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INTEGRATING LIVESTOCK IN COTTON PRODUCTION IN THE COASTAL PLAIN: INFLUENCE OF WINTER PASTURE AND TILLAGE

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Abstract

Recent research in Alabama found that contract grazing of stocker cattle in winter-early spring (100 to 140 days) offers returns from $70 to $225 per acre (Bransby et al., 1999). Such a system is ideal for small farmers with limited capital and offers potential for added income for producer's doublecropping cotton behind winter grazing of annual pastures.

Soil management strategies that improve soil quality include conservation tillage, cropping intensification, and inclusion of sod-based rotations. Crop rotation is critical to cropping intensification and has long been recognized as being agronomically and economically beneficial (Bayer et al., Reeves, 1994). Short-term forage rotations with cotton not only offer reduced economic risks for producers but also could increase soil organic carbon, improving soil quality and productivity and enhancing profitability for producers. However, winter-annual grazing results in excessive soil compaction, which can severely limit yields of double-cropped cash crops (Miller et al., 1997). Although, in-row subsoiling at planting is frequently used to alleviate soil compaction for cotton grown on sandy coastal plain soils (Raper et al., 1994), tillage requirements for cotton following winter-annual grazing have not been researched or developed.

The objective of the study was: compare two winter pasture forages under grazing and their residual effect on cotton, determine depth and degree of compaction from grazing, and determine an optimal tillage system for establishment, growth, yield and quality of cotton grown following winter annual grazing.

The experiment was conduced in 2001 and 2002 at the Alabama Agricultural Experiment Station's Wiregrass Research and Extension Center in southeastern Alabama. The soil was a loamy sandy (Plinthic Paleudults). Winter forage and tillage were evaluated in a strip plot design with four replications. Winter forage (main plots) were oat (*Avena sativa* L.) and ryegrass (*Lolium multiflorum* L.) planted with a no-till drill. Grazing was continuous as contract grazing from January to April at a stocking rate of two head/acre. Tillage systems for cotton (subplots) included: moldboard with disk leveling, chisel and disk; and non-inversion deep tillage (none, in-row subsoiling or paratilling) with and without disking. We evaluated soil cover after grazing, plant population, cotton lint yield for 2001 and 2002, cotton quality parameters for 2001, and soil compaction in 2002.

Gross returns from grazing averaged between $141 to $160/acre/year; annual production costs averaged around $75. Ryegrass and no-tillage systems (averaged over deep tillage treatments) provided the greatest residue cover (average of 2001 and 2002 = 77%). Conventional tillage systems (moldboard, chisel and disking) resulted in the lowest residue cover. Grazing increased soil compaction in the first 4 inches (9% more soil strength averaged all treatments after 60 days grazing) but conventional tillage or non-inversion deep tillage conservation tillage systems alleviated this problem at planting. Cotton populations were 17% greater following oat than ryegrass. Strict no-tillage had the lowest plant stand, but strip-tillage, i.e., subsoiling alleviated this problem. Cotton lint yields were affected by forage species and tillage system interactions, however, strict no-tillage (934 lb cotton lint/acre averaged over years) resulted in the lowest lint yields (18% less than the mean) for both species and subsoiling was necessary to maximize yields. Cotton required more intensive tillage or more aggressive non-inversion deep disturbance (paratilling) to maximize lint yield following grazing of ryegrass compared to grazing of oat (1006 and 1120 lb $acre^{-1}$ in ryegrass and 1131 and 1097 $acre^{-1}$ in oat for no intensive tillage and intensive tillage respectively).

With respect to fiber quality, tillage system affected only micronaire, and strict no-tillage resulted in the lowest value (38.3 vs. 40.5 averaged over treatments). There were minor effects of forage species on strength and color grade.

Comparing cotton lint yield for full season non-irrigated cotton variety trials at the Experiment Station (1029 lb acre^{1}) with the average for this experiment (1201 lb acre^{1}) in 2001, double-cropping following grazing is an excellent way for producers to increase income without decreasing yield.

In conclusion, integrating winter annual grazing with cotton can be achieved using non-inversion deep tillage in conservation tillage systems Oat also appears to be a better choice than ryegrass for cotton grown following winter-grazing.

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