

Impacts of Cattle Grazing Corn Residue

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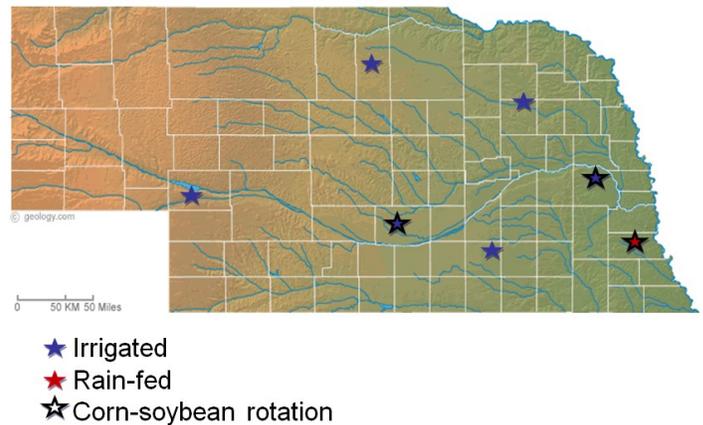
Introduction

Many crop farmers have concerns that cattle trampling will adversely affect soil physical properties and subsequent crop productivity. Soil compaction, measured as an increase in bulk density or penetration resistance, influences the ability of a plant to acquire water, nutrients, and oxygen because of restricted soil water movement, oxygen and nutrient diffusion to roots, consequently reducing crop yield. Studies conducted by the University of Nebraska at 7 locations have found that grazing in late fall or winter does not result in biologically significant compaction on cropland or negative impacts on subsequent crop yields.

Crop Yield and Compaction

Sixteen years of corn residue grazing in Eastern NE did not result in detrimental effects on soil properties (including bulk density and penetration resistance) or crop yields. These fields had silt-clay-loam soil were managed under no-till and in corn-soybean rotation. In fact, grazing of corn residue improved soybean yields by 3.4 bu/ac with fall (Nov. to Feb) grazing. In a western NE field managed in continuous corn, grazing of corn residue for a 5 year period did not affect corn yields (148 vs 154 bu/ac, for not grazed and grazed, respectively). A three year study with five locations in eastern NE also showed that grazing had no impact on subsequent crop yields. Three locations were managed under continuous corn with corn yields of 239 bu/ac for grazed and 223 bu/ac for ungrazed (which did not statistically differ). Two locations were in a corn-soybean rotation with soybean yields not differing between grazed (59 bu/ac) and ungrazed (62 bu/ac). During the last two years, soil penetration resistance was measured in the spring and was found to be slightly increased at two locations. However, the increase in penetration resistance would not have impeded root growth (below threshold level) and did not carry over into the next year.

Figure 1. Locations of corn residue grazing research in Nebraska



Soil Microbial Activity

After 16 years of grazing corn residue, an increase in the soil microbial community was observed (when compared to areas that were not grazed). The effects on the soil microbial community may explain the improvement in soybean yields which was observed in the grazed treatment because an increase in soil microbes (actinomycete bacteria and saprophytic fungi) may increase the rate of nutrient cycling.

Surface Roughness

It should be noted that an increase in surface roughness due to grazing has been observed, especially under wet soil conditions when the soil is thawed which can sometimes impede seed placement. A study in SE Iowa evaluated the effects of grazing corn residue on fields managed under spring till or no-till in a corn-soybean rotation over a three-year period. Cows were moved to a new section of the field each month during the winter. Therefore, the impact of grazing was measured in 15 areas for each tillage treatment. There was only one instance when grazing had an effect on soybean yield. In this instance, they reported a reduction in soybean yields from 45 bu/ac to 41 bu/ac when corn stover was grazed in the no

Table 1. Summary of 7 studies on the impact of grazing corn residue on cropland	
Soil compaction	No effect on porosity of soil; infrequent increases in penetration resistance (below levels that affect yield) and no carryover from year to year (short lived; no longer measurable by June).
Residue cover	Reduction of less than 20%
Soil temperature	no effect
Soil water content	no effect
Soil fertility	no effect on nutrient levels; increase in soil microbial community
Crop yield	no effect or slight improvement in subsequent yields

-till system. Bulk density (soil porosity) was not affected. However, surface roughness was increased in this instance, suggesting seed placement may have been the cause of yield loss.

Soil Organic Matter and Nutrient Content

Another concern is that grazing may reduce soil OM (due to residue removal) or result in the export of nutrients such as N, P and K. After 16 years of grazing, no differences in soil organic matter, N, P or K were measured. It is important to remember that most of the nutrients (such as N, P, K, Ca, etc.) consumed by cattle are excreted back on to the land.

Soil Cover

Grazing only removes a small percentage of residue (target 15%) and thus cover is maintained and erosion risk is not substantially increased. However, it should be noted that there are some corn fields which, due to topography (steep slopes) and/or low corn grain yield (especially in rotation with other low residue crops like soybeans) which should not be grazed by cattle because there is not enough residue present to provide adequate cover (even before grazing). However, most fields in Nebraska would not fit into this category. Alternatively, grazing can be used as a residue management strategy for high yielding or continuous corn rotations where excess residue is a problem. The combination of the residue consumption and the increase in microbial activity may be beneficial in these fields.

Conclusion

Grazing corn residues can benefit both cattle and crop producers. Grazing of corn residue can be a low-cost source of winter feed for cattle and a source of income for farmers (without detrimental effects on the land).

Figure 2. Ungrazed (left) and grazed (right) corn residue. Targeted removal rate to maintain cattle performance is only 15% of residue.



Information related to grazing of corn residue can be found at beef.unl.edu/cropland including things to consider when developing rental agreements.

References

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