The past two decades have seen major changes in cultural practices in the peanut/cotton cropping systems. Among these changes are consolidation of farm units, increased irrigation, reductions in corn/soybean acreage, large increases in cotton production, and changes in support programs for peanut. Technological changes have also been rapid and include an almost 100% adoption of transgenic use for corn and soybean as well as cotton and planting date changes for peanut based on tomato spotted wilt virus control. Furthermore, conservation tillage is now widely adopted in the US Southeast (SE), and the SE leads the nation in the use of this practice (National Crop Residue Management Survey 2002).

The changes in economics, technology, and government support programs have led to the need for a change from the traditional cropping to an integrated peanut/cotton rotation with perennial grass and livestock production systems. The yields for peanut and cotton reached a plateau almost 25 years ago and have been stagnant until recent improvements (USDA 2014). This is not surprising because short two-year rotations can become susceptible to classic problems similar to monocultures, such as low yields, soil degradation, and pests surviving and adapting to the rotations (Crookston 1995; Tanaka et al. 2002). It is thus essential to find alternative cropping systems that can increase yields and simultaneously enhance soil quality and conservation and promote environmental stewardship.

An excellent system to achieve higher yields and environmental benefits is a four-year sod-based rotation, which includes bahiagrass for two years, followed by one year of peanuts, and then a year of cotton, in place of the traditional peanut/cotton rotation. To increase economic returns in the overall system, livestock can be integrated into the peanut/cotton cropping system with the whole farm utilized during winter months for winter grazing or cover crops. Numerous benefits can be obtained by including bahiagrass/livestock in the rotations.

Bahiagrass is a good choice for a perennial grass in the SE because it is grown as a pasture grass; hence, it is not new to most farmers. It is drought tolerant and can be grown on a wide range of soil types, including sandy soils (Field and Taylor 2002). Furthermore, its nutritional value, including crude protein (CP), acid detergent fiber (ADF), and neutral detergent fiber (NDF) values, is comparable to other grasses, and can be grazed or harvested for seed or hay. This
article is an introduction to a series of articles that report on an extensive program from the Tri-State region (Florida, Georgia, and Alabama) on the many benefits of adopting sod/livestock/peanut/cotton farming systems.

Farmer tend to specialize in crops because of environmental constraints, economics, infrastructure, or because that is what has been grown for many years. However, like all successful ventures, farming is dynamic and must respond to changing environmental and economic conditions. While conservation tillage greatly reduces soil degradation, including perennial grasses will improve soil health and consequently improve crop growth and yield.

Furthermore, bahiagrass is a non-host to several plant pathogens and nematodes. Synergistic effects are achieved with a combination of improved soil health, resulting in enhanced plant growth. In turn, this leads to a better ability to outcompete weeds and an ability to better tolerate diseases. All of these culminate in higher yields at reduced costs. While cotton and peanut prices vary from year to year, the cost of inputs has continued to rise. Thus, for peanut/cotton to remain viable, there is a need for an alternative farming system that reduces production costs.

Early in US agricultural history, mixed livestock and crop production was the norm. While mixed farming was necessary for early farmers, the last half of the 20th century was a time with increasing emphasis on commercial farming, and an increase toward specialization. However, changing economic, technological, and ecological values have made it necessary to re-visit diversified crop/livestock enterprises. Integrated livestock/crop farming systems feed into each other; the products from one enterprise can be used as inputs for the other enterprise and land resources can be used year round in the SE US.

Additionally, diversified cropping can provide a buffer against unpredictable weather, such as droughts and floods. A good example is the four major hurricanes that swept through Florida in 2004. While all four hurricanes caused economic damage to crops at different stages of growth, Hurricane Ivan severely impacted cotton during the boll opening stage, and as a result, a number of farmers lost a large part of the crop. If a grower had most of their farm in cotton, they would have lost most of their income. On the other hand, if a grower had some section of the farm under bahiagrass, the bahiagrass would have survived the hurricanes and perhaps produced higher yields due to good moisture.

Diversified cropping systems reduce economic risks by reducing yearly variations in returns and also increase the total income. We developed an interactive business model that evaluates the economic feasibility of a four-year livestock/peanut/cotton/sod rotation. The URL for the model is http://nfrec.ifas.ufl.edu/programs/sod_rotation.shtml. Results from the model show returns to be 3- to 6-fold greater for the fourth year of the integrated sod/livestock/peanut/cotton farming system compared to the conventional peanut/cotton rotation. Other researchers also identify livestock as the key link in developing sustainable systems. There are other advantages of the sod/livestock/peanut/cotton farming systems, which go beyond the monetary values.

Expansion of cropland coupled with intensification of agriculture have drastically reduced both micro and macro flora and fauna population density and diversity. It is thus imperative that flora and fauna biodiversity be progressively maintained in agricultural farmlands. Sod-based cropping systems can provide niches to preserve biodiversity.

Numerous factors interact to bring about the positive outcome for implementation of the sod-based livestock/peanut/cotton cropping system. Development of an effective sod-based livestock integrated cropping system is an economically and ecologically viable alternative to the current peanut/cotton cropping system. Furthermore, this system is applicable under different climatic conditions and soil types. We recommend growers read our related articles on this subject for details and also visit our website http://nfrec.ifas.ufl.edu/programs/sod_rotation.shtml for more information.

### Key Points of Sod-Based Farming

The sod based farming system results in the following:

- Enhanced soil and water quality by increasing organic matter content 0.1% per year or 1.5% over 15 years. This reduces irrigation needs by 50–70% from an average of 12 acre inches/yr to 3–6 acre inches/yr. With 10% adoption of the “sod rotation” an additional 500 cu/ft/s (2000cu/ft/s with full implementation) of water can be added to the Flint River as part of the Apalachicola/Chattahoochee/Flint River System;
- Increased water and nutrient holding capacity from increased organic matter resulting in increased earthworm populations, better soil tilth and soil functions. Earthworm and bahiagrass root channels increase water infiltration resulting in more subsoil moisture.
- Reduced pesticide use (more than 50%) since perennial grasses reduce plant diseases and nematodes.
• From 20–50% percent increase in peanut yields compared to the best conservation practices using a conventional rotation; mainly due to larger and deeper root mass.

• Reduced financial risks with half the farm out of “cash” crops, and perennial grasses withstand drought, hurricanes, and various stresses better than row crops.

• Reduced N and K fertilizer inputs by 50% due to recycled nutrients in manure of grazing animals. Cotton yields improved by 200 lbs/A lint following grazing as compared to cover crops alone and much of this was due to livestock grazing causing roots of the following crop to grow deeper, faster and double the root exploration. (Dourte et al. 2015; George et al. 2013)

• Enhanced microbial populations with cover crops further enhanced by grazing during winter months along with enzyme activity responsible for C, N, P, and S cycling indicating a healthier soil.

• Improved farm income by 2- to 7-fold (http://nfrec.ifas.ufl.edu/programs/sod_rotation.shtml).

References


