REITMEIER, LANCE J.[1], DAVID W. FRANZEN[1], JOSEPH F. GILES[1], NORMAN R. CATTANACH[1] and ALLAN W. CATTANACH[2], [1]Soil Science Department, North Dakota State University, Fargo, ND 58102 and [2]American Crystal Sugar Company, Moorhead, MN 56560. **Use of remote imagery to reveal high levels of deep soil nitrogen and direct nitrogen applications.**

ABSTRACT

The levels of nitrogen available to a sugarbeet crop can have a detrimental effect on the quality of the crop produced. A sugarbeet producing area, about four townships in size, in the northeastern corner of North Dakota has been experiencing high yields and poor quality on their sugarbeet crop for many years. One of the distinguishing characteristics about this area of the Red River Valley of the North is the rotation of potatoes, sugarbeets, and small grains.

The purpose of this experiment was to determine whether high N levels were the cause of the problem. The source of high N levels was also to be determined, and possible management strategies to correct the problem investigated.

The project was conducted in 1997 (two 40-acre sugarbeet and two 40-acre potato fields) and 1998 (two 40-acre sugarbeet fields and one 40-acre wheat field) using a full-scale approach. Using the full-scale approach, the whole field could be analyzed for relationships between foliage color and N content, and soil N levels throughout the field.

The sugarbeet crop for 1997 was subjected to randomized treatments of conventional and variable rate applications. Petiole samples were taken, in both years, from the sugarbeet plants at two-week intervals in ½ acre grids. Plant tops and roots were harvested from the same grids in the fall. Aerial and satellite images were taken throughout the growing season of both years. Soil samples were taken down to six feet, following harvest, and tested for nitrogen.

The potato fields from 1997 were sugarbeets in 1998. One potato petiole sampling was taken mid-summer from each ½ acre grid and tested for nitrate-N. Aerial and satellite images were taken throughout the growing season. Vine samples, cull samples, and soil samples down to six feet were collected in the fall.

The wheat field in 1998, following sugarbeets, was soil sampled to 12 inches throughout the growing season beginning at wheat emergence. The purpose was to monitor N mineralization as a result of the sugarbeet tops from the previous year. Additional samples were taken to the four-foot depth in the middle of August to identify any nitrogen leaching.

No significant differences in yield or percent sugar were found between application methods on the 1997 sugarbeet crop. Results are believed to have been due to the presence of excess amounts of nitrogen becoming available to the beets through mineralization of the potato vines and nitrogen levels below the traditional four-foot soil sampling depth.

Sugarbeet petiole nitrate-N levels did not show a consistent correlation with the N levels in the sugarbeet tops. Soil sampling after sugarbeets was not a good indicator of N available to the subsequent crop. Aerial photography and satellite imagery were found to delineate areas of high or low sugarbeet top nitrogen. Both were useful for directing sampling for sugarbeet top analysis and six-foot soil sampling following potatoes to reveal N levels to sugarbeet growers.

The sugarbeet crop for 1998 was grown using no supplemental N, based on N found at the six-foot level following potatoes and the N credit given to the potato tops. The yields obtained from these fields were quite high, as were the levels of recoverable sugar when compared to neighboring fields with similar characteristics. These results suggested sufficient

nitrogen was available to the crop, and consideration of deep N levels does have an impact on the sugarbeet quality.

Recommendations for wheat were made giving as high as 100-pounds/acre N credit from the previous year's sugarbeet tops. Yields obtained with the reduced N rates were high and similar to yields with higher N recommendations.

Results suggest that low sugarbeet quality is caused by high, previously undetected, N levels under potatoes. To deal with these levels, growers should consider the N content of the sugarbeet tops as a credit before wheat. They should also consider soil sampling to a six-foot depth following potatoes. Sugarbeet top and deep soil sampling locations can be minimized through analysis of aerial or satellite imagery.