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Effects of Grazing Corn Stalks in the Spring on Subsequent Crop Yields

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Grazing corn residue in spring improves soybean yields. Subsequent corn yields may be reduced at stocking rates of .32 acres per calf (2.5 times normal) for 60 days.

Summary

Two studies evaluated impact of grazing corn residue during the spring on subsequent soybean yields in a corn-soybean rotation. Each study was conducted for two consecutive years. Tillage treatments consisting of ridge-till, fall-till, spring-till, and no-till were also evaluated to determine if yields could be maintained by alleviating compaction from grazing in the spring. No significant differences in yield with tillage treatment and grazing were observed. Grazing treatments overall increased soybean yields in both studies. In the second study only a depression in subsequent corn yield was noted with spring grazing at stocking rate of .32 acres/calf for 60 days.

Introduction

In Nebraska, corn residue grazing generally occurs from November to February. Previous research has shown that grazing corn residue during this time does not impact subsequent crop yields of corn or soybeans (*2001 Nebraska Beef Report, pp. 43-45*). Presumably no effect is observed, because cattle are maintained in crop fields when the ground is frozen.

Producers require both holding areas and feed sources for cattle from February until pastures are available in late April. Some producers may use spring grazing areas as holding or calving pens where stocking rates are greater than .8 acres per calf. Fields generally are wet and not frozen from February to April. Therefore, compaction from cattle may cause yield losses in subsequent crops. The hypothesis was spring grazing will interact with tillage. When grazing caused surface compaction, we hypothesized that tillage would offset the compaction and maintain yield. The objective of this research was to evaluate the impact of grazing corn residue from late February until late April on subsequent crop yields in a corn-soybean rotation with ridge-till, fall-till, spring-till and no-till cropping systems.

Procedure

In 1997, a 90-acre field (silty clay loam, 2 to 2.5% OM) was identified. The field was split into quarters with ungrazed check strips replicated across each quarter. Crop production was based on an annual corn-soybean rotation with one-half of the field planted to each crop. The field was irrigated by a linear-move (2425 feet width) irrigation system (Valmont, Valley, Neb.) and the grazing areas replicated within each half grown to corn for grazing experiments. The first grazing trial was conducted from Feb. 25 until April 14, 1998 (48 days) and from March 1 until April 26, 1999 (56 days). Animals were fed supplement daily at 1.5 lb per calf per day. Calf stocking rate was .8 acres per calf for 60 days. The stocking rate was based on average stocking rates to optimize animal performance. With this in mind the second two-year grazing trial was conducted from Feb. 4 until April 19 in 2000 (75 days) and from Feb. 21 until May 1, 2001 (68 days). Stocking rate was increased 2.5 times to .32 acres per calf for 60 days. Animals were fed supplement daily consisting of 1 lb protein supplement and 5 lb dry rolled corn per calf per day, to maintain calf gain throughout the grazing period.

Tillage treatments included ridge-tilling during the summer, no-tillage, fall tillage with a chisel followed by conventional tillage (disk) in the spring, or spring conventional tillage alone. All tillage treatments were conducted during the corn rotation with no tillage following the soybean crop. Grazed and ungrazed treatments were superimposed on tillage treatments. The no-till, ridge-till and spring-till treatments each contained a grazed and ungrazed section. Treatments were applied to an eight-row strip and grazing treatments managed with electric wires.

At soybean harvest, the middle six rows were harvested out of the 8-row strip to maintain one border row on each side and eliminate effects from grazing pressure and fences. After each individual replication (eight replications per treatment; seven treatments) was harvested, total grain weight was recorded using a weigh wagon. Samples were collected following the grain weight measurement to determine DM and DM yield. Corn harvest (1999, 2000, and 2001) was conducted on all eight rows included in the replication. Weighing and sampling was performed similar to soybeans except a 550 bu grain cart with load cells was used for weighing.

Results

Trial 1

Calf performance was variable across years (Table 1). In 1998, calves gained 2.12 lb per day. In 1999, ADG was significantly less and calves just maintained weight during the 56 days (ADG = -0.1 lb per day). Gain differences across years may be explained by residual corn grain in fields. In 1998, residual grain estimation from surrounding fields suggested an average of 15 bu of corn grain per acre was available to calves. In 1999, no corn grain was available based on residual grain measurements.

Soybean yields the following fall after spring grazing showed a trend for main effect of treatments (P = 0.14). Soybean yields showed no difference

Table 1. Performance of calves grazing corn residue in the spring (Trial 1).[a]

	Year[b]		
Item	1998	1999	SE
Initial weight, lb	611	688	17.4
Final weight, lb	714	683	18.0
ADG, lb	2.1	-.1	.13

[a]Stocking rates were .8 acre per calf for 60 days
[b]Significant year effect was observed for initial weight and ADG (P < 0.05).

Table 2. Grazing and tillage impacts on soybean and corn yields in Trial 1.

		Soybean yield (bu/acre)		Corn yield (bu/acre)[a]	
Contrast	Treatment[b]	P-value	Means	P-value	Means
Grazed vs Ungrazed	1,2,7 vs 3,4,5,6	.40	45.7 vs 45.0	.45	212.4 vs 214.3
Ridge vs No-till	6,7 vs 1,5	.39	46.4 vs 45.7	.61	213.5 vs 211.8
Spring-till vs No-till	2,3 vs 1,5	.15	44.6 vs 45.7	.41	214.6 vs 211.8
Fall-till vs No-till	4 vs 1,5	.38	44.9 vs 45.7	.49	214.6 vs 211.8
Ridge GR vs Ridge UG	7 vs 6	.14	47.2 vs 45.6	.64	212.4 vs 214.5
No-till GR vs No-till UG	1 vs 5	.55	46.0 vs 45.4	.57	210.5 vs 213.1

[a]Corn yield the second year post grazing.
[b] Treatment numbers are: 1=No-till grazed (GR), 2=Spring till grazed, 3=Spring till ungrazed, 4=Fall/Spring ungrazed, 5=No-till ungrazed (UG), 6=Ridge-till ungrazed (UG), and 7=Ridge-till grazed (GR).

Table 3.Performance of calves grazing corn residue in the spring (Trial 2).[a]

	Year		
Item	2000	2001	SE
Initial weight, lb	677	671	4.4
Final weight, lb	775	746	10.1
ADG, lb	1.3	1.1	.11

[a]Stocking rates were .32 acre per calf for 60 days

Table 4.Grazing and tillage impacts on soybean and corn yields in Trial 2.

		Soybean yield (bu/acre)		Corn yield (bu/acre)[a]	
Contrast	Treatment[b]	P-value	Means	P-value	Means
Grazed vs Ungrazed	1,2,7 vs 3,4,5,6	.01	65.3 vs 63.8	.11	210.0 vs 212.3
Ridge vs No-till	6,7 vs 1,5	.01	65.9 vs 63.3	.36	213.8 vs 211.5
Spring-till vs No-till	2,3 vs 1,5	.45	64.0 vs 63.3	.32	208.9 vs 211.5
Fall-till vs No-till	4 vs 1,5	.69	63.7 vs 63.3	.34	214.5 vs 211.5
Ridge GR vs Ridge UG	7 vs 6	.15	66.9 vs 65.0	.79	213.3 vs 214.3
No-till GR vs No-till UG	1 vs 5	.07	64.5 vs 62.0	.05	207.9 vs 215.1

[a]Corn yield the second year post grazing.
[b] Treatment numbers are: 1=No-till grazed (GR), 2=Spring till grazed, 3=Spring till ungrazed, 4=Fall/Spring ungrazed, 5=No-till ungrazed (UG), 6=Ridge-till ungrazed (UG), and 7=Ridge-till grazed (GR).

between grazed and ungrazed treatments. Spring and fall tillage treatments had no effect on soybean yield when compared to the no-till treatments. Yield on the ridge-till grazed treatment tended to be greater than the ridge-till ungrazed treatment (P < 0.15). Table 2 illustrates contrasts used and statistics for soybean and corn yields. Spring grazing did not depress soybean yields the following season as was our original hypothesis. Our hypothesis was that yields would potentially be depressed, but tillage treatments might help alleviate yield depressions due to soil compaction from spring grazing. Based on the results of Trial 1, spring and fall tillage caused a depression in yield relative to ridge-till and no-till grazed treatments. Corn yields two years post grazing showed no significant differences in treatments.

Trial 2

Calf performance was not different across year in Trial 2. In 2000 calves gained 1.3 lb/day and in 2001, calves gained 1.1 lb/day (Table 3). The more uniform performance with increased stocking rate may have been the result of the additional corn fed to maintain performance.

Soybean yields showed a significant effect of treatment (P = 0.028). Overall grazing improved soybean yields over ungrazed treatments (P = 0.015) and included significant improvement in yield in no-till grazed over no-till ungrazed treatments. Spring and fall tillage had no effect on soybean yield when compared to no-till treatments. Table 4 illustrates contrasts used and statistics for soybeans and corn.

Corn yields the second year after grazing in Trial 2 showed a depression in yield with the 2.5 times normal grazing treatment. There was a trend (P =0 .11) for grazing to reduce corn yields when compared to the ungrazed treatments. The no-tillage grazed treatment showed a significant depression in yield compared to no-tillage ungrazed treatment (P = 0.05). The ridge-till grazed treatment showed no difference when compared to ridge-till ungrazed treatment (P = 0.79). This suggests that grazing of ridge-till stalks in the spring is not detrimental to subsequent corn yields. Also, tillage treatments may alleviate any effects on corn yields two years following grazing.

In summary, spring corn residue grazing appears to have no detrimental impacts on subsequent soybean yields. With 2.5 times normal stocking rate soybean yields actually improved with grazing. The corn yields two years post grazing showed a depression in yield. However, this yield depression was related to the tillage system. Any depression in corn yields with higher stocking rates may be eliminated with a deep tillage treatment following soybeans and prior to corn planting. Because the carryover effect of grazing to the subsequent corn crop following soybeans was unexpected, there was no additional tillage treatment imposed between the soybeans and corn in this research.

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