2013 ADOPT Project Report

MaximizingYields and Net Returns Through Nitrogen Fertilization on Canola

Prepared by;

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1. **Project Title:** Maximizing Yields and Net Returns Through Nitrogen Fertilization on Canola

2. **Project Number:**20120439

3. **Producer Group Sponsoring the Project:** Conservation Learning Centre Inc

4. **Project Location:** Conservation Learning Centre, Prince Albert, Sask. Located on the SW 20-46-26 W2, RM 461

5. **Project Start and End Date:** May 1,2013 to December 31, 2013

6. **Project Contact Person and Contact Details:** Larry White, A/Manager Conservation Learning Centre, Box 3003, Prince Albert, Sask. S6V 6G1 306 764-7320 or 306 960-1834, info@conservationlearningcentre.com

7. **Project Objectives:** The project objectives were;
   To determine the Nitrogen (N) fertilization rate that provides the ability of high yielding canola to reach its genetic potential.
   To determine the N fertilization rate that provides the producer with maximum net returns through a cost/benefit analysis.

8. **Project rationale:** Many producers use a rule of thumb of fertilizing at 100 lbs of N per acre on a canola crop. One bushel of canola contains about 1.8 lb of N, but it takes about 3lbs of N/ac of fertilizer N to increase canola yield by one bushel per acre. The extra N is needed to grow other parts of the plant and account for N that the crop does not use. Typical fertilizer N rates used by canola growers are in the 80 – 100 lb/ac rate. These rates would cover removal by a 45-60 bu/ac canola crop. However new high yielding canola varieties have the genetic potential to yield in excess of 100 bu/ac, leading growers to question whether higher yields are economically feasible if higher fertilizer N rates are used.

   Local producers will benefit from understanding the optimal rate of N fertilization that can increase yields and at what price of N and canola is this feasible and what effect does it have on net returns.

9. **Methodology:** The demonstration was set up as a factorial randomized complete block design with treatments replicated four times.

   There were four fertilizer rate treatments of 100, 150, 200 and 225 lb/ac of fertilizer N on three canola varieties;

   Invigor L130
   Pioneer 45S54
   45H31

The cost benefit analysis was done using three canola prices;

$10.00
$12.50
$15.00

The project was set up on oat stubble with a pre-seed burn off of Advantage Plus we applied at a rate of 1.5 L/ac on May 17, 2013. The weather was warm and dry when the herbicide was applied.

The treatments were deep banded on May 24, 2013 and then harrowed after deep banding. There was 52 lbs P/ac applied with the seed.

The project was seeded on May 24, 2013 @ 6 lbs/ac, with 52 lb/ac of P_2O_5 applied with the seed. The soil temperature at seeding was 12C, however cool dry weather followed seeding. Crop emergence occurred June 3, 2013, but plant densities were less than ideal due to dry, cold soil. Precipitation during May was only 7mm and only 5mm during the first week of June, resulting in low and variable crop emergence. Abundant precipitation later in June and July allowed the crop to recover relatively well.

The treatments were sprayed on June 24 as follows;

Invigor L130 was sprayed using 1 L/ac of Liberty.

Pioneer 45S54 and 45H31 were sprayed with Maverick @ 1 L/ac.

The herbicide treatments resulted in very good weed control, however there was significant damage done to the Invigor L130 variety. Roundup drift seems to have been the reason. The consequence was that the Invigor L130 variety was a complete write off as it was not possible to get any reliable yields.

10. Results:

Precipitation during May was only 7mm and only 5mm during the first week of June, resulting in low and variable crop emergence. Abundant precipitation later in June and July allowed the crop to recover relatively well.

The average yields were as follows;

Variety 45S54

100 lbs/ac N	50.7 bus/ac
150 lbs/ac N	46.3 bus/ac
200 lbs/ac N	59.6 bus/ac
225 lbs/ac N	52.3 bus/ac

Variety 45H31

100 lbs/ac N	45.2 bus/ac
150 lbs/ac N	35.8 bus/ac
200 lbs/ac N	44.2 bus/ac
225 lbs/ac N	60.7 bus/ac

The yields for the individual treatments are recorded in APPENDIX A

Typically grain yield increases with increasing fertilizer N until some other factor limits yield. At that point yield ceases to increase and may begin to decline as

more fertilizer N is applied. In this trial yield decreased when the N rate increased from 100 to 150 lb/ac, but was highest at 200 lb/ac for 45S54 and at 225 lb/ac for 45H31. It is possible that a significant portion of the yield difference was due to experimental error since the site was somewhat variable coupled with low and variable crop emergence. There were some extreme variations in canola yields between replicates of the same treatments. There was no visible difference in soil conditions between treatments although the site was not level. The early dry conditions and heavier weed pressure in some of the treatments would seem to have affected yield differences.

This trial was featured at the CLC summer field day on July 18, 2013 with 50 in attendance. A summary of results will be posted on the CLC website, and results will be presented at winter meetings as opportunities arise. Results will also be presented at industry workshops alone or in combination with results from other Agri-ARM sites as opportunities arise.

11. **Conclusions and Recommendations:** Although yield variability within the trial did affect reliability of data collected, it did appear that economic increases in canola yield are feasible with increased fertilizer N. Improved seeding equipment would likely place seed more uniformly resulting in more uniform and abundant crop establishment. Variable weed pressure at this site is an ongoing issue that is being recognized and addressed to reduce weed seed banks in the soil and facilitate more uniform trials. This will take more than one year to fully address. To deal with soil variability at this site, numbers of treatments in an individual trial should be kept to a minimum, possibly splitting larger trials into more than one trial. As these issues are dealt with, the quality of data generated is expected to improve considerably.

12. **Acknowledgements:** The Conservation Learning Centre would like to acknowledge the ADOPT funding provided by the Ministry of Agriculture for the project.

They would also like to thank the staff of the CLC for their contribution including Curtis Braaten, Manager, Field Technician Russell Wall and summer students Rae and Morgan Braaten; Joanne Kowalski and Cyril LaForge of the Ministry of Agriculture for their agrology expertise and Stewart Brandt, NARF for the his expertise provided on the project design, field assessments and report.

13. **Appendices:** Appendix A, Treatment Data

14. **Abstract/Summary:** During 2013, we seeded 3 cultivars of canola with rates of 100, 150, 200 and 225 lb/ac of fertilizer N. Crop emergence was low and variable across the site due to dry cool conditions. Weed pressure was also variable across the trial. One canola cultivar was lost due to herbicide damage, but good yields ranging from 35 to over 60 bu/ac were recorded for the remaining 2 cultivars. Although yield variability within the trial did affect reliability of data collected, it did appear that economic increases in canola yield are feasible with increased fertilizer N. Improved seeding equipment would likely place seed more

uniformly resulting in more uniform and abundant crop establishment. Variable weed pressure at this site is an ongoing issue that is being recognized and addressed to reduce weed seed banks in the soil and facilitate more uniform trials. This will take more than one year to fully address. To deal with soil variability at this site, numbers of treatments in an individual trial should be kept to a minimum, possibly splitting larger trials into more than one trial. As these issues are dealt with, the quality of data generated is expected to improve considerably.

APPENDIX A

Canola Variety 45S54

N Rate/ac	Yield Bus/ac	Fertilizer Cost $/ac	Yield Increase Over 100 lbs	Added Return at $10/bus	Added Return at $12.50/bu	Added Return* at $15/bus
100	50.66	60.00				
150	46.28	90.00	(4.38)			
200	59.59	120.00	8.93	29.30	51.63	73.95
225	52.33	135.00	1.67	(58.30)		

*Added Return is the average yield increase for the different rates of nitrogen times the canola price minus fertilizer cost over the 100 N rate

Canola Variety 45H31

N Rate/ac	Yield Bus/ac	Fertilizer Cost $/ac	Yield Increase Over 100 lbs	Added Return at $10/bus	Added Return at $12.50/bus	Added Return* at $15/bus
100	45.22	60.00				
150	35.77	90.00	(9.45)			
200	44.24	120.00	(0.98)			
225	60.68	135.00	15.46	75.46	118.25	156.90