

Improving Yield of Second Year Soybeans (St. Clair SCIA Regional Partner Grant) (Interim Report)

Purpose:

The purpose of this project is to determine the value of a rye or winter wheat cover crop in fields where soybeans follow soybeans. Many growers find themselves in a situation where for cropping, economic or other reasons they plant soybeans in a field two or more years in a row. This results in yield loss and can increase pest and disease pressure in the field.

The rye or wheat is planted immediately following soybean harvest and killed off in the spring prior to planting soybeans. Hopefully, enough growth will be generated to provide some benefits to the soil and increase the yield of the succeeding soybean crop. There is some research from Pennsylvania indicating that cover crops can improve soybean yields in these situations. The intent of the project is not to replace a good crop rotation for soybean production, but to provide a tool for growers who find themselves growing multiple years of soybeans.

Methods:

The project sites are established in the St Clair Region Soil and Crop Improvement Association area (Essex, Kent and Lambton). Fields are selected which have had one or more years of soybeans previously and will be going into soybeans. Immediately following soybean harvest, the winter wheat and rye cover crop is drilled in or broadcast and worked in. Main project sites have both cover crops and secondary sites will have a minimum of one cover crop. Each site will have at least two replications. The cover crop is left over winter and is killed prior to soybean planting.

At cover crop establishment, soil samples are taken to determine fertility, organic matter content and soybean cyst nematode levels. Other soil quality measurements may be taken either at establishment, the next season or both. Cover crop growth is monitored. Soybean growth and yield measurements are taken for the treatments.

Results:

The first project year 2006/2007 (fall '06 to soybean harvest '07) was the start-up year for the project. The soybean crop was late maturing and the fall became very wet so plots were only planted in Essex County. One main and two secondary sites were planted in the first week of November. The main site had a corn residue strip in it and two reps of the rye and wheat cover crops. One secondary side had both wheat and rye and the other had just rye. The main plot was on a sandy loam soil and growth was slow but uniform in the fall. By the beginning of May the rye had reached a height of 31cm (12") leaf extended and the winter wheat was 26cm (10") tall. Cover crop growth was slow on the two secondary sites due to late planting and clay soils. By early May, growth was uneven and generally poor. Fertility, organic matter and soybean cyst nematode (SCN) samples were taken and analyzed. The three sites had adequate fertility and organic matter averaged about 3.5%. The main site SCN samples were generally in the low to moderate risk range. The two secondary sites had no SCN present. Bait lamina strips were inserted in four treatments of the main site. The strips were inserted into the soil about 8 cm or 3" and had "soil life food" in holes at different depths. They were removed from the soil after 10 days and give an indication of the amount of biological activity in the soil. See Table 1 for the soybean yield results.

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Table 1. 2007 Soybean Yield Results (bu/ac)

Plot	Check Soybean Yield	Soybean Yield after Rye Cover Crop	Soybean Yield after Winter Wheat Cover Crop	Soybean Yield Following Grain Corn
Main - Kingsville	34.1	46.6	48.5	52.0
Secondary – Amherstburg*	48.1	48.9	---	---

* Site had poor cover crop growth.

In the second year of the project 2007/2008 the fall was more favourable for the establishment of cover crops after soybean harvest. Plots were planted in all three counties; three main plots and three secondary plots. Two of the main plots had a corn residue strip again and one of the main plots had manure applied as an extra treatment. All the plots were on clay or clay loam soils. The plots were soil sampled in the fall of 2007 and the fertility levels are moderate to high. The organic matter levels ranged from 3 to 4.5%. One of the main plots had significant levels of soybean cyst nematode; the other plots had no SCN. The cover crop growth was good going into the winter. Height measurements of the cover crops were taken between May 4 and May 9, 2008 (see Table 2). The measurement was taken from the ground to the extended leaf tip.

Table 2. Cover Crop Growth (cm)

Cover Crop	Comber*	Amherstburg	Kingsville	Wallaceburg	Florence	Merlin
Rye	42 (27)	26	39	25	34	NA
Winter Wheat	NA	22	27	NA	25	25

Table 3. 2008 Soybean Yields (bu/ac)

Cover Crop	Comber*	Amherstburg	Kingsville	Florence*	Merlin*
Check	36	32.0	35.2	22.1	36.8
Rye	35	30.8	34.4	19.5	NA
Winter Wheat	NA	30.6	37.0	20.6	32.9
Following Corn	NA	NA	55.2	27.9	NA

* Notes: The Comber site cover crop had to be replanted so growth was less. The number in brackets in Table 2 is the height of the replant. The Florence experienced reduced rainfall and significant weed pressure. The rye planted at the Merlin site had very poor emergence so yields the plot was moved to a part of the field where the winter wheat has areas of winterkill.

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The fall of 2008 was about average for time of harvest of the soybeans and cover crop planting was completed just a little later than last year. Early growth conditions were good but winter set in mid November and stopped growth earlier than in 2007. Three main plots and two secondary plots were established. Soil tests revealed very good fertility and an average organic matter level of 4%.

Summary:

The results from the main site in year one showed some promise although it is only one year at one site. The plot was on a sandy loam soil and it was a dry year so moisture conservation may have contributed to the yield increase. The cover crops significantly increased soybean yields compared to the check but were not quite as good as the corn-soybean rotation. If the yield advantage is real at a 13 bu/ac yield increase, the net return would be \$95-\$100 (\$9.50/bu soybeans and \$24-\$29 for cover crop seed and planting). The growth of the cover crops on the secondary sites was poor enough that it wouldn't have had an effect on soybean yield.

The results of year two showed no yield advantage to either cover crop. Yields were not significantly different between the rye and winter wheat cover crops and the check. All sites this year were on clay or clay loam soils and many of the plots experienced a dry spell especially those in Essex County. There may be benefits to the soil as the living crop may help protect the soil from erosion, stimulate soil life or provide a small contribution to soil organic matter levels but those benefits are difficult to measure in the short time the cover crop is in the ground.

Next Steps:

Soybeans will be planted following the cover crops in the spring of 2009 and yields will be taken in the fall. This will be the final year of the project. The OMAFRA/OSCIA Partner grant funding ended in 2008. The St Clair Region SCIA has secured funding to complete the third full cycle of the project. Bill Deen, University of Guelph has received funding from the OMAFRA Ontario Great Lakes Program to establish research plots at several locations to study cover crop benefits to soybeans.

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