

# Enhancing the Value of Cover Crops through Utilization by Beef Stocker Cattle: Progress Report (Year 2)

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### Introduction

Cover crops are an important component of the Iowa Nutrient Reduction Strategy to improve Iowa's water quality. To meet the goal of a 45 percent reduction in the total nitrogen and phosphorus loads, it is estimated the total number of acres planted to cover crops will need to be at a minimum of four million acres or equivalent to about 20 percent of Iowa's row crop acres. This implies millions of acres may be seasonally available for grazing.

Although the benefits of improved soil health and nutrient retention through cover crops are well known, limited data is available on utilization by beef cattle. Therefore, a study was designed to measure cattle performance while spring grazing cereal rye and to evaluate the impact grazing had on the soil profile.

Most of the limited research conducted on cover crop grazing has focused on integrating cover crops into row crop systems that cow-calf producers already raise. However, many Iowa row crop producers do not have a cattle enterprise. Stocker cattle may be an opportunity to utilize a cover crop grazing system that allows cattle to be bought and sold based on forage availability. It is important for livestock producers to check for crop

rotational restrictions on labels of pesticides used during the growing season as well as grazing restrictions if they intend to use the cover crop as a forage source.

Because many variables impact the successful integration of cover crops and livestock into row crops, this is a four-year study summarizing data from year two.

### Materials and Methods

Approximately 140 acres of crop ground were planted to cereal rye in the fall of 2016 at three ISU research farms varying in soil type: Allee Memorial Demonstration Farm, Newell; McNay Memorial Research and Demonstration Farm, Chariton; and Western Research and Demonstration Farm, Castana. Soil bulk density measures were taken following cash crop harvesting prior to cover crop seeding and in the spring, pre- and post-cattle grazing. Within each field, three treatments were applied: grazed cover crop, ungrazed cover crop, and no cover crop.

Forage biomass yield and nutritional quality also were measured pre- and post-grazing. All cattle were sourced from the ISU McNay Angus herd. Individual body weights were collected prior to rye turn out and after removal from the rye to determine average daily gain. All animals were drylotted overnight to account for gut fill differences before weighing.

At the Allee Farm, 31 fall-born heifers grazed 15 acres of cereal rye, and 31 fall-born steers grazed another 15 acres. At the Western Farm, 40 yearling heifers grazed 32 acres. At the McNay Farm, 80 replacement heifers grazed 42 acres of cereal rye. The goal was to achieve a stocking density of 2 hd/acre, but cattle numbers and forage availability dictated

stocking rates, with stocking densities ranging from 1.25 to 2.1 hd/acre.

Calves at Allee and Western were implanted the day of turnout with Revalor-G (Merck Animal Health). Due to high moisture content of the forage, cattle were supplemented with a distillers grain and soyhull-based supplement at 0.5 percent of body weight (BW).

### **Results and Discussion**

As expected, nutrient analysis of cereal rye varied greatly across farms and by month of production. Table 1 summarizes the average value of the cereal rye based on the month of sampling. Overall, dry matter of the cereal rye averaged 21 percent, indicating the forage is very high in moisture and may limit dry matter intake.

Cattle performance and grazing days are summarized in Table 2. For the fall-born calves at Allee (466 lb average initial BW), average daily gain was 1.48 lb/day, whereas, heavier spring-born heifers at Western (657 lb at study initiation) averaged 1.69 lb/day. Replacement heifers grazing at McNay averaged 3.10 lb/day. Differences in cattle size and ability to consume high moisture forage based on rumen size, as well as forage yield, may have contributed to the differences in gain.

Soil bulk density data were collected as a way to measure compaction (Table 3). Looking at the bulk density results and the soil texture of the field, the bulk density results still fall within the range of bulk densities considered ideal (less than 1.40 g/cm<sup>3</sup>) for plant growth, according to Natural Resource Conservation Services' general relationships with soil texture (silty loam or silty clay loam) and bulk densities. Bulk densities that negatively affect root growth would be 1.55 g/cm<sup>3</sup> or greater.

Soil moisture is another aspect that can affect compaction. Soil moisture data was gathered from the weather stations located on the farms during the time of grazing. During the time of grazing, soil moisture at Allee and McNay was at or above field capacity. At Western, the soils are well drained and the soil moisture was below field capacity during grazing.

Additional data will be collected for another two years and will be included in a final report. Ultimately, the synergy of cattle and cover crops added to row crop production across the state has the potential to increase producer profitability while improving the environment and water quality in Iowa.

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**Table 1. Nutrient analysis of cereal rye based on month of sampling.**

Month <sup>1</sup>	DM <sup>2</sup> , %	CP <sup>3</sup> , %	ADF <sup>4</sup> , %	NDF <sup>5</sup> , %	TDN <sup>6</sup> , %
March	31.5	18.8	28.3	30.1	66.8
April	19.8	22.0	21.6	34.1	72.0
May	19.4	21.0	25.3	37.9	62.8

<sup>1</sup>March, *n* = 5 samples; April, *n* = 34 samples, May; *n* = 13 samples.

<sup>2</sup>Dry matter.

<sup>3</sup>Crude protein.

<sup>4</sup>Acid detergent fiber.

<sup>5</sup>Neutral detergent fiber.

<sup>6</sup>Total digestible nutrients (calculated).

**Table 2. Cattle performance while grazing cereal rye.**

Farm	Sex	Initial BW <sup>1</sup>	Final BW <sup>1</sup>	Days grazed	Average daily gain	Cattle turnout date	Cattle removal date
Allee	steers	485	526	27	1.52	4/4/17	5/1/17
Allee	heifers	447	485	27	1.42	4/4/17	5/1/17
Western	heifers	657	685	20	1.69	4/28/17	5/18/17
McNay	heifers	712	795	26	3.10	4/13/17	5/9/17

<sup>1</sup> Body weight; 4% shrink was applied to all body weights.

**Table 3. Soil bulk density measurements in g/cm<sup>3</sup>.**

Farm	Sampling depth, in.	Fall baseline <sup>1</sup>	Spring pre grazing <sup>2</sup>	Spring post grazing	Spring cover crop not grazed	Spring no cover crop
Western	0-6	1.39	1.27	1.37	1.34	1.33
Western	6-12	1.35	1.31	1.34	1.31	1.31
McNay	0-6	1.42	1.37	1.32	1.33	1.45
McNay	6-12	1.45	1.43	1.31	1.27	1.18

<sup>1</sup>Fall baseline is the field average bulk density.

<sup>2</sup>Spring pre-grazing is an average of grazed and non-grazed cover crop area.