

Evaluating Cover Crop Options after Winter Wheat and in Standing Corn

(St Clair SCIA - Interim Report)

Purpose:

Cover crops can provide many benefits; they can protect the soil from erosion, add organic matter, stimulate soil life, provide nitrogen, scavenge or retain nitrogen, reduce compaction and improve water holding capacity. Interest in cover crops has been growing in recent years. Including a cover crop after winter wheat is the easiest way to start including cover crops in most typical field crop rotations. Red clover establishment in winter wheat has been variable in recent years, many farmers end up with a poor stand of red clover after wheat harvest, while others have abandoned the practice all together. There is still a desire to reap some of the benefits of red clover so farmers are looking to other cover crops to provide some or all of the benefits. There are a number of different cover crops options to choose from. Planting date, managing cover crop growth and control afterwards are just a few of the things growers must consider when planting a cover crop. The seed is relatively expensive in some cases so it is important to get the most out of the seeding operation. After winter wheat harvest the soil conditions are often not optimal for establishment. Planting a mixture may reduce establishment risk. The purpose of this project is to optimize establishment and provide the most benefit from cover crops following winter wheat.

Some growers are looking for ways to plant cover crops in other parts of their rotation. Establishing cover crops after grain corn is difficult as there is little or no growing season left in Ontario. There is interest in exploring the seeding of cover crops into standing corn. A project currently exists where various cover crops are seeded into seed corn. There are a couple of units capable of seeding cover crops into corn. There is potential to link with the seed corn project and explore seeding cover crops into standing grain corn. This will be explored as a small sub project of this partner project. Several cover crops and mixtures (based on the results of the seed corn project) would be seeded into standing corn and evaluated for stand establishment. A second purpose of the project is to evaluate options for establishing cover crops in standing corn.

Methods:

Cover crops were seeded following winter wheat harvest but generally not before the beginning of August. Management of volunteer winter wheat is being investigated including comparisons of leaving it untouched, light tillage and herbicide control. Two cover crop mixtures: TillageMax Dover™ (Tillage Radish + seed oats) and TillageMax Daytona™ (Tillage Radish + crimson clover) plus feed oats (see figure 1) were compared to evaluate the establishment and benefits of each. The Dover mixture was seeded at 25 lbs./ac and the Daytona + oats was seeded 25 lbs./ac (5 lbs./ac Daytona + 20 lbs. oats). Cover crop mixtures may help to ensure cover crop establishment success. A check strip with no cover crop planted was left for comparison. There were three replications of each treatment. Nitrogen was applied at 50 lbs. N/ac to ensure adequate cover crop growth. A soil nitrate test will be taken prior to seeding to assess soil N levels and a zero strip will be left where possible. Cover crop biomass measurements will be taken at two times one in the middle of the growth period and one late fall. The above ground plant material will be removed from four 0.25 m² areas in each cover crop strip. Economics will be a consideration in the evaluation, for example

cover crops that do not require an herbicide will be included as a way of keeping the cost of growing the cover crop down.

Four cover crops: common annual ryegrass, Tillage RootMax™ annual ryegrass, feed oats and TillageMax Daytona™ blend (Tillage Radish and crimson clover) were hand seeded into standing grain corn in plots that were four rows wide by 10 m long and replicated three times. One plot was seeded after silage harvest. Visual observations were made of cover crop growth in late fall.

Figure 1. Daytona + oats mixture



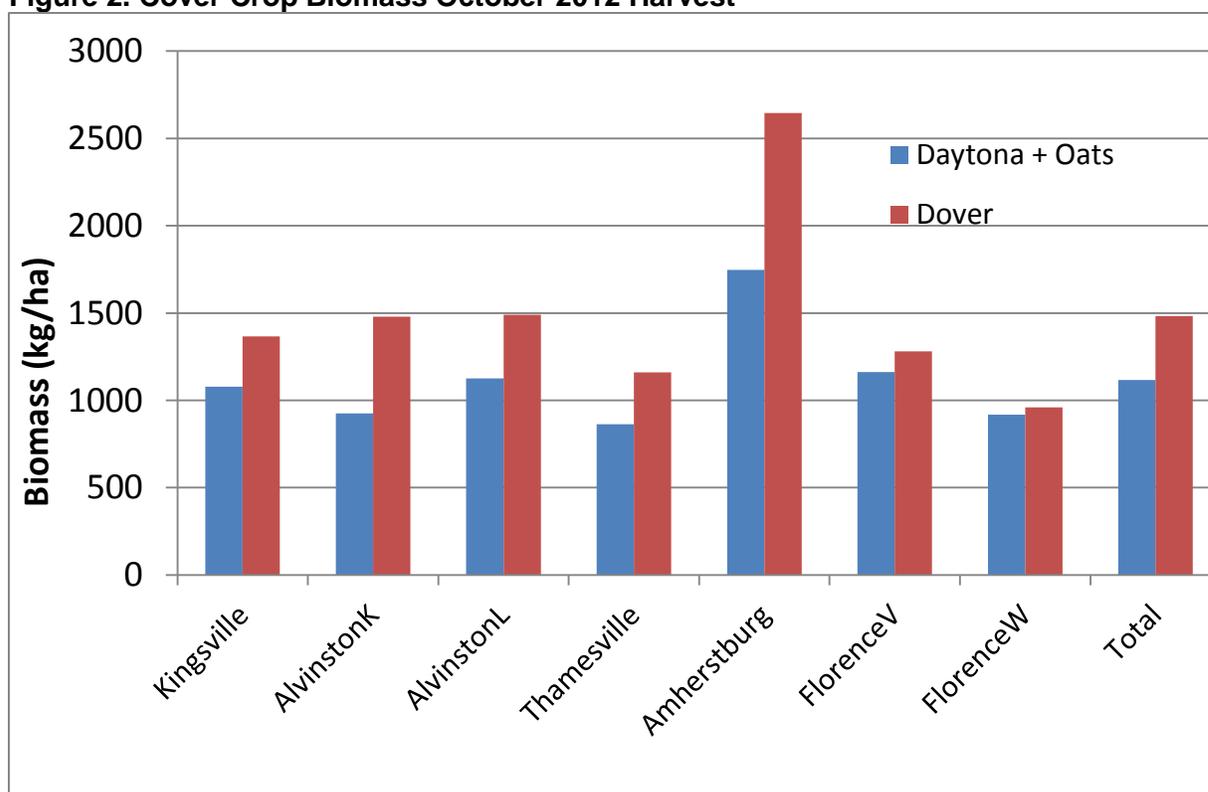
Results:

2012 was the start-up year for this project. Like many start-ups, the project was delayed. As a result cover crop planting following winter wheat did not occur until August 27th to August 31st. Seven sites were planted: three in Lambton county, two in Chatham-Kent and two in Essex county. A variety of drills and planters were used. No-till drills with and without small seed boxes and an air seeder were used. Generally all did an adequate job of planting. There was concern that the three way mix would separate out in the drill so in a couple of cases the Daytona (radish/clover) seed was put through the small seed box. The oats are a relatively large seed, Tillage Radish a small to medium sized seed and crimson clover is a small seed. Surprisingly, the seed did not appear to separate out. Stand establishment was equally as good when planted with and without using the small seed box. The real challenge came with seeding depth. In a few cases the cover crop seed was planted one inch or deeper. In those cases the oats came up fine, the

Tillage Radish emergence was delayed and often had a reduced stand. There were no zero nitrogen strips but the nitrogen that was applied produced good growth. Nitrate nitrogen samples showed a low level of nitrogen at the Amherstburg and FlorenceW sites and a moderate level at the Kingsville, Thamesville and FlorenceV sites.

The cover crops chosen provide different benefits. The oats provide a fibrous root to improve soil structure, take up nitrogen in the soil and produce significant biomass to return to the soil. The Tillage Radish provides a deep tap root to open up the soil and takes up nitrogen. The crimson clover also has a tap root, has fibrous roots and produces some nitrogen. The first cover crop biomass harvest took place during the third and fourth weeks of October. Biomass weights were highest at the Amherstburg site and similar at the rest of the sites. The Daytona + oats averaged 1100 kg/ha and the Dover mixture was higher at 1500 kg/ha, see Figure 1. The lower amount of biomass with the Daytona + oats could be due to the feed oats in this mixture either having a lower germination rate and lower vigour than the seed quality oats in the Dover mixture. Some of the treatments with feed oats had mustard or canola in them. As these come from the west it is possible that the canola could be Roundup Ready and may be difficult to control in the following crop if glyphosate is the only herbicide to be used.

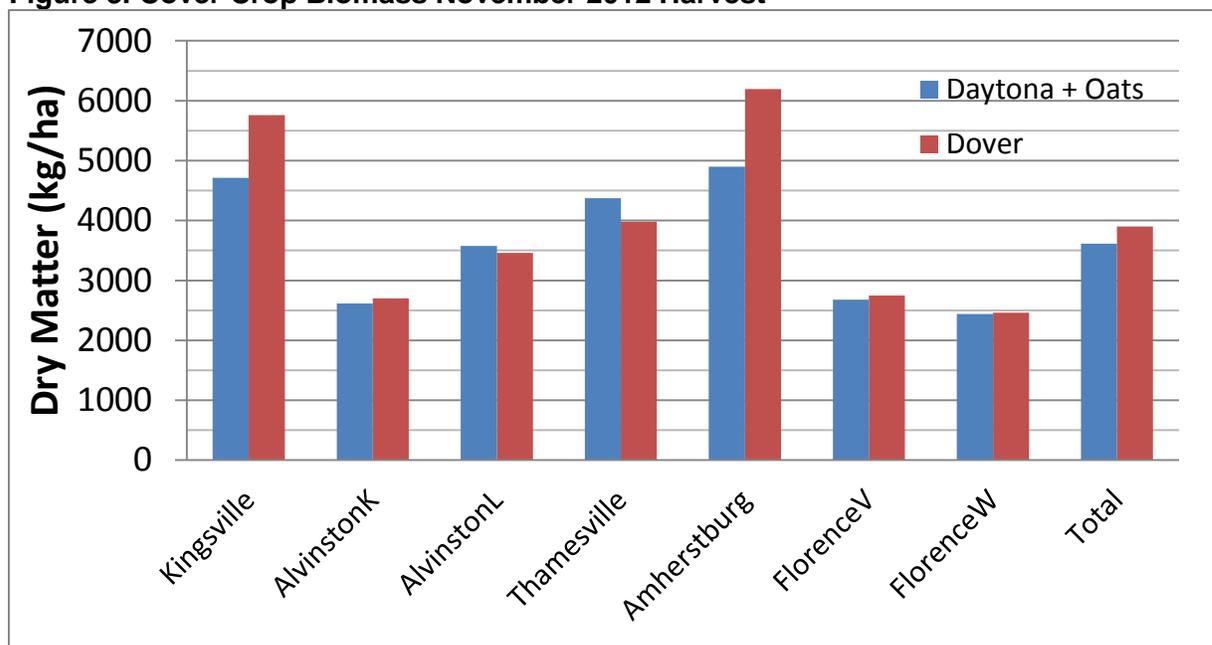
Figure 2. Cover Crop Biomass October 2012 Harvest



The cover crop biomass increased significantly at the second harvest which was completed the second and third week of November. The Kingsville, Bothwell and Amherstburg locations had higher growth than the other sites. The first two sites were on sandy soils and the Amherstburg site is on a clay loam soil. Average biomass for the Daytona + plus oats was 3600 kg/ha and the Dover mix was higher at 3900 kg/ha, see Figure 2. There was not as much of a difference between the two mixtures at this

harvest. The growth at the two Alvinston sites may lag behind some of the others because the nitrogen was applied as ESN nitrogen which would have delayed the availability of the nitrogen. The FlorenceV site received the nitrogen a few weeks after the others and it was planted deeper delaying the Tillage Radish emergence so that may help explain the reduced growth. The FlorenceW site was tilled prior to planting and the soil was dry so that may explain the reduced growth there.

Figure 3. Cover Crop Biomass November 2012 Harvest



The corn was hand seeded into four grain corn fields and after silage harvest at another site from the last week of August to the middle of September. The cover crop establishment was sparse at all four sites. The plants that did establish had minimal growth. The annual ryegrass had the best growth and establishment of the cover crops tested. Overall the growth was reasonable considering the late planting. The cover crops planted after corn silage had reasonable growth.

The cost per acre of the Dover mixture was \$37.50 and the Daytona plus oats mixture was \$16.90 per acre. The cost of 50 lbs. of urea per acre was \$34.50 and custom application is \$10. per acre. Approximately \$10 per acre worth of herbicide will control the crimson clover.

Summary:

The later planting date of the cover crops still produced significant growth by the second half of November. The Dover mixture averaged 3900 kg/ha and the Daytona + oats averaged 3600 kg/ha. Planting the cover crop at the correct depth is important to ensure the cover crop germinates rapidly or even germinates at all. This showed one of the benefits of planting a mixture. When the crimson clover did not emerge and the Tillage Radish was delayed the oats grew to begin providing cover and helped fill in where the other cover crop growth was poor or missing. The Dover mixture will be killed by cold temperatures. The crimson clover will have to be killed with an herbicide in the spring.

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Cover crops will grow when inter seeded in grain corn. Not all cover crops will tolerate the shade well or germinate well on the soil surface.

Next Steps:

The cover provided by each mixture will be assessed in the spring. The crop yields following the cover crops will be measured where possible. The mixtures will be assessed to determine their performance and other cover crops will be evaluated to see if they should be included in 2013 trials. Further evaluation of cover crops that will establish well in that environment will be conducted. An attempt will be made to rent a seeder to inter seed several cover crops into standing corn mid-season.

Acknowledgements:

Thanks to the co-operators for their commitment to planting these plots. The funding for this project was provided by the OSCIA regional partner grant and the Southwest Agricultural Conference grant. Thank you to Speare Seeds for giving us a discount on the seed. Thanks also to Anne Verhallen, OMAFRA for her assistance with project design and biomass harvest. Thanks to SGS Agri-Food Laboratories for assistance with the cost of soil nitrate analysis and to Ridgetown Foodland for providing paper grocery bags (for biomass harvest) at a reduced cost.

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