INTEGRATION OF WINTER GRAZING AND IRRIGATED COTTON PRODUCTION[1]

G. M. Hill[2], R. K. Hubbard [3], R. C. Lacy[4], C. Blalock[5],
[2]Dept. of Animal and Dairy Science, Univ. of Georgia, Tifton Campus, [3]Southeast Watershed Research Unit, USDA-ARS, Coastal Plain Sta., Tifton, [4]Dept. of Agricultural Economics, RDC, Tifton Campus, [5]Sunbelt Agricultural Exposition, Moultrie, GA

Introduction

This project involves sustained production from Georgia farmlands throughout the year, involving the major commodity crops of irrigated cotton and peanuts, with the inclusion of grazing cattle into the cropping systems. Recent uncertainties in all traditional farm commodity prices and programs have mandated changes in the farm products produced. With thousands of acres committed to row crop production, much of it under irrigation, livestock should regain importance as farm enterprises that utilize land and resources during winter months. Effects of cattle grazing during winter on subsequent cotton and peanut are major factors that need to be be determined when cotton and peanuts are produced in controlled rotations over several years. The longer time span will assist in providing meaningful information collected over different environmental conditions while simulating actual production systems using actual farm inputs and production practices. Stocker cattle gains during the winter-spring grazing period will be determined, and economic analyses will determine the added economic contribution of cattle to these production systems.

Materials and Methods

The project was planned to extend over several years to take into account environmental conditions while evaluating effects of rotational grazing on cotton and peanut production when these crops are grown in rotation, and to determine long-term economic returns to the farming systems. In years 1 and 3, the fields are being planted to cotton as the row-crop, and in years 2 and 4, peanuts are being the summer row crops. Conventional and strip tillage (2 fields, 2.5 acres each, in each tillage treatment) effects on cotton and peanut production, will be determined.

The project began in Autumn, 2000, and test pastures, irrigation strips, and fencing were completed. Ryegrass and rye were planted on 10 acres, using Big Daddy ryegrass at 20 lb/acre, plus Wrens Abruzzi rye at 60 lb/acre. Following cotton harvest in 2001 and 2003 and peanut harvest in 2002, Wrens Abruzzi rye was planted at 2 bu/acre (112 lb/acre) using a drill. For winter grazing in 2002, fertilizer (7-14-21; 350 lb/acre) was applied at time of planting of rye (October 30, 2001); and, for 2003, the fertilizer (12-0-29; 200 lb/acre,

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applied January 3, 2003) was reduced following peanut harvest, which supplied residual nitrogen. The steers were supplemented with 1000 lb whole cottonseed and 7200 lb of perennial peanut hay during the course of the 84-day grazing period. Supplemental feeding was not necessary in 2002, but heifers were fed a total of 300 lb of whole cottonseed at 5 lb/heifer daily and approximately 2200 lb hay, fed free-choice in January, 2003. Cotton was harvested October 8, 2003, and with the normal dry fall weather, Wrens Abruzzi rye was planted in conventional and no-till strips in late October. In 2003, specialized equipment was used to cut cotton stubble on no-till strips, and conventional strips were disked. Rye was planted with a grain drill on conventional tillage strips, and with a No-till Drill on the strip-till strips. After a good stand of rye was observed, 12 heifers (543 lb) were added to the grazing area on January 16, 2004. Heifer stocking rate will be increased in 2004, and grazing will continue until mid-March, 2004, and then Peanuts will be planted on the test area. Soil test samples in grazed and un-grazed areas will be taken in March, at the end of the grazing period.

Results and Discussion

An important aspect of integrating a winter grazing crop involves effects on subsequent cotton or peanut production the following spring and summer. In Year 1 of the experiment, the amount of residue left on the fields indicated that grazing reduced the biomass by 55 % (Biomass: Grazed plots= 2330; Ungrazed plots= 5150 lb/acre). Evaluations on July 5, 2001, indicated that cotton stands (plants/row foot) were at 2.7 and 2.3 cotton plants, respectively, for grazed and ungrazed areas. There were 2.8 and 2.3 cotton plants per row foot, respectively, in conventionally tilled and strip tilled areas. Therefore, in the initial year, 2001, evaluations of cotton stands in fields planted after grazing the rye/ryegrass pastures indicated no difference in cotton stands following grazing, and no effect of tillage method on cotton stands. Cotton was harvested from the fields in October, 2001, and no differences in lint yields (Table 1) were observed for grazed and ungrazed areas. Tillage effects were observed, with slightly higher lint yields occurring on strip-till plots compared with conventional tillage (Table 1). Peanut yields in 2002 (Table 1), following planting after winter grazing, indicated no effect of winter grazing (ungrazed vs Grazed, 3700 vs 3750 lb/acre). However, peanut yields were increased by 400 lb/care when strip-till was practiced (Table 1). The 2003 cotton harvest (Table 1) indicates slight advantages in yield for both grazed areas and for cotton planted in strip-till areas. These results indicate no adverse effects on cotton or peanut yields following winter grazing by cattle during the first three crop years. Figures 1 and 2 indicate only slight effects of tillage and grazing on water conductivity through the soil, and effects on soil bulk density. Water conductivity and bulk density effects may become more evident over time as the experiment continues with cotton and peanut harvests in 2004, following the same tillage and grazing management.

In the first year of the study, steers had acceptable average daily gains of 1.83 lb during the 84-d grazing period (Table 2). Heifers used in 2002 and 2003 had very good gains on rye pastures, averaging 2.12 and 2.03 lb/day for 84 and 57 days, respectively. Since the pasture was stocked at one steer or heifer/acre for the duration of the grazing trial each year, resulting gain/acre was relatively low, averaging 154,178, and 116 lb/acre,

respectively, for 2001, 2002, and 2003 (Table 2). Peanut harvest was delayed in 2002 by heavy rains that continued into November, and rye planting was delayed until November 30, resulting in delayed forage growth. Heifers were added to pastures on January 30, 2003, almost one month later than in previous years, which reduced total grazing time to 57 days for the 2003 grazing period. Although stocking rates at 1.0 stocker animal/acre was lower than the normally recommended 1.75 to 2.0 animals/acre for this size of animal grazing winter annuals, grazing returned an estimated $100 to $147/acre to the crop production system (Table 2). These returns have not been adjusted for costs of winter annual pasture establishment. Returns to the system from cattle gains are respectable, considering the low additional input costs required for grazing above costs of planting winter annual cover crops without grazing. The recent increase in large cattle operators who will own the cattle and contract graze with row-crop farmers during winter, the higher prices paid for stocker cattle gain in recent years, and the large supply of calves during autumn, make the cattle/cotton/peanut systems more appealing to area farmers. The Sunbelt Expo Field Days in July 2002 and 2003, indicated a lot of farmer interest in this project. Press interviews and a television appearance highlighted the project, and spread results and interest across the Cotton/peanut growing region of the South. Coupled with Florida and Alabama research efforts on sustainability of cotton/peanut production with livestock integration also underline the importance of the continued research efforts of this project.

Stocking rates were increased in January, 2004, to increase potential returns, and to spread input costs. In spring, 2004, peanuts will be the principal row crop planted in following grazing by beef steers. Complete economic analyses will be determined at the conclusion of the 4th year of the experiment. Impact of cattle grazing and tillage practices on cotton and peanut production, and added value of cattle gains during winter to sustain cropping systems will be determined at the conclusion of the experiment.

SUMMARY

A pattern of consistently higher yields for strip-tilled cotton is being observed for this project, and grazing following either cotton or peanuts apparently does not affect or reduce cotton or peanut yields the following season. The contribution of cattle to the overall returns to the farming enterprise are significant, and add sustainability to these farming operations by spreading costs, and providing returns during spring before planting the next summer crop. This project has indicated no adverse effects on soils, however, after three years, we are just now getting field conditions into shape for true effects of tillage treatment, crop rotation, and cattle grazing to begin to impact cotton and peanut yields. Increased stocking rates during winter in 2004 will impact costs and returns, and economic analyses later this year following the two crop years in cotton and peanuts will be important.

Table 1. Cotton and peanut production following winter grazing by stocker cattle.

Item	Cotton -2001	Peanut - 2002	Cotton-2003
Grazing effect (lb/ac)			
Ungrazed area	1080	3700	1023
Grazed area	1100	3750	1150
Tillage effect (lb/ac)			
Conventional tillage	1030	3530	1028
Strip-tillage	1140	3902	1145

Table 2. Grazing performance of stocker cattle during winter following cotton or peanuts.

Item	2001 Year 1	2002 Year 2	2003 Year 3	2004 Year 4
Summer crop	Cotton	Peanuts	Cotton	Peanuts
Winter grazing[a]	Rye/Ryegrass	Rye	Rye	Rye
Cattle	Steers	Heifers	Heifers	Heifers
No. acres	10	10	10	12
No. cattle	10	10	10	12
No. days	84	84	57	
Began grazing	Jan 11	Jan 10	Jan 30	Jan 16
Initial wt, lb	526	482	520	543
Final wt, lb	680	660	636	
ADG, lb	1.83	2.12	2.03	
Gain/acre, lb	154	178	116	
Value of gain, $/acre[b]	127	142	100	

[a]Ryegrass ("Big Daddy", 20 lb/ac) and rye (Wrens Abruzzi 60 lb/ac) in Year 1; Rye at 2 bu/acre (112 lb/ac) in years 2, 3 and 4.
[b]Value of gain based on $0.85, $0.80, $0.86/cwt in Years 1, 2, and 3, respectively. Returns/acre have not been adjusted for ryegrass land preparation and seeding costs estimated at $100 to $125/ac

Figure 1. Effects of Tillage and Grazing on Water Conductivity in Soils

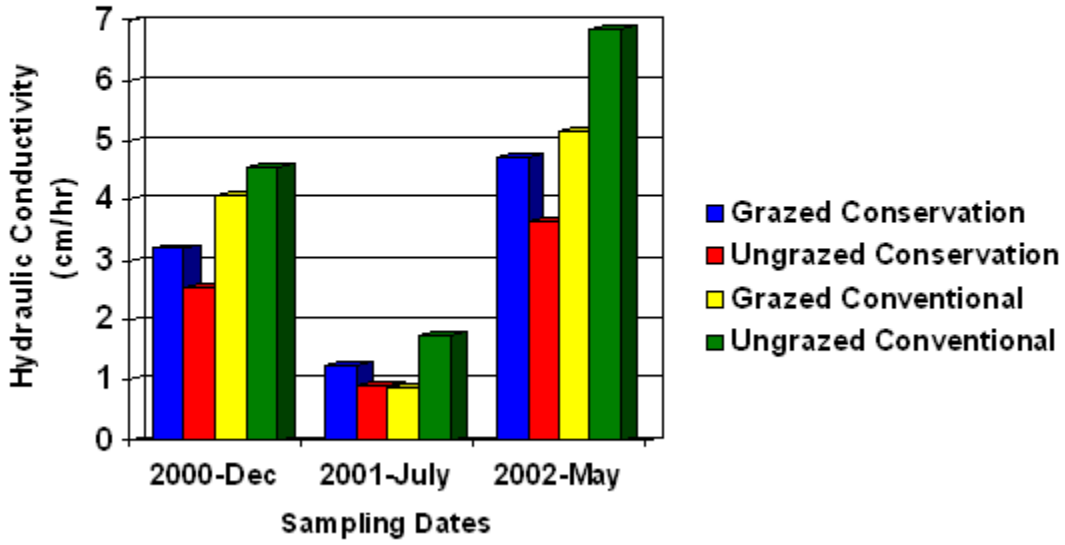

Figure 2. Effects of Tillage and Grazing on Soil Bulk Density