Extending the Grazing Season With Corn Residue and Cover Crop

Stephanie Becker[1], Michael Undi[1], Ryan Odenbach[2] and Hal Weiser[3]

[1]Central Grasslands Research Extension Center- NDSU, Streeter
[2]Stutsman County Soil Conservation District, Jamestown, N.D.
[3]Natural Resources Conservation Service, Jamestown, N.D.

Methods of supplementing grazing cattle in winter should aim to reduce winter feed costs, which are the single highest annual cost in a cow-calf operation. Methods that eliminate pasture visits in winter can reduce labor and fuel costs. This four-year study will evaluate methods of supplementing cows grazing corn residue.

Summary

The study evaluates the performance of cows grazing corn residue alone, corn residue plus protein/energy tubs, and corn residue plus cover crop. The cover crop was established successfully in 2016, the first year of this project. While the corn residue/cover crop biomass was sufficient to graze beef cows, the grazing study was abandoned due to a blizzard.

Introduction

The abundance of corn residue in North Dakota gives beef producers a readily available feed resource to graze cattle in winter. Corn residue is a poor-quality feed, low in protein and minerals, and with limited feed intake and digestion when fed as a sole feed. The nutrient supply to cows grazing corn residue can be improved by targeted supplementation.

Supplementation methods that reduce labor and fuel costs by eliminating pasture visits are of interest to beef producers. Providing grazing animals with feeds that possess complementary characteristics can eliminate pasture visits.

Poor-quality/good-quality feed combinations such as corn residue and alfalfa hay (Klopfenstein and Owen 1981) or corn residue and creeping forage legumes (Undi et al. 2001) have been shown to improve performance in beef cattle (Klopfenstein and Owen 1981) and sheep (Undi et al. 2001). Cover crops intercropped into corn can be grazed in combination with corn residue after corn harvest.

The benefits of cover crops in improving cropping systems and agricultural sustainability are well-documented (Magdoff and van Es 2009; Blanco-Canqui et al. 2012; Wortman et al. 2012). Cover crops increase soil organic matter, reduce soil erosion, improve soil physical and biological properties, increase nutrient cycling, suppress weeds, improve soil water availability, supply nutrients to the following crop and break pest cycles (Magdoff and van Es 2009; Blanco-Canqui et al. 2012; Wortman et al. 2012). Some cover crops are able to break into compacted soil layers, allowing the following crop's roots to develop more fully (Magdoff and van Es 2009).

An additional benefit of cover crops, which normally receives the least consideration, is the importance of cover crops as a source of livestock feed. For poor-quality feeds such as corn residue, cover crops will improve animal performance by supplying nutrients that are low in residue because intercropping corn residue with forage legumes will improve corn residue quantity and quality (Alford et al. 2003).

This study will evaluate methods of supplementing cows that graze corn residue for part of the winter. Methods being evaluated include the use of protein/energy tubs and cover crops as supplements.

Procedures

This study is being conducted on a 90-acre field planted to corn. The field has been divided into nine 10-acre paddocks to examine the following supplementation strategies: a) grazing corn residue (control), b) corn residue plus protein/energy tubs and c) corn residue plus cover crop.

In the first year, a cool-season cover crop (triticale, winter rye, oats, peas, yellow clover, crimson clover and brassicas) was intercropped at 38 pounds/acre into standing corn at the


Michael Undi

V6 to V7 stage. The cover crop was established successfully and monitored throughout the growing season. Each component of the corn residue and individual crop in the cover crop mixture was sampled for nutrient composition.

The grazing portion of this study due to start after the corn harvest was terminated due to a series of blizzards in December. The study will be continued to assess cow performance, impacts on soil health and the economics of corn residue grazing and supplementation.

Results

Intercropping a cover crop into corn did not influence the corn yield; the yield averaged 43.7 ± 1.7 and 45.8 ± 1.7 bushels/acre for corn and corn-cover crop plots, respectively. The nutrient composition of corn residue is shown in Table 1.

Components with the highest nutrient content are the grain and the leaf. The husk is low in protein but has a good energy profile, while the cob is poor in protein and energy. The nutrient composition of the cover crop is shown in Table 2 (next page). All cover crops have high crude protein (CP) content, but rapeseed and radish have extremely low dry-matter content.

Discussion

The cover crop was established successfully and monitored throughout the growing season. At the end of corn harvest, the corn residue/cover crop biomass was sufficient to graze

beef cows. Planting a cover crop when the corn was well-established minimized competition for nutrients; hence, intercropping did not impact corn yield negatively.

In cereal-legume mixes, agronomic features such as fertilizer application, sowing time and the proportion of crop mixture are basic determinants of competition among component crops (Belel et al. 2014). Where constituent crops are arranged in rows, the degree of competition is determined by the comparative growth rates, growth duration and proximity of roots of the diverse crops (Belel et al. 2014).

The cereal component in a cereal-legume intercrop has a faster growth rate, a height advantage and a more widespread rooting system that gives it an upper hand in competition

Table 1. Nutrient composition in percent of dry matter (%DM) of whole corn and corn residue components.

			Component				
	Whole plant	Residue[1]	Grain	Leaf	Husk	Cob	Stalk
CP[2]	9.0	3.0	10.3	9.2	5.7	3.6	3.5
TDN	76	57	90	56	62	15	50
NDF	35.1	75.1	7.9	70.5	75.3	87.7	81.0
ADF	18.9	44.8	1.7	45.8	36.5	44.0	53.9
Ca	0.2	0.1	0.04	0.7	0.2	0.07	0.2
P	0.2	0.05	0.2	0.1	0.2	0.04	0.07
K	0.5	0.6	0.2	1.0	1.1	0.34	1.4
Mg	0.2	0.2	0.1	0.3	0.2	0.05	0.2
S	0.1	0.04	0.1	0.1	0.02	0.03	0.04

[1] Whole plant minus grain

[2] Crude protein (CP), total digestible nutrients (TDN), neutral detergent fiber (NDF), acid detergent fiber (ADF), calcium

Table 2. Nutrient composition of individual crops in the cover crop mix.

	Rapeseed	Radish	Winter peas	Oats	Winter rye	Triticale
DM[1], %	17	9	63	79	67	66
Nutrient composition (% of DM)						
CP	21.8	20.1	18.5	10.3	10.9	11.0
TDN	75	73	61	60	61	64
NDF	18.0	25.1	38.0	62.6	56.4	49.2
ADF	16.5	20.2	35.7	37.2	35.7	32.2
Ca	1.6	1.5	2.1	0.3	0.2	0.2
P	0.4	0.4	0.4	0.3	0.3	0.3
K	2.9	3.9	2.9	1.6	1.1	1.1
Mg	0.3	0.3	0.4	0.2	0.1	0.1
S	0.5	0.4	0.6	0.1	0.1	0.1

[1] Dry matter (DM), crude protein (CP), total digestible nutrients (TDN), neutral detergent fiber (NDF), acid detergent fiber (ADF), calcium (Ca), phosphorus (P), potassium (K), magnesium (Mg) and

with associated legumes (Belel et al. 2014). Other studies have reported that intercropping corn with red clover and ryegrass (Scott et al. 1987) or red clover and vetch (Baributsa et al. 2008) does not impact corn yield negatively.

This year, the first year of the study, was marked by three blizzards that led to huge snow accumulations. As a result, the grazing study failed to take off. The study will continue for three more years.

Acknowledgments

We thank Dwight Schmidt and Rodney Schmidt for technical assistance.

Literature Cited

Alford, C.M., Krall, J.M., and Miller, S.D. 2003. Intercropping irrigated corn with annual legumes for fall forage in the High Plains. Agron. J. 95: 520-525.

Baributsa, D.N., Foster, E.F.F., Thelen, K.D., Kravchenko, A.N., Mutch, D.R., and Ngouajio, M. 2008. Corn and cover crop response to corn density in an interseeding system. Agron. J. 100: 981-987.

Belel, M.D., Halim, R.A., Rafii, M.Y., and Saud, H.M. 2014. Intercropping of corn with some selected legumes for improved forage production: A Review. J. Agric. Sci. 6 (3): 48-62.

Blanco-Canqui, H., Claassen, M.M., and Presley, D.R. 2012. Summer cover crops fix nitrogen, increase crop yield and improve soil–crop relationships. Agron. J. 104: 137-147.

Klopfenstein, T., and Owen, F.G. 1981. Value and potential use of crop residues and by-products in dairy rations. J. Dairy Sci. 64: 1250-1268.

Magdoff, F., and van Es, H. 2009. Building soils for better crops: Sustainable soil management. 3rd ed. Handbook Series Book 10. Sustainable Agriculture Research and Education (SARE).

Scott, T.W., Mt. Pleasant, J., Burt, R.F., and Otis, D.J. 1987. Contributions of ground cover, dry matter, and nitrogen from intercrops and cover crops in a corn polyculture system. Agron. J. 79: 792-798.

Undi, M., Kawonga, K.C., and Musendo, R.M. 2001. Nutritive value of maize stover/pasture legume mixtures as dry season feed for sheep. Small Rum. Res. 40: 261-267.

Wortman, S.E., Francis, C.A., and Lindquist, J.L. 2012. Cover crop mixtures for the Western Corn Belt: Opportunities for increased productivity and stability. Agron. J. 104: 699-705.