An Economic Analysis of Variable Rate Nitrogen Management

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INTRODUCTION

Precision farming is an emerging technology that prescribes inputs based on site-specific soil and crop characteristics. This technology enables one to spatially measure, monitor, and manage factors that influence crop yield, and to place inputs where they are most needed. Given that farmers face increasing input costs and a highly competitive market structure, it is important they maximize efficiency. A site-specific farming system provides the manager with increased information which may improve efficiency.

Analysis of crop production, regardless of the technology, requires determining the responsiveness of yield to inputs. The interaction between soil, seed, applied inputs, and the environment must be managed to optimize yield. One of the greatest challenges in precision farming is linking spatial yield data to agronomic practices to explain and manage variability (Lowenberg-DeBoer et al., 1994). The success of site-specific management is contingent on the reliability of quantifying the spatial distribution in crop yield as well as field and soil characteristics. Since input application decisions are based on yield goal, and field and soil characteristics, it is vital to understand the relationships between these parameters and yield.

The economic analysis of production primarily evaluates enterprise selection and input (or resource) allocation. A production function describes the relationship that transforms inputs (resources) into outputs (commodities) (Debertin, 1986). Two important issues that surface when estimating a production function are 1) what variables to include in the model, and 2) the functional form. The variables to include in a site-specific production function are those measurable factors expected to spatially affect yield. These include field characteristics, nutrient status and inputs applied (i.e. seed, fertilizer). The functional form of the model depends upon the expected nature of the relation between yield determinants and yield.

Benefits from precision agriculture are expected to be derived from savings