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Livestock Research

Grazing Cover Crops on Corn Ground

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Cooperators:

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Web Link:

http://bit.ly/pfi_livestock

In a Nutshell

- Cover crops provide a high-quality and low-cost feed during times of low feed supplies.
- Beef graziers worked with neighboring row crop farmers to plant cover crops and monitored grazing value.
- Grazing cover crops extended the grazing time on crop stubble fields and reduced the amount of stored feeds required.

Key findings:

- Soil compaction was not increased following cattle grazing cover crops.
- Cover crops provide reasonably-priced forage for grazing livestock, protect the soil for crop farmers, and allow graziers to rest their pastures longer in the spring.

Project Timeline:

September 2013 - April 2014

Cover crops provide high-quality and low-cost feed for beef graziers with access to crop stubble fields.

Background

The single greatest cost of maintaining forage-based cattle over winter is the purchase of stored feeds (Miller et al. 2001). Previous research by Practical Farmers of Iowa and numerous studies at Iowa State University have worked to identify strategies to reduce this cost. These strategies include stockpiling forage for winter grazing, cornstalk grazing (often with some concentrate supplementation), and now, selecting forage species to allow for late fall and early spring grazing. With the rising interest and adoption of cover crops in Iowa, this is becoming a particularly attractive and feasible option. There are challenges however, as cover crop growth is not always guaranteed or easily predictable, and soil conditions in early spring may prohibit grazing to avoid soil damage for crops. In the fall of 2013, PFI farmer-cooperators agreed to document the planting of cover crops, and any subsequent grazing or harvest of the cover crop forage.

Materials and Methods

Bruce Carney raises grass- and corn-fed cattle at his family farm in Maxwell. He aerially seeded 49 ac of a willing neighbor's cornfields with VNS winter cereal rye in early Sept 2013. He then rotationally grazed those acres with his cattle the following spring, recording the number and weights of animals, and how long they grazed. Using a 1-ft2 quadrat, Bruce sampled aboveground cover crop biomass in the spring prior to grazing by clipping the forage within the square at ten randomly-selected locations. A subsample of forage was also submitted to Dairyland Labs (Arcadia, WI) for nutrient analysis. Before and after grazing, Bruce measured penetration resistance to determine soil compaction at eight randomly-selected locations, every three inches down to a depth of 24 in.

Animal weights and body condition scores (BCS) were recorded before grazing; however, since grazing was not for very long, no final weights or BCS were taken.

Results

VNS cereal rye was aerially seeded on the 49-ac field on Sept 4 2013, at a rate of 2 bu/ac. The entire field cost $2205 to seed:

- Seed cost: $14/bu x 2 bu/ac = $28/ac
- Aerial seeding cost: $17/ac
- Total cost: $45/ac, or $2205 for 49 ac.

Bruce clipped aboveground cover crop biomass samples on April 21 2014, before grazing. After being dried, biomass production per acre was calculated at 1460 lb DM/ac, or 0.73 ton DM/ac. At $45/ac to establish the cover crop, this forage essentially cost Bruce $61.66/ton DM to produce. In addition to being below the average cost of hay (up to $140/ton seen in early spring hay auctions [Barnhart 2014]), the cover crop provides benefits to the crop farmer and the soil, and allows Bruce to rest his pastures longer before initiating spring grazing.

A sample of forage was submitted for nutrient analysis (**Table 1**). The cereal rye was in a vegetative state and thus very high in crude protein (CP) concentration and digestibility (IVTDMD), while fiber (ADF and NDF) concentrations were low. The relative forage value (RFV) is an index comparing a sample to alfalfa: alfalfa is set at an RFV of 100, so forage with an RFV above 100 is considered of higher quality than alfalfa. This cover crop is a very high-quality feed and actually exceeds the nutrient requirements of the cattle grazing it.

Table 1

	Nutrient analysis of VNS winter cereal rye cover crop								
Nutrient	**CP (% DM)**	**ADF (% DM)**	**NDF (% DM)**	**lignin (% DM)**	**IVTDMD (% DM)**	**TDN (% DM)**	**NEg (Mcal/ cwt)**	**NEm (Mcal/cwt)**	**RFV**
Cover crop values	26.0	25.5	43.4	2.8	88.0	67.0	48.8	76.6	147.5

Bruce grazed the field in spring 2014, splitting it into an east and west half (24.5 ac each). Ideally he would have divided it into four or more paddocks, but limitations on the watering system prevented further division. A total of 184 cattle were grazed, equivalent to 170.3 animal units (AU, a 1000-lb animal equivalent).

Cattle were grazed on the field for a total of eight days, though they were not contiguous (**Table 2**). Bruce removed the cattle when it rained heavily, to prevent pugging of the field and reduce the risk of compaction. Animal unit days (AUD) were calculated by multiplying the number of AU by the number of days grazed. An AU consumes about 26 lb of forage dry matter (DM) each day, so the approximate amount of forage consumed can be calculated.

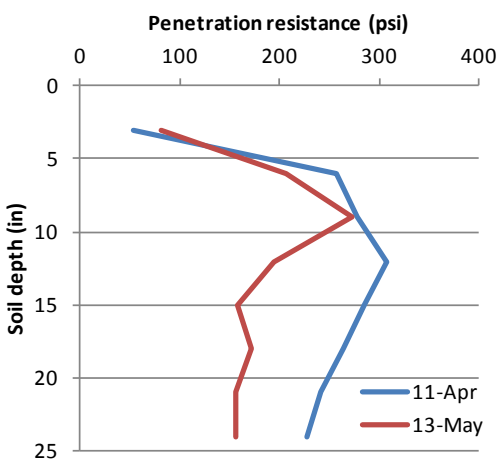
Table 2

	Paddock rotations, animal unit days (AUD), and estimated forage DM production of grazed cover crops.						
Paddock ID	**Size (ac)**	**Date in**	**Date out**	**Days grazed**	**Animal unit days (AUD)**	**Forage DM consumed (lb)**	**Forage DM consumed (lb/ac)**
west half	24.5	21-Apr	23-Apr	2	340.6	8855.6	361.5
east half	24.5	25-Apr	27-Apr	2	340.6	8855.6	361.5
west half	24.5	3-May	4-May	1	170.3	4427.8	180.7
east half	24.5	4-May	5-May	1	170.3	4427.8	180.7
all	49	5-May	7-May	2	340.6	8855.6	180.7
			TOTAL	8	1362.4	35422.4	1265.1

Recalling that the biomass clippings estimated 1460 lb DM/ac, the cattle consumed a high proportion of the forage. While cornstalks and some fallen corn were available, Bruce said the cows went after the lush green cover crop instead. "My [crop farmer] neighbor said jokingly that he didn't like the cover crop, because the cows didn't clean up the corn!" Bruce remarked. Volunteer corn was spread throughout the following crop of soybeans. Bruce hypothesizes that some light grazing in the fall, while the rye is small, might encourage the cows to eat more of the corn.

Crop farmers are often concerned that grazing livestock will compact the soil of their cropfields. Bruce sampled penetration resistance before and after cattle grazed the cropfield to see if this was true. Compaction increases with penetration resistance. Bruce's results, shown in **Figure 1**, demonstrate that at the very top of the soil, penetration resistance is slightly increased following grazing (from 53 to 81 psi). This is not significant in terms of fieldwork or crop root growth. At all other depths, the compaction following grazing was less than that before grazing. Less compaction later in the spring could also be attributed to cover crop root growth (Williams and Weil, 2004).

Figure 1



Conclusions and Next Steps

Bruce hopes to plant cover crops and graze again on his neighbor's ground. He is working to demonstrate that livestock and crops can coexist and benefit one another. He also hopes to convert his neighbor to no-till or reduced-till management of his cropfields. On his own pastures, Bruce has worked with interseeding cover crops and various annuals to boost pasture productivity and diversity.

References

Barnhart, S. K. 2014. Mid- to Late-January, 2014 Hay Price Update. Iowa State University Extension. http://www.extension.iastate.edu/taylor/news/mid-late-january-2014-hay-price-update

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Williams, S. and R. Weil. 2004. Cover crop root channels may alleviate soil compaction effects on soybean crop. Soil Sci. Soc. Am. J. 68:1403:1409.

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