EVALUATING SOIL COMPACTION FOR AN ANNUAL WINTER GRAZING/VEGETABLE PRODUCTION ROTATION IN NORTH-CENTRAL ALABAMA

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ABSTRACT

Degraded soils of Alabama have demonstrated the ability to respond well to conservation tillage in a large variety of crops. However, farmers are always looking for new and better ways to increase profits as well as reduce risks. Winter annual grazing/sod-based rotations with summer vegetable production can offer reduced economic risks for producers but may change tillage requirements for vegetable production. More information is needed to know if current conservation tillage methods are compatible with winter annual grazing vegetable rotation systems.

A 3-year field study was conducted on a Wynnville fine sandy loam, in north-central Alabama to evaluate soil compaction in vegetable production systems after winter annual grazing. In the fall, all plots were planted to ryegrass [Lolium multiflorum (L.)] and grazed from early December to mid-April at a stocking rate of 2.7 cattle per acre. After grazing, a rotation of sweet corn [*Zea mays*, (L.)], southern field pea [*Vigna unguiculata* (L.)], and watermelon [*Citrullus lanatus* (L.)] was established. All three crops were grown simultaneously in a factorial arrangement of three surface tillage treatments (chisel/disk/level, disk/level & no surface tillage) and three deep tillage treatments (no deep tillage, in-row subsoiling & paratilling) in a randomized complete block design with four replications. Soil strength measurements were taken using a tractor-mounted multiple-probe soil cone penetrometer to evaluate the level of soil compaction in all of the plots.

In-row cone index values near the soil surface peaked greater than the critical 300 psi root limiting value for the strict no-till plots (no surface/no deep tillage) in all three crops. In-row subsoiling and paratilling without surface tillage were equally effective in reducing cone index values to the tillage depth (16 in). Surface tillage (chisel/disk/level and disk/level) without deep tillage reduced the in-row cone index values at the peak (2 to 4 in) but had little effect on cone index values below this depth. In-row subsoiling had cone index values equal to or less than both the paratill and no deep tillage in the surface tillage plots (chisel/disk/level and disk/level). However, paratilling was less effective in reducing in-row soil compaction compared to the in-row subsoiling treatment in the same surface tillage plots.

Yields for all three crops responded differently to tillage treatments. Corn yields were greater with surface tillage (chisel/disk/level and disk/level) all three years compared to

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no surface tillage. Data shows that in two of the three years in-row subsoiling had greater yields than no deep tillage. Paratilling only increased corn yields in one year. Maximum corn yield was achieved with the combination of both deep tillage and surface tillage. Southern field pea yields increased with surface tillage (chisel/disk/level and disk/level) two of the three years although deep tillage had no effect. Watermelon yields were not affected by surface tillage but in two of the three years in-row subsoiling had greater yields compared to no deep tillage.

Soil compaction problems from winter annual grazing can be reduced by either surface tillage and/or deep tillage. Although field peas and corn remain a viable option, watermelon appears to be the best choice to eliminate the need for surface tillage and promote soil quality.