Extension Professionals' Attitudes Toward Climate Change and Intention to Share Climate-Smart Agriculture Information

Introduction/Theoretical Framework

Climate change poses major challenges for future generations, especially in agriculture. Agricultural producers must manage extreme weather and climate variability while increasing food production and reducing resource use and emissions (James et al., 2014; Lou et al., 2024). Climate-Smart Agriculture (CSA) has been recognized as a foundational practice that addresses these challenges by improving food security, enhancing resilience to climate change, and reducing greenhouse gas emissions (Lipper & Zilberman, 2018). One of the ways these practices can be conveyed to producers is through the land-grant university extension service. Past research indicates extension agents are trusted sources of information (Burnett et al., 2014) and recognize climate change's impact on agriculture (Diehl et al., 2017). Despite the perceived value of these individuals, extension agents face communication barriers such as limited farmer interest, insufficient information, and a lack of resources when addressing these topics (Becerra et al., 2016). These barriers, along with their beliefs towards climate change may shape how and whether extension agents seek or share information on CSA. However, studies have yet to examine the relationship between beliefs on climate change and extension agents' information-seeking and sharing behaviors towards CSA practices.

The Theory of Planned Behavior (TPB) offers a foundation to explore why extension agents share and seek information about CSA. TPB states behavior can be predicted by the intention of a behavioral act (Ajzen, 1991), which is influenced by three different factors: attitudes, subjective norms, and perceived behavioral control (Surjanti et al., 2023). The Six Americas Super Short Survey (SASSY), a segmentation tool that categorizes individuals based on their attitudes and beliefs about climate change, complements the TPB framework by offering a structured way to assess the attitudinal component (Chryst et al., 2018). SASSY uses four Likert-scale questions to determine if participants are worried about climate change, if it was important to them, and if they thought it would harm them or future generations. Based on responses to four questions, participants are clustered into six memberships groups; Alarmed, who are the most engaged and view climate change as a serious and urgent threat; Concerned, who believe climate change is a problem but are less personally involved than the Alarmed; Cautious, who think climate change is happening but are less certain about its causes and believe it will have limited personal impact; Disengaged, who rarely think about climate change and have minimal engagement with the topic; Doubtful, who are uncertain about whether climate change is occurring, do not perceive it as a personal threat, and believe current efforts are sufficient; and Dismissive, who are actively opposed to the idea that climate change is real or human-caused (Chryst et al., 2018). Integrating SASSY into the TPB framework may provide an understanding of how climate change attitudes influence extension agents' behavior with CSA. Furthermore, adding moral norms to the TPB framework can enhance the predictability of behavior (Kitten, 2024). These theories have been widely used and recommended as effective frameworks for examining behavior within agricultural contexts (Luke, 2025; Neumann et al., 2022; Wang & Lin, 2018). Together, these theories and tools serve as a strong framework to examine extension agents' intention to seek or share information based on their attitudes towards climate change.

Purpose & Objectives

The purpose of this study was to explore whether county extension agents' attitudes, perceived behavioral control, and social and moral norms influence their information-seeking behaviors regarding CSA practices, and if the communication material that they are seeking on CSA is available to them. The following research objectives guided the study:

RQ1: What are extension agents' attitudes toward climate change?

RQ2: How do extension agents' TPB attributes toward sharing information about CSA differ between SASSY groups?

RQ3: How do extension agents' seeking frequency of CSA information differ between SASSY groups?

RQ4: What communication materials do extension agents have to support the dissemination of information about CSA?

Methods

This exploratory relational research study employed a parallel mixed methods design conducted between December 2024 and February 2025, in two research phases (Creswell, 2013). By utilizing this approach, we can comprehensively explore all attributes of the theory of planned behavior in examining county extension agents' intentions to share information about climate-smart agriculture practices.

Phase one of this study investigated research objectives one, two and three. An online survey instrument was created and disseminated using Qualtrics. Attitudes toward climate change ($\alpha = 0.92$) were measured using the SASSY tool (Chryst et al., 2018). Likert-type questions adapted from Kitten (2024) were used to measure subjective norms ($\alpha = 0.88$), moral norms ($\alpha = 0.94$), and perceived behavioral control ($\alpha = 0.78$) related to the ability to share information about CSA practices. All Likert-type questions were on a 5-point scale (1 = strongly disagreed, 5 = strongly agreed). Multiple choice questions asked how frequently participants sought CSA information and from where. A panel of experts reviewed the questionnaire to establish face validity. Participants who completed the questionnaire had the chance to enter a drawing for a gift card to decrease non-response errors. Using a purposive sampling method, the survey was emailed to county extension agents working within agriculture and natural resources in [state]. Two reminder emails were sent to encourage responses during the 6-week data collection timeframe. A total of 125 extension agents responded.

Descriptive and inferential statistics were conducted using SPSS. First, we conducted a two-step hierarchical cluster analysis using the SASSY questions, which categorized participants into six groups ranging from Alarmed to Dismissive. Following, we utilized a one-way ANOVA to compare the TPB attributes between the different SASSY membership groups. Finally, we utilized Chi-square to assess if there were differences in frequency of seeking CSA information between the SASSY membership groups (Field, 2024).

Phase 2 was used to explore research question 4 (RQ4). An inventory audit was conducted of online communication efforts related to CSA by [extension services] released before December 31, 2023. Content was gathered from [extension service] websites, online

learning databases, news blogs, and social media platforms. This approach provided a summary of communication assets (Land, 2014). The search terms used were "Climate-Smart Agriculture," "Regenerative Agriculture," and "Sustainable." These terms have strong links to CSA practices (Ashutosh et al., 2024) and ensured that all possible materials were found. A codebook was developed to guide the inventory audit and describe the content found (i.e., communication channel, date posted, CSA practices, and agriculture sectors). Utilizing an online calculator called "ReCal3" (Freelon, n.d.) a Krippendorf's agreement coefficient alpha (Krippendorf, 2004) of 0.83 or above was reached for all categories coded. Descriptive statistics were utilized through Microsoft Excel to answer this research question.

Results

RQ1: What are Extension Agents' Attitudes Toward Climate Change?

The first research question of this study was to explore extension agents' attitudes toward climate change. A cluster analysis was conducted based on the SASSY framework, resulting in six distinct groups that aligned with the original SASSY segments. Most extension agents fell within the Cautious (n = 34, M = 3.4), Disengaged (n = 27, M = 2.7), or Doubtful (n = 29, M = 1.9) SASSY groups. Alarmed (n = 11, M = 4.5, SD) had the highest attitude mean, followed by Concerned (n = 17, M = 3.8). The Dismissive (n = 7, M = 1.0) group was the smallest with the lowest attitude mean. Through an ANOVA, significant differences in their attitude mean were found between all SASSY groups, $F(5, 119) = 283.11$, $\eta^2 = .992$ $p < .05$.

RQ2: How do Extension Agents' TPB Attributes Toward Sharing Information About CSA Differ Between SASSY Groups?

As seen in Table 1, Alarmed and Concerned had higher moral norm means toward sharing information about CSA than Disengaged, Doubtful, and Dismissive groups.

Table 1

*TPB Attributes Mean Toward Sharing Information about CSA Arranged by SASSY Group (*N = *125).*

SASSY		Moral Norms		Subjective Norms		Behavioral Control	
Clusters	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Alarmed	11	4.3_{a}	.39	3.5_{a}	.71	3.2	.82
Concerned	17	3.8_{a}	.68	3.4_{ab}	.70	3.3	.78
Cautious	34	3.5_{ab}	.58	3.1_{ab}	.45	3.2	.50
Disengaged	27	3.0_{bc}	.57	2.7_{c}	.79	2.9	.64
Doubtful	29	3.0_{bc}	.59	3.1_{ac}	.69	3.2	.67
Dismissive	7	2.2_{c}	.95	2.9_{bc}	.57	3.3	.80
F- Value (η^2, p)		11.7 (.331, < .001)		3.5 (.129, .005)		.770 (.031, .57)	

Note. Means with different subscripts indicate significant group differences at $p < .05$ based on the Bonferroni post hoc test. Means that share a subscript letter are not significantly different. F(5, 119).

Dismissive was also different from Cautious within their moral norms toward sharing information about CSA, but Cautious did not differ from the Alarmed, Concerned, Disengaged, and Doubtful clusters. For subjective norms toward sharing information about CSA, the Disengaged cluster reported lower subjective norm scores compared to the Alarmed, Concerned, and Cautious clusters. Alarmed reported a higher subjective norm mean compared to Disengaged and Dismissive. There were no differences in subjective norms between Concerned, Cautious, and Dismissive clusters, while there was no difference between Alarmed, Concerned, Cautious, and Doubtful. No difference was found in behavioral control (Table 1).

RQ3: How do Extension Agents' Seeking Frequency of CSA Information Differ Between SASSY Groups?

Due to low cell counts across seeking frequencies, clusters were regrouped into high (Alarmed, Concerned, Cautious) and low (Disengaged, Doubtful, Dismissive) attitude categories (Table 2). The likelihood ratio chi-square revealed significant differences between the high and low SASSY clusters and CSA information seeking, $\chi^2(4, N = 125) = 17.99$, $p < .001$. The findings indicated that high attitude group extension agents mostly sought information from weekly to quarterly, whereas the low attitude agents did so quarterly to never.

Table 2

*Descriptive Statistics of Seeking Frequency of the Different Cluster Groups (*N = *125)*

SASSY	Weekly		Monthly		Quarterly		Rarely		Never	
Clusters	*f*	*f%*	*f*	*f%*	*f*	*f%*	*f*	*f%*	*f*	*f%*
					High Attitude					
Alarmed	3	27	4	36	4	36	0	0	0	0
Concerned	4	26	5	29	2	11	5	29	1	5
Cautious	3	8	6	17	6	17	16	47	3	8
Total	10	16	15	24	12	19	21	33	4	6
					Low Attitude					
Disengaged	2	7	2	7	2	7	16	59	5	18
Doubtful	4	13	1	3	7	24	11	37	6	20
Dismissive	0	0	0	0	1	14	2	28	4	57
Total	6	9	3	4	10	15	29	46	15	23

Note. High Attitudes (*n* = 62) and Low Attitudes (*n* = 63).

RQ4: What Communication Materials do Extension Agents Have to Support the Dissemination of Information About CSA?

Research question 4 (RQ4) asked what resources extension agents have to support the dissemination of information about climate-smart agriculture. Results showed that the most frequently sought online communication materials were [extension service] news and announcements (*f* = 121), followed by extension publications and educational resources (*f* = 61), social media (*f* = 38), and research publications (*f* = 37) (Table 3). However, the frequency of these types of materials sought did not align with those found through the content audit. Research publications were the most commonly found resource (*f* = 134), followed by social

media (f = 56), news and announcements (f = 51), and extension publications and educational resources (f = 30) (Table 3).

Table 3
Frequency Counts of Information Extension Agents are Seeking Information and What Types of Information can be Found

Action	Research Publication	Social media	News and Announcements	Extension Publication and Education Material
Information Sought	37	38	121	61
Information Found	134	56	51	30

Conclusions and Recommendations

This study found a range of attitudes among [state] extension agents regarding climate change, and when extension agents are clustered by their attitude toward climate change, there are differences in their seeking behavior on CSA information and determinants of their intention to share that information. We found that low attitude extension agents are not seeking information as frequently as high attitude extension agents. This could be due to the differences in subjective norms and moral norms found between the groups. While moral norms, an individual's internal sense of right and wrong, can be difficult to change, subjective norms, which reflect social influences from others, may be something the [extension service] can actively influence (FeldmanHall et al., 2018). Strengthening relationships between CSA researchers and extension agents, particularly those with lower attitudes toward climate change, may increase the agents' intention to share information on CSA. The TPB also states that individuals are more likely to perform a behavior if they perceive it as easy and have the necessary resources to do so (Ajzen, 1991). While we did not find a significant difference in behavioral control, we found neutral feelings toward sharing CSA information. We also found that the communication material did not align with the types of communication extension agents sought. For this reason, we recommend there should be an increased effort to translate the research into a variety of material types (Leach, 2018) and distribute them through [extension service] using internal announcements, publications, external online learning databases and social media platforms. This will ensure extension agents can easily find and share not just useful information, but also usable information (Thorn et al., 2017)

There were multiple limitations to this study due to time and resources. Phase 2 of this research did not assess the quality of communications made or how accessible the information was to the extension agent. We also acknowledge that extension agents may be creating their own communication material, but it may not be published through [extension service's] public platforms and websites. Further research is needed to evaluate the content of climate-smart agriculture (CSA) communication materials available to extension agents, ensuring they are not only useful but also usable (Thorn et al., 2017) when supporting farmer education on CSA practices. We also recommend that the perceived level of trust among extension agents in these information sources be investigated. Finally, applying this study to other foundational agricultural approaches, such as precision agriculture, would determine whether the same discrepancies in communication materials found versus sought persist across different topics and to identify factors influencing the flow of information from scientists to producers.

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