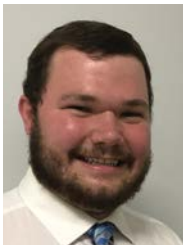
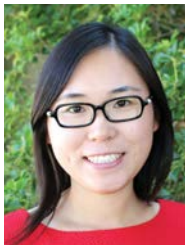
Motivations and Challenges of Cover Crop Utilization for Georgia Crop Production

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Acknowledgment

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Abstract

Georgia is the second largest producer of cotton and the largest producer of peanuts in the United States. These crops combined represent a significant portion of Georgia's economy. As natural resources become more threatened, the cotton and peanut industries have been facing increasing challenges to improve environmental sustainability. This research utilizes focus group interviews to identify the individual cost and revenue changes resulting from cover crop adoption, as well as the perceived benefits and challenges from changes in cultural practices that a farmer considers when adopting cover crops.

INTRODUCTION

Cover crops are known to yield numerous agricultural production benefits, as well as positive externalities and environmental benefits to society; however, little research has been conducted to explore the overall financial impact of utilizing cover crops for Georgia crop production. Culpepper et al. (2010) found that rye cover crop had the potential to reduce palmer amaranth emergence by 94% in the areas between rows in the field. Truman, Shaw, and Reeves (2005) demonstrated that cover crops in no-till conservation systems increased soil moisture infiltration by 54% compared to a conventional tillage without a cover crop treatment. Furthermore, cereal rye has been reported to collect from 20–100 pounds of nitrogen per acre, which can be utilized by the following summer crop (Gaskin, Cabrera, and Kissel, 2016). Reduced nitrogen leaching into groundwater is one of the most relevant environmental benefits of cover crop usage (Meisinger et al., 1991). Despite the potential on-farm and environmental benefits that cover crops can generate, the United States Department of Agriculture (USDA) 2017 Census of Agriculture reports that only 12% of harvested cropland in Georgia was planted with cover crops (USDA, 2019). This research will seek to identify and explore the individual costs and benefits associated with utilizing cover crops in cotton and peanut production systems.

This subdued rate of adoption can be traced back to the seemingly conflicting information regarding the economic benefits of cover crop adoption (Boyer et al., 2017). Cover crops can increase farm production costs and negatively impact crop yields. Producers might be concerned that implementing cover crops in their

production practices might bring more economic uncertainties in their farming operations. This dilemma often results in producers relying entirely on conventional production practices.

Plastina et al. (2018a, 2018b, 2018c) examined the economics and motivations of cover crop use in corn and soybean production in the Midwest. Their findings aligned with previous research that insufficient familiarity with cover crops is a major barrier of adoption of cover crops (Nassauer et al., 2011). Plastina et al. (2018a) found that controlling soil erosion and improving soil health were the two most commonly stated benefits associated with cover crop adoption. Other benefits reported by focus group participants ranged from moderating risks to reducing farm production inputs. Furthermore, numerous costs and revenue changes were also reported by participants as a result of planting cover crops. Yield was a major budget revenue variable that farmers reported conflicting outcomes regarding the change they observe after planting a cover crop. However, partial budget results from a larger study indicated that adding cover crops to a production system often decreased net farm returns—except for farmers who utilize cover crops for winter grazing, who were typically able to increase their profitability (Plastina et al., 2018b, 2018c).

For Georgia row crop producers, limited research results are available in examining the comprehensive economic effects of cover crop usage for cotton and peanut production systems. As a result, most producers in Georgia chose not to adopt cover crops to avoid increasing the uncertainties from their farming operations. The goal of this study is two-fold. First, to inform growers, farm managers, and related professionals about the changes in costs and benefits faced by individual cotton and peanut growers who adopted winter cover crops in Georgia. Many of the aspects of these instruments that were necessary to be customized and updated were related to irrigation and moisture retention because supplemental irrigation is a larger consideration in the state of Georgia. Second, to explore farmers' motivations and obstacles to planting cover crops, as well as the variables farmers considered when making cover crop adoption decisions.

DATA

Based on the research methodology and survey instruments developed by Plastina et al. (2018a), this research investigated the cover crop adoption for Georgia's cotton and peanut production systems. Focus group interviews were conducted in four locations across Georgia with farmers who employ both conventional practices without cover crops and practices that incorporate winter cover crops into their production systems. The interviews were conducted from January 2019 to March 2019 in the Georgia cities of Sylvester, Vienna, Moultrie, and Waynesboro with cotton and peanut producers from seven Georgia counties in the central and southern portion of the state. In each interview location, two to six producers were interviewed. In total, 14 farmers participated in the focus group interviews. Two of the first questions asked during the focus group interviews were aimed at identifying the original and current motivations for utilizing cover crops. During the focus group discussions, farmers were asked general questions related to how the implementation of cover crops alters their production variables and their farm budgets. Questions related to how cover crop use impacts farm budgets were broken into the two categories of cost and revenue. Cost questions were designed to identify individual cost changes resulting from cover crop use, and revenue questions were intended to recognize revenue changes observed when farmers plant cover crops. Participants were also asked to describe some of their obstacles with cover crop usage and how they managed their winter cover crops. The consent form and questions presented to participants are included as Appendixes 1 and 2. The qualitative data collected through the farmer focus group interviews were carefully analyzed, and findings are summarized in the following section.

RESULTS

Cover crop management decisions varied from farm to farm, including the type of cover crop planted, termination technique, and methods of establishment. Rye, oats, wheat, hairy vetch, and crimson clover are all types of cover crops that were reported as being used in cover crop systems. The consensus among focus group participants was that herbicide burn-down was the preferred method for terminating a cover crop. It was on rare occurrence that a small percentage of farmers recalled atypical years that required another approach. In particular, some expressed that during the years of excessive rainfall, they were unable to access their fields, requiring the use of controlled burn to terminate cover crops. This remains a less preferable method since it results in

lesser weed control and soil moisture holding capacity, and the lack of frequent frost prohibits frost termination from being reliable. Broadcasting and drilling seeds into the ground were found to be the two dominant methods of establishing cover crops. However, one farmer reported that their crimson clover reseeded itself each year, eliminating the need to replant cover crops annually despite crimson clover commonly being classified as an annual plant.

As observed in Figure 1, the original motivation for planting cover crops was mostly limiting or preventing soil erosion. After a farmer mentioned soil erosion control as their original motivation for planting cover crops, they were asked to clarify whether they were referring to wind erosion or water erosion. Most commonly, when farmers were posed with this question, they would indicate that both wind and water erosion control were motivations for planting cover crops.

When farmers were asked to identify their current motivations for planting cover crops as opposed to original motivations, the reasons they offered were much more varied, as shown in Figure 2. Producers explained that over several years of planting cover crops, they began to reap unintended benefits, such as being able to reduce their number of irrigation applications and reduced weed pressure from the noxious weed palmer amaranth because cover crop residue minimized sunlight reaching the soil. Although soil erosion control remained the most commonly stated reason for currently planting cover crops, increasing soil water holding capacity and reduced need for cultivation were more commonly expressed as current motivations for planting cover crops in cotton and peanut production systems.

In focus groups, nine farmers indicated that by planting a cover crop they were able to simply terminate the crop with herbicide and plant their cotton and peanuts without other extensive preparation such as field cultivation. Moisture retention over the growing season was another benefit of planting cover crops that was mentioned by eight producers. Remaining cover crop biomass and increased organic matter resulting from planting cover crops enabled farmers to irrigate their crops less frequently and increase productivity in dryland acres. Weed suppression was also a commonly stated current motivation for planting cover crops. However, research findings indicate that cover crop use rarely influenced insecticide and fungicide application decisions in cotton and peanut production.

Interestingly, five farmers reported that drought risk management was an important current motivation in their decision to plant cover crops. Farmers explained that in years of limited rainfall, fields without irrigation were more productive when a cover crop had been planted in the previous year because these fields were able to retain large quantities of water that could be used during dry periods. Conversely, during years of excessive rainfall, it was reported that fields planted after a cover crop were less productive than those not previously planted in a cover crop. Therefore, to neutralize farm production risks farmers would plant some of their acres in cover crops to hedge against drought and not plant cover crops on other acres to hedge against a season of excessive rainfall.

After farmers answered questions about their original and current motivations for planting cover crops, they were asked about their individual budget changes observed from planting cover crops. In many instances, at least one budget change was associated with a mentioned current motivation for planting cover crops. As observed in Figures 3 and 4, cover crops were reported to have both positive and negative impacts on farm costs and revenues. The majority of budget changes reported to be associated with cover crop use were related to costs rather than revenues for cotton and peanut production.

Aside from the initial costs of establishing a cover crop, such as the costs of seed and fuel used during cover crop planting, numerous positive and negative cost changes were reported to be associated with cover crop adoption. Most cost changes reported in focus groups were cost reductions. However, some producers did report that their decision to plant cover crops increased their cotton and peanut seeding rate, mandated additional herbicides to terminate cover crops, and required purchasing additional farm equipment. However, several farmers explained that they did not view the cost of a burn-down herbicide application as an additional cost for cover crop. These farmers apply a spring burn-down herbicide, such as glyphosate, even if they do not plant cover crops to eliminate winter weeds.

Focus group participants did identify a few notable revenue changes resulting from cover crop usage, as shown in Figure 4. Reported revenue changes resulting from planting cover crops include occasional yield increases, selling harvestable cover crops, grazing livestock on cover crops, and payments from government programs. Farmers reported conflicting changes about yield resulting from planting cover crops. Five farmers reported that yield for their cash crops increased, while four farmers reported decreased yield. Although both

positive and negative yield changes were reported in focus groups, most farmers agreed that cotton and peanut yields were only minimally influenced by a previously planted cover crop. Cost share programs were found to be the most commonly reported revenue change resulting from cover crop use, with nine farmers indicating that they received some additional revenue from either the Conservation Stewardship Program (CSP) or the Environmental Quality Incentives Program (EQIP). Finally, two producers reported that they observed a revenue increase from planting cover crops in the form of selling harvested cover crops and providing grazing for livestock.

The focus group interviews revealed that soil erosion, cultivation, and irrigation applications are some of the production variables most impacted by cover crop adoption. Although the exact cost of erosion is difficult to quantify, erosion prevention was the leading motivation for planting cover crops among farmers. Farmers explained that controlling erosion saved them money for multiple reasons. By preventing soil erosion, farmers eliminate the cost of repairing field washouts and prevent nutrients from being carried out of their fields. Similarly, focus group participants explained the benefits of planting cover crop to be able to plant cash crops without cultivation, which resulted in fuel saving since field cultivation equipment requires large amounts of fuel to operate. Cover crop residue was reported by eight farmers to decrease irrigation requirements, which saved the farm irrigation expenses.

CONCLUSION

Qualitative data collected from focus group interviews provides an insightful view of how cover crop utilization affects farm profitability. There are costs and revenue changes associated with this conservation practice. Focus group participants indicated that controlling soil erosion, reducing annual irrigation requirements, and eliminating field cultivation were among the most notable benefits of cover crop adoption. Similarly, the major expenses related to cover crop adoption were the additional cost of cover crop seed, fuel for planting cover crops, herbicide application, and labor. These findings are valuable information in determining the direction of the effects of cover crops on farm profitability. However, to determine the magnitude of the effects, future research should include quantitative data collection.

REFERENCES

Boyer, C.M., D.M. Lambert, J.A. Larson, and D. Tyler. 2017. "Investment analysis of long-term cover crops and tillage systems on cotton production." Agricultural and Applied Economics Association Annual Meeting, Chicago.

Culpepper, A.S., J. Kichler, L. Sosnoskie, A. York, D. Sammons, and B. Nichols. 2010. "Integrating cover crop residue and moldboard plowing into glyphosate-resistant palmer amaranth management programs." Beltwide Cotton Conferences, Cordova, TN.

Gaskin, J., M. Cabrera, and D. Kissel. 2016. "Predicting nitrogen release from cover crops: the cover crop nitrogen availability calculator." University of Georgia Extension Bulletin 1466.

Meisinger, J.J., W.L. Hargrove, R.L. Mikkelsen, J.R. Williams, and V.W. Benson. 1991. "Groundwater Impacts: Effects of cover crops on groundwater quality." In *Cover Crops for Clean Water*, edited by W.L. Hargrove, 57–68. Ankeny, IA: Soil and Water Conservation Society.

Nassauer, J.I., J.A. Dowdell, Z. Wang, D. McKahn, B. Chilcott, C. Kling, and S. Secchi. 2011. "Iowa farmers' responses to transformative scenarios for Corn Belt agriculture." *Journal of Soil and Water Conservation* 66 (1): 18A–24A.

Plastina, A., F. Liu, F. Miguez, and S. Carlson. 2018a. "Cover crops use in Midwestern US agriculture: perceived benefits and net returns." *Renewable Agriculture and Food Systems* 1–11.

Plastina, A., F. Liu, W. Sawadgo, F. Miguez, and S. Carlson. 2018b. "Partial Budgets for Cover Crops in Midwest Row Crop Farming." *Journal of the American Society of Farm Managers and Rural Appraisers* 90.

Plastina, A., F. Liu, W. Sawadgo, F.E. Miguez, S. Carlson, and G. Marcillo. 2018c. "Annual net returns to cover crops in Iowa." *Journal of Applied Farm Economics* 2 (2): Article 2.

Truman, C.C., J.N. Shaw, and D.W. Reeves. 2005. "Tillage effects on rainfall partitioning and sediment yield from an ultisol in central Alabama." *Journal of Soil and Water Conservation* 60 (2): 89–98.

U.S. Department of Agriculture (USDA) National Agricultural Statistics Service (NASS). 2019. "2017 Census of Agriculture."

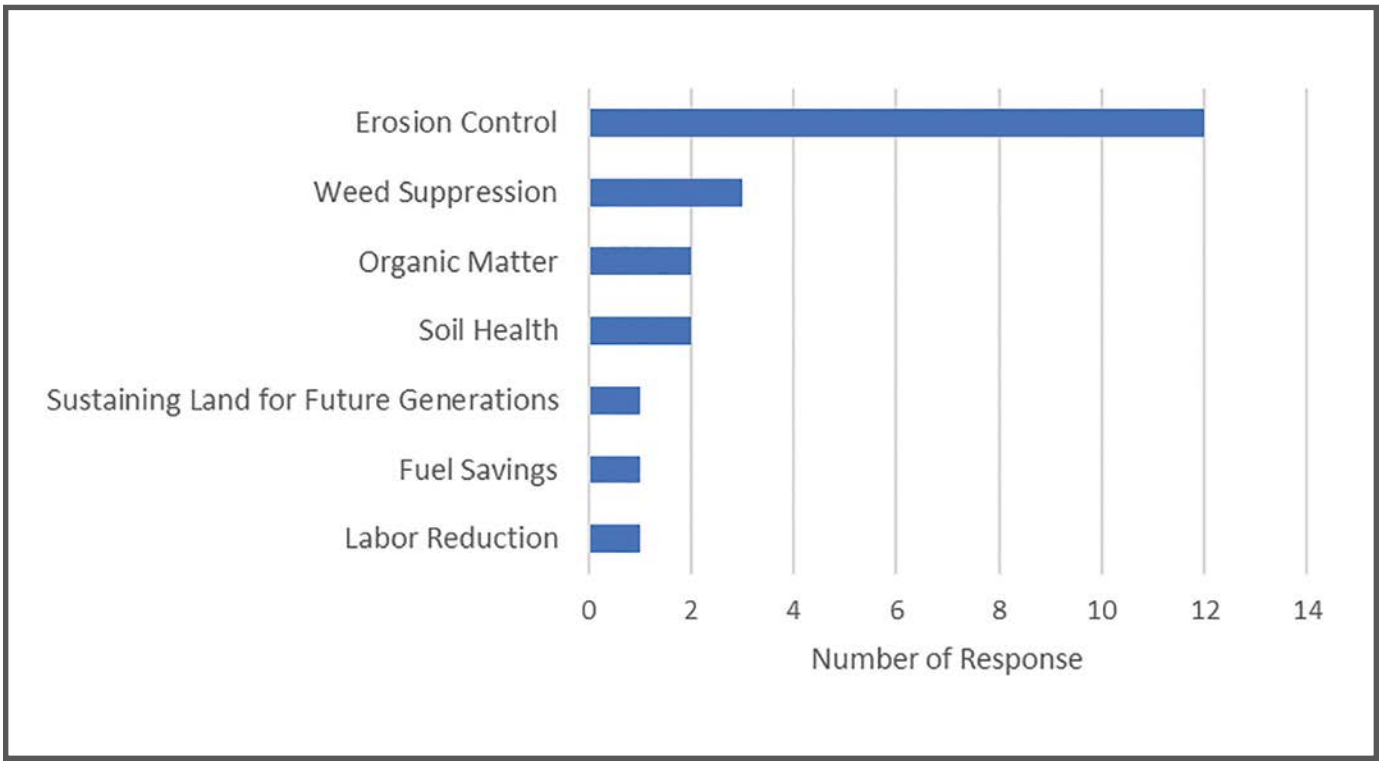

Figure 1. Most Commonly Stated Initial Reasons for Planting Cover Crops in Georgia

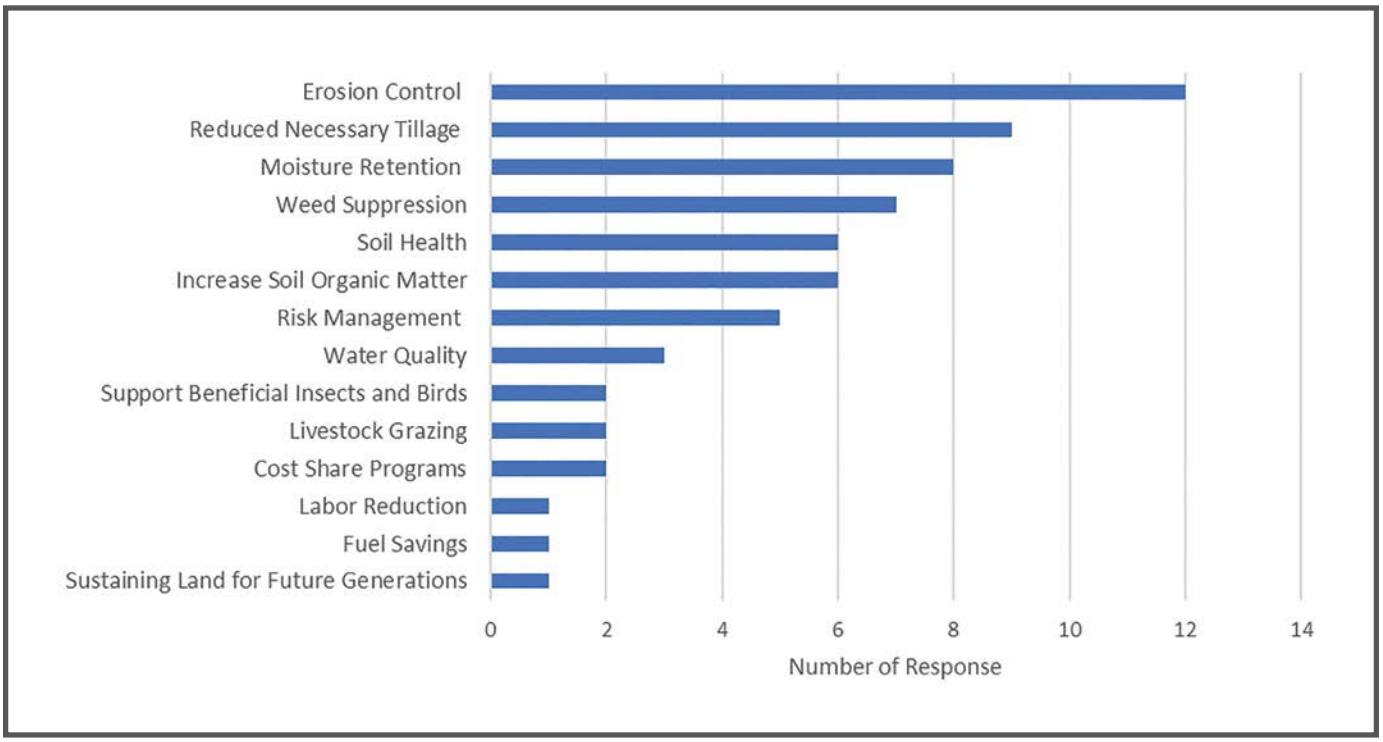

Figure 2. Most Commonly Stated Current Reasons for Planting Cover Crops in Georgia

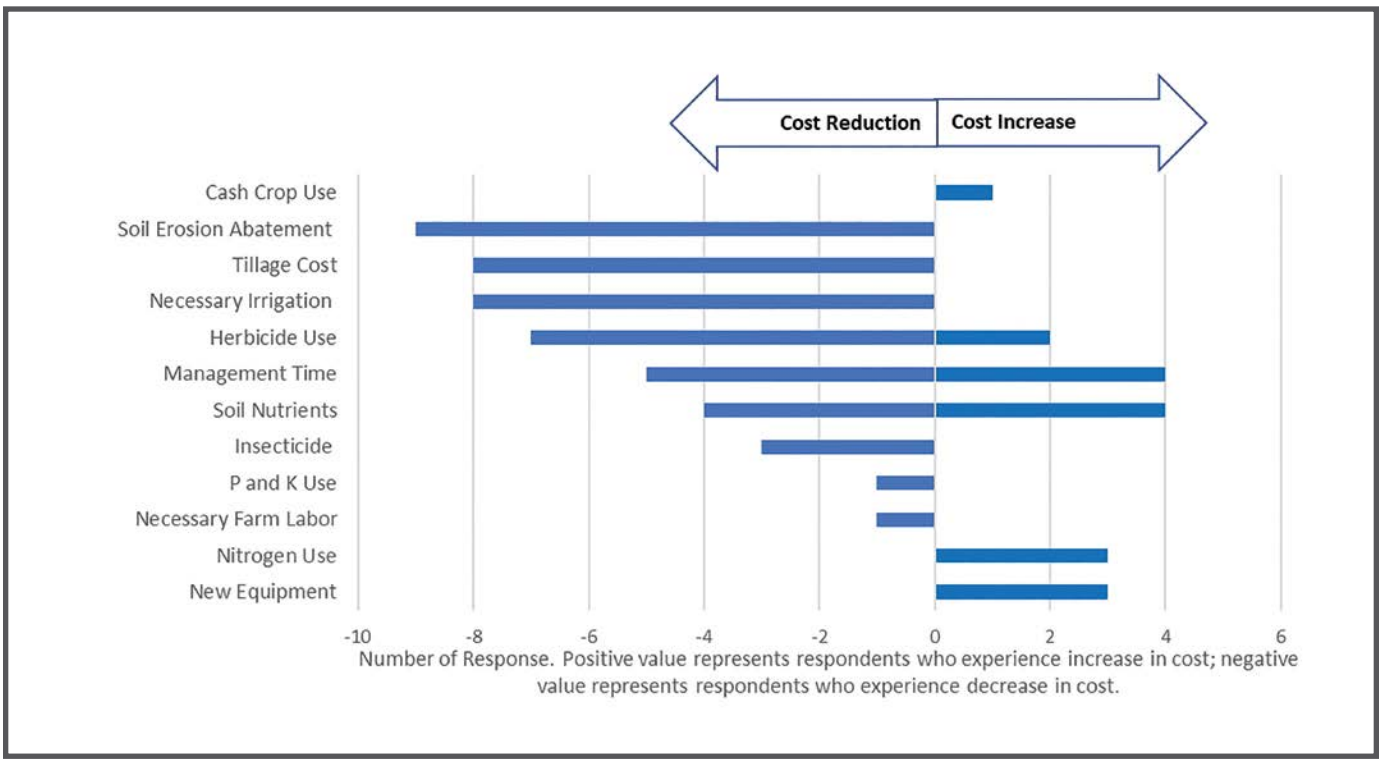

Figure 3. Reported Cost Changes Associated with Cover Crop Use

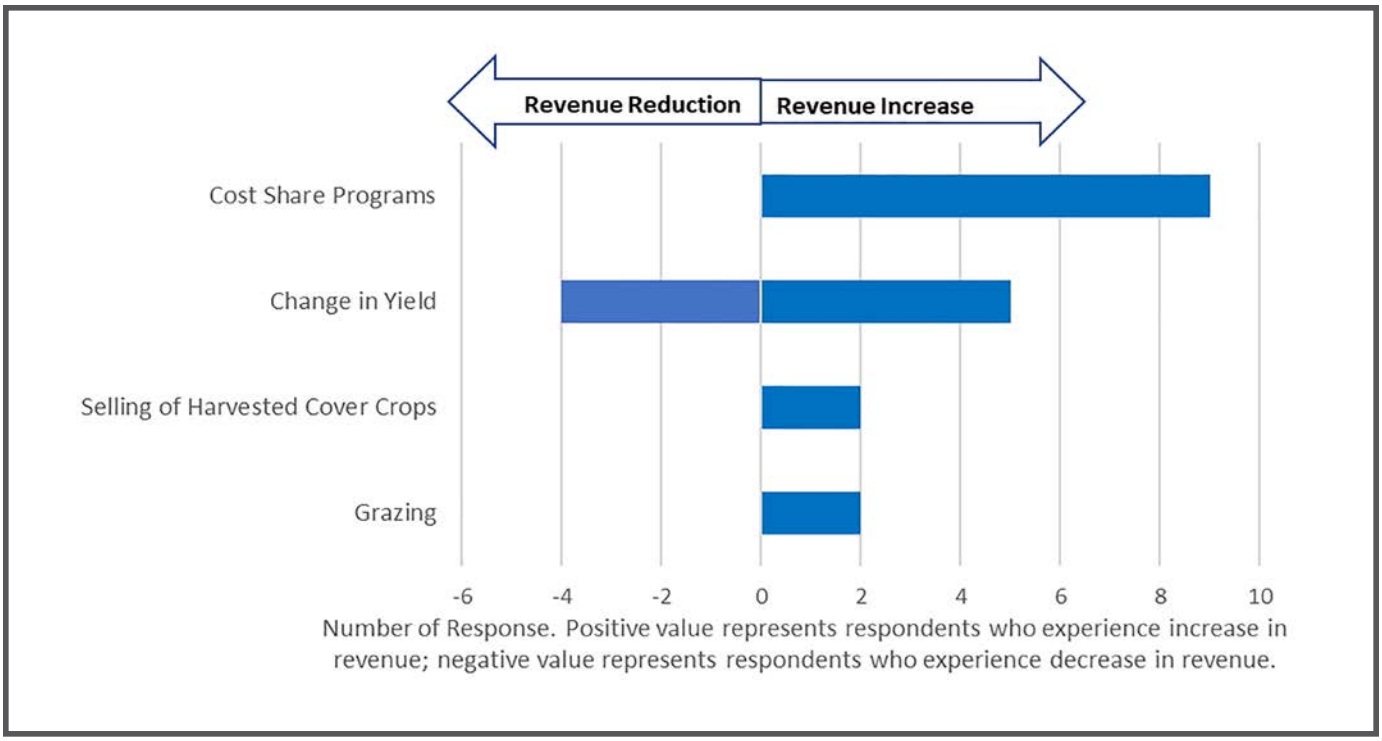

Figure 4. Reported Revenue Changes Associated with Cover Crop Use

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An Economic Analysis of Cover Crop Utilization in Georgia Cotton and Peanut Production

Goals

Science-based information on the potential return on investment for cover crops in the in Southern Coastal Plain is very limited. The first goal of this project is to develop and promote the use of partial budgets for cover crops in southern cotton and peanut row crop farming. The marginal benefits and the marginal costs of cover crops will be compared against a control scenario of leaving the land fallow during winter to assess the annual net benefit of adopting cover crops.

Timeline

Meetings will be conducted with groups of experienced cover crop farmers each to record farm management practices, associated changes in costs and revenues related to the practice. Based on the information collected through the focus groups, a survey instrument will be made available to validate and expand on the original results. A final report with benchmark partial budgets will be complete in 2019.

Privacy of the data

Data collected through the focus groups and the survey will be de-identified: the names and/or physical addresses of the respondents will not be recorded. Only regional averages (not identifiable data) will be made publicly available in the final report and all other publications stemming from this project.

If you have any questions related to this research project, you can contact Dr. Yangxuan Liu at (229) 386-3512 – Yangxuan.Liu@uga.edu, Ms. Amanda Smith at (229) 386-3512 – a.Smith@uga.edu, Dr. Alejandro Plastina (515) 294-6160 – Plastina@iastate.edu or Guy Hancock at (229) 425-6279 – ghancock@uga.edu.

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Sign me up!

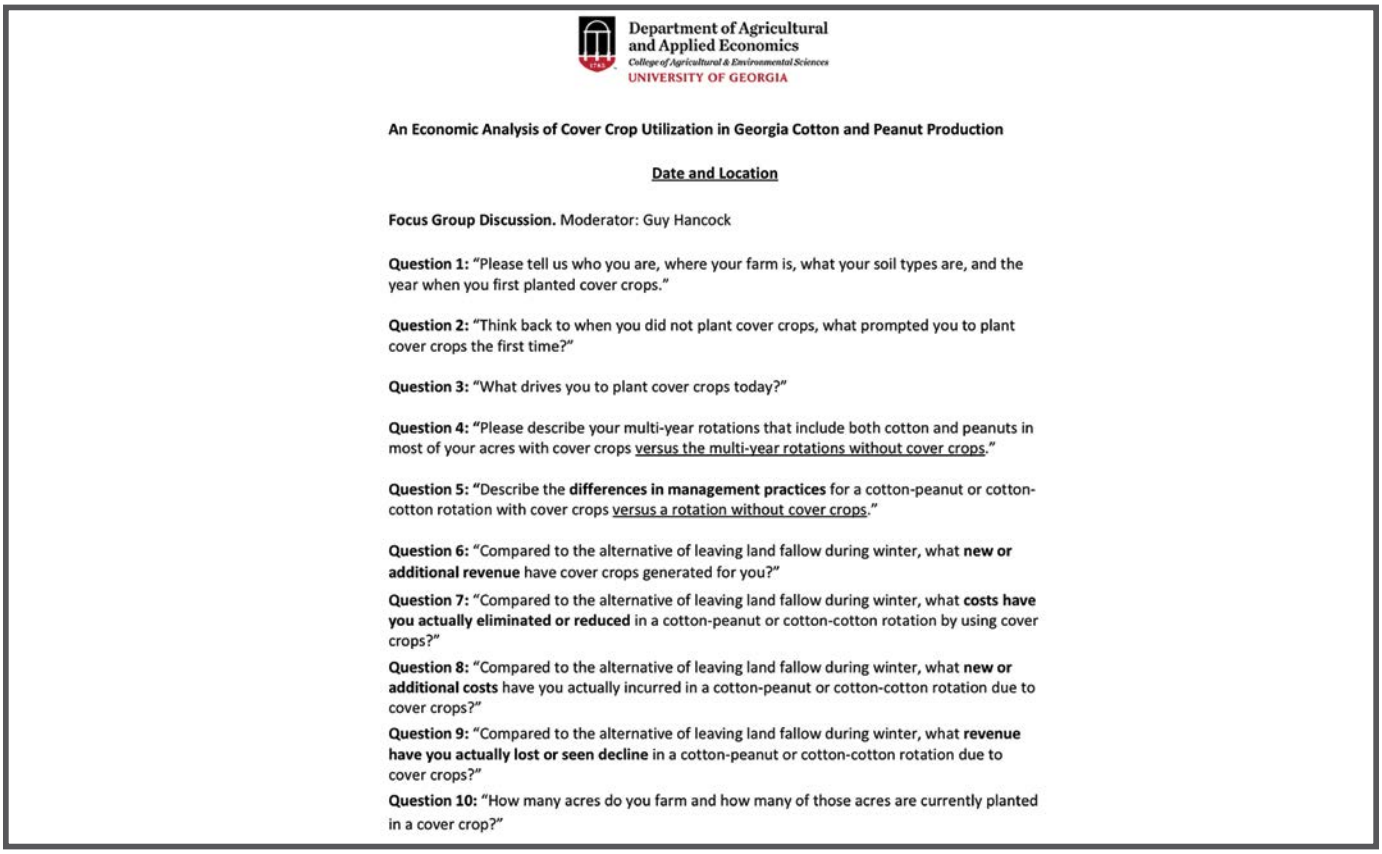
Participation in the Focus Groups is voluntary. I hereby acknowledge my intention to participate in the Focus Groups and survey planned for this study, in exchange, receive a detailed cost-benefit analysis of cover crop for my farm.

Name _____ Signature _____ Date _____

Address _____

Telephone (___)_____ Email _____

Appendix 1. Focus Group Consent Form



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An Economic Analysis of Cover Crop Utilization in Georgia Cotton and Peanut Production

Date and Location

Focus Group Discussion. Moderator: Guy Hancock

Question 1: "Please tell us who you are, where your farm is, what your soil types are, and the year when you first planted cover crops."

Question 2: "Think back to when you did not plant cover crops, what prompted you to plant cover crops the first time?"

Question 3: "What drives you to plant cover crops today?"

Question 4: "Please describe your multi-year rotations that include both cotton and peanuts in most of your acres with cover crops versus the multi-year rotations without cover crops."

Question 5: "Describe the **differences in management practices** for a cotton-peanut or cotton-cotton rotation with cover crops versus a rotation without cover crops."

Question 6: "Compared to the alternative of leaving land fallow during winter, what **new or additional revenue** have cover crops generated for you?"

Question 7: "Compared to the alternative of leaving land fallow during winter, what **costs have you actually eliminated or reduced** in a cotton-peanut or cotton-cotton rotation by using cover crops?"

Question 8: "Compared to the alternative of leaving land fallow during winter, what **new or additional costs** have you actually incurred in a cotton-peanut or cotton-cotton rotation due to cover crops?"

Question 9: "Compared to the alternative of leaving land fallow during winter, what **revenue have you actually lost or seen decline** in a cotton-peanut or cotton-cotton rotation due to cover crops?"

Question 10: "How many acres do you farm and how many of those acres are currently planted in a cover crop?"

Appendix 2. Focus Group Questions