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Cover Page Footnote

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Examining Influences on Cotton and Peanut Farmers' Intentions to Adopt Agricultural Best Management Practices in Southeast Georgia

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Abstract. Various factors have been found to influence farmers' adoption of best management practices. This study examines the influences on farmers' intentions to adopt best management practices by using an extended model of the theory of planned behavior. This descriptive exploratory study surveyed Georgia cotton and peanut farmers (N = 41). Findings revealed farmers had positive attitudes toward best management practices and showed that the use of best management practices is aligned with farmers' intrinsic motivations. Agricultural practitioners may enhance educational and outreach efforts by leveraging farmers' motivations and necessary capacities as outlined in this study.

INTRODUCTION

Intensive farming practices used in conventional agriculture that lead to soil erosion, water degradation, and biodiversity loss will need to be abandoned to preserve natural resources and ensure a sustainable future for agriculture (Ribaudo & Shortle, 2019; Zhang et al., 2007). These practices can be feasibly replaced with sustainable alternatives through farmers' adoption of research-based best management practices (BMPs; Cassman & Grassini, 2020; Chiang et al., 2014; Liu et al., 2017). Agricultural BMPs are farming practices specifically designed for the various sectors of crop and livestock production that farmers can voluntarily adopt to reduce non-point source (NPS) pollution and increase water quality goals in a practical manner (Reimer et al., 2012). As NPS pollution from agriculture includes nutrient pollution from runoff and leaching, these practices are designed to effectively reduce this pollution and increase soil and air quality (Liu et al., 2017).

Despite the well-documented benefits attributed to the adoption of these practices, ranging from increased economic gains for farmers (Chiang et al., 2014) to positive impacts on soil health and water quality (Liu et al., 2017), the rate of adoption is low and has increased in recent decades at only a gradual pace that is not sufficient to achieve widespread sustainability in agriculture (Liu et al., 2018; Wauters & Mathijs, 2013). Although there are numerous agricultural BMPs that can be applied to crop and livestock production (Georgia Soil and Water Conservation Commission, 2013), this study investigates eight specific BMPs that Georgia cotton and peanut farmers intend to adopt for these crops as practical methods for reducing NPS pollution to achieve water quality goals. These selected BMPs are described in Table 1.

Current understanding of the motivations and barriers for agricultural BMP adoption stems primarily from research focusing on livestock and row crops in the midwestern and mid-Atlantic regions of the United States(Akkari & Bryant, 2017; Arbuckle & Roesch-McNally, 2015; Prokopy et al., 2008; Reimer et al., 2012; Schall et al., 2018). Because the literature investigating influences on BMP adoption in the southeastern region of the United States is minimal, localized studies are needed to examine the determinants of BMP adoption across the major crop sectors in this region. Specifically, because few studies have investigated the motivations and barriers to adoption of BMPs in cotton and peanut farming (McNamara et al., 1991; Riar et al., 2013), there is a strong need to better understand the factors and decision-making processes that lead to effective implementation of BMPs in these staple crops of the Southeast (Liu et al., 2018; Mishra et al., 2018). As one of the top producers of cotton and peanuts in the country (Kane, 2021), the state of Georgia provided an optimal location for this study.

Table 1. Best Management Practices for Cotton and Peanut Production in Georgia

Best Management Practices (BMPs)	Description
Cover Crops	A practice that includes using close-growing grasses, legumes, and forages as a temporary cover to reduce soil erosion, capture and use excess nutrients, and improve soil quality.
Crop Rotation	A planting system in which different crops are planted in a recurring sequence on the same fields.
Nutrient Management Plans	A planning and recordkeeping process to assist farmers with improving the management of nutrient use for higher efficiency and a reduction of nutrient runoff.
Conservation Tillage	The use of any tillage system that maintains at least 30% residue cover on the soil surface after planting; this includes mulch tillage, strip tillage, no-tillage, reduced tillage, and ridge tillage.
Field Borders	Permanently vegetated borders established around fields and pastures to reduce soil erosion, protect water quality, provide wildlife habitats, and stabilize streambanks and channels. This also includes hedgerows, riparian forest buffers, and critical area planting.
Water and Sediment Control Basins	An impoundment constructed to temporarily capture runoff, trap sediment, reduce soil erosion, and improve water quality. This also includes irrigation land leveling, underground outlets, irrigation recovery systems, subsurface drains, and alternative water systems.
Irrigation Water Management	A management plan designed to efficiently use irrigation water by determining and controlling its rate, amount, and timing. This also includes the use of microirrigation, sprinklers, and other precision irrigation technologies.
Integrated Pest Management	A management plan that uses environmentally sensitive practices to control weeds, insects, and disease on fields and pastures to reduce negative effects on humans, soil, and water quality.

Note. This list includes the specific best management practices investigated in this study.

THEORETICAL FRAMEWORK

As social science researchers have sought to identify why low rates of adoption continue, many approaches have been undertaken to better understand adoption decisions (Baumgart-Getz et al., 2012; Clay, 2020; Delaroche, 2020; Prokopy et al., 2019). The Theory of Planned Behavior (TPB; Ajzen, 1991) has been found to be a useful and effective framework for investigating the decision-making process of farmers and explaining their adoption behavior (Borges et al., 2014; Daxini et al., 2019; Delaroche, 2020; Ranjan et al., 2019). Our study applies an extended model of the TPB (Ajzen, 1991) as the framework for our investigation into the BMP decision-making process of Georgia cotton and peanut farmers (Reimer et al., 2012).

The TPB consists of three primary constructs that include *attitudes, subjective norms,* and *perceived behavioral control* (Ajzen, 1991). These constructs serve to predict the behavioral intention of individuals and the likelihood that they will perform a behavior (Ajzen & Fishbein, 1980; Russell & Fielding, 2010).

According to the TPB, an understanding of behavioral intention is accomplished by exploring each of these three primary constructs that factor into an individual's beliefs (Ajzen, 1991): (a) attitudes—the individual's positive or negative beliefs toward the behavior and the perceived degree of impact the behavior will have on the individual; (b) subjective norms—the impact of perceived social expectations on whether the behavior is performed; (c) perceived behavioral control—the degree of ease or difficulty that an individual feels toward performing the behavior (Ajzen, 1991). By combining these constructs, the individual will either form a positive or negative intention toward a behavior (Tama et al., 2021). For example, if each construct is found to be favorable toward a behavior, the intention to perform the behavior will be strong (Ajzen, 1991).

In the context of this study, attitudes refer to farmers' positive or negative evaluation of performing the behavior of BMP adoption. While attitudes are an important variable to consider, subjective norms are the next variable that affects farmers' behavioral intention (Savari & Gharechaee, 2020). Subjective norms in the context of this study can be defined as the perceptions a farmer has of whether the decision to adopt BMPs is socially acceptable and encouraged by individuals close to them. For this study, perceived behavioral control refers to farmers' perceptions of how difficult it will be to adopt BMPs. This includes how farmers judge their own capabilities in performing this behavior and their confidence level in having enough financial resources or experience for this behavior to be in their control.

EXTENDED MODEL OF THE THEORY OF PLANNED BEHAVIOR

Although the TPB model is limited to the constructs of attitudes, subjective norms, and perceived behavioral control, Ajzen (1991) suggested this theory is open to including additional explanatory variables that contribute to a clearer understanding regarding the variance of behavior and intentions, as well as to an increase in the predictive power of the TPB model. Many studies have used the suggestion from Ajzen (1991) and Chen (2017) to apply an extended model of the TPB to improve the prediction of behaviors, demonstrating that the inclusion of *moral norms* and *knowledge* have most significantly contributed to predictive power in this extended TPB model (Bagheri et al., 2019; Govindharaj et al., 2021; Rezaei et al., 2018). This extended model of the theory of planned behavior is displayed in Figure 1.

Moral norms, which are defined as a moral commitment felt by people toward performing a certain behavior (Bamberg & Moser, 2007), have been found to be a significant predictor of intention in several TPB studies analyzing farmers' intentions and behaviors (Ataei et al., 2021; Bagheri & Teymouri, 2022; Savari & Gharechaee, 2020). In the context of this study, moral norms refer to the moral commitment felt by farmers toward adopting BMPs. The knowledge construct in the context of this study is defined as the knowledge a farmer has regarding recommended BMPs and their potential benefits, as well as knowledge regarding strategies to conserve natural resources and the potential impacts of agriculture on natural resources.

PURPOSE AND RESEARCH OBJECTIVES

The purpose of this study is to explore and describe Georgia cotton and peanut farmers' perceptions of BMPs. The study investigates potential influences on BMP adoption through examining sociopsychological and sociodemographic characteristics to provide practical recommendations for disseminating information and educating farmers about BMPs. We developed the following research objectives to guide this study:

1. Describe the sociodemographic characteristics of Georgia cotton and peanut farmers.
2. Describe Georgia cotton and peanut farmers' attitudes toward, subjective norms about, perceived behavioral control toward, and intent to adopt best management practices.
3. Describe Georgia cotton and peanut farmers' knowledge and moral norms related to best management practices.
4. Examine the relationship of participants' attitudes, subjective norms, perceived behavioral control, knowledge, and moral norms to intent to adopt best management practices.

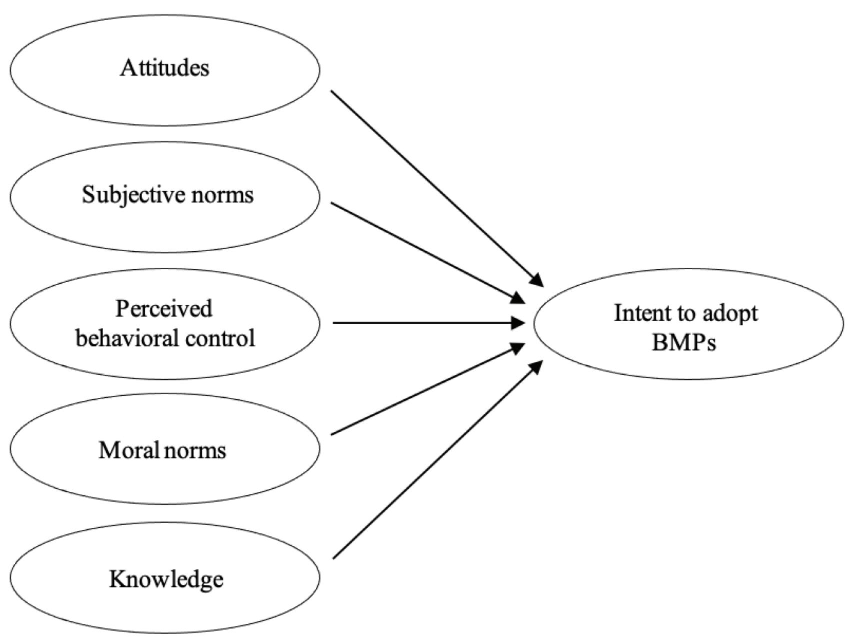

Figure 1. Expanded model of the theory of planned behavior. This model was adapted from Rezaei et al. (2018) with the inclusion of "moral norms" and "knowledge" as additional constructs.

METHODS

This study takes an exploratory approach to investigating influences on Georgia cotton and peanut farmers' intentions to adopt BMPs; we do not seek to provide generalizable conclusions. Instead, this study aims to produce insightful information that can assist the outreach and education efforts made by agricultural practitioners regarding BMPs, as well as to advance theoretical understandings of an expanded TPB model. Additionally, this study seeks to provide meaningful recommendations for researchers interested in advancing this field of inquiry. To understand the influential factors on farmers' perceptions of BMPs, we administered a paper survey to study participants.

The population of interest was cotton and peanut farmers in Georgia who interact with Cooperative Extension services. Because one of Cooperative Extension's primary roles is to extend research-based information to farmers about BMPs, investigating the perceptions of farmers who interact with Cooperative Extension was a crucial aspect of this study. We collected data from a convenience sample of participants by distributing the survey to cotton and peanut farmers who attended the Georgia Peanut Show, the Georgia Cotton Commission Annual Meeting, and Cooperative Extension production meetings in two Georgia counties. Out of an estimated 150 growers in attendance at these four events, a total of 41 completed surveys for an estimated response rate of 27.3%. This response rate is not abnormal in this field of research as response rates from survey research with farmers tends to be low and is continuing to decline (Glas et al., 2019; Prokopy, 2011).

We designed this survey to accomplish the specific objectives of the study by measuring the constructs of an extended TPB model and relevant sociodemographic characteristics of the study sample. We structured the data collection instrument for this study in a survey format similar to that used by Rezaei et al. (2018), with an extended TPB model that included knowledge and moral norms as additional constructs to explore farmers' intent to adopt BMPs. We adapted a researcher-developed questionnaire from previous studies (Avemegah, 2020; Bagheri et al., 2019; Borges et al., 2014; Despotovic et al., 2019; Maleksaeidi & Keshavarz, 2019; Rezaei et al., 2018; Savari & Gharechaee, 2020; Tama et al., 2021). Before we administered this survey, a panel of agricultural social science experts examined it for face and content validity; we obtained Institutional Review Board approval from the University of Georgia; and we conducted a pilot study with Cooperative Extension agents to test the clarity of the survey questions. Following the pilot study, we made minor adjustments to the survey by rephrasing or removing items within each construct in the interest of clarifying each of the questions. Additionally, we checked internal consistency by ensuring the estimated reliability for each construct scale exceeded a Cronbach's alpha (α) of .7 (Santos, 1999).

We divided the survey questionnaire into seven sections that we used for data analysis: (a) attitudes toward BMPs; (b) subjective norms regarding BMP use; (c) perceived behavioral control toward using BMPs; (d) intent to adopt BMPs; (e) knowledge about BMPs; (f) moral norms regarding BMP use; (g) sociodemographic characteristics, including farmer demographics and farm characteristics. We collected responses for each of these construct scales using a 5-point Likert scale: 1 = *strongly disagree*; 2 = *disagree*; 3 = *neutral*; 4 = *agree*; 5 = *strongly agree*. Overall means were calculated to represent participants' attitudes, subjective norms, perceived behavioral control, intent, knowledge, and moral norms. The last section of the survey questionnaire included multiple-choice and fill-in-the-blank questions that captured participants' age, race, sex, education level, off-farm income, farm size, ratio of owned to rented farmland, critical area farmland, farming experience, production areas, and BMP use.

DATA ANALYSIS

The convenience sample in this study resulted in the data not meeting normality assumptions. Accordingly, this did not allow the use of inferential statistics. Instead, we used descriptive statistics and non-parametric tests as empirically advised (Field, 2013) to address the research objectives. Data for objective one were analyzed and reported using descriptive statistics. The data for objectives two and three were analyzed and reported using descriptive statistics and following real limits for interpretation. The real limits set for the interpretation of responses were: 1.00 to 1.49 = *strongly disagree*; 1.50 to 2.49 = *disagree*; 2.50 to 3.49 = *neutral*; 3.50 to 4.49 = *agree*; and 4.50 to 5.00 = *strongly agree*. For research objective four, Spearman's rho was the non-parametric test that weappliedto examine relationships between the ordinal variables of each construct scale. This test is the most commonly used non-parametric correlation measure (Croux & Dehon, 2010). To interpret these correlations, the following guidelines were applied: $.01 \geq r \geq .09$ = negligible; $.10 \geq r \geq .29$ = low; $.30 \geq r \geq .49$ = moderate; $.50 \geq r \geq .69$ = substantial, $r \geq .70$ = very strong (Davis, 1971).

RESULTS

There was a similar uneven distribution by sex and race, with the majority of participants being male (n = 40; 97.6%) and White (n = 38; 92.7%). The largest proportion of participants were between the ages of 36-50 (n = 17; 41.5%). The largest proportion of participants either held a 4-year college degree (n = 13; 31.7%) or had attended some college (n = 13; 31.7%). The majority of participants did not receive off-farm income (*n* = 23; 56.1%). The largest proportion of farmers had a ratio of owned-to-rented farmland of 25 to 75% (*n* = 15; 36.6%). Additionally, the largest proportion of participants had a farm size over 1,000 acres (*n* = 15; 36.6%). The majority of participants reported having critical areas on 0-25% of their farmland (*n* = 33; 80.5%). Also, the largest proportion of farming experience among participants was over 20 years (*n* = 24; 58.5%). These results are displayed in Table 2.

Additionally, 92.7% of participants (*n* = 38) reported currently using BMPs; 7.3% of participants (*n* = 3) do not currently use BMPs but intend to in the future. A requirement of this study was for participants to be cotton and/or peanut farmers: the majority of study participants reported producing peanuts (*n* = 40; 97.6%); 95.1% of participants (*n* = 39) produced cotton; and 61% of participants (*n* = 25) also produced other row crops. Nearly half of participants (*n* = 17; 41.5%) also produced other specialty crops, and only 34.1% of participants (*n* = 14) also produced livestock.

The overall mean for attitudes was 4.16 (*SD* = .538; see Table 3), which indicates an overall positive view toward BMPs among these farmers. Georgia cotton and peanut farmers agreed that BMPs will increase their crop yields (*M* = 3.93, *SD* = .685), and that BMPs should be used by all farmers to protect natural resources (*M* = 3.93, *SD* = .787). Participants also agreed that BMPs can bring environmental benefits to their farms (*M* = 4.22, *SD* = .613). Georgia cotton and peanut farmers had the strongest agreement with the statement "I believe BMPs are beneficial for farmers and society" (*M* = 4.56, *SD* = .594). The internal reliability estimate for the attitudes scale was $\alpha = .811$.

For the subjective norms of Georgia cotton and peanut farmers, results indicated an overall mean of 3.61 (*SD* = .552; see Table 3). Participants were generally neutral about whether they feel that they are under pressure to use BMPs (*M* = 2.76, *SD* = .830), and they agreed farmers in their area are increasingly using BMPs (*M* = 3.71, *SD* = .602). Georgia cotton and peanut farmers also agreed that people whose opinions they value want them to use BMPs (*M* = 3.63, *SD* = .942) and would approve of them using BMPs (*M* = 3.93, *SD* = .818). The largest proportion of agreement was shared with the statement "I feel like it is important to listen to agricultural experts about using BMPs (*M* = 4.05, *SD* = .631). The internal reliability estimate for this scale was $\alpha = .757$.

Georgia cotton and peanut farmers generally agreed they have enough information to be able to use most BMPs (*M* = 3.73, *SD* = .867). They also shared in agreement that they have enough confidence in their ability to use BMPs successfully (*M* = 3.98, *SD* = .570). Participants indicated they agree that the use of BMPs is completely up to them (*M* = 3.98, *SD* = .724). As reported in Table 3, the overall mean for perceived behavioral control was 3.89 (*SD* = .617). The internal reliability estimate for this scale was $\alpha = .799$.

Table 2. Demographic and Socio-Economic Characteristics of Study Participants (N = 41)

Characteristic	***n***	**%**
Sex		
Male	40	97.6
Female	1	2.4
Race		
Black	3	7.3
White	38	92.7
Age		
21–35	7	17.1
36–50	17	41.5
51–65	11	26.8
66+	6	14.6
Education		
High school graduate / GED	8	19.5
Some college	13	31.7
2-year college degree	3	7.3
4-year college degree	13	31.7
Graduate or Professional degree	4	9.8
Receives off-farm income		
Yes	15	36.6
No	23	56.1
Prefer not to answer	3	7.3
Owned-to-rented ratio of farmland		
0 to 100%	3	7.3
25 to 75%	15	36.6
50 to 50%	12	29.3
75 to 25%	5	12.2
100 to 0%	6	14.6
Farm size		
<250 acres	2	4.9
250-500 acres	12	29.3
500–1,000 acres	11	26.8
>1,000 acres	15	36.6
Prefer not to answer	1	2.4
Critical area farmland		
0–25%	33	80.5
25–50%	5	12.2
50–75%	2	4.9
75–100%	1	2.4
Farming experience		
1–10 years	6	14.6
11–20 years	11	26.8
Over 20 years	24	58.5

As seen in Table 3, the overall mean for Georgia cotton and peanut farmers' intent was 3.91 (*SD* = .544). Georgia cotton and peanut farmers reported a mean of 3.80 (*SD* = .679) for their agreement with the statement "I intend to strongly recommend that other farmers use BMPs." Participants agreed they intend to seek out financial support for using BMPs (*M* = 3.68, *SD* = .850). They also agreed they intend to regularly try to use BMPs on their farms in the near future (*M* = 4.07, *SD* = .608). Georgia cotton and peanut farmers shared the largest agreement with the statement "I intend to use BMPs on my farm this year" (*M* = 4.10, *SD* = .583). The internal reliability estimate for the intent scale was α = .800.

As seen in Table 4, Georgia cotton and peanut farmers reported an overall mean for knowledge of 3.94 (*SD* = .539). They shared in agreement that they are aware of the environmental and financial benefits attributed to BMPs (*M* = 3.95, *SD* = .545) and the importance of engaging with BMPs (*M* = 4.00, *SD* = .632). Georgia cotton and peanut farmers agreed they are sufficiently knowledgeable about BMPs (*M* = 3.63, *SD* = .799). They agreed they are familiar with usual farming methods to protect natural resources (*M* = 4.02, *SD* = .612) and familiar with the impacts agriculture can have on natural resources (*M* = 4.10, *SD* = .583). The internal reliability estimate for the knowledge scale was α = .897.

For the moral norms of Georgia cotton and peanut farmers, results in Table 4 indicate an overall mean of 3.75 (*SD* = .555). Participants felt neutral about whether they would feel guilty for not using BMPs (*M* = 3.39, *SD* = .919). Participants also felt neutral about whether they did not feel responsible for encouraging other farmers to use BMPs (*M* = 3.12, *SD* = .872). Georgia cotton and peanut farmers agreed

Table 3. Descriptive Statistics for Each Theory of Planned Behavior Construct Scale

Construct Scales	α	*n*	*M*	*SD*
Attitudes	.811			
I believe BMPs are beneficial for farmers and society		41	4.56	.594
I believe BMPs will increase my crop yields		41	3.93	.685
Construct Scales				
I believe BMPs should be used by all farmers to protect natural resources		41	3.93	.787
I believe BMPs can bring environmental benefits to my farm		41	4.22	.613
Overall Mean		**41**	**4.16**	**.538**
Subjective Norms	.757			
I feel like the people whose opinions I value want me to use BMPs		41	3.63	.942
I feel like it is important to listen to agricultural experts about using BMPs		41	4.05	.631
I feel like the people whose opinions I value would approve of me using BMPs		41	3.93	.818
I feel like farmers in my area are increasingly using BMPs		41	3.71	.602
I feel like I am under pressure to use BMPs		41	2.76	.830
Overall Mean		**41**	**3.61**	**.552**
Perceived Behavioral Control	.799			
I believe that I have enough information to be able to use most BMPs		41	3.73	.867
I believe that I have confidence in my ability to use BMPs successfully		41	3.98	.570
I believe that whether or not I use BMPs is completely up to me		41	3.98	.724
Overall Mean		**41**	**3.89**	**.617**
Intent	.800			
I intend to use BMPs on my farm this year		41	4.10	.583
I intend to regularly try to use BMPs on my farm in the near future		41	4.07	.608
I intend to seek out financial support for using BMPs		41	3.68	.850
I intend to strongly recommend that other farmers use BMPs		41	3.80	.679
Overall Mean		**41**	**3.91**	**.544**

Note. Respondents were instructed to indicate their level of agreement or disagreement with each of the presented statements. Responses were based on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

Table 4. Descriptive Statistics for the Additional Theory of Planned Behavior Construct Scales

Construct Scales	α	***n***	***M***	***SD***
Knowledge	.897			
I am sufficiently knowledgeable about BMPs		41	3.63	.799
I am familiar with the impacts agriculture can have on natural resources		41	4.10	.583
I am aware of the importance of engaging with BMPs		41	4.00	.632
I am familiar with usual farming methods to protect natural resources		41	4.02	.612
I am aware of the environmental and financial benefits attributed to BMPs		41	3.95	.545
Overall Mean		**41**	**3.94**	**.539**
Moral Norms	.762			
Construct Scales	α	n	M	SD
I think it is my responsibility as a farmer to protect natural resources		41	4.41	.591
I think the use of BMPs is in agreement with my principles, values and beliefs		41	4.10	.700
I think I am morally obligated to use BMPs		41	3.71	.750
I think I would feel guilty if I did not use BMPs		41	3.39	.919
I think I am NOT responsible for encouraging other farmers to use BMPs*		41	3.12	.872
Overall Mean		**41**	**3.75**	**.555**

Note. Respondents were instructed to indicate their level of agreement or disagreement with each of the presented statements. Responses were based on a 5-point Likert scale with 1 = strongly disagree and 5 = strongly agree. Reverse coded statements are denoted with *.

in thinking they are morally obligated to use BMPs ($M = 3.71$, $SD = .750$). They also agreed in thinking the use of BMPs aligned with their principles, values and beliefs ($M = 4.10$, $SD = .700$). Additionally, participants shared in agreement that it is their responsibility as a farmer to protect natural resources ($M = 4.41$, $SD = .591$). The internal reliability estimate for this scale was $\alpha = .762$.

Further data analysis was conducted to examine the relationships between Georgia cotton and peanut farmers' attitudes, subjective norms, perceived behavioral control, knowledge, moral norms, and intent to adopt BMPs. At the .01 level, a Spearman's rho revealed a substantial significant relationship between attitudes toward BMPs and intent to adopt ($r = .502$, $p = .001$). There was a moderate significant relationship between subjective norms regarding BMPs and intent to adopt at the .05 level ($r = .350$, $p = .025$). There was also a moderate significant relationship at the .05 level between perceived behavioral control toward BMPs and intent to adopt BMPs ($r = .310$, $p = .049$). Moderate significant relationships were also observed between knowledge of BMPs and intent to adopt BMPs at the .05 level ($r = .331$, $p = .035$), and between moral norms toward BMPs and intent to adopt BMPs at the .01 level ($r = .461$, $p = .002$).

DISCUSSION

It is important to reiterate that this study was based on a convenience sample of a small farmer group in southeast Georgia. The resulting low sample size could be due to survey fatigue as this population is frequently asked to participate in surveys distributed by government agencies, private entities, and universities (Liu & Brouwer, 2022). Despite the sample size, the fact that these individuals were Extension clientele attending various producer meetings and events suggests that they are potentially a unique group of motivated, knowledgeable, and socially aware producers. The study's overall objective was to investigate potential influences on BMP adoption to inform outreach and education efforts made by agricultural practitioners regarding BMPs, as well as to advance theoretical understandings of an expanded TPB model. The following discusses the results as they relate to each construct of the TPB model.

ATTITUDES

Georgia cotton and peanut farmers felt that BMPs not only are beneficial for farmers and society, but that they also will increase yields and bring environmental benefits to farms. The positive attitudes Georgia cotton and peanut farmers held toward these practices extend to wanting all farmers to use BMPs to protect natural resources. The Spearman's rho revealed that attitudes have the largest association with Georgia cotton and peanut farmers' intent to adopt BMPs.

The insights from this study suggest that careful consideration should be given to farmers' attitudes and that this could be crucial for educational efforts focusing on promoting the feasibility and benefits of BMPs. Taking into consideration the value of explaining specific benefits, costs, risks, and prevalent management concerns regarding BMPs, educational efforts could fulfill some needs of Georgia cotton and peanut farmers (Formiga, 2021; Miller et al., 2012). Once farmers are open to learning more about these practices, training farmers may enable them to adopt BMPs and enhance their capacity to evaluate their management practices more efficiently (Despotovic et al., 2019).

SUBJECTIVE NORMS

Georgia cotton and peanut farmers did not feel that they were under pressure from anyone, including those whose opinion they value, to use BMPs. However, they did believe farmers in their area are increasingly using these practices and that it is important to listen to agricultural experts about using BMPs. As all farmers in this study interact with Cooperative Extension, this finding could potentially mean that they have been using BMPs for years without being aware that Extension's management recommendations were aligned with the use of BMPs. These findings could support the idea that putting pressure on nonadopters may not actually be the best solution to increase adoption rates, but rather that establishing knowledge networks between farmers and conservation leaders within a community may be a more effective solution to pursue (Franz et al., 2010; Singh et al.,2018); this is a key role that Extension professionals often play. Additionally, these findings could point to a need for the development of new ways to document the use of BMPs on farms. Furthermore, Georgia cotton and peanut farmers felt that those whose opinions they value would be supportive of their decision to use BMPs. Because farmers' subjective norms toward using BMPs were found to be positively associated with intent to adopt BMPs, these findings could potentially add weight to the suggestion of Daxini et al. (2019) that agricultural experts and professional sources of information may be more influential on farmers' views toward BMPs than friends or family.

PERCEIVED BEHAVIORAL CONTROL

Past research has indicated that farmers' perceived behavioral control toward using best management practices is typically associated with their intentions to adopt BMPs (Daxini et al., 2018; Daxini et al., 2019; Doran et al., 2020). The results of this study concur with this common finding as the perceived behavioral control of farmers had a significant and positive association with intent to adopt BMPs. Although this could be due to the majority of farmers in this study having over 20 years of farming experience, it should still be inferred that farmers' beliefs that they have enough information, confidence, and control over their decision to use BMPs are important considerations when examining their intentions to use these practices. While this suggests that practitioners should work to ensure sufficient farmer education and training, they should also employ outreach efforts to address other potentially influential variables, including structural barriers such as costs, time, and labor, influencing farmers' capacity to adopt BMPs, .

KNOWLEDGE

Georgia cotton and peanut farmers shared an awareness of BMPs and of the potential impacts agriculture can have on natural resources. Yet while awareness about a topic such as BMPs can have a notable influence on farmers' adoption behavior, knowledge about how to perform the behavior is a more relevant consideration for examining BMP adoption (Kaiser et al., 1999). In an investigation into farmers' intentions to use pesticides, Bagheri et al. (2019) found knowledge of pesticide use was the most important factor influencing intention. Accordingly, Georgia cotton and peanut farmers' knowledge of BMPs was found to be significantly and positively associated with intent to adopt BMPs. This finding could be explained by the fact that all participants in this study participated in Cooperative Extension activities and therefore are more likely to be knowledgeable about BMPs than farmers who do not interact with this service. Likewise, this finding may have implications for researchers as a comparison of the knowledge levels of BMPs between farmers who engage in Cooperative Extension services versus farmers who do not, and it could provide valuable insights into the most effective sources for disseminating information about BMPs.

MORAL NORMS

Research investigating the impact farmers' moral norms have on their intentions to adopt a practice or technology has found that farmers who have stronger moral norms tend to have stronger intentions toward performing the behavior (Bagheri et al., 2019; Rezaei et al., 2018). Georgia cotton and peanut farmers share the altruistic feeling of being responsible for the protection of natural resources, and the significant positive relationship between moral norms and intent to adopt BMPs in this study concurs with this prior research. This finding could suggest that educational seminars and trainings for farmers should include discussions about how not utilizing BMPs can lead to detrimental impacts on natural resources.

CONCLUSIONS

This study contributes to the foundation that complementary studies can use to investigate conservation practice adoption. In addition, there are key recommendations Extension professionals can consider as they engage with Extension and non-Extension clientele regarding the adoption and use of BMPs.

RESEARCH RECOMMENDATIONS

A valuable area of inquiry would be to examine the information sources most frequently used by cotton and peanut farmers. Such results would be beneficial to conservation and agricultural entities, such as Cooperative Extension, which can be seen by farmers as lacking personalization and flexibility (Houser et al., 2018). Although farmers in this study valued the expertise of agricultural practitioners such as Cooperative Extension, farmers' use of Cooperative Extension as their primary information source varies widely by state (Borrelli et al., 2018; Houser et al., 2018; McLeod et al., 2019). A further area of inquiry in this issue could be to investigate the preferences targeted populations of farmers hold for specific educational and technical support approaches regarding conservation practices. This can help shed light on the role of partnerships between the private sector and agricultural government entities in conducting on-farm field trials to educate farmers about conservation practices.

While most farmers in this study had over a decade of experience farming, it may also be valuable to examine BMP perceptions of unique farming groups, such as new or beginning farmers, which account for 27% of the U.S. farming population (USDA National Agricultural Statistics Service, 2020). Conducting research with farmers among various demographic, ethnic, and cultural groups could reveal helpful insights into where these groups of farmers are seeking farm management information, key factors that influence their decision-making process, and how BMPs are perceived or prioritized within an overall business plan.

IMPLICATIONS FOR EXTENSION PROFESSIONALS

One of the limitations of this study was a low sample size, which could be due to survey fatigue as this population is frequently asked to participate in surveys distributed by government agencies, private entities, and universities (Liu & Brouwer, 2022). While future research in farmer perceptions regarding on-farm and production decision-making processes is always important for deepening understanding and building theory, there is still the need for on-the-ground, day-to-day application by Extension professionals. Therefore, this study's design and subsequent findings could serve as a discussion guide Extension professionals could consider and incorporate into existing workshops, one-on-one meetings with Extension clientele, and casual conversations with non-Extension clientele—all for the purposes of refining farmer perceptions and behavior around BMPs adoption and use:

- **Attitudes**. Beyond whether farmers have a positive or negative attitude regarding BMPs, do they see the implementation of BMPs as feasible or beneficial?
- **Subjective norms**. Do farmers feel pressure to adopt BMPs? If so, from whom or what entity? How would they describe such pressure?
- **Perceived behavioral control**. Do farmers believe they have enough information, confidence, and control over their decisions to use BMPs? If not, what are the constraining or limiting factors?
- **Knowledge**. Based on varying engagement and relationship building with diverse farmer groups, including those who engage with or depend on Extension and those who do not, what are farmers' knowledge levels of BMPs, and are they aware of available programs and policies that reduce costs to implementing BMPs?
- **Moral norms**. Are farmers aware of the consequences (short- or long-term) or detrimental impacts on natural resources of not using BMPs? What is the extent of their awareness of such consequences or impacts?

As BMPs play a crucial role in advancing sustainable agricultural intensification that is needed to meet global food and fiber demands, the continued development of this area of research and engagement will be critically important to facilitate increased adoption of BMPs.

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