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Site-Specific Management of Potatoes

Project Leader: Dr. Colin McKenzie, Alberta Agriculture, Food and Rural Development, Crop Diversification Centre South, SS #4, Brooks, AB T1R 1E6 (403-362-1300).

This completed project evaluated the use of yield monitoring technology and global positioning systems (GPS) to determine optimal fertility management of irrigated potato production in southern Alberta. The variability in potato yield was compared to soil and petiole samples collected through the growing season and geo-referenced with the portable GPS.

Despite large applications of fertilizer phosphorus (P), potatoes grown in fields where manure had not been applied showed low levels of petiole P from mid-season onward. Strips of additional fertilizer P above that recommended by soil testing resulted in slight yield increases, indicating that current P recommendations may be limiting potato yields. The lack of response to additional P on manured fields indicates that late season crop P requirements are being met from the season-long release from the manure. Cool soil and air temperatures were attributed to the low early season petiole potassium (K) levels measured. As the growing season progressed petiole K levels moved into the adequate and high range. Continued research will evaluate if these low petiole K levels early in the growing season are limiting final tuber yield of the potato crop.

Landscape Management of Agronomic Processes for Site-Specific Farming

Project Leader: Mr. Len Kryzanowski, Alberta Agriculture, Food and Rural Development, Agronomy Unit, 9th Floor, O.S. Longman Bldg., 6909 – 116 St, Edmonton, AB T6H 4P2 (780-427-6361)

This newly initiated three-year project is focusing on how landscape-scale variability influences soil properties and processes that are related to the soils release of nitrogen (N), phosphorus (P), potassium (K), and sulfur (S), and crop responses to both soil and fertilizer N, P, K and S. The long-term objective of the project is to develop agronomic models, which will assist farmers in making fertilizer management decisions, based on landscape units.

The field test site chosen for this trial has rolling topography in the Black soil zone of eastcentral Alberta. The cooperating farmer has been using a combine yield monitor and global positioning system (GPS) to measure yield variability on his farm, as well as variable rate fertilizer application to compensate for in-field differences in soil residual nutrients. Soil and crop measurements were conducted in 1999 using both grid and landscape transect sampling to assess crop establishment, growth and development, and soil nutrient supply. Crop biomass production increased as you moved from the upland shoulder to backslope to depressional footslope landscape positions. The higher productivity of footslope positions resulted in higher nutrient demands, and was reflected in increased uptake of N, P, K and S. Ion exchange membrane probes were used to measure soil nutrient supply rates throughout the growing season, and revealed that the moisture and temperature conditions characteristic of the landscape controlled nutrient release. These landscape-based nutrient dynamics will be used to test mechanistic simulation models for their ability to predict soil nutrient supply and aid in refining fertilizer recommendations.

Soil – Carbon – Food Symposium, Predicting the Future from the Past

Dr. Jim Robertson, Department of Renewable Resources, 442 Earth Sciences Building, University of Alberta, Edmonton, AB T6G 2E3 (780-492-6466)

This one-year contribution supported a symposium held at the University of Alberta in July, 1999 to discuss the global, North American and western Canadian perspective on soil organic matter and carbon budgets. Participants from around the world discussed how sustainable farming practices could be used to maintain and improve soil organic matter and soil fertility. The meeting also focused attention on the 70 years of

research carried out at the University of Alberta Bretton plots. These long-term rotation study plots have provided vital information on the impact that cultural and nutrient management practices have had on soil quality and productivity. The important role of phosphorus fertilization on these Gray wooded soils has been clearly demonstrated over the years, and the impact of fertilizer additions on soil organic matter and nutrient supplying power continue to be issues under study. In addition, the long-term data set from these studies provides the information necessary to test computer simulations models and provide refinements that improve their effectiveness.

Potash & Phosphate Institute (PPI), 655 Engineering Drive, Suite 110, Norcross, Georgia 30092-2837 USA
Phone: 770-447-0335, Fax: 770-448-0439,