

“I talk to producers like I’m a producer!” Exploring Extension Professionals’ Perceptions and Framing of Climate Change

K. R. Wilson¹, S. C. Mukembo²

Abstract

Climate change is a central risk to global agriculture. As extension professionals are key disseminators of information on agricultural production, their perceptions of climate change and how they convey climate information to farmers is important to understand. This study explored how extension professionals in Missouri perceive the issue of climate change, how they frame communications with their producer stakeholders, and their need for training. We conducted an online survey with 112 extension professionals in the state, using Maibach and colleagues’ Six Americas Scale. The majority of participants believed that climate change is happening, although participants fell into each segment of the scale. There was a significant relationship between conservative ideological leaning and disbelief in climate change. Participants were more likely to use terms like “extreme weather,” “weather variability,” and “long-term weather” and least likely to say things like “climate debate,” “global warming,” and “greenhouse gases.” Only 6.7% of participants had received any formal training on climate change. These findings point to the need for participatory training for extension professionals on climate change, to build climate literacy while also teaching climate scientists best practices for communicating these issues to the public.

Article History



Received: July 25, 2023

Accepted: October 11, 2023

Published: November 3, 2023

Keywords

agricultural extension; climate literacy; agricultural communications; climate change

-
1. Kelly R. Wilson, Assistant Professor, School of Natural Resources, University of Missouri, 1406 E. Rollins St. 207 Ag Engineering Building, Office 232, Columbia, MO 65211, kellywilson@missouri.edu,  <https://orcid.org/0000-0002-8462-0586>
 2. Stephen C. Mukembo, Postdoctoral Fellow, Division of Applied Social Sciences, University of Missouri, 320 Mumford Hall Columbia, MO 65211, mukembos@missouri.edu,  <https://orcid.org/0000-0003-1909-9349>

Introduction and Problem Statement

The role of extension professionals is to bring science-based advisory services to farmers to help them mitigate and adapt to new challenges. Climate change is a key challenge to global agriculture (James et al., 2014; Prokopy et al., 2017). An estimated 97% of scientists agree that climate change is occurring (Cook et al., 2016), and there is considerable research showing that human activity has directly and indirectly contributed to driving climate change (Chen et al., 2013; Dey & Mishra, 2017). As such, this topic should be of particular relevance to farmers, as agriculture and natural resource management are both impacted by the effects of climate change and could play a role in mitigating and adapting to climate change (Arbuckle et al., 2013).

However, this near consensus among scientists and accumulated scientific evidence is not reflected in our public discourses. There are wide disparities in perspectives on climate change in the U.S. (Egan & Mullin, 2017; Ruth & Colclasure, 2023), pointing to a disconnect between scientific research and the general public. As the designated translators of scientific research to the people, extension professionals have a natural role to play in extending awareness and understanding of climate change. The way that extension resource providers engage their audiences with climate change—and their own perceptions of the risks—is important to understand, since they are a trusted source of information for the farmers. In this study, we explore how extension professionals, including Cooperative Extension and Private Land Conservationists in Missouri, perceive the issue of climate change and explore what factors impact their perceptions. We further explore how extension professionals frame discussions on climate issues with their stakeholders to understand what terms, phrases, and entry-points may be fruitful—rather than detrimental—in generating solutions to help farmers and the general public address these very real challenges.

Theoretical and Conceptual Framework

A variety of studies have explored people's beliefs about climate change since the 1990's. Crucially, we understand that climate change is a complex issues and that peoples' understandings, beliefs, and risk assessments are shaped by more than "just the facts," the approach most climate scientists lean on to educate the public (Wilke & Morton, 2015). In fact, scholars suggest the focus on scientific facts alone without being in conversation with the public can lead to resistance and opposition rather than action (Filho, 2009; Moser, 2010).

Studies show that perceptions about climate change are shaped less by knowledge variables, but by demographic, political, socio-cultural, and psychological factors. Demographic factors include age, gender, and level of education (Arbuckle et al., 2013; Egan & Mullin, 2017). Different research finds that women, those with higher levels of education, and younger people are more likely to believe that climate change is real and a pertinent issue that society should deal with (Arbuckle et al., 2013; Egan & Mullin, 2017; Liu et al., 2014; Wiest et al., 2015). Ideological and political orientation is one of the strongest predictors of climate change perception; liberal orientation is more often associated with belief and concern about climate

change than conservative orientation (Cook et al., 2016; Egan & Mullin, 2017; Liu et al., 2014; Ruth & Colclasure, 2023; Tyson et al., 2023; Wiest et al., 2015). Beliefs about climate change are also shaped by socio-cultural and psychological factors, including personal experiences, beliefs about the world, and personal values (Weber, 2006, 2010).

How and by whom information about climate change is disseminated further impacts how individuals receive and interpret the information. By virtue of their advisory role, extension professionals' perceptions of climate change and how they convey climate information to farmers can significantly impact farmers' management decisions. In a 2012 survey, almost three-quarters of extension educators across 12 Corn Belt states believed that climate change was occurring, but only 19.2% believed that it is caused mostly by human activities (Prokopy et al., 2015). Similarly, about 75% of agriculture advisors in four Corn Belt states believed that climate change was occurring, yet only 12.3% related it to human activity. These findings mark an important difference between most scientists' beliefs that climate change is happening and caused by human actions, and thus what people are willing to do to address it.

To assess these factors, we employed the Six Americas scale, a conceptual framework developed to categorize individuals by their views on climate change by Maibach et al. (2011). In this scale, respondents are classified into six segments (Table 1). This conceptual framework has been adopted by other researchers to categorize extension professional perceptions in other areas of the US (Bowers et al., 2016).

Table 1

Descriptions of the Six Americas Segments based on Maibach et al (2011) framework

Six Americas segment	Description
Alarmed	Perceive climate change as a real and pressing problem that is caused by human activities; strongly endorse a national response; most proactive about making changes in their lives
Concerned	Perceive climate change as real and a pressing problem; support a national response; less involved than alarmed and less proactive about making changes in their lives
Cautious	Perceive climate change as an issue but are less certain; do not see climate change as a pressing issue that is relevant to them personally; less willing to make changes in their lives or endorse a national response
Disengaged	Have not engaged with the issue of climate change; most likely to alter their perspectives
Doubtful	Uncertain whether climate change is happening or don't know; if it is occurring, perceive it as caused by natural patterns; do not see climate change as a pressing threat that requires action
Dismissive	Believe that climate change is not happening and poses no threats; do not see climate change as a pressing threat that requires action; may be involved in the issue because of their disbelief in climate change

Purpose

The purpose of this paper is to assess how extension professionals in Missouri perceive the issues of climate change and explore what factors are associated with their views. The specific objectives are to:

1. Describe perceptions of extension professionals regarding issues of climate change based on the Six Americas segmentation scale.
2. Explore factors that influence extension professionals' perceptions of climate change issues.
3. Assess how extension professionals frame their communication to engage their audience and other stakeholders in addressing climate change issues.
4. Evaluate perceptions of extension professionals need for additional information and training about climate change.

Methods

We conducted an online survey with Missouri extension resources professionals from Cooperative Extension and the Missouri Department of Conservation from January-April 2023. These groups provide advisory services to landowners and producers across the state. Following IRB approval (IRB number: 2095416), we recruited participants by email and through organizational listservs. We used quota sampling (Saunders et al., 2012) to obtain a balanced number of respondents from each organization and to have similar representation from each region of the state.

The survey tool was adapted from the 15-scale Six Americas audience segmentation typology and the complementary manual with instructions on how to use this validated instrument (Maibach et al., 2011). This is a standard instrument that has been used by several researchers (and revised since 2011). It is a single tool that uses 15 single items, and the authors use discriminate analysis to segment the population. The items (alone) are not grouped into constructs to run reliability estimates. The reliability estimates for the 15-item scale across the six segments ranges from 0.69 to 0.97 (Chryst et al., 2018a; Maibach et al., 2011). These reliability estimates fall within the commonly cited estimates of 0.68 to 0.95 (Tavakol & Dennick, 2011). We reviewed this tool with a panel consisting of experts in Missouri agriculture, extension professionals, and climate scientists. The primary revision we made was to modify the wording from "global warming" to "climate change." The argument for this change was that today, climate change is a more common phrase than global warming. We added a set of questions specific to the role of extension professionals and how they frame climate issues with their stakeholders, asking what terms or phrases they use—or avoid—when talking to stakeholders, adapting a list of relevant terms identified in previous research (Getson et al., 2022). Finally, we asked demographic factors identified in previous research as influential to perceptions on climate change.

We analyzed data using statistical software package SPSS version 29. After cleaning the data for missing responses, we included 112 responses in data analysis. This represents a 48.07%

response rate which falls between the acceptable 30-70% range for social science surveys (Ali et al., 2020; De Vaus, 2013; Mellahi & Harris, 2016). Further, it exceeded the average response rates for online surveys reported by various authors, such as 33.3% (Nulty, 2008), 36.11% (Ali et al., 2020), and 44.1% (Wu et al., 2022). It is worth noting that studies with lower response rates may actually “yield more accurate results than studies with response rates of 60% to 70%” (Morton et al., 2012, p. 107). Participant demographics are provided in Table 2. We followed directions from the Six Americas Manual to produce a Six Americas classification for each respondent according to the 15-item syntax for audience segmentation analysis (Maibach et al., 2011). This protocol created several composite variables and replaced the small number of missing item responses with mean values. We assessed relationships between factors predicted to have a relationship with Six Americas segments based on previous research, including gender, age, level of education, and ideological leanings. We further explored how responses to questions such as “do you feel you need more information on climate change” and “have you received formal training on climate change” related to where participants were placed along the segments. We also analyzed the few open-ended questions, which added nuance to questions such as having received/not received training on climate change. Finally, we explored how extension professionals framed conversations around climate issues.

Findings

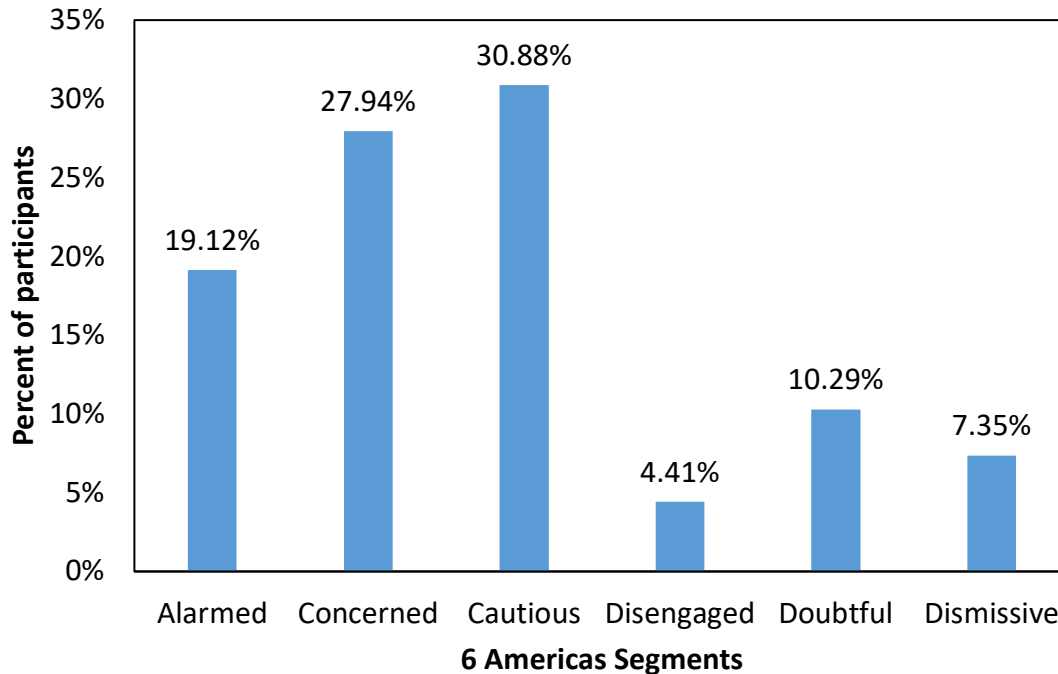
Participant Demographics

Objective 1: Describe perceptions of extension professionals regarding issues of climate change based on the Six Americas segmentation scale.

When plainly asked “do you think that climate change is happening?” 83.9% ($n = 94$) said “yes” and 12.5% ($n = 14$) said “no.” Although participants skewed left toward having more concern for climate change, they fell into every category of the six Americas segmentation typology (Figure 1). The largest segment was *Cautious* (30.9%, $n = 21$), followed by *Concerned* (29.9%, $n = 19$), *Alarmed* (19.1%, $n = 13$), *Doubtful* (10.3%, $n = 7$), *Dismissive* (7.4%), then *Disengaged* (4.4%, $n = 3$).

Figure 1

Description of extension professionals regarding issues of climate change based on the Six Americas segmentation scale.



Objective 2: Explore factors that influence extension professionals' perceptions of climate change issues.

Table 2 provides an overview of how participants were categorized based on different demographic factors, including gender, education, ideological leanings, and organization type. We used Spearman's Rho tests to assess whether demographic factors were significantly associated with segments; the only statistically significant relationship was between ideological leanings and segments, with a negative correlation between conservative leaning ideology and being more dismissive of climate change [$r(68) = -.647, p < .001$]. This finding was compounded where, on an open-ended question asking what type of informal training they did on climate change, one participant from the dismissive segment commented: "Climate change is an ideology pushed by the progressive left to eliminate fossil fuels in the US."

Table 2*Six Americas Segments for participants by demographics*

	Total		Alarmed		Concerned		Cautious		Disengaged		Doubtful		Dismissive	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Gender														
Male	58	51.80%	6	9.5%	11	17.5%	15	23.8%	2	3.2%	3	4.8%	3	4.8%
Female	27	24.10%	5	7.9%	5	7.9%	4	6.3%	0	0.0%	2	3.2%	0	0.0%
Non-binary / third gender	0	0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Prefer not to say	12	10.70%	1	1.6%	2	3.2%	1	1.6%	1	1.6%	1	1.6%	1	1.6%
Total	97	86.60%	12	19.0%	18	28.6%	20	31.7%	3	4.8%	6	9.5%	4	6.3%
Education														
Less than high school degree	0	0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
High school graduate (high school diploma or equivalent including GED)	0	0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Some college but no degree	0	0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Associate degree in college (2-year)	0	0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Bachelor's degree in college (4-year)	43	38.40%	1	1.5%	9	13.8%	10	15.4%	1	1.5%	4	6.2%	1	1.5%
Master's degree	42	37.50%	10	15.4%	6	9.2%	5	7.7%	2	3.1%	1	1.5%	4	6.2%
Doctoral degree	13	11.60%	1	1.5%	3	4.6%	4	6.2%	0	0.0%	1	1.5%	0	0.0%
Professional degree (JD, MD)	2	1.80%	0	0.0%	1	1.5%	1	1.5%	0	0.0%	0	0.0%	0	0.0%
Total	100	89.30%	12	18.5%	19	29.2%	20	30.8%	3	4.6%	6	9.2%	5	7.7%
Ideological leanings														
Very conservative	6	5.4%	0	0.0%	0	0.0%	1	1.7%	0	0.0%	3	5.1%	1	1.7%
Conservative	41	36.6%	1	1.7%	6	10.2%	10	16.9%	1	1.7%	2	3.4%	3	5.1%
Moderate	28	25%	6	10.2%	8	13.6%	6	10.2%	0	0.0%	1	1.7%	0	0.0%
Liberal	10	8.9%	3	5.1%	4	6.8%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Very liberal	3	2.7%	2	3.4%	1	1.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total	88	78.6%	12	20.3%	19	32.2%	17	28.8%	1	1.7%	6	10.2%	4	6.8%
Organization type														
1862 Land Grant University	55	49.1%	11	16.9%	9	13.8%	9	13.8%	0	0.0%	2	3.1%	5	7.7%
Farm agency	49	43.8%	2	3.1%	9	13.8%	11	16.9%	3	4.6%	4	6.2%	0	0.0%
Total	104	92.9%	13	20.0%	18	27.6%	20	30.7%	3	4.6%	6	9.3%	5	7.7%

Objective 3: Assess how extension professionals frame their communication to engage their audience and other stakeholders in addressing climate change issues.

To assess how extension professionals frame communications around climate issues, we asked them about the terms or phrases they use (Table 3). Participants were most likely to use the terms/phrases “extreme weather,” “weather variability,” and “long-term weather” but were least likely to say things like “climate debate,” “global warming,” and “greenhouse gases.” In addition, participants were less likely to use the term/phrases “man-made and/or human-made” and “climate change.”

Table 3

How likely are you to use the following terms/phrases when talking to producers about climate change issues?

Term	N	Minimum	Maximum	Mean	Std. Deviation
Extreme weather	98	1	5	4.15	0.967
Weather variability	98	1	5	4.10	0.879
Unusual weather	98	1	5	3.86	1.025
Long-term weather	98	1	5	3.79	1.086
Uncertainty	98	1	5	3.73	1.051
Climate variability	98	1	5	3.41	1.191
Climate change	98	1	5	2.91	1.363
Rapid change	98	1	5	2.87	1.136
Man-made and/or human made	98	1	5	2.83	1.202
Greenhouse gases	98	1	5	2.64	1.401
Global warming	97	1	5	2.43	1.306
Climate debate	98	1	5	2.16	1.062
Valid N (listwise)	97				

In addition to the phrases listed in Table 3, participants outlined other terminologies that they would avoid or be cautious about using while talking to producers about climate change. Several underscored that they will not talk about climate change specifically because it is too “political,” with one participant saying they “won’t talk about climate change in any manner: very political situation so [I] avoid upsetting anyone who has polarizing views.” One participant wrote: “I talk to producers like I am a producer. If you talk to them like you are from a local university, they will not listen!!”

One participant described their approach to discussing climate change with producers:

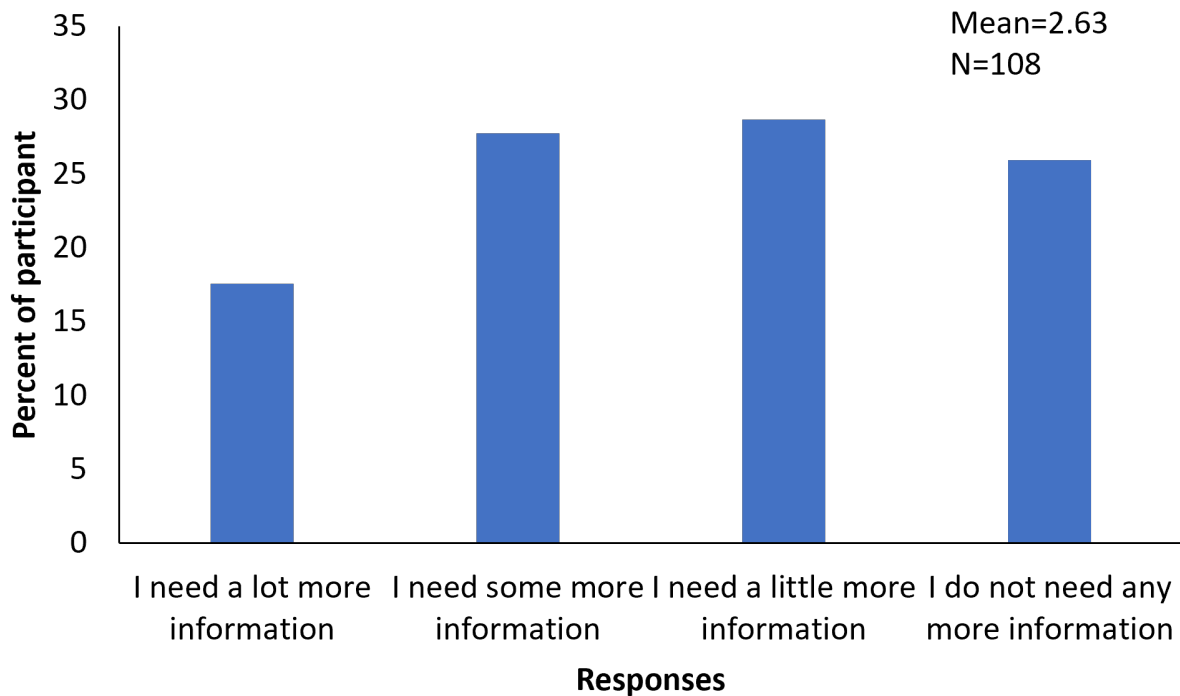
I've done a lot of public presentations that touch on climate change and used audience feedback to hone my message. Talking about adapting to certain weather events was easy. I found that it was important to stick to things that are simple, observable, and difficult to dispute when discussing the existence of climate change and whether humans cause it.

Objective 4: Evaluate perceptions of extension professionals need for additional information and training about climate change.

As part of the six Americas tool, participants were asked whether they felt they needed more information to form a firm opinion about climate change on a scale of 1-4, where 1 was “I do not need more information” and 4 was “I need a lot more information.” Though the responses were relatively evenly distributed ($M = 2.63$, $SD = 1.05$) only 26% of the participants indicated they did not need more information to form an opinion about climate change (Figure 2). A majority of participants indicated they needed information to help them form an opinion about climate change. The need for additional information varied with 29% indicating they needed a little more information, 26% indicated needing some more information and only 18% indicated needing a lot more information. Further, we found a significant negative correlation between feeling like they need more information and the six Americas segments; those more dismissive of climate change were less likely to say they needed more information [$r(108) = -.272$, $p = .025$].

Figure 2

Participants need for information to form an opinion about climate change



Note. Full question: On some issues people feel that they have all the information they need in order to form a firm opinion, while on other issues they would like more information before making up their mind. For climate change, where would you place yourself?

Further, we explored if a relationship existed between individuals having received formal training to communicate with stakeholders about climate change and whether they needed more information to form an opinion about climate change. We found a statistically significant

association with a small effect size between extensional professionals who had not received formal training to communicate with stakeholders and their need for information to form an opinion about climate change (Cramer's $V = .276$, $Sig. = .044$; see Table 4). More extension professionals who had not received formal training on climate change indicated they needed more information before they could form an opinion on climate change. Those that received training were more likely to indicate that they did not need more information to form an opinion.

Table 4

Association between Participants Receiving Formal Training to Communicate with Stakeholders About Climate change and Their Need for Information to Form an Opinion about Climate Change

		Need for information				Cramer's V^*	Sig.
		Do not need any more information	Need a little more information	Need some more information	Need lot more information		
Received formal training about climate change	Yes	2	5	0	0	0.276	0.044
	No	26	31	30	19		
Total		26	31	30	19		

Note. "Yes" was coded 1 and "No" was coded 2. A statistically significant correlation at $p < .05$. Cramer's V ranges in value from -1 to +1. Values near 0 indicate a very weak relationship, and values near 1 indicate a very strong relationship. Cramer's $V = .10$ (small effect size); Cramer's $V = .30$ (medium effect size); Cramer's $V = .50$ (large effect size) (Green, Salkind, & Akey, 1997).

As a follow up, participants were asked an open-ended question to indicate if they had received any type of informal training on climate change and their sources of information. Their responses included doing their own reading (books, research papers), through the media (news broadcasts, mainstream media, watching YouTube videos), by virtue of their profession, and a few noted that climate change was touched upon in other workshops/presentations they had attended, although it was not the focus. A few participants explained that they had learned more about "extreme" or "severe" weather, which helped them support their farmer stakeholders. One participant noted: "No training but understanding that many farmers are frustrated by drought and are looking for help to mitigate losses despite their belief or non-belief in climate change," which led them to seek for more information to help address the farmer's concerns.

Conclusions, Discussion, and Recommendations

This study offers insights into how extension professionals serving Missouri perceive climate change and how they approach communications with their stakeholders on climate issues. Following previous studies conducted elsewhere in the U.S., there was a significant relationship between conservative-learning ideology and disbelief that climate change is occurring (Cook et al., 2016; Egan & Mullin, 2017; Liu et al., 2014; Ruth & Colclasure, 2023; Tyson et al., 2023; Wiest et al., 2015). That said, in a state that leans largely conservative, the majority of respondents fell into segments of cautious, concerned, and alarmed (over 75% of all participants). With the exception of ideological leanings, other demographic factors were not statistically significantly related to perceptions on climate change.

This study unveiled how extension professionals frame conversations about climate and weather variability with their stakeholders. Participants made clear how they are intentional about what terms and phrases to use or avoid when trying to reach a producer, and not get shut down, as other studies have found (Arbuckle et al., 2014; Mase, 2014). Language that they considered “political” was pointedly avoided, and several participants felt the term “climate change” itself fell into this category, whether or not they believed in climate change. Understanding how these communication professionals approach these conversations has implications for how we as a broader scientific community talk about climate change. Previous ways that scientists and others have communicated about climate change has put us in this place where the word itself is perceived as politically taboo. Rather than presenting “just the facts,” climate scientists should engage with extension professionals to better understand what is happening in the field and how they can improve their communication approaches (Filho, 2009; Moser, 2010).

An overwhelming majority of participants in our study had never received any formal training on climate change. Moreover, more participants who had not received formal education on how to communicate with stakeholders indicated that they needed additional information to form an opinion about climate change. This finding indicates that a need exists to provide formal training opportunities to enable extensional resource professionals to form an opinion, promote climate literacy and empower them to communicate with stakeholders about issues relating to climate change. This leads to the issue of how to conduct trainings and raise climate literacy. Several indicated interest in having more resources and training opportunities. Clearly, there is need to create forums to discuss and educate people about climate change, but they should be participatory forums for two-way conversations between climate experts and extension professionals. This process of co-education is essential to improve climate literacy and help develop the and right terminologies to use when addressing the stakeholders to improve trust between the scientific community and those who translate science to the public. To make this a more participatory process, extension professionals should have training to develop facilitation skills in discussing controversial topics (Corp & Darnell, 2002).

Unlike previous research, we included two types of extension resource providers: Cooperative Extension and Private Land Conservationists from a state agency. Each of these groups’ role is

to work closely with farmers and landowners and are important connectors of research and how land is managed. While the land grant's Cooperative Extension provides a valuable service, we are long past a time when they are the only professionals providing advisory services to producers and landowners. These groups fell similarly along the 6 Americas Segments, with no significant differences in perceptions on climate change. Future research would need to recruit private agronomists, a group that also plays an important role in advising producers' decision-making. There is also a need to explore perceptions of producers and landowners on climate change to assess how the views of extension professionals about their stakeholders aligns with the reality.

Acknowledgements

We would like to acknowledge the support of Missouri Department of Conservation, University of Missouri's Cooperative Extension, and Lincoln University's Cooperative Extension. Thank you for the fine work you do on the ground supporting farmers and landowners each day.

Author contributions:

K. R. Wilson – instrument development, formal analysis, investigation, writing-original draft; **S. Mukembo** – instrument development, formal analysis, investigation, writing-review and editing.

References

- Ali, F., Ciftci, O., Nanu, L., Cobanoglu, C., & Ryu, K. (2021). Response rates in hospitality research: An overview of current practice and suggestions for future research. *Cornell Hospitality Quarterly*, 62(1), 105–120. <https://doi.org/10.1177/1938965520943094>
- Arbuckle, J. G., Prokopy, L. S., Haigh, T., Hobbs, J., Knoot, T., Knutson, C., Loy, A., Mase, A. S., McGuire, J., & Morton, L. W. (2013). Climate change beliefs, concerns, and attitudes toward adaptation and mitigation among farmers in the Midwestern United States. *Climatic Change*, 117, 943–950. <https://doi.org/10.1007/s10584-013-0707-6>
- Bowers, A. W., Monroe, M. C., & Adams, D. C. (2016). Climate change communication insights from cooperative extension professionals in the US southern states: Finding common ground. *Environmental Communication*, 10(5), 656–670. <http://dx.doi.org/10.1080/17524032.2016.1176947>
- Chen, H., Zhu, Q., Peng, C., Wu, N., Wang, Y., Fang, X., Gao, Y., Zhu, D., Yang, G., Tian, J., Kang, X., Piao, S., Ouyang, H., Xiang, W., Luo, Z., Jiang, H., Song, X., Zhang, Y., Yu, G., ... Wu, Y. (2013). The impacts of climate change and human activities on biogeochemical cycles on the Qinghai-Tibetan Plateau. *Global Change Biology*, 19(10), 2940–2955. <https://doi.org/10.1111/gcb.12277>

- Chryst, B., Marlon, J., van der Linden, S., Leiserowitz, A., Maibach, E., & Roser-Renouf, C. (2018a). "Six Americas short survey": Audience segmentation of climate change views using a four question instrument. *Environmental Communication*, 12(8), 1109–1122. <https://doi.org/10.1080/17524032.2018.1508047>
- Cook, J., Oreskes, N., Doran, P. T., Anderegg, W. R., Verheggen, B., Maibach, E. W., Carlton, J. S., Lewandowsky, S., Skuce, A. G., & Green, S. A. (2016). Consensus on consensus: A synthesis of consensus estimates on human-caused global warming. *Environmental Research Letters*, 11(4), 048002. <https://doi.org/10.1088/1748-9326/11/4/048002>
- Corp, M. K., & Darnell, T. (2002). Conflict-laden issues: A learning opportunity. *Journal of Extension* 40(1), 10. <https://archives.joe.org/joe/2002february/rb1.php>
- De Vaus, D. (2013). *Surveys in social research* (6th ed.). Routledge. <https://doi.org/10.4324/9780203519196>
- Dey, P., & Mishra, A. (2017). Separating the impacts of climate change and human activities on streamflow: A review of methodologies and critical assumptions. *Journal of Hydrology*, 548, 278–290. <https://doi.org/10.1016/j.jhydrol.2017.03.014>
- Egan, P. J., & Mullin, M. (2017). Climate change: US public opinion. *Annual Review of Political Science*, 20, 209–227. <https://doi.org/10.1146/annurev-polisci-051215-022857>
- Filho, W. L. (2009). Communicating climate change: Challenges ahead and action needed. *International Journal of Climate Change Strategies and Management*, 1(1), 6–18. <https://doi.org/10.1108/17568690910934363>
- Getson, J. M., Church, S. P., Radulski, B. G., Sjöstrand, A. E., Lu, J., & Prokopy, L. S. (2022). Understanding scientists' communication challenges at the intersection of climate and agriculture. *PLoS One*, 17(8), e0269927. <https://doi.org/10.1371/journal.pone.0269927>
- James, A. A., Estwick, N. M., & Bryant, A. (2014). Climate change impacts on agriculture and their effective communication by Extension agents. *Journal of Extension*, 52(1), 1. <https://doi.org/10.34068/joe.52.01.01>
- Liu, Z., Smith, W. J., & Safi, A. S. (2014). Rancher and farmer perceptions of climate change in Nevada, USA. *Climatic Change*, 122, 313–327. <https://doi.org/10.1007/s10584-013-0979-x>
- Maibach, E. W., Leiserowitz, A., Roser-Renouf, C., Mertz, C. K., & Akerlof, K. (2011). *Six Americas screening tools: Survey instruments; instructions for coding and data treatment; and statistical program scripts*. Yale Project on Climate Change. https://climatecommunication.yale.edu/wp-content/uploads/2016/02/2012_03_Global-Warming%E2%80%99s-Six-Americas-Screener-Manual.pdf

- Mellahi, K., & Harris, L. C. (2016). Response rates in business and management research: An overview of current practice and suggestions for future direction. *British Journal of Management*, 27(2), 426–437. <https://doi.org/10.1111/1467-8551.12154>
- Moser, S. C. (2010). Communicating climate change: History, challenges, process and future directions. *Wiley Interdisciplinary Reviews: Climate Change*, 1(1), 31–53. <https://doi.org/10.1002/wcc.11>
- Morton, S. M., Bandara, D. K., Robinson, E. M., & Carr, P. E. A. (2012). In the 21st Century, what is an acceptable response rate? *Australian and New Zealand Journal of Public Health*, 36(2), 106–108. <https://doi.org/10.1111/j.1753-6405.2012.00854.x>
- Nulty, D. D. (2008). The adequacy of response rates to online and paper surveys: What can be done? *Assessment & Evaluation in Higher Education*, 33(3), 301–314. <https://doi.org/10.1080/02602930701293231>
- Prokopy, L. S., Bartels, W.-L., Burniske, G., & Power, R. (2017). Agricultural extension and climate change communication. In *Oxford Research Encyclopedia of Climate Science*. <https://doi.org/10.1093/acrefore/9780190228620.013.429>
- Prokopy, L. S., Morton, L. W., Arbuckle Jr, J. G., Mase, A. S., & Wilke, A. K. (2015). Agricultural stakeholder views on climate change: Implications for conducting research and outreach. *Bulletin of the American Meteorological Society*, 96(2), 181–190. <https://doi.org/10.1175/BAMS-D-13-00172.1>
- Ruth, T., & Colclasure, B. (2023). The media's influence on climate change beliefs: A partisan comparison. *Advancements in Agricultural Development*, 4(2), 20–33. <https://doi.org/10.37433/aad.v4i2.263>
- Saunders, M., Lewis, P., & Thornhill, A. (2012). *Quota sampling*. Business Research Methodology. <https://research-methodology.net/sampling-in-primary-data-collection/quota-sampling/>
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, 2, 53–55. <https://doi.org/10.5116%2Fijme.4dfb.8dfd>
- Tyson, A., Funk, C., & Kennedy, B. (2023). *What the data says about Americans' views of climate change*. Pew Research Center. <https://www.pewresearch.org/short-reads/2023/04/18/for-earth-day-key-facts-about-americans-views-of-climate-change-and-renewable-energy/>
- Weber, E. U. (2006). Experience-based and description-based perceptions of long-term risk: Why global warming does not scare us (yet). *Climatic Change*, 77(1–2), 103–120. <https://doi.org/10.1007/s10584-006-9060-3>

- Weber, E. U. (2010). What shapes perceptions of climate change? *Wiley Interdisciplinary Reviews: Climate Change*, 1(3), 332–342. <https://doi.org/10.1002/wcc.41>
- Wiest, S. L., Raymond, L., & Clawson, R. A. (2015). Framing, partisan predispositions, and public opinion on climate change. *Global Environmental Change*, 31, 187–198. <https://doi.org/10.1016/j.gloenvcha.2014.12.006>
- Wilke, A. K., & Morton, L. W. (2015). Climatologists' communication of climate science to the agricultural sector. *Science Communication*, 37(3), 371–395. <https://doi.org/10.1177/1075547015581927>
- Wu, M.-J., Zhao, K., & Fils-Aime, F. (2022). Response rates of online surveys in published research: A meta-analysis. *Computers in Human Behavior Reports*, 7, 100206. <https://doi.org/10.1016/j.chbr.2022.100206>

© 2023 by authors. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).