Utilizing annual forages in single- and dual-crop systems for late-fall and early winter grazing: Impacts on cattle performance and economics

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The objective of this research was to evaluate the economic potential of using annual forages to extend the grazing season into fall and early winter months in North Dakota. Choosing a grazing strategy that promotes long-term soil health is likely to increase the cost effectiveness of winter grazing programs.

Summary

Annual forages planted in late summer can provide an early winter grazing option to complement grazing rangeland. Cocktail mixtures can include crops such as foxtail millet, sorghum-sudangrass, turnips and legumes that can provide high-quality forage and serve as cover crops. The selection of species within a mixture offers producers the opportunity to minimize costs associated with production. During 2012 and 2013, this study tested three grazing treatments on two cropping systems. A single-crop (annual cocktail forage crop) and a dual-crop (cereal crop/annual cocktail forage crop) system were subjected to the following treatments: 1) full use, 2) 50 percent degree of disappearance and 3) no use. Cattle fed in a drylot served as a control. Soil health, forage production and quality, and beef cattle performance were monitored for two years. Analysis of soil health and forage production and quality is under review and results will be integrated at a later date. The costs associated with the cocktail mixture varied by $1.06/acre between the two years. On average, cattle performance was poorest on the full-use cocktail forage crop, although all systems provided an increased final body condition score (BCS) and average daily gain (ADG) in all years. In 2012, the greatest return/head and return/acre were experienced with full use of the dual-crop system.

Introduction

Reducing costs associated with production is a common goal among livestock producers. Research has demonstrated that extending the grazing season has the ability to reduce feed costs, thereby lowering the total costs associated with production (D'Souza et al., 1990; Adams et al., 1994). Utilizing stockpiled perennial forages decreases the amount of hay needed to maintain body condition (Hitz and Russell, 1998).

Another alternative to extend the grazing season into the fall and early winter months is through the integration of annual forages. Annual forages can provide high-quality feed late into the grazing season. The objective of this study was to determine the effects of a cocktail forage mix on animal performance, economic returns and soil health as affected by three different grazing strategies.

Experimental Procedures

Using a split-plot, randomized block design, one half of each paddock was dedicated for an annual cocktail forage crop (single-crop system) while the other half (dual-crop system) was planted to the annual cash crop: barley in 2012 and oats and peas in 2013.

In 2012, barley was seeded in mid-May at a rate of 100 pounds/acre. After seeding, fertilizer was applied to achieve 50 pounds/acre of nitrogen using urea. The annual crop of oats and field peas, established in 2013, followed a similar protocol but was seeded at a rate of 50 pounds/acre for each species.

Soil samples were collected to analyze the biological, chemical and physical attributes of the soil. Clipping for peak biomass production occurred 60 to 80 days after seeding.

In 2012 and 2013, the single- and dual-crop portions were seeded to the annual cocktail forage crop in mid-July. Seeding rates for the cocktail mix were 15, 10, 4, 1.5, 1 and 0.75 pounds/acre for oats, field peas, sorghum-sudangrass, sunflower, radish and turnip, respectively. In 2013, due to the unavailability of seed, sorghum-sudangrass was not included in the cocktail mix and was replaced by two varieties of foxtail millet (German and Siberian) seeded at a rate of 4 pounds/acre. In mid-August, soil samples again were collected to examine soil health.

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Each year, midgestation Angus-Simmental crossbred beef cows were assigned to graze paddocks from mid-October to late November or early December. The grazing treatments were: 1) full use, 2) 50 percent degree of disappearance 3) and no use. At the beginning and end of the trial, two-day body weight (BW) and BCS were collected.

Economic Analysis

Costs associated with production for the 2012 cocktail mix were 25 cents, 44 cents, 70 cents, 30 cents, $2 and $2.85 per pound for oats, field peas, sorghum-sudangrass, sunflower, radish and turnip, respectively. This resulted in a total seed cost per acre of $15.54. Other input costs for 2012 included $7.15, $21.20, $4.25 and $6.63 per acre for grain seed, fertilizer (barley), herbicide (barley) and herbicide (fallow), respectively.

Custom rates were $14.97, $11.93, $5, $25.82 and $44.10 per acre for seeding/fertilizer application, seeding, spray application, combining and cropland rental costs, respectively. Yardage and delivery costs for 2012 were estimated at 40cents/head.

In 2013, costs associated with the production of the cocktail mix were 25 cents, 52 cents, 84 cents, 40 cents, $2 and $2.25 per pound for oats, field peas, foxtail millet, sunflower, radish and turnip, respectively. This resulted in a total seed cost per acre of $16.60. Other input costs for 2013 included $14.56, $4.25 and $6.63 per acre for grain seed, herbicide (oats and peas) and herbicide (fallow), respectively.

Results and Discussion

On average, cattle performance was poorest on the full-use cocktail crop, although all systems provided neutral or increased final BCS and ADG in all years (Table1). In 2012, the full-use dual-cropping system provided the lowest cost per head to feed the cattle, followed by the full-use single-cropping system and drylot (Table 2). The full-use dual-cropping system and drylot system showed the highest return per head. The 50 percent single-cropping system was not cost effective in 2012, with a loss of $36.46 per head. Overall, the full-use dual-cropping system provided the greatest return per acre, compared with all grazing treatments in 2012 (Table 3).

Table 1. Heifer average daily gain (ADG) and body condition score (BCS) using a drylot feeding system, 50 percent use of cocktail cover crop and full use of cocktail cover crop at the Central Grassland Research Extension Center in 2012 and 2013.

Year	Drylot	50% Use of Cocktail Crop	Full Use of Cocktail Crop
2012			
ADG (lb/d)	2.90	2.43	2.02
Initial BCS	5.2	5.3	5.4
Final BCS	5.6	5.6	5.4
2013			
ADG (lb/d)	2.80	1.30	0.70
Initial BCS	5.2	5.3	5.3
Final BCS	5.7	5.6	5.5

Table 2. Number of heifers grazed, cost per head per day (cost/hd/d) and return per head (hd) by treatment at Central Grasslands Research Extension Center in 2012 and 2013.

Treatment[1]	No. of Head	Cost/hd/d	Return/hd
2012			
Full use – single crop	21.5	$1.92	$24.00
Full use – dual crop	14.5	$0.89	$56.96
50% degree of disappearance – single crop	9.5	$4.35	($36.46)[2]
50% degree of disappearance – dual crop	5.5	$2.34	$27.84
Drylot	39.0	$2.13	$54.40
2013			
Full use – single crop	24.0	n/a	n/a
Full use – dual crop	13.0	n/a	n/a
50% degree of disappearance –single crop	3.0	n/a	n/a
50% degree of disappearance – dual crop	1.0	n/a	n/a
Drylot	39.0	n/a	n/a

[1]Each treatment averaged 22.5 acres
[2]Parenthesis indicate negative value

Table 3. Overall return per acre by treatment at the Central Grasslands Research Extension Center in 2012 and 2013.

Treatment	Return/ac
2012	
Full use – dual crop	$60.08
50% degree of disappearance – dual crop	$30.28
Full use – single crop	$22.56
No grazing – dual crop	($3.87)[1]
50% degree of disappearance – single crop	($14.21)[1]
No grazing – single crop	($88.20)[1]
2013	
Full use – dual crop	n/a
50% degree of disappearance –dual crop	n/a
Full use – single crop	n/a
No grazing – dual crop	n/a
50% degree of disappearance – single crop	n/a
No grazing – single crop	n/a

[1]Parenthesis indicate negative value

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