Cover Crops as Forage

Integrating Winter Forage Cover Crops into North-Central Wisconsin Crop Production Systems

Contact:

Jason Cavadini — jason.cavadini@wisc.edu
University of Wisconsin Madison, Marshfield Agricultural Research Station

Collaborators:

Marshfield Agricultural Research Station

The Midwest Forage Association

In short…

- Triticale fall-planted as a cover crop can provide an ideal forage for livestock producers with its yield and quality potential.
- Soybean yield differences related to planting date and maturity are effected more by fall weather (length of season) than by the cover crop system.
- This system provides farmers with a unique opportunity to double-crop in the Upper Midwest and to implement conservation while improving profit, and could result in the increased adoption of cover crops on corn silage acres in North-Central WI.

What's the Question?

Can triticale harvested as a spring forage be used with a shorter day soybean without sacrificing soybean yield?

Why Does it Matter?

Adoption of the conservation practice of fall-planted cover crops has been slower in North-Central Wisconsin than in other parts of the Midwest. This is due largely to a small establishment window. A relatively short growing season bookended by typical wet spring soil and early fall frost leave many farmers questioning the feasibility of cover crops. Farmers are often skeptical of the value of a cover crop that does not appear to result in much fall growth. Furthermore, they do not want to risk further delaying planting with the additional management required by an actively growing cover crop in the spring. They often conclude that the cost and risk of growing cover crops outweighs the reward.

However, North-Central WI could tremendously benefit from fall-planted cover crops. The region is predominated by forage based dairy and livestock systems that rely heavily on alfalfa and corn silage rotations. The practice of corn silage results in the complete removal of biomass from thousands of acres in a relatively small window of time going into fall and winter. Those acres, when left uncovered, are sensitive to losses of sediment and nutrients especially during spring snowmelt periods. While waiting until after corn silage harvest may rule out many cover crop species, winter annual small grain cover crops such as triticale have proven to establish well when planted late in the fall.

when fall growth appears insignificant, triticale resumes growth in the spring and anchors soil and nutrients during the critical snowmelt periods. In addition to providing late-fall establishment opportunities, triticale also provides significant forage value in the spring. Triticale possesses desirable yield and quality characteristics when managed as a forage in the spring by mechanically harvesting or grazing. Furthermore, spring harvesting a triticale cover crop still leaves plenty of time for planting an annual crop such as soybeans.

Fall planted, spring harvested triticale can be viewed as a multi-functional cover crop for dairy and livestock operations. The cover crop can protect the soil, retain nutrients, build soil carbon, and provide forage value, all while allowing a unique opportunity to double-crop in a northern climate. More importantly, the multi-functional cover crop has the potential to improve farm profit. A cover crop practice that is feasible and lucrative will achieve conservation and profit simultaneously, and is the key to widespread adoption of cover crops.

What are the Results?

A fall planted, spring harvested cover crop system was put to the test in North-Central WI in 2015 and 2016 at the UW Marshfield Agricultural Research Station near Stratford, WI. Triticale was fall planted after corn silage harvest, and harvested the following spring prior to planting soybeans. This was termed the Trit-Chop-Soy (TCS) system, and was compared to a more conventional system where full season maturity soybeans were planted at a normal planting date with no previous cover crop.

Triticale was no-till drilled into corn silage residue around October 1 at a rate of 100 lbs/acre. The full season maturity soybeans (1.4 RM) were planted with a no-till drill at 15 in rows around May 15. The triticale in the TCS system was harvested at boot stage around June 1. After harvest, the short maturity soybeans (0.6 RM) were planted around June 3. Soybeans in both systems were planted at 135,000 seeds/acre, and were harvested around October 20.

Triticale forage consistently displayed good yield and quality characteristics (Table 1). However, the tradeoff between yield and quality was different each year. The triticale in spring of 2015 experienced an early thaw and re-freeze which caused stress to the crop and delayed maturity, while spring of 2016 provided ideal conditions which expedited maturity. Regardless of the differences, the results from two springs demonstrate that triticale is a resilient cover crop that has the potential of providing a very good quality feed.

Year	Yield (tons DM/A)	CP (%)	ADF (%)	NDF (%)	NDFD48 (%)	NFC (%)	TDN (%)	RFQ	Milk/ton (lbs)
2015	1.9	14.0	31.2	52.6	67.8	27.8	69.4	165	3476
2016	2.8	11.9	36.4	61.5	64.1	20.7	63.4	128	3014

Table 1. Triticale forage characteristics.

Establishing Crop Values

Respective values of triticale forage and soybean grain were determined according to their market value at the time of harvest. The forage value can be determined using either of several methods. The price often ends up being around $1.00 per point of RFQ; so forages with RFQ values of 165 and 128 could be valued at $165 and $128/ton DM respectively. The average values determined by UW Extension spreadsheets was $119 and $92/ton DM respectively. For the purposes of this experiment, the conservative values of $119 and $92/ton were used. The local market value of soybeans at the time of harvest was approximately $8.57/bu.

Subsequent Soybean Yields

In 2015 there were slight varietal differences between the full and short maturity soybeans early in the season, but by the end of the season there was no yield difference between the early and late soybeans (Table 2). This suggested that there were not adversarial effects of cover crops, short maturity, or late planting date in the TCS system. However, in 2016 there were yield differences for soybeans, suggesting that there is a potential for a negative response to planting date and maturity. Previous research in Wisconsin has found soybean yield losses of 0.4 bushels per acre per day when planting is delayed in May (Conley et al, 2012). The same report also noted that later maturities can increase yield, but only when the growing season is not shortened by frost. The killing frost in 2015 occurred on October 15 and limited any potential yield benefit of longer maturity. The killing frost in 2016 occurred nearly a month later, likely allowing the long maturity soybeans to fully express their yield potential. It is plausible to assume that under normal fall conditions, the yield would have been the same both years.

System	Type	2015 Yield (bu/ac)	2016 Yield (bu/A)
Trit-Chop-Soy	Short maturity	49	52
No Cover-Soy	Full season maturity	48	60

Table 2. Soybean yields by system and season.

The total cost of production for each system was estimated using values from the 2013 Wisconsin Custom Rate Guide. The final values for each system are listed in Table 3. The results exemplify how slight changes in crop yield and value can have a large impact on overall profitability, and therefore are very important considerations when making decisions for an operation. When there was no yield difference for soybeans, the spring harvested cover crop system was more profitable than the conventional system. However, when soybean yields and forage value were lower, the conventional system was more profitable.

There are a few assumptions behind the values in table 4. It was assumed that soybeans were sold for the market value at the time of harvest. It is not uncommon for soybeans to be contracted or stored in order to command a greater price than the harvest value. It was also assumed that the farmer would place a conservative value on the forage that they would feed. It is possible that a farmer could place a higher value on the feed or sell it at a higher price. There are also a few intangible values associated with the TCS system that must be considered as well. The TCS system also provides benefits to the soil as a cover crop, which the conventional system lacked; soil protection, nutrient retention, carbon inputs, etc. That system also possesses opportunity costs because at the end the farmer has forage to feed, while at the end of the conventional system the farmer still needs to purchase feed. Slight variations in any of these assumptions would have significant impacts on final profit.

System	2015 Profit ($/A)	2016 Profit ($/A)
Trit-Chop-Soy	$332	$353
No Cover-Soy	$229	$394

Table 3. Economic analysis by treatment using 2016 crop values.

What's the Status of the Research? Are There Updates?

The research ended in 2016. Triticale fall planted as a cover crop can provide an ideal forage for livestock producers with its yield and quality potential. Subsequent soybean yield differences related to planting date and maturity are effected more by fall weather (length of season) than by the cover crop system. The soybean yield was not effected in a normal fall with a normal frost date, but was effected in a fall with a late frost date. In the worst case scenario, the value of the triticale forage will help to offset some of the cost in the TCS system while providing all of the benefits of a cover crop. In the best case scenario, the value of the triticale forage will increase profit per acre in the TCS system. The profit potential takes much of the perceived risk out of growing cover crops in a northern climate. Overall, this system provides farmers with a unique opportunity to double-crop in the Upper Midwest and to implement conservation while improving profit, and could result in the increased adoption of cover crops on corn silage acres in North-Central WI.