Effect of Grazing Corn Residue on Corn and Soybean Yields

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Summary

Grazing corn residue in the fall/winter or spring in either a corn-soybean rotation or a continuous corn system shows generally positive effects on yields. Soybean yields for both fall/winter and spring-grazed corn residue when compared to ungrazed corn residue in a corn followed by soybean rotation show an increase in yields.

Introduction

Grazing corn residue is an inexpensive and attractive grazing opportunity for cattle producers as more and more land is being taken out of pasture and put into corn or crop production. Crop residues provide cattle producers with the opportunity to extend their grazing season and reduce the amount of stored forage needed to maintain cattle through the winter. One of the biggest concerns about grazing cattle on cropland is the effect that grazing and residue removal will have on subsequent grain yields.

Procedure

Numerous studies have been done at the University of Nebraska over the years to determine the effect of grazing crop residue on grain yields in the subsequent years. In 1996, a grazing trial was started on a linear move irrigation field in a corn-soybean rotation looking at the time of the year that crop residue is grazed and its effect on subsequent yield. This 100-acre field is divided into two sections with half of the field in corn and half in soybeans every year. Each year they switch sides so the soybean yields reflect the direct impact of the grazing of corn residue, and the corn yields are a year removed from the grazing treatment. Grazing has been initiated at two different times, fall/winter grazing and spring grazing. The fall/winter grazing typically is from November until February and is the time that most cattle are on crop residue. The field is typically frozen, and mud and compaction due to cattle in the field are at a minimum. Spring grazing in this field is typically from February through mid-April. This was designed to be the worst possible situation for grazing crop residue as the soil is thawing and spring rains will cause the fields to be muddy and the amount of compaction and trampling should be at its highest. To increase the possibility of trampling and compaction, starting in 2000 calves have been stocked at 2.5 times the normal level (9 head/3 ac). The three treatments, fall/winter grazed, spring grazed, and ungrazed, have been maintained in the same area since 1996.

Grain yields have been reported in previous beef reports (*2012 Nebraska Beef Cattle Report*, p. 11; *2001 Nebraska Beef Cattle Report*, p. 43; *1997 Nebraska Beef Cattle Report*, p. 27) and are updated and compiled in this beef report (Table 1). Several other studies looking at the effect of fall/winter grazing of crop residue have been reported by Lesoing in Nebraska Beef Reports (*1996 Nebraska Beef Cattle Report*, p. 40; *1997 Nebraska Beef Cattle Report*, p. 34). A study was conducted in 1993-95 on two center pivot irrigated corn fields in a corn-soybean rotation. Each center pivot was divided into halves with one-half in corn and one-half in soybeans each year. During the fall, half of the corn acres, resulting in one-quarter of the total center pivot area, was fenced off and grazed while the other half of the corn acres were left ungrazed. Each year 20 cows grazed 29 acres for 60, 69, and 60 days in 1993, 1994, and 1995, respectively. In the fall of 1992 a study was initiated looking at the effect of fall/winter grazing of corn, soybean, and grain sorghum residue in a dryland strip cropping system on subsequent grain yields. Exclosures were placed within grazed fields to provide an ungrazed section, and then five foot sections of rows were harvested both in the grazed and ungrazed sections. These exclosure locations were maintained from 1993-95 so the compounding effect of grazing could be seen. In this system corn followed soybean, grain sorghum followed corn, and soybeans followed grain sorghum. Eighty-one calves grazed this 27-acre field for 30 days in 1993; in 1994, calves grazed in November and December and then it was grazed throughout the winter by ewes; and in 1995, calves grazed periodically from late November until early March. Yields were collected for all three crops from 1993-95. In another study, from 1993-95, looking at the effect of fall grazing of corn residue on irrigated corn in a continuous corn system, exclosures were placed in two irrigated continuous corn fields and grazed and ungrazed sections were harvested as described earlier.

Results

Fall/Winter Grazed Residue

Fall/winter grazing of corn residue on the linear move irrigation field showed a significant ($P = 0.0010$) increase in soybean grain yields of 2 bu/ac due to grazing the year before, and no statistical effect ($P = 0.1808$) on corn yields with a numerical increase of about 3 bu/ac for the fall/winter grazed treatments. The center pivot irrigated corn-soybean rotation showed no significant difference ($P = 0.7418$) in yields in the grazed area compared to the ungrazed. In the dryland strip grazing trial there was no significant difference between

Table 1. Grain yields.

Years of Study[1]	Cropping System[2]	Crop	Grazed Yield	Ungrazed Yield	SEM	*P*-value
93-95	Irrigated Corn-Soybean[3] Rotation	Soybeans	54.6667	55	3.3747	0.7418
93-95	Dryland Strip Cropping[4]	Soybeans	39.3333	42.6667	17.5431	0.8289
93-95	Dryland Strip Cropping[4]	Grain Sorghum	106.33	107	17.5431	0.8289
93-95	Dryland Strip Cropping[4]	Corn	184.67	174.67	17.5431	0.8289
93-95	Irrigated Continuous Corn[5]	Corn	185.33	181.67	27.3272	0.5766
96-11	Fall Grazed Corn-Soybean[6]	Soybeans	62.4	60.4	2.1056	0.001
96-11	Fall Grazed Corn-Soybean[6]	Corn	208.9	205.8	7.8359	0.1808
96-11	Spring Grazed Corn-Soybean[6]	Soybeans	61.7	60.4	2.0156	0.001
96-11	Spring Grazed Corn-Soybean[6]	Corn	207.2	205.8	7.8359	0.1808

[1]Starting and ending year that the study was conducted.
[2]Type of cropping system that the field was managed in.
[3]Center pivot irrigation, corn residue grazed and soybean yields reflect impact of grazing on yields.
[4]This field was in a strip cropping study in a rotation where residue from all crops was grazed. Corn followed soybeans, grain sorghum followed corn, and soybeans followed grain sorghum.
[5]Was maintained in a continuous corn system.
[6]Fields are from linear move irrigation field and maintained in corn followed by soybean rotation for 14 years.

treatments for any of the crops ($P = 0.8289$). However, soybeans following the grazing of grain sorghum residue showed a numerical decrease of 3.3 bu/ac, grain sorghum yields following corn residue grazing showed a numerical decrease of 0.77 bu/ac, and corn grain yields following the grazing of soybean residue showed a numerical increase of 10 bu/ac. In the irrigated continuous corn cropping system there was no significant difference between treatments ($P = 0.5766$) but there was a numerical increase of 3.7 bu/ac due to fall grazing.

Spring Grazed Residue

Corn yields the second year of the spring grazing show no significant difference ($P = 0.1808$) but a 1.2 bu/ac numerical increase in yield on the grazed treatment. Soybean yields, planted the year following grazing of the corn residue, show a significant increase in grain yield ($P = 0.0010$) with a numerical increase of 1.3 bu/ac in the grazed treatment.

Conclusion

Irrigated corn grain yields in either a continuous corn or a corn-soybean rotation show no effect of grazing on grain yields and soybeans planted the year following corn residue grazing show a significant increase in yields due to grazing treatment. Timing of grazing, fall grazed or spring grazed, seems to have little effect on grain yields. Since the treatments in the linear move irrigation field have been maintained over an extended period of time any detrimental effects from grazing would have been picked up. With the statistical increase in yields of soybeans, especially in the spring grazing treatment, cattle grazing corn residue actually help the grain yields by working some of the nutrients and residue into the ground and removing some of the excess residue so the ground can warm up faster. In an article by Wilhelm et al. (*Agronomy Journal*, 2004, 96:1), the authors suggest that the removal of 20-30% of the corn residue will have little effect on the structure and fertility of the soil and leaving 70-80% of the residue will provide enough organic matter to add carbon back into the soil and maintain the integrity of the soil structure. An article in the *2013 Nebraska Beef Cattle Report,* pp. 36-37 by McGee et al., shows that cattle will remove between 10.5% and 25.5% of the residue on the field. From this same report we can find that the average digestibility of residue is 55%, meaning that the cattle are only able to utilize 55% of the organic matter, and the remaining 45% of the organic matter is returned to the soil surface where it can be reincorporated into the soil supplying organic matter for the soil microbes.

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