NITROGEN USE EFFICIENCY IN MODERN SNAP BEAN PRODUCTION

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INTRODUCTION

- Current UW guidelines suggest
  - Soil <2% OM: 60 lb/ac of N
  - Soil 2-10% OM: 40 lb/ac of N
- Are current guidelines adequate?
- What are the benefits (yield) and drawbacks (N loss) to more N?

EXPERIMENTAL DESIGN

- 2010, 2011, 2012 @ Del Monte farm, Plover, WI
- Two treatment effects:

1. Variety (4 or 5 varieties)
2. Nitrogen rate (0, 40, 80, 120 lb/ac)

RESULTS

- Yields
- Total N uptake (whole plant)
- Nitrogen balance (N removed – N applied)
- Nitrogen removal efficiency

  (**N removal w/N fertilizer** – *N removal w/out N fertilizer*) / N applied
- N Uptake efficiency

ADDITIONAL NUE MEASURES OF NODULATING SNAP BEAN

N rate	N removed	PNB	N uptake	UpE
2010	lb-N/ac	%	lb-N/ac	%
0	47		159	
60	53	88	172	22
100	52	52	164	5
140	59	42	199	3

If application of N fertilizer supressess nodulation, then the fertilizer should get more credit for N uptake, resulting in higher Uptake Efficiency values.
(More of the plant N was fertilizer derived)

USE OF 15N ISOTOPES

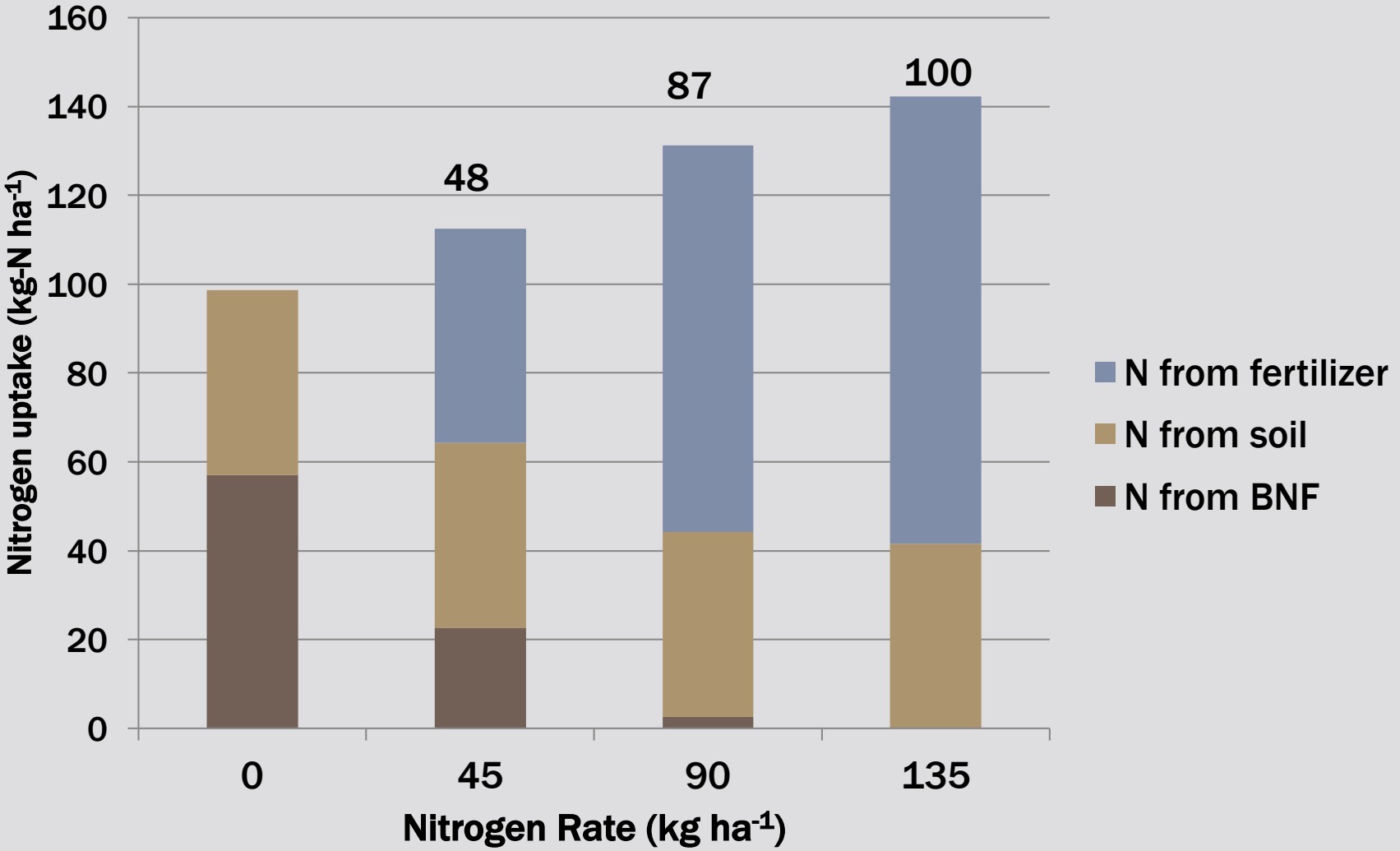
- Nitrogen has two stable isotopes
  - ^{14}N and ^{15}N
- 0.3% of atmospheric N is ^{15}N
- This “heavier” isotope is used less by N fixing bacteria and thus N in nodulating plants will have a slightly lower 15N concentration compared to non-nodulating plants.

THIS CAN BE APPLIED TO OUR STUDY

- We need a reference plant
- We have a non-nodulating snap bean!

- We can evaluate the 15N in Huntington with and without N fertilizer should get a greater credit for the

N fertilizer appears to nearly completely suppress N fixation.



CONCLUSIONS

- Nitrogen removal efficiency of applied fertilizer averaged less than 20% based on traditional measures.
- Use of 15N measures reveled that N fixation is suppressed and that the fertilizer should get more credit in NUE calculations.
- This work is continued in 2016 and 2017 at the Hancock ARS, funded by DATCP Specialty Crop Block Grant.