MORAGHAN, JOHN T., Soil Science Department, North Dakota State University, Fargo, ND 58105. **Was application of a new precision farming concept after a sugarbeet crop efficacious?**

ABSTRACT

A new precision farming technique, based on remote sensing of sugarbeet canopies late in the growing season, was recently proposed as an efficient way to reduce N-fertilizer applications for small-grain crops following sugarbeets. There is a need to test this new technology under commercial conditions. The objective of the present study was to determine if the new technology reduces the cost of growing a wheat crop after a sugarbeet crop without reducing grain yields in the Red River Valley.

A satellite infrared image of a 160-acre sugarbeet field was obtained in September, 1997. Based on this image the field was divided into irregular zones (polyhedra) which represented "dark green", "green", "yellow-green" and "yellow" sugarbeet canopies. The irregularly-shaped polyhedra representing the "dark green", "green", "yellow-green", and "yellow" sugarbeet canopies received 50, 80, 110 and 130 pounds of spring-applied anhydrous ammonia-N/acre, respectively, at planting. Without the sugarbeet canopy data 130 pounds of fertilizer N/acre would have been applied to the entire field. A Raven control system, in association with a GPS unit mounted on the tractor cab, was used to apply bands of the required quantities of ammonia at 12-inch intervals. A Concord air-seeder was used to plant 'Lars' wheat in bands approximately 6 inches in width. The wheat bands were spaced 6 inches apart at a depth of 1.5 inches. The anhydrous ammonia outlets were located 3 inches from the outside of a wheat-seed band. The anhydrous ammonia control unit was programmed to change the ammonia-N rate when the GPS unit on the tractor cab was 20 feet in advance of the designated boundary of a given polyhedron. No ammonia fertilizer was applied to four 33' x 33' areas with "dark-green" canopies and to four 33' x 33' areas with "yellow" or "yellow-green" canopies. The areas were divided into two and either 0 or 120 pounds urea-N/acre was applied to the subplots.

The commercial grain yield for the entire field averaged 72 bu/acre. On-the-go monitoring of commercial grain yields indicated that most areas in the field yielded 65 to 85 bu/acre. These yields are well-above-average for this region.

Nitrogen fertilizer increased grain yields, by 16 bu/acre to 77 bu/acre, only at the antecedent "yellow" canopy sites. Yield of grain in the check and urea-fertilized plots at the "green" sites both averaged 76 bu/acre. This high yield of 76 bu/acre was obtained even though soil nitrate-N (0-2') in late autumn, 1997 was only 29 pounds/acre. The data strongly support the importance of taking into account the N content of sugarbeet canopies when making N fertilizer recommendations for following crops. Nitrogen fertilizer increased grain-crude protein percentages only at the antecedent "yellow" canopy sites. A comparison of the grain-protein data in the commercial field with that obtained in the N-fertilizer experiments indicated that nitrogen deficiency was not limiting grain yields in the commercial field. In other words, reduction in N-fertilizer use, based on a knowledge of a sugarbeet canopy from a satellite infrared image, did not result in lowered grain yields.