FORAGE AND TILLAGE SYSTEMS FOR INTEGRATING WINTER-GRAZED STOCKER CATTLE IN PEANUT PRODUCTION

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ABSTRACT

The use of crop rotation systems involving winter annual grazing can help peanut (*Arachis hypogaea* L.) producers increase profitability, however, winter-annual grazing could result in excessive soil compaction, which can severely limit yields. We conducted a 3-yr field study on a Dothan loamy sand (fine-loamy, kaolinitic, thermic Plinthic Kandiudults) in south Alabama to develop a conservation tillage system for integrating peanut with winter-annual grazing of stocker cattle under dryland conditions. Winter annual forages [oat (*Avena sativa* L.) and annual ryegrass (*Lolium mutiflorum* L.)] and tillage systems were evaluated in a strip-plot design. Tillage systems included: moldboard and chisel plowing; and combinations of non-inversion deep tillage (none, in-row subsoil or paratill) with/without disking. We evaluated soil water content, peanut leaf stomatal conductance, plant density, peanut yield, peanut net return, and total system annual net return. Peanut following oat increased soil water extraction (15%), stands (12%) and yields (21%) compared to peanut following ryegrass. Strict no-tillage resulted in the lowest yields (2045 lb/acre, 42% less than the mean of the other tillage treatments) and non-inversion deep tillage (especially in-row subsoil) was required to maximize water use and yields with conservation tillage. Net return from annual grazing ($75/acre, 3-yr mean) represented 40% of the total return for the best treatment (no-tillage with in-row subsoil following oat, $187/acre). Integrating winter-annual grazing in this region using non-inversion deep tillage following oat in a conservation tillage system can benefit peanut growers, allowing extra income without sacrificing peanut yields.

SUMMARY

Peanut production has traditionally been a tillage intensive operation and peanut yields have not increased for a number of years, even with new varieties and technology. Under the 2002 market loan program (Farm Bill), which has resulted in lower prices, producers are forced to reduce costs and increase productivity to remain competitive.

Integrating winter-annual grazing with peanut production may offer producers increased potential for profits; however, grazing may result in excessive soil compaction, which can severely limit peanut yields. Tillage requirements following winter-grazing have not been researched, and there is producer concern that intensive tillage might be required following

winter-grazing in order to achieve acceptable peanut yields. Adoption of conservation tillage has been limited by peanut producers and apprehension over compaction following winter-annual grazing could limit adoption even more. The objective of this study was to identify a practical forage and conservation-tillage system combination for peanut production following winter-annual grazing for Coastal Plain soils.

The field study was conducted for 3-yr on a Dothan loamy sand in south Alabama. Winter-annual forages and tillage systems were evaluated in a strip-plot design of 4 replications. Forages were oat and annual ryegrass. Both forages were terminated prior to summer tillage with an application of glyphosate approximately 4-6 wk before peanut planting. Yearling steers of mixed breeding Angus × Simmental (initial weight 570 lb averaged over years) were stocked at 2-head/acre.

During the summer, the experimental area was divided into peanut and cotton areas, which were rotated each year. Tillage plots within these areas were 50-ft long and 24-ft wide with eight, 36-in rows. 'Georgia Green' peanut was planted every year. The eight summer tillage practices were: 1) moldboard plowing to a depth of 12-in + disk/level (4- to 6-in depth); 2) disk/level only; 3) chisel plowing to a depth of 8-in + disk/level; 4) in-row subsoil with a narrow-shanked subsoiler (KMC®, Kelley Manufacturing Co., Tifton, GA) to a depth of 14- to 16-in + disk/level; 5) in-row subsoil + no-tillage; 6) under-the-row paratill with a bent-leg subsoiler (Paratill®, Bigham Brothers, Inc., Lubbock, TX) to a depth of 17- to 19-in + disk/level; 7) paratill + no-tillage; and 8) no-tillage. All tillage operations were performed after the removal of cattle from the winter annual forages. Tillage and planting equipment were guided with a tractor equipped with a Trimble AgGPS® Autopilot automatic steering system (Trimble, Sunnyvale, CA), with 1-in level precision, which reduced equipment-induced compaction near the peanut row. Alabama Cooperative Extension System recommendations were used to apply all herbicides, insecticides, and fungicides. We evaluated soil water content, peanut leaf stomatal conductance, plant density, peanut yield, peanut net return, and total system annual net return.

Peanut following oat increased soil water extraction (15%), stands (12%) and yields (21%) compared to peanut following ryegrass. We speculate that improved plant populations and increased rooting and soil water extraction of peanut following oat, compared to following ryegrass, could be associated with greater N depletion by ryegrass, increased peanut root restriction under ryegrass, and possible ryegrass allelopathic effects on peanut. We found no clear effect of forage species or tillage system on peanut leaf stomatal conductance. Strict no-tillage resulted in the lowest yield (2045 lb/acre averaged across years). Strict no-tillage reduced peanut plant populations 47%, soil water extraction 15%, and yields 42% compared to the mean of the other seven tillage systems. Oat appeared to be a better choice than ryegrass for peanut grown following winter-annual grazing and non-inversion deep tillage was necessary to maximize soil water extraction and yields in no-tillage systems. Deep tillage in conventional surface tillage systems did not increase peanut yield. Within no-tillage systems, peanut yields were greater with in-row subsoiling using the narrow-shanked implement compared to paratilling (3688 lb/acre vs. 3429 lb/acre, respectively).

Oat together with in-row subsoiling for peanut production had the greatest total annual net return ($187/acre) and net returns from animal production ($75/acre) represented 40% of the total

system return. In conclusion, integrating winter-annual grazing with peanut using non-inversion deep tillage in conservation tillage systems can increase profitability for producers in the Coastal Plain without sacrificing peanut yields.