

Using Cover Crops In Corn Silage Systems

With little residue left after harvest, fields harvested as corn silage pose some of the greatest risks for soil erosion and nutrient runoff as compared to fields grown to other forage crops, particularly perennials. Continuous cropping of corn grown for silage will often result in a reduction of soil organic matter and soil structure leading to increased compaction and runoff. These are important considerations for farms trying to meet nutrient management and conservation objectives as laid out in comprehensive nutrient management plans.

Erosion and Runoff Control - With little residue left after harvest, fields harvested as corn silage pose some of the greatest risks for soil erosion and nutrient runoff as compared to fields grown to other forage crops particularly perennials. Cover crops help protect the soil from intensive rainstorms and provide a physical barrier to runoff. Besides the actual benefit of saving soil, inclusion of cover crops can also provide some flexibility in crop rotation planning. There are times when the addition of a cover crop might allow a farmer to add another year of corn silage to the crop rotation and still meet conservation goals.

Nitrogen Management – With the high costs of N fertilizer, the use of cover crops to capture excess soil N in the fall making it available to the subsequent crop might be a viable management tool. The savings in N fertilizer could, at least, help offset the cost of the cover crop seed. I use the word “might” carefully here, because the actual N that will be captured will depend largely on time corn silage harvest, time of cover crop of seeding, and amount of cover crop growth both in the fall and spring.

The more growth produced by the cover crop, the higher the amount of N taken up; therefore, cover crops must be established as early as possible to produce good fall growth. In northern New York and Vermont, this would usually be in early to mid September. Killing or plowing down the cover crop in the spring when the crop is still relatively young (early May) is important for N availability. If they are killed late when the plant is in boot stage or later,



decomposition will be slower. If the C: N ratio is over 30, the dead cover may actually cause an increase in N requirement in the next crop because soil microbes need extra N to be able to decompose the high carbon residue.

Table 1. Some C:N ratios of cover crops at plow down.

<u>Organic material</u>	<u>C:N Ratio</u>
Young rye plants	14:1
Rye at mid-boot	40:1
Hairy vetch	10:1 to 15:1
Crimson clover	15:1
Corn stalks	60:1
Sawdust	250:1

(from 2005 Penn State Agronomy Guide)

N Fixation – Leguminous cover crops are often highlighted as a way to provide N to subsequent crops. However, in our region, there is just not enough time between silage harvesting and corn planting to get enough growth for adequate N fixation. The best (and perhaps only) way that leguminous cover crops could fix a significant amount of N in Northern New York and Vermont would be if it were allowed to grow as a fallow crop for a season.

Improving Soil Structure - Continuous cropping of corn grown for silage will often result in a reduction of soil organic matter and soil structure leading to increased compaction and runoff. The root biomass of cover crops, particularly grasses, hold soil particles together and create biopores in dense soil.

Organic molecules released when cover crops are plowed down improve soil structure. A cover crop with a low C:N ratio (Table 1) will increase soil aggregates more quickly but the effect is short lived. A cover crop with a high C:N ratio takes longer to decompose, but the effect on soil aggregation is longer term.

Weed Management – Cover crops growing in the off-season will do little to control weeds that directly compete with corn. Some cover crops such as rye, wheat, oats, hairy vetch and some brassica species can, when plowed down, produce allelochemicals that inhibit the germination and growth of some weeds; however, results have been too inconsistent and unreliable to be a dependable management option.

Cover Crop Establishment

An important criterion for erosion control during the fall season is the need for a quick and dense cover; therefore, fall cover crops need to be seeded early – at least by mid to late September. If planted later, there just will not be enough cover or growth to be effective. The most common time to seed cover crops is right after harvest. This means that the corn must be harvested in early September, so careful selection of early maturing corn hybrids is critical.

The most successful species to be seeded after corn silage harvest is cereal rye although winter wheat and triticale can also be used. Rye is the most vigorous of the winter cover crops. Established mid-September, rye can provide adequate cover in the fall and spring and can produce about 1000 lbs/A of dry matter by the first of May. In upstate NY and Vermont, legume cover crops have not been as successful when seeded in September. They establish slower and there is just not enough growth to provide neither adequate cover nor significant N fixation. With adequate moisture, rye can be successfully established with a broadcast spreader (in late August in the standing crop or after harvest) or an air seeder. If seeded directly on the ground, it may be necessary to use a higher seeding rate (2 – 3 bu/A). The most uniform stands result from either broadcast followed by a light harrowing or if drilled with a grain drill. In these cases the seeding rates can often be reduced to 1 ½ bu/A.

Establishment at Last Cultivation – Interseeding cover crops usually occurs at last cultivation time. Some farmers will combine cultivation, N sidedress and cover crop seeding all into one operation. Seeding earlier in the season allows growers to use a

wider variety of cover crop species including some legume cover crops. However, they must be shade tolerant. Winter rye, annual or perennial ryegrass, tall fescue, medium red clover, mammoth red clover, crimson clover, white clover and hairy vetch have all been successfully established in corn at last cultivation time (late June/early July). Winter wheat, oats, alfalfa, birdsfoot trefoil have not done as well.

The best time to interseed most cover crops is when the corn is between 6 and 24 inches tall. Cultivation is critical to assure good soil to seed contact. For large seeded cover like rye, the seed can be broadcast before cultivation. Smaller seeded legumes are best spread after cultivation. It is important to choose a herbicide program that is compatible with the cover crop. A short residual herbicide combined with a late as possible seeding can reduce the risk of herbicide injury. Using a Roundup Ready corn hybrid with glyphosate only is quite compatible since there is no residual activity.

Table 2. Seeding rate and approximate cost of cover crops.

Cover Crop	Seed Rate	Cost
	lbs/A	\$
<i>Grasses:</i>		
Winter Rye	90–120	\$8 – 10 /bu
Annual ryegrass	18–20	\$1 – 2 /lb.
Tall fescue	15-20	\$1 – 2 /lb.
<i>Legumes:</i>		
Medium red clover	10-12	\$1 – 2 /lb
Mammoth red clover	10-12	\$1 – 2 /lb
White clover	5-7	\$2.50 / lb
Crimson clover	15	\$1 – 2 /lb
<u>Hairy vetch</u>	<u>25</u>	<u>\$2 – 3 /lb</u>

Adapted from Mt. Pleasant, Ext. Series E93-5, Cornell University

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