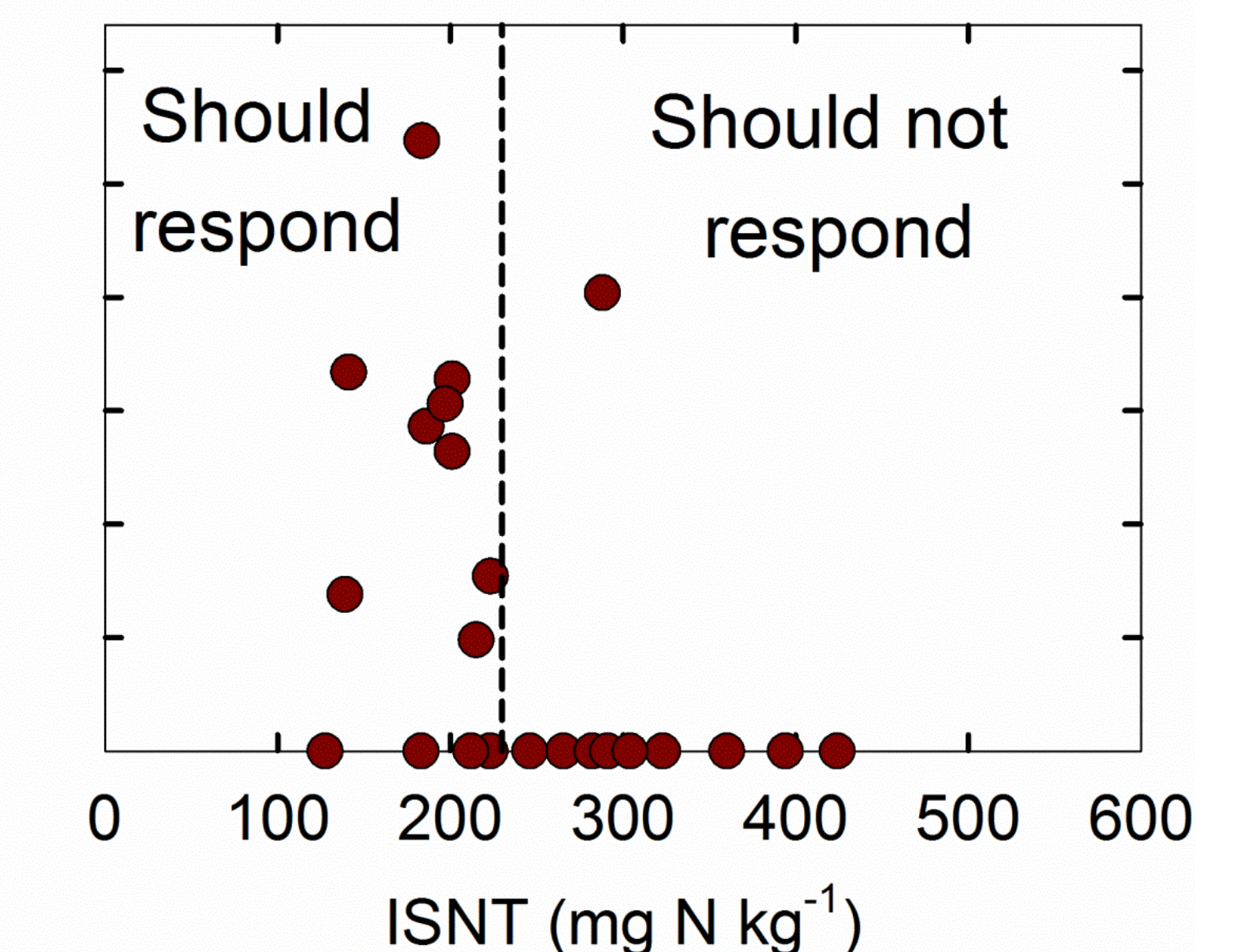
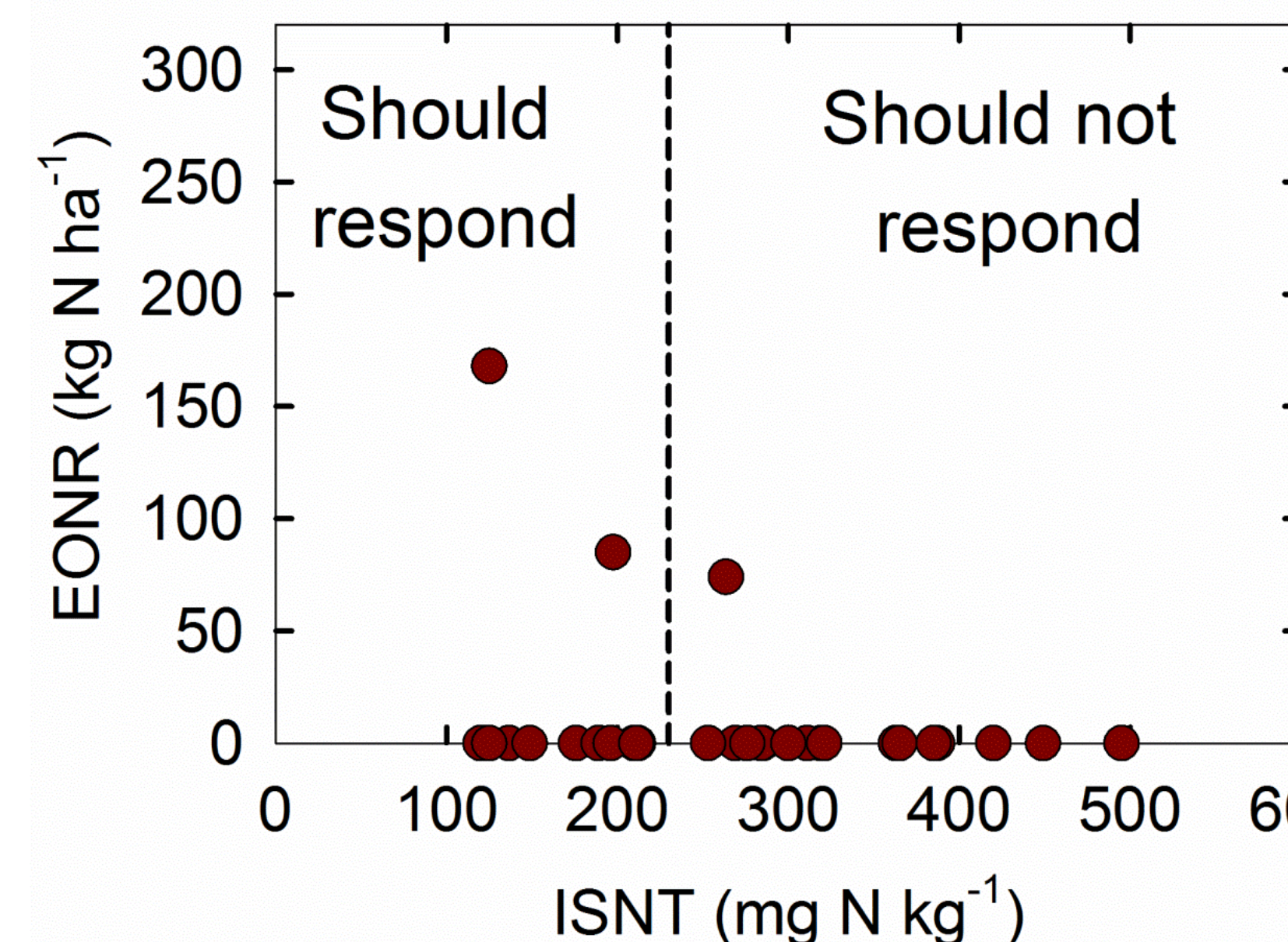


57% ($n = 53$)

The accuracy of the PSNT was similar for first- and second-year corn and was twice more accurate than BVNCs for second-year corn. Errors were mainly over-estimation of N response.

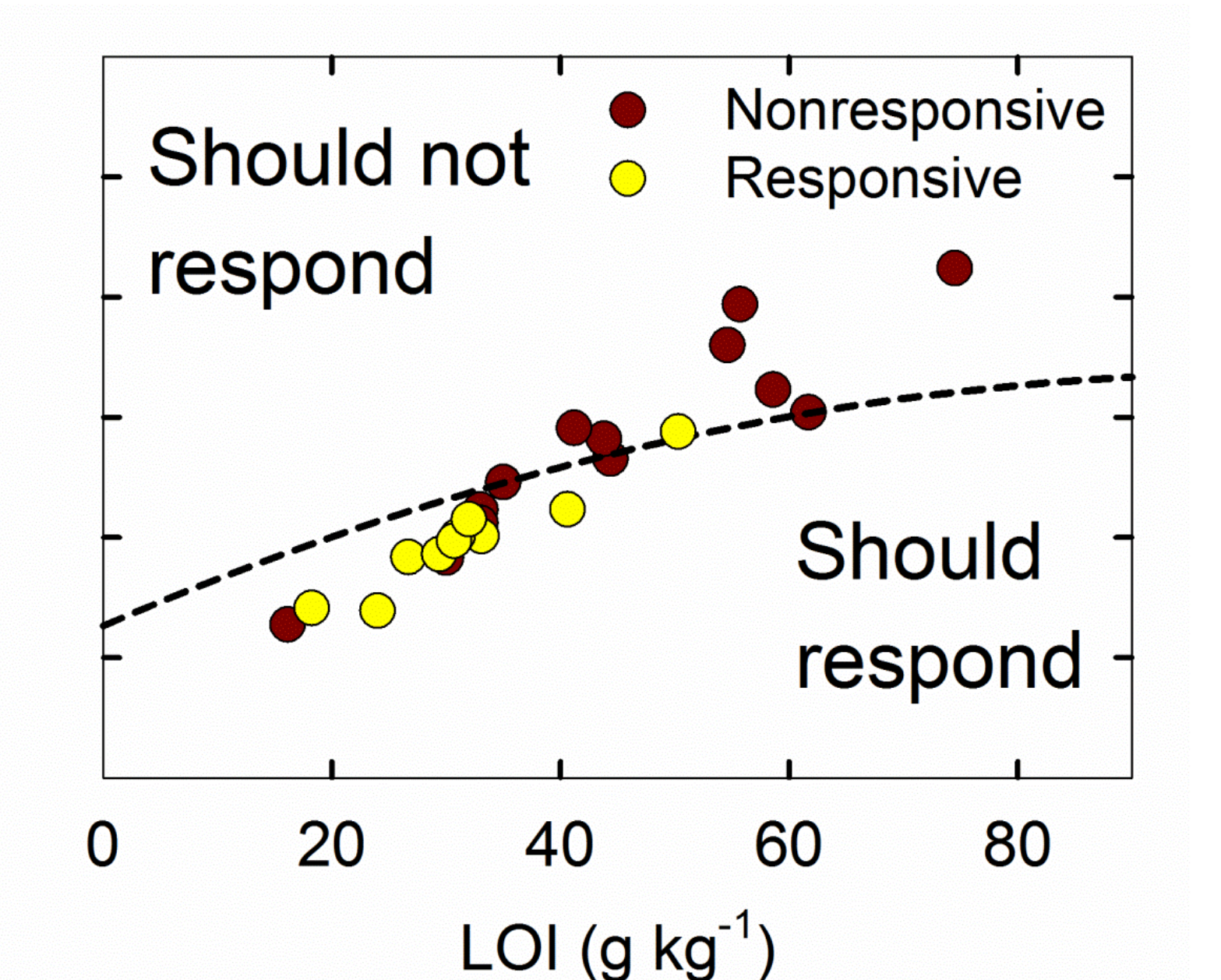
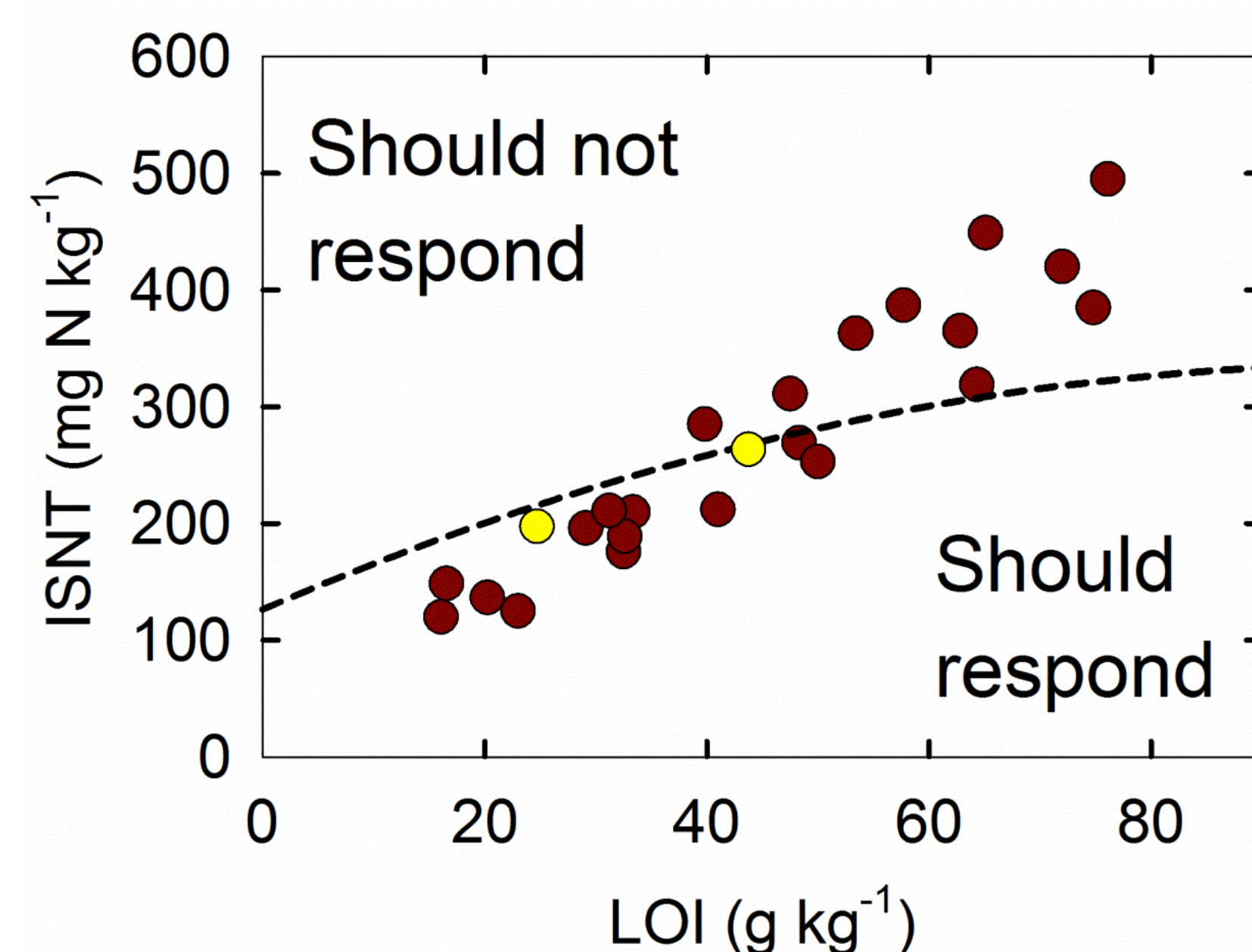
Illinois soil N test (ISNT)

62% ($n = 29$)



78% ($n = 23$)

50% ($n = 24$)



78% ($n = 23$)

The accuracy of the ISNT was higher for second- than first-year corn and was nearly three times more accurate than BVNCs for second-year corn. The LOI adjustment did not improve accuracy.

IMPLICATIONS

Opportunities remain to improve site-specific prediction of N response in corn following alfalfa.

