

Soil compaction in cropland pastures used for winter grazing

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Introduction In the northern United States, forage availability on cool season pastures declines rapidly late in the growing season (Moser & Hoveland 1996). To supplement low forage availability in the fall and winter, producers can graze livestock on cropland pastures containing annual cover crops and crop residues. Managed properly, cropland pastures can provide livestock with abundant, high quality forage that lasts long into winter. A potential issue with cropland pastures is that presence of cattle on moist, non sod-bearing soils could lead to severe soil compaction. The objective of this particular study was to determine how winter grazing on cropland pastures would effect soil compaction and subsequent crop yield.

Materials and methods The cropland pastures evaluated in this study are part of an integrated pasture and row crop experiment located on the Dudley Smith research farm in central Illinois, USA. Soil compaction was compared among 4 crop/forage systems used on the farm: 1) ungrazed corn fields, 2) summer pastures, 3) winter cropland pastures with corn residues, and 4) winter cropland pastures with cover crops. Soils across the 90 ha farm ranged from silt loams and silty clay loams. Beef cattle (1.1 cows/ha) were released into the cropland pastures in November 2003 and they grazed pastures until March 2004. Soil compaction, expressed as penetration resistance, was measured in late March, when soils were moist. Twenty electronic penetrometer measurements (1 cm cone diameter) were taken to a depth of 45 cm in each system. Soil moisture was measured gravimetrically from 6 locations on each field. Corn yields were recorded in September.

Results Penetration resistance was greater at 46 cm depth compared with 15 cm (Figure 1). Penetration resistance differed significantly at 46 cm (One Way ANOVA, $P = 0.07$, $df = 3, 8$). Apparent soil compaction

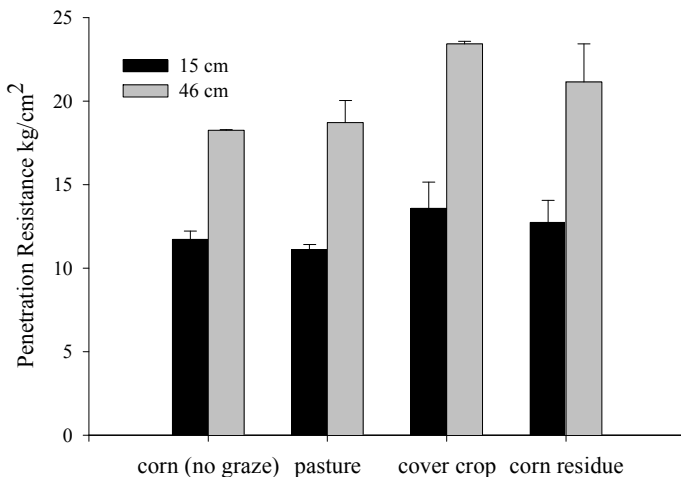


Figure 1 Soil compaction measured at 15 and 46 cm depths in the 4 crop and forage systems (March 2004). Error bars are 1 SE

was greatest in the winter cropland pastures and highest under the cover crops. The adjacent corn fields and summer pastures exhibited significantly less compaction. Soil moisture at the time of sampling did not differ significantly among the 4 locations ($P > 0.10$). Corn yields on the cropland pastures ranged from 12.3 to 14.9 Mg/ha in 2004 and were virtually identical to yields from ungrazed corn fields.

Conclusions Although cropland pastures provide badly needed forage in the late autumn and winter, preliminary conclusions suggest cattle trampling can cause significant soil compaction at depth (45cm). Compaction was worse under cover crops where cattle tend to spend more time grazing during the winter. Subsequent corn yields were unaffected by the apparent soil

References Moser, L.E., and C.E. Hoveland. 1996. Cool-season grass overview, *In*: L. E. Moser, et al. (eds) Cool-season forage grasses. *Agronomy Monograph* 34. ASA, CSA and SSSA, Madison, Wisconsin.