

**SUMMARY RESEARCH PROGRESS REPORT FOR 1997
AND RESEARCH PROPOSAL FOR 1998**

Submitted to:

SLV Research Center Committee

and the

Colorado Potato Administrative Committee (Area II)

Title: Precision Farming Using Soil Mapping and Variable Rate Fertilizer Application

Project Leaders: Susie Thompson-Johns, CSU-AES, and Merlin Dillon, CSU-CE, SLVRC, Kirk Thompson and Jon Gilley, Agro Engineering, Inc., Chris Sittler, Stone's Farm Supply, Randal Ristau, CSU-CE and Ron Riggenbach, NRCS, SLV Water Quality Demonstration Project.

Project Justification:

Increasing yields on fields with high variability has been demonstrated using precision farming practices. Precision farming includes the use of GIS in conjunction with GPS to properly locate and map variations in agronomic characteristics across a field. Soil texture, soil nutrient availability, crop biomass, vegetative cover, and crop yield are typical characteristics incorporated. Combined with variable rate technology, the information can be used to provide the optimum amount of nutrients, seed, water or other agrichemicals to each location within a field. Advantages of the more precise application of inputs include efficient stewardship of natural resources, and perhaps economic advantages, as well.

Project Status: Second Year

Significant Accomplishments for 1997:

San Luis Valley Research Center - About 60 acres were sampled on a one-acre grid basis and fertilized using VRT and conventional means. Coors malting barley and Centennial soft white spring wheat were planted. Nitrogen level ranged from 19 to 79 ppm on the barley field, with nitrogen applications ranging from 0 to 115 lbs./acre. Combine yield was 160 bu/acre. While no statistics were applied, yield differences between areas fertilized on a variable rate basis, compared to those conventionally applied appear to be non-significant. On the 30 acres of soft white spring wheat, soil nitrogen level ranged from 28 to 78 ppm. Nitrogen applications to this portion of the field varied from 0 to 138 lbs./acre. The field produced 135 bu/acre, combine yield.

Rob Jones Farm - About 132 acres were sampled on a one-acre grid basis and fertilized using VRT and conventional means. Russet Nugget potatoes and Centennial soft white wheat were planted. Nitrogen level ranged from 1.9 to 20.7 ppm across the entire circle. Organic matter varied from 0.7 to 1.59 percent and pH varied from 8.2 to 8.89. On the potato half, nitrogen was applied to the VRT portion at the rate of 1 to 10 lbs./acre, preplant. The conventional portion received 11 lbs./acre. Yield monitoring data provided yield averages of 374 cwt./acre for VRT compared to 360 cwt/acre on conventionally applied areas of the potato field. Small plot samples indicated no significant differences between total yield and US No. 1 yield for the two treatments. Tuber number and average tuber size were significantly different, however. Nitrogen application varied from 153-164 lbs./acre on the VRT area. The convention side received 180 lbs./acre N. Wheat yields averaged 103 bu/acre for both portions.

Objectives for 1998:

The objectives of the current project are to:

1. Determine the soil sampling frequency which is necessary to adequately describe the variability within the field and remain cost effective for the producer.
2. Quantify if there is a yield and quality increase from the use of variable rate fertilizer applications and determine if this increase is cost effect.

Specific objectives include:

1. GIS Mapping. Overlay 1998 yield maps, biomass and vegetative cover maps developed from color photos, false-color infrared aerial photos, Landsat satellite images, and digitized soil survey maps. Use these maps to discriminate areas of the field that have produced differently and to determine where intensive soil sampling is warranted.
2. Soil sample on different grid sizes.
3. Interpret soil samples, providing fertilizer recommendations based upon test results.
4. Apply fertilizer according to recommendations for the different grids using variable rate technology (VRT).
5. Use yield monitoring equipment to produce yield maps at harvest, comparing the VRT portions to conventional areas.

Funding Request:

1997 Allocation: \$7500

1998 Request:

Soil Analysis (300 samples @ \$20 each)	\$ 6000
Digitizing Aerial Photos (6)	600
Obtaining Satellite Imagery	1000
Plant Analysis (200 @ \$6)	1200
Labor	<u>1500</u>
Total Request	\$10300