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Topography – a guide to variable rate fertilizer application

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TOPOGRAPHY - A GUIDE TO VARIABLE RATE FERTILIZER APPLICATION

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TOPOGRAPHY - A guide to Variable Rate Fertilizer Application

A field-scale demonstration was used to compare crop yield response to applied fertilizer on three slope positions (low, mid, upper). The demonstration simulated how an air drill with variable rate application capability could change rates with changes in slope position.

The demonstration was located on W 1/2 26-O 1-24 W2, southeast of Coronach, Saskatchewan on a Fife Lake clay loam soil. Under crop insurance the land is class J, risk area 03, with an area average wheat yield of 22.9 bu/ac on summer fallow and 15.1 bu/ac stubble.

Soil tests were done for the three slope positions on April 24 and May 8. Columbus spring wheat (70 lb/ac) was direct seeded in wheat stubble on June 1 with a Flexicoil 5000 air drill equipped with 3 inch paired row opener on 12 inches row spacing. Three rates of fertilizer (35-15-O) were used on low (44 lb/N/ac), mid (70 lb N/ac) and upper (60 lb N/ac) slope positions to achieve the yield goal of 35 bu wheat/ac. For comparison an adjoining parallel strip of land received 28 lb N/a/c on all slope positions.

An altimeter was used to measure elevation along the slope. Samples were taken for plant tissue analysis on July 30. An aerial infrared photograph was taken of the site in August.

The wheat was harvested and weighed on October 9. A combine with a straight-cut header was used to harvest several strips, the length of each treatment. Grain samples from each treatment were taken to local elevator for protein determination.

RESULTS

Soil Test Nitrogen Levels - April 24 & May 8

	Actual (lb/ac)	Recommended
Low	20	45
Mid	16	65-75
Upper	19	60-70

Plant Tissue Analysis - July 30

	N%		**N%** Check	
Low	2.15	(44)	1.70	(28)
Mid	2.47	(70)	1.72	(28)
Upper	2.41	(60)	1.96	(28)

Grain Yield - October 9

	bu/ac	bu/ac Check
Low	27.60	26.84
Mid	29.72	26.19
Upper	26.06	24.13

Grain Protein - October 11

#1 CWRS

	%	% Check
Low	14.2	13.4
Mid	13.8	11.4
Upper	13.6	11.5

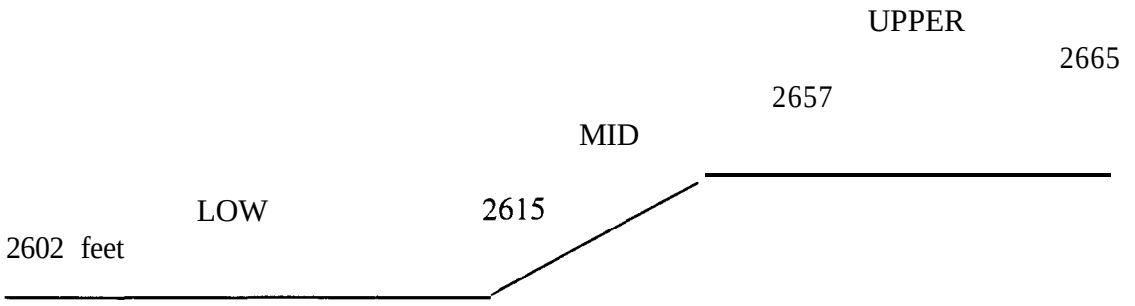
Return on Variable Rate Fertilization

	$/ac	$/ac Check
Low	117.30*	108.16*
Mid	123.04*	101.09
Upper	107.89*	93.14

*** protein premium included**

*** urea ammonium phosphate 35 - 15 - 0 $339/tonne**

ELEVATION - Field Profile



Precipitation (mm) Coronach Poplar River Power Station (10 miles west)

	April	May	June	July	Aug	Sept	Total
1996	27.9	36.2	84.8	44.8	11.8	32.5	238
Normal	25.6	5 1.2	66.2	42.2	36.0	29.1	250.3

COMMENTS

At the Coronach site in 1996 there was a trend for grain yield and protein to decline as elevation rose. In contrast, plant tissue analysis revealed nitrogen content increased on the check and the treatment strip as elevation rose.

The net dollar return applying different rates of fertilizer on different slopes compared to a single uniform rate across the field was $2.21/acre, low-slope; $3.47/acre mid slope; and $0.12/acre, upper - slope.

Protein premiums improved the dollar return from variable rate fertilization. The greatest yield increase 3 1/2 bushel - mid slope ($13.51) earned an extra $8.44/acre from higher grain protein.

At the rates of fertilizer used nitrogen did not limit the crop yield potential. Lower rates of fertilizer may have improved net dollar return on the different slope positions. If this assumption were true and changes in elevation across the field may guide variable rate fertilization. Changes in elevation can be measured accurately in the field with a simple inexpensive altimeter.

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