Conservation Systems Research

Tillage Requirements for Winter-Annual Grazing Rotations with Vegetables

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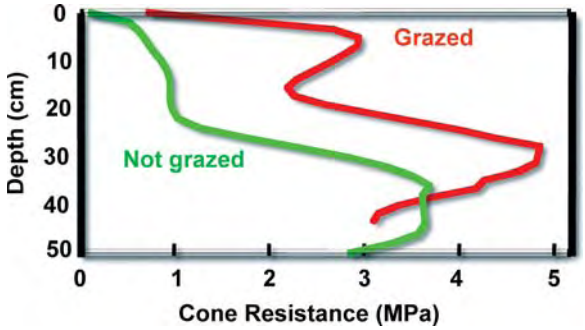
Field peas, watermelon, and sweet corn in rotation with winter grazing

The Challenge

Beef production is an important part of farming operations in the USDA Southern Region. A profitable option for Alabama farmers is to double-crop high-value vegetables with winter grazing of beef cattle. Recent research in Alabama found that contract grazing of stocker cattle for 100 to 140 days returned $70 to $225 per acre (Bransby, et al., 1999). However, grazing causes soil compaction that can severely limit vegetable yields, especially during the winter months when precipitation is great. In fact, cattle typically produce greater compaction force than tractors. Vegetable growers can supplement their income with winter grazing, but need to alleviate soil compaction that can reduce their vegetable yields.



Typical soil compaction (measured as cone-resistance) in a southern coastal plain cotton field following grazed and non-grazed winter cover crops (Miller et al., 1997). When cone resistance is greater than 2 MPa, plant root growth is severely limited.

The Experiment

A three-year study began in the autumn of 2000 at the Sand Mountain Research and Extension Center in northern Alabama to compare vegetable yields following winter annual grazing of stocker cattle with a variety of tillage operations.

The vegetables in the study were sweet corn, watermelon, and field peas in a three-year rotation that included grazing of annual ryegrass each winter.

Three surface tillage operations were disk, chisel + disk, and none.

Three deep tillage operations were in-row subsoiling, paratill, and none.

Watermelon harvest.

What We Learned

Field Peas

Either type of surface tillage (disk or chisel + disk) produced greater yields than none in two of three years. Deep tillage did not improve yields.

Sweet Corn

Greater yields were achieved with either type of surface tillage compared to none in all three years. Deep tillage produced greater yields in one of three years. However, the best sweet corn production was achieved with a combination of surface and deep tillage.

Watermelon

Surface tillage had no effect on watermelon yields. In-row subsoiling had superior yields in two of three years; paratilling was equivalent to subsoiling in one of those years.

Field peas required only surface tillage, watermelon required only deep tillage, and sweet corn required both types of tillage to maximize yields.

Summary

Vegetable crops following winter stocker cattle grazing usually benefited from some type of tillage.

Surface tillage provided greater yields for field peas, but had no effect on watermelons. A combination of surface and deep tillage was the best option for sweet corn.

Deep tillage did not improve yields of field peas. Deep tillage, especially in-row subsoiling, increased watermelon yields in two of three years.

Although not examined in this experiment, it may be possible that a strip tillage system would be a viable option for vegetable production following winter grazing. In this system, about one-third of the row width is disturbed with surface coulters ahead of a subsoil shank that eliminates below-ground compaction. This would leave the majority of the field undisturbed, with less exposure to erosion.

Happy stocker cattle grazed annual ryegrass each winter as part of a summer vegetable/winter grazing rotation.

Related Publications

Bransby, D., B.E. Gamble, B. Gregory, M. Pegues, and R. Rawls. 1999. Feedlot gains on forages: Alabama's stocker cattle can make significant gains on ryegrass pastures. Alabama Agric. Expt. Sta. Highlights Agric. Res. 46 (2). Summer 1999.

Miller, M.S., D.W. Reeves, B.E. Gamble, and R. Rodriguez-Kabana. 1997. Soil compaction in cotton double-cropped with grazed and ungrazed winter covers. Proc. Beltwide Cotton Conf. January 6–10. New Orleans, LA. Vol. 1. pp. 647–648.