
Biobased Industry Center Grant Proposal

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Motivation

Producers systematically over-apply N fertilizer
- estimates range from 8% to 36% of optimal
- drivers are uncertainty about yield responses, weather, residual nitrate in soil
- consistent with expected profit maximization but not wanting to be “caught short” in a good weather year, when N would be the limiting input

N fertilizer is a risk-increasing input but this may not be internalized rationally by producers
Motivation

Pressure on N use decision in agriculture

- EPA’s Science Advisory Board Panel on Gulf Hypoxia recommends reduction in N reaching Gulf of Mexico ≈ 40%
- input cost control
- world food/feed demand pressures

Technology is proceeding on at least three fronts

- seed engineering advances
- N fixation strategies
- soil sampling
Big Unknowns

N application responses by producers (?)

Market Impacts

- intensive margin effects due to increased productivity
  - scope for biomass

- extensive margin effects (land use)
  - increased profits (expansive)
  - increased productivity (contractive)
Research Opportunities

To what extent will such advances change expected N fertilizer use?
  - how significant do reductions in uncertainty involving N (yield impacts, availability for plant) need to be to affect application rates?

What are the implications for the extensive margin?
  - yield improvements → demand met on fewer acres?
  - divert more land to cropping?
ISU Agronomy Extension: Optimal N Application in IA
Proposal Objectives and Approaches

1. Estimate optimal N application rates under mean– and variability–improving technology scenarios under input certainty and uncertainty
   - not reinventing the wheel with respect to optimal application rates
   - compare scenarios of potential yield impacts due to technology
   - update input and output price assumptions

Output: A quantitative measure of how such technologies are expected to affect producer application behavior.
Proposal Objectives and Approaches

2. Adopt land-use decision modeling strategy to incorporate the case of uncertainty over N as an input.

3. Develop prediction of land use changes due to extensive and intensive margin effects:
   - take a “shares” approach in modeling land allocation effects.
   - use current land quality/capability class data.
   - vary scenarios as in Objective 1.

Output: Flexible model to nest or feed into GHG models, world feed/food demand models and biomass modeling efforts.
Bottom Line

- We need an evaluation mechanism for potential N-reducing technologies that incorporates uncertainty in a manner indicative of landowner behavior.

- Who benefits from the information this project can generate?
  - private firms
  - producers
  - policy analysts and researchers
  - fish
Beyond This Project

- survey
- producer / analyst decision tools
Questions?

Thanks for your time!