Applying Precision Conservation Methods to Claypan Soils

Precision agriculture is seen by many as a way of increasing economic viability and minimizing negative environmental effects of agriculture (such as reducing leaching or runoff of nitrogen fertilizer and pesticides). Implementation by producers is dependent on efficient methods for obtaining, managing, and utilizing the vast quantities of data required to understand spatial variations in crop yields and on developing precision management plans. We demonstrated how a decade-long database of soil and water quality and yield information could be used for developing a precision agriculture plan that increased profitability and conservation for a claypan soil field. We found that yearly average profitability of a corn-soybean rotation on this field ranged from a loss of greater than $60/acre to a profit of greater than $60/acre for sub-field areas of manageable size. Prominent features of the field associated with loss or low profit (e.g., eroded side-slopes where topsoil is thin) coincided with field areas most contributing to water quality problems (e.g., sediment and herbicide loss in runoff). In other investigations, we found fields with greater variation in topsoil depth and pH had greater potential for increased profitability and water quality benefits from variable rate management. *This research benefits farmers by identifying technologies and methods they can use to develop management plans that will improve efficiency of nutrients, pesticides, and irrigation, thereby increasing their profits.* The general public benefits because practices and inputs are targeted to sub-field areas, reducing over-application of agrichemicals and irrigation, situations where excess nutrients and pesticides may move off fields into lakes and streams.

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