

# Flat Profit Functions Associated with Variable Nitrogen Rates – Implications for Producers, Researchers and Policy-makers.

Bill Deen, Ken Janovicek<sup>1</sup>, Greg Stewart<sup>2</sup>, Alfons Weersink and Predrag Rajsic<sup>3</sup>

<sup>1</sup> Plant Agriculture Department, University of Guelph, Guelph, Ontario, Canada

<sup>2</sup> Ontario Ministry of Agriculture, Food and Rural Affairs, Guelph, Ontario, Canada

<sup>3</sup> Food, Agricultural and Resource Economics Department, University of Guelph, Guelph, Ontario, Canada

**Background and Objectives:** Considerable producer, research and extension efforts are aimed at optimizing nitrogen rates by spatial location, year or price scenario. The assumption underlying such efforts is that deviations from the optimal nitrogen rate significantly impact profitability. The objective of this research is to examine the profit implications of deviating from the maximum economic rate of nitrogen (MERN).

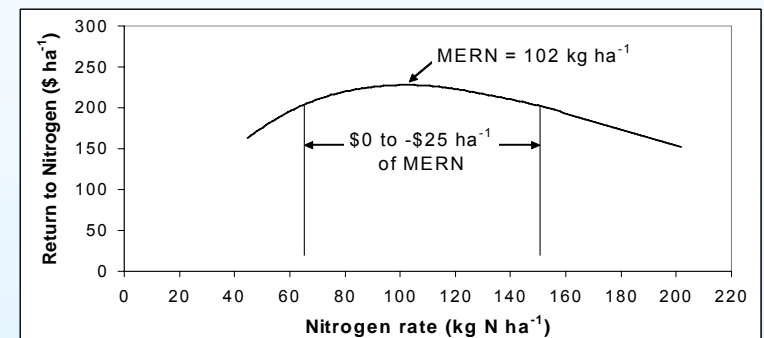
## Materials and Methods:

- Winter wheat (*Triticum aestivum*) nitrogen response data: 12 trials, Ontario, Canada.
- Corn (*Zea mays*) nitrogen response data: 19 pair-wise comparisons of corn following red clover (*Trifolium pratense*) versus corn following no red clover, Ontario, Canada.
- Yield response to nitrogen rate characterized by fitting a quadratic polynomial function.
- MERN calculated as the rate where marginal value product of nitrogen equals marginal factor cost of nitrogen.

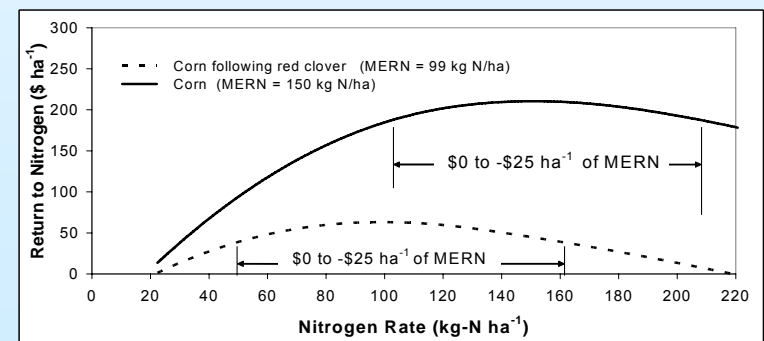
## Results and Discussions:

- Large deviations from MERN had limited impact on profitability.
- Risk of profit reductions are lower for over-application than under-application.
- Producers have a wide margin for error in their nitrogen rate decisions.
- Value of R&D efforts to optimize nitrogen may be low.
- Benefit of using 'precision farming' technologies for nitrogen may be limited.
- Producers may justify over-application of nitrogen based on risk and amenity values.

**Conclusions:** The existence of a flat profit function has implications for assessing value to 1) nitrogen optimizing techniques, 2) precision farming technologies, and 3) over-application of nitrogen by producers.



**Figure 1:** Effect of nitrogen rate on returns for winter wheat, average of 12 Ontario locations, 2006. (N @ 1.00 \$Cdn kg<sup>-1</sup>, wheat @ 114 \$Cdn t<sup>-1</sup>)



**Figure 2:** Effect of nitrogen rate on returns for corn, average of 19 pair-wise comparisons between 1990-99. (N @ 1.00 \$Cdn kg<sup>-1</sup>, corn @ 100 \$Cdn t<sup>-1</sup>)