

LAMB, JOHN A.¹, MARK W. BREDEHOEFT², and STEVE R. ROEHL², ¹Univ. of Minnesota, St. Paul, MN 55108, and ²Southern Minnesota Beet Sugar Cooperative, Renville, MN **Management zones for nitrogen management.**

Optimum use of nitrogen fertilizer is needed to produce the most sucrose. Variable nitrogen application could be a key component. To use this technology in Southern Minnesota, a soil nitrate-N map is needed for the field. Several methods could be used to develop this map. A study was conducted in Southern Minnesota with the objectives to determine if management zones for variable rate N fertilizer application will result in better root yield and quality than the use of a single N fertilizer rate for the whole field and to determine what information is necessary to best delineate management zones in a southern Minnesota landscape. A three year study was initiated in 2001 in a Southern Minnesota Beet Sugar Cooperative grower's field near Danube, Minnesota. The 32 acre field was in a soybean-corn-sugar beet rotation. The treatments for the study were the following four nitrogen application strategies: 1. no N fertilizer applied to determine the need for N fertilization, 2. N applied based on a nitrate-N soil test for the whole field, 3. N applied at a rate based on a nitrate-N soil test from a management zones determined from the soil survey, and 4. like 3, N would be applied based on soil tests from the management zones. The basic difference between treatments three and four is the knowledge used to create the management zones. The use of nitrogen fertilizer did not increase root yield and recoverable white sucrose per acre but did reduce the sucrose concentration. There were differences in the root yield and recoverable white sucrose between the two zone treatments. The use of an order 2 soil survey for creating zones did not yield as well as the use of zones based on crop and soil parameters. Neither zone treatment affected the measured parameters different than the conventional treatment based on the average soil nitrate-N for the field.

Treatment	Root Yield (t/ha)	Recoverable White Sucrose (t/ha)	Sucrose Concentration (%)
1. No N	18.5	1.5	8.1
2. N based on whole field test	19.2	1.6	8.3
3. N based on management zones (soil survey)	19.8	1.7	8.6
4. N based on management zones (crop and soil parameters)	19.5	1.6	8.2

* All tests applied were 15% of the label rate.
 † Aerial 90 non-ionic surfactant was applied with treatments at 0.25% v/v.
 ‡ Aerial oil emulsion herbicide was applied with treatment at 1.0% v/v.

Data was collected over 3 study years with a considerable range in environmental conditions and production potential. The 2003 test was planted earlier and harvested later than the 2004 test with total growing days of 181 in 2003 and 140 in 2004. Soil-applied and post-emergence sugar beet herbicides were applied over all treatments in both years to represent commercial agronomic practices prior to applying pesticide (this treatment sugar beet herbicides included glyphosate (state seedbed), ethofenprox, pyrazon and triallate (pre-emergence), desmediphalan/phenmediphan, clopyralid and setoxydim (post-emergence)).