



Crop Solutions that Work

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Using Winter Wheat Under Seeded with Red Clover to Manage Soils

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With a wheat crop in Lambton, Middlesex, Chatham-Kent and Essex down 12 - 20 per cent from last year, how can we get the best agronomic returns from our planted acres?

The benefits of including wheat, and especially wheat plus red clover in your rotation may persist beyond just the following year. Studies have shown that under seeding red clover into wheat resulted in yield responses in every year for three consecutive years compared to when red clover was not included in four-year rotation systems. Table 1 shows the benefit of including red clover in the rotation.

Table 1. Corn Yield Response to Rotation

Rotation ¹	Corn Grain Yield ²	
	Loam (1990-95)	Clay Loam (1990-93)
	t/ha (bu/acre)	
Continuous corn	8.84 (141)	6.59 (105)
Soybean-corn	9.78 (156)	7.40 (118)
Soybean-wheat-corn	9.47 (151)	7.90 (126)
Soybean-wheat (RC) ³ -corn	10.23 (163)	8.47 (135)
Soybean-wheat (RC)-RC ³ -corn	10.35 (165)	8.28 (132)

Source: Vyn, University of Guelph

¹ On a Toledo loam near Chatham, Ont., and on a Brookston clay loam near Maidstone, Ont.

² All corn treatments were fertilized with 179 kg/ha (160 lb/acre) of N.

³ Red clover plow-down was under-seeded into wheat. "Wheat (RC)-RC" indicates that under-seeded red clover was not plowed under but harvested for seed the following year and then fall plowed.

Ref: OMAFRA PUB 811 Agronomy Guide for Field Crops 2009

The use of under-seeding is an important tool in soil management. Under-seeded clover will add considerable biomass that breaks down to increase soil organic matter and ultimately add to soil carbon levels. This increase in soil organic matter will improve soil structure as well as create better conditions for soil microbial activity. The fibrous root systems of cereals and forage crops such as red clover are excellent for building soil structure.

The benefits of improved soil structure and organic matter levels will help with field drainage by allowing the water to escape the field surface through improved permeability and water infiltration rates. The structural strength will increase with higher organic matter helping to reduce the amount of compaction under normal farming operations. Soils with higher organic matter levels will also have more water holding capacity helping crops tolerate droughty periods more efficiently.

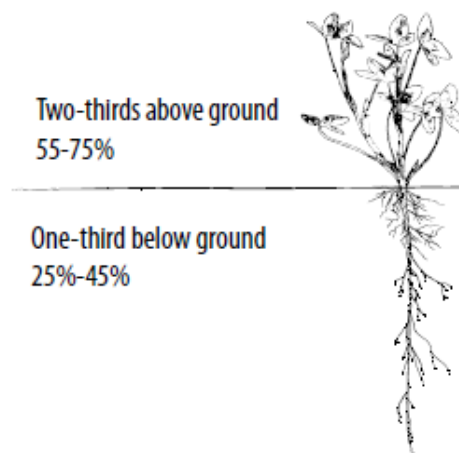
Under-seeded crops will help build organic matter in lighter soils, or in situations that have short rotations with low residue crops. Under-seeding red clover with winter wheat provides many benefits. The legume cover crop fixes nitrogen from the air as well as taking up residual nitrogen left over from the previous crop or a manure application.

Red clover can fix up to 40#/ac of Nitrogen on a well established 16" clover stand. Figure 2 shows the distribution of nitrogen in the biomass of red clover plants. For most red clover stands the more top growth produced, the more nitrogen fixation that will occur.

With a good catch of red clover there is additional erosion control from the time the wheat crop is harvested until the red clover is killed off. If the clover is killed or worked down in the spring, the clover will provide erosion control through the winter.

Legume cover crops are only 80 per cent as efficient as non-legume cover crops at accumulating nitrogen from the soil. However most of their accumulated nitrogen is from fixation. Precipitation, temperature, soil conditions, tillage, and climate will affect the amount of nitrogen accumulated in the growing season and subsequently the amount available to the following crop.

Figure 2. Nitrogen Distribution in Unharvested Red Clover Biomass





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The management of a red clover stand can be tailored to fit the following year's crop production plans. The timing of killing the cover crop can impact the timing of nitrogen release. Red clover has its nitrogen in the organic form and must be broken down by soil bacteria.

Delaying when the stand is killed off will not significantly affect the total nitrogen that the red clover has accumulated, however this will alter the pattern as to when the nitrogen becomes available. When the red clover is spring killed the nitrogen release pattern is governed by soil temperature and moisture. Warm moist conditions encourage a more rapid breakdown and release of mineralizable nitrogen. Using a pre-side dress nitrate test may assist in measuring the release of nitrate nitrogen. In a cool dry spring the release of nitrogen maybe delayed slightly. Red clover establishment decreases as nitrogen fertilizer rates and wheat yields increase due to the highly competitive performance of the wheat.

Research in Iowa shows there is a three fold reduction in the weed populations between wheat stubble that is under seeded with red clover compared to fields that are fallowed after harvest. Depending on your management system this could be a savings on mechanical or chemical weed control.

Thick stands of clover with a large amount of top growth while beneficial to soil building may have an increased risk of slug feeding damage to following crops.

Red clover that is under-seeded into wheat is most commonly applied by frost seeding with a broadcast spreader in March or April. This allows for multiple thaw/freeze events to occur as well as spring precipitation to increase the seed to soil contact. Most red clover is broadcast before the ground thaws however later seeding can still be accomplished but results may vary depending on precipitation.

Seed can be applied to snow cover provided the snow is not too deep and the soil is firm and level. Caution should be exercised not to get the seed on too early and having the red clover germinate and be killed off by a killing frost. Clover can tolerate temperatures down to -4°C.

Most commonly seven - ten pounds per acre is seeded to get an adequate establishment. Clover needs temperatures over 5°C for germination to occur. Seeding on frozen ground also reduces potential injury to the established wheat plants. Reduction in soil compaction is also a benefit when done on frozen ground.

There are two main types of red clover that are under-seeded into wheat in Ontario. Double cut and single cut. Double cut will have more aggressive top growth and therefore will fix more nitrogen. It will flower in the year of seeding and produces knee high vegetation after wheat harvest. Single cut will have more root development and less top growth in the seeding year and is a later flowering type that may not readily set seed in the first year. Single cut may be more beneficial for building soil structure.

As your planning for spring continues, let your local AGRIS or Wanstead branch know of your red clover requirements for your March spreading window.

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