Fall Cover Crops
(Dufferin SCIA – Interim Report)

Purpose:
This study is to determine the benefits of an under-seeded clover crop into barley compared to a post-harvest seeded crop of forage peas. The aim is to test ability of each cover crop to fix nitrogen, sequester soil nitrogen, contribute organic matter and reduce weed growth and soil erosion. The primary objective is to determine which crop would provide the greatest fertility boost to the subsequent crop. The secondary objective is to determine the erosion control (wind & water) and spring cultivation cost impact of a legume cover crop.

Methods
Year 1:

The trial was conducted on the home farm of Alan Lyons located between Shelburne and Alliston. In spring 2012, 3 replications were set up using 5 acre plots of double cut red clover seeded with barley. The barley was harvested in mid-August with the straw spread back onto the field. Immediately after harvest the test area stubble was disked once and planted to forage peas at 120 lb. /ac. A packer was pulled behind the drill to ensure good seed to soil contact and preserve any soil moisture available. At that time there appeared to be some clover growth but it was a very poor catch possibly due to the heat and drought of the early summer. The clower was left in hopes that it may improve if we got some much needed fall rain. Unfortunately it did not, so the comparison between the cover crop species did not occur. Brian Hall and I agreed that there wass still value in continuing the test of the fall-seeded peas. At the urging of Brian and Bonnie Ball, 3 different rates of nitrogen were applied to following canola crop to both the pea cover crop and check (no-cover). None of the plots were worked in year of establishment of the peas so we will also be able to report on the impact on erosion and the implications to spring cultivation.

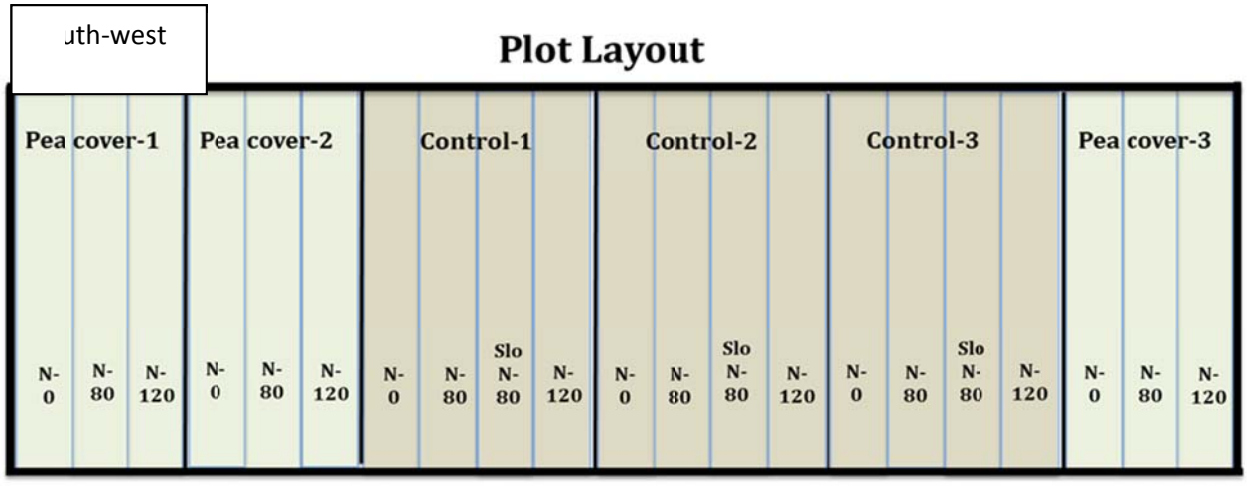
2nd Year Activity:
The initial plan was to use the 5 acre plots but since the farm was also hosting the Canola sulphur plots for OMAF, we decided to use smaller plots and concentrate on N rate comparisons between the pea cover plots and the control plots. We set up 3 replications of 0, 80 and 120 lb. /ac. N on both areas, using Ammonium Nitrate as our N source. We also did a comparison of slow release Super U/AL at 80 lb. /ac on the control plot only. The net result was 21 plots, each 30’ wide by 500’ long.

Soil samples were taken from the plots pre-plant and at full bloom. The P and K as well as all spray applications, were applied perpendicular, across all plots. All plots were worked once before fertilizer application and had a shallow (2-3”) pass with a cultivator after fertilizing. All plots were planted on May 18/13 with a seeding rate of 5.5 lb. /ac of Liberty Link L150 spring canola.

Plot Soil Type:

Plots were oriented east-west, the same direction as slope in the field. The soil type ranged from straight Honeywood Loam in the south plot through to sandy loam in the north plot. By duplicating the pea cover on both ends, we were able to see what impact, if any, there was on the N requirements. The yield results showed considerable variation based on soil type. We also noted a significant increase in Swede Midge impact moving from the loam to the sandy area. This impacted yield results.

Figure 1. Plot Layout



Results:

1st Year Benefits:

In year of establishment the greatest benefit was the amount of biomass generated through the control and pea plots. The pea plot averaged over 4000 lb. /ac. and the control plot (volunteer barley, disked) yielded over 3000 lb. /ac d/m while the “clover” plot (un-disked) produced only 520 lb. /ac. d/m. The north end of the field, which has the steepest topography, was also planted to clover with the same poor result. There was some minor erosion in that area.

2nd Year Results

The number of plots, and variations throughout the plots provided a large amount of data that I have analyzed to show the impact of not only the cover crop but the N levels as well as the soil type variation.

Note: Due to the combined impact of extreme heat at full bloom, devastating Swede Midge damage and severe lodging in parts of the field, this year’s yields are the poorest that I have had in almost 30 years of growing Canola.

Figure 2. Biomass Yield of Cover Crops

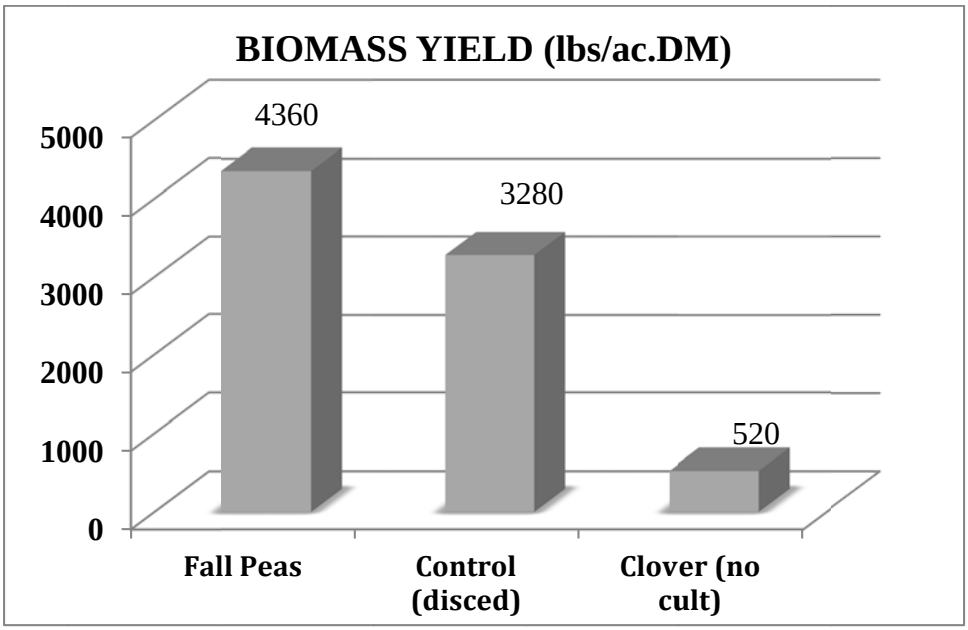


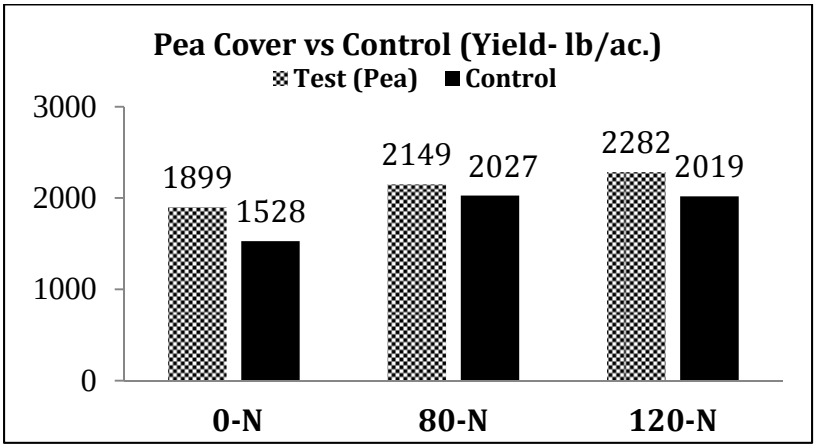
Figure 3. Example of Cover Treatments in the Field

Yield Comparison: Test (Peas) vs. Control

Based on the averages of all test plots vs. all control plots, at each N level, the cover crop plots (peas) out yielded the control plots. Comparing the yield differences between the pea cover crop and no-cover the largest increase in yield occurred between the 0 N and 80 lb./ac N treatment. Following the pea cover, yields were increased by 250 lb/ac

(13% increase) between 0 N and 80 lb. N/ac; whereas following no cover, the 80 lb. N/ac treatment increased yields by 500 lb. /ac (33% increase). Thus the peas may have supplied some N to the following canola crop but this would not explain all of the yield increase. Spring 2013 soil N test levels indicated about 10 -12 lb N/ac more following the peas than the no cover.

Figure 4. Impact of N Fertilization on Cover Crop Yield



Return on Fertilizer Investment ($ROI based on sale price of crop)

As we added more N, did it pay for itself? All plots but one had a peak return at the 80lb/ac N level. Increasing N above that level did not show as much profit. The cover crop at the north end (sandier soil) showed a dramatic increase in yield at the 120 lb. /ac. N level. This pushed the average abnormally high. See the soil type variation graphs for better detail.

Cover Crop Return ($ROI)

Did the pea cover crop return enough to cover the input costs? Input costs were based on: seed peas @ $20.00/55 lb. bag, 1 pass cultivation @ $10.00/ac, seeding @ $10.00/ac, (substitute) No-till @ $18.00/ac.

With a seeding rate of 120 lb. /ac. the planting cost ranged from $61.00 to $63.00/ac. using the 0-N plot comparison, the average return difference between the pea cover crop and control plots was $89.22 minus the $63.00 input cost leaves us with a net return of $26.22/ ac. This does not consider the economic value of the 4000 lbs. /ac. of above ground pea biomass that was on the field going into the winter.

Impact of Soil Type:

The field where the plots were located was a mixture of Honeywood Loam at the south end (P-1) with increasing amounts of sand moving further north. The P-3 plot would be

Figure 5. Return on Investment From Cover Crops and Fertilizer N

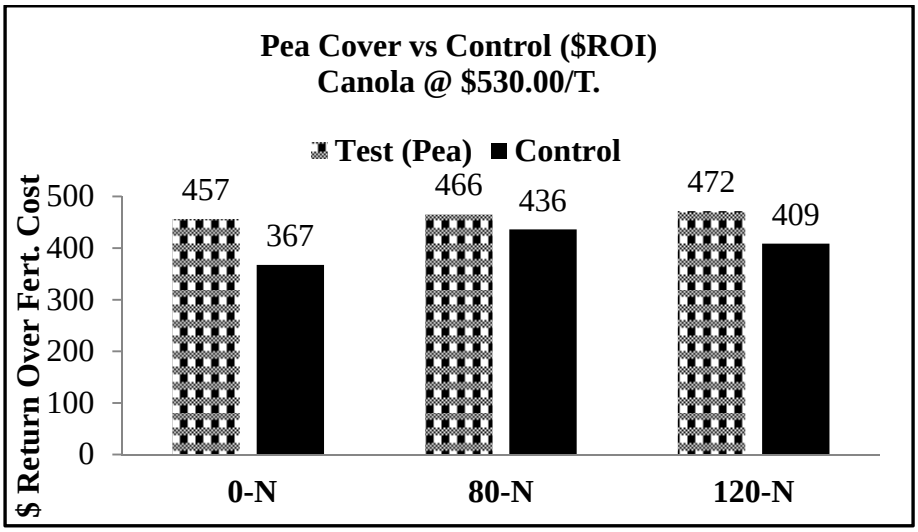
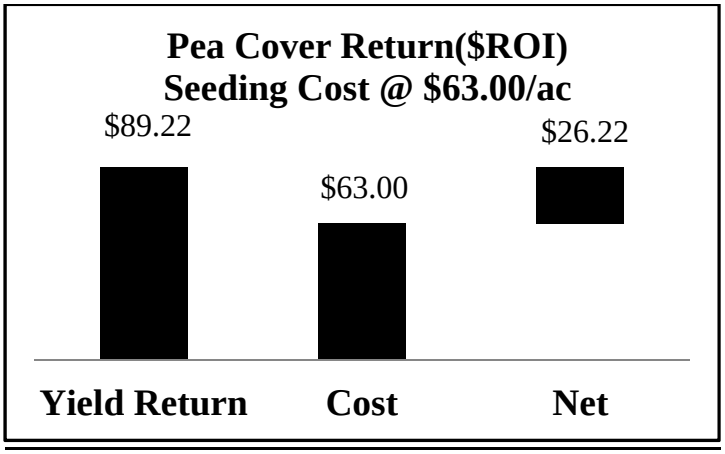


Figure 6. Seeding Cost of Cover Crops

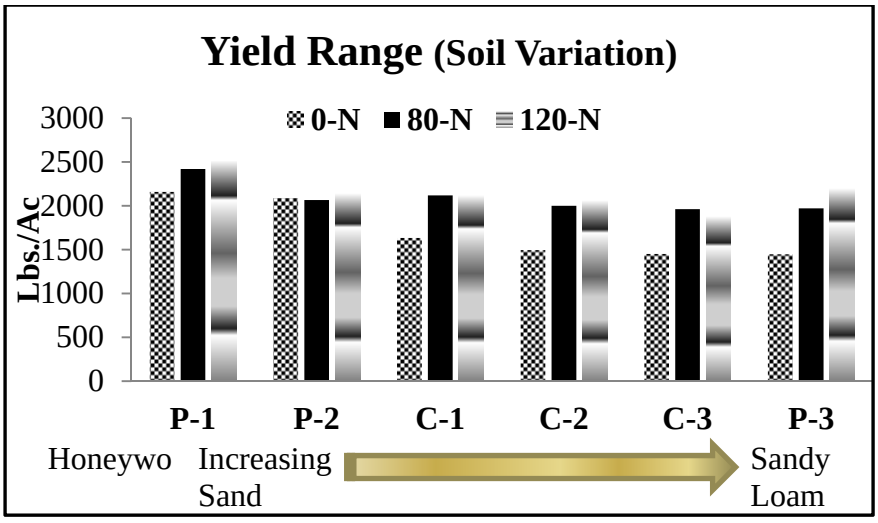


classed as sandy loam. By including the P-3 plot which was under-seeded to peas, we were able to see the impact of the cover crop on a soil type that could most benefit from it. Interestingly July 2013 soil nitrate samples indicated much higher soil N at 6-12 inch depth in P-3 plot where 80 or 120 N was applied versus all other plots. This may help explain the much bigger response to applied N versus the 0 N treatment in P-3 plot. The canola received high amounts of rainfall in June-July.

Economics of N Rate:

There was considerable variation in return over fertilizer cost between replications. In the check (no cover) the 80 lb. N/ac consistently provided highest return. The increase in return following peas was mixed. Only the P-3(north) pea cover plot showed strong economic advantage to increased N rate.

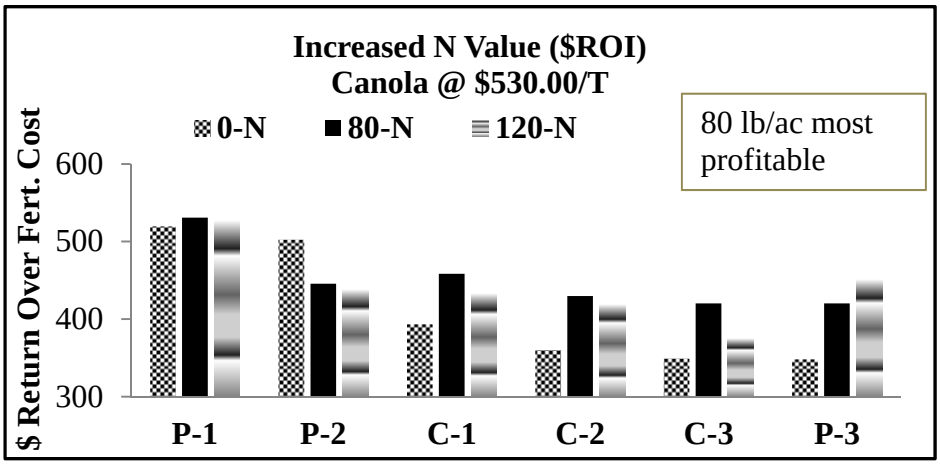
Figure 7. Impact of Soil Variation on Cover Crop Yield



Summary:

Canola yielded higher following the pea cover at all nitrogen rates. The most profitable N rate was 80 lb. N/ac. The largest difference in yield between the pea cover and no cover occurred at the 0 N rate, however spring 2013 soil N tests indicated the peas may have only supplied 10-12 lb. N/ac higher than the no-cover. In other Soil & Crop trials, pea cover crop followed by corn has not consistently shown a yield advantage or nitrogen sequestering benefit. Additional trials with using cover crops to sequester residual soil N and relay that to the following crop need to be investigated.

Figure 8. N Rate Value



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