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Climate Change Challenges for Extension Educators: Technical Capacity and Cultural Attitudes

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Abstract

We surveyed Extension educators in the southern Great Plains about their attitudes and beliefs regarding climate change, their interactions with constituents surrounding climate change, and challenges they face in engaging constituents on the topic of climate change. Production-oriented and sociocultural challenges in meeting constituents' information needs exist. Educators reported (a) lacking capacity for addressing climate change issues and (b) needing information, especially regarding drought and extreme or unseasonable weather events and related management practices. Educators also identified a need for more educational resources, including print materials and online decision aids. Implications are relevant to educators working beyond the study area and in any agricultural production system.

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Introduction

There is consensus in the scientific community that the earth's climate is changing, that agricultural production will be affected (Intergovernmental Panel on Climate Change, 2007, 2014), and that agriculture is considered one of the most vulnerable areas of the U.S. economy (James, Estwick, & Bryant, 2014). It is expected that climate change will have direct and indirect effects on agricultural production systems. Recent droughts have focused attention on agricultural production systems in the southern Great Plains. Effects of the drought that began in 2011 have caused agricultural losses throughout the region. In Kansas, as of May 2014, a Drought Declaration from the Office of the Governor identified 56 counties in emergency status, 26 in warning status, and the remaining 23 in watch status (Kansas Office of the Governor, 2014). In Oklahoma, agricultural losses are estimated to exceed $1.7 billion (Oklahoma Water Resources Center, 2011; Shideler, Doye, Peel, & Sahs, 2012). Combined direct and indirect costs of the drought added up to economic losses of nearly $8 billion in Texas (Combs, 2012), and in April 2014, Texas designated 240 counties as primary natural disaster areas due to

drought (U.S. Department of Agriculture, Texas Farm Service Agency, 2014). According to the U.S. Environmental Protection Agency (n.d.), climate change projections for the region include increases in both temperature and frequency of drought, indicating that some areas will experience less summer rainfall and more intense storm events. These events and projections have raised questions about the resiliency and sustainability of agricultural production systems in the region.

In addition to vulnerabilities brought about by variable weather, social factors contribute to both vulnerability and resilience in an integrated (biophysical-social) system. For example, declining population and the concomitant loss of key social institutions (e.g., "county" Extension agents, schools, locally owned businesses, towns) can introduce vulnerability into a production system in terms of its long-term viability. At a more micro level, producer knowledge, attitudes, beliefs, and behaviors may add to vulnerabilities if they present barriers to the implementation of practices designed to mitigate the impacts of climate variability. Social factors also can contribute to system resilience. Institutional support (e.g., Extension), community solidarity, and social capital are resources that can help households, communities, and production systems be more resilient.

Fraisse, Breuer, Zierden, and Ingram (2009) cited implementation of changes in cultural practices as one approach for mitigating risk associated with climate change. They posited that such changes might involve producers' replacing traditional practices with new or alternative management practices. For example, research among Iowa corn producers showed that although few of them would support actions to reduce greenhouse gas emissions, they were supportive of best management practices designed to reduce vulnerability (Arbuckle et al., 2013). Many of these best management practices also are useful for mitigating greenhouse gas emissions. Arbuckle et al. (2013) suggested promoting such dual-purpose practices as a way to accomplish both producer adoption and climate change mitigation, which, in turn, will build system resiliency.

The goal of the research discussed here was twofold: (a) to develop a better understanding of the social factors in Extension that contribute to system vulnerability and resilience and (b) to produce knowledge that can inform the development of capacity-building materials. Specifically, we sought to better understand the attitudes, beliefs, and perceptions of Extension educators regarding climate change and to identify gaps in information and/or materials educators need to engage effectively with constituents on this topic. The findings are relevant to the general attitudes, beliefs, and needs of Extension educators regardless of specialty in the region, especially regarding the capacity of educators to address climate change issues. The information gaps and self-reported lack of capacity potentially extend beyond the study area.

Methods

An online survey was developed and administered to Extension educators in Kansas and Oklahoma. Through the cooperation of Kansas State Research and Extension and Oklahoma Cooperative Extension Service, emails containing an introductory message and a link to the survey were sent June 20, 2014, to all Extension educators in both states. The survey was part of the Great Plains Grazing Project, a multi-institutional Coordinated Agricultural Project funded by the Agriculture and Food Research Initiative of the U.S. Department of Agriculture National Institute of Food and Agriculture and intended to improve understanding of vulnerabilities and enhance resilience of beef production in the southern plains (Steiner et al., 2014). The questions on attitudes and perceptions regarding climate change were drawn from the 15 core questions of the Global Warming's Six Americas 2009 survey (Burnett, Vuola, Megalos, & Adams, 2014; Maibach, Roser-Renouf, & Leiserowitz, 2009).

The survey was constructed and delivered and initial analysis was performed through the use of Qualtrics survey

software (Qualtrics, Provo, UT). The Kansas State University Office of Educational Innovation and Evaluation was contracted to assemble survey panel members (638) and their contact addresses and to oversee delivery of the survey. The survey was open for 24 days; recipients received reminder emails at weekly intervals and a final reminder on the closing day of the survey. An opened email was considered a successful delivery. Upon successful delivery, an email address was removed from the panel to prevent further contact. Also, addresses were disassociated from completed surveys to ensure participant confidentiality.

We asked participants about their attitudes and beliefs regarding climate change; their interactions with constituents surrounding climate change; and challenges they face in engaging constituents on the topic of climate change, including challenges related to the need for credible information to educate themselves and the need for appropriate educational resources to share with constituents. Responses to open-ended questions about challenges educators face were open coded; coded items were grouped into descriptive themes through the use of a grounded theory approach (Glaser & Straus, 1967). In an iterative reliability process with two coders, similar themes were collapsed into unique items. Intercoder reliability ($\alpha = 0.9342$) was determined through the use of Krippendorff's alpha (Hayes & Krippendorff, 2007).

Results and Discussion

Of the 638 surveys emailed, 228 (36%) were delivered to Kansas Extension educators, and 410 (64%) were delivered to Oklahoma Extension educators. Of the surveys emailed, 370 surveys were successfully delivered. Completed surveys numbered 226, yielding an overall 61% adjusted response rate. Some participants did not answer every question; completed questions from incomplete surveys were accepted for data analysis.

Respondents were predominantly male and White. They ranged in age from 26 to 68 years, with the median age being 49 and the average age being 46; 48% of respondents were 50 or older, and 52% were younger than 50. Thirty-one participants (18%) did not respond to the survey question about age. Figure 1 shows age range data. The majority of respondents had worked in their current capacities for more than 10 years (Figure 2). Sixty-nine percent of respondents listed agricultural and natural resource content specializations as their areas of expertise. The next largest content specialization category was 4-H, which was followed by family- and nutrition-related specializations (family and consumer science, children and families, family resilience, nutrition). A comparison of survey respondents to the total study population showed that female educators and family and consumer science educators were somewhat underrepresented in the survey.

Figure 1.

Age Ranges ($n = 171$)

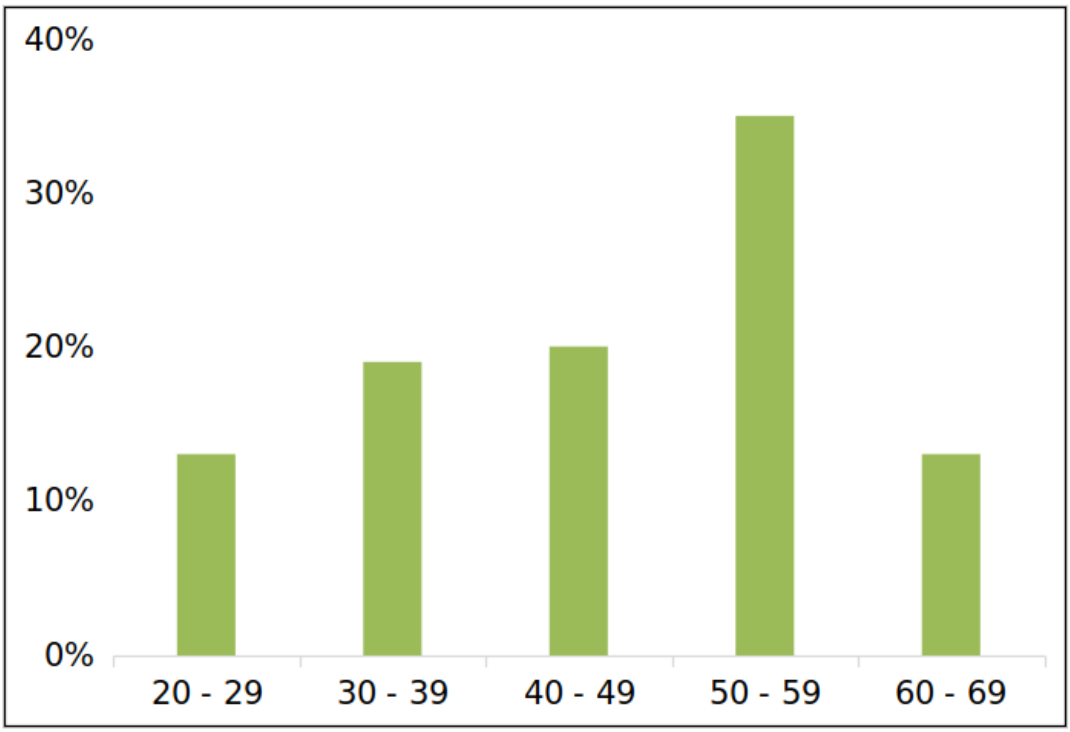
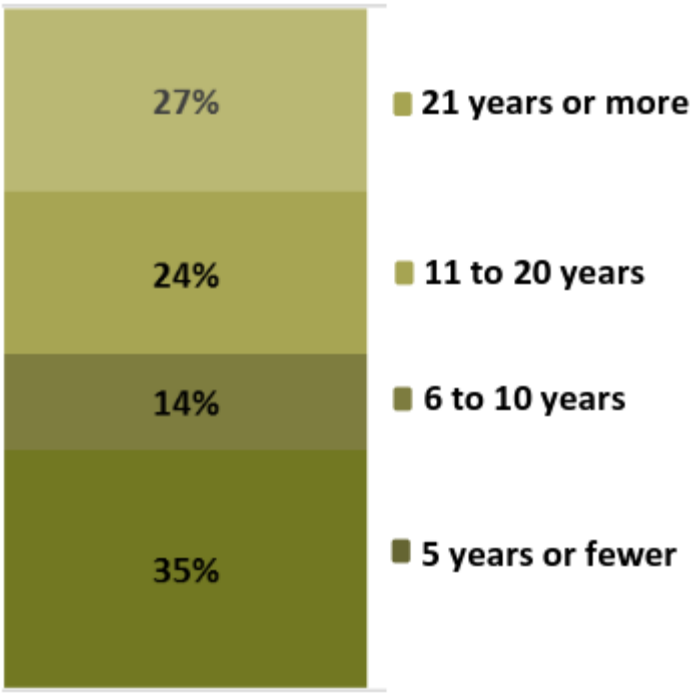


Figure 2.
Lengths of Time Served in Current Capacities



Attitudes and Beliefs Regarding Climate Change

Survey questions about attitudes and beliefs focused on whether respondents believed the climate is changing, what they believed the cause of climate change is, and the level of personal importance climate change held for them. We also asked respondents normative questions about what priority they thought climate change should be given by Extension as an institution, what priority it should be given at the federal level, and whether citizens

should do more or less to address climate change.

Almost all respondents (97%) indicated having thought about climate. A substantial majority of respondents (81%) believed the climate is changing (Table 1). However, degree of certainty varied among both those who believed the climate is changing and those who did not believe the climate is changing. A significant proportion of respondents (19%) indicated their uncertainty by answering either "Yes, but I am not at all sure" (15%) or "No, but I am not at all sure" (4%) (Table 1). When asked whether they could easily change their mind, 55% of respondents said they could not and 45% said they could.

Table 1.

Responses to the Question "Do You Think the Climate Is Changing?"

Response	*f*	%	Cumulative %
Yes			
Yes, and I'm extremely sure	15	8%	8%
Yes, and I'm very sure	38	20%	28%
Yes, and I'm somewhat sure	72	38%	66%
Yes, but I am not at all sure	28	15%	81%
No			
No, but I'm not at all sure	7	4%	4%
No, and I'm somewhat sure	15	8%	12%
No, and I'm very sure	8	4%	16%
No, and I'm extremely sure	6	3%	19%
Total	189	100%	100%

When asked whether climate change is mostly the result of human activities or natural environmental changes, 60% of participants who responded indicated believing that climate change is mostly the result of natural causes (Table 2). Among the remaining participants who answered the question, roughly one-quarter (23%) reported believing that climate change results primarily from human activities, 9% reported believing that it is a combination of human and natural causes, 4% reported being unsure of the cause, and another 4% reported that they do not believe climate change is occurring (Table 2). These results are somewhat concerning as the majority of climate scientists attribute climate change to human causes. Moreover, public opinion research on climate change has shown that more Kansans and Oklahomans believe human activities are the cause of climate change than the number in each state who believe the causes are natural (Howe, Mildenberger, Marlon, & Leiserowitz, 2015). Therefore, respondents in our study were more likely than the general public in their states to disagree with the scientific consensus on the causes of climate change. This circumstance suggests a need for professional development on climate change. We also asked respondents about their perceptions about humans' ability to mitigate climate change effects. The results are shown in Table 2.

Table 2.

Beliefs Regarding Climate Change Causes and Humans' Ability to Mitigate Climate Change

Effects

Belief	*f*	%	Cumulative %
Climate change is mostly caused by . . .[a]			
Natural changes in the environment	127	60%	60%
Human activities	50	23%	83%
Both human and natural causes	19	9%	92%
Unsure of causes	9	4%	96%
None . . . climate change isn't happening	8	4%	100%
Which is the closest to your view?[b]			
Humans could reduce climate change, but it is unclear at this point whether we will do what's needed.	88	43%	43%
Humans cannot reduce climate change even if it is happening.	59	29%	72%
Humans could reduce climate change, but people are not willing to change their behavior, so we are not going to.	48	23%	95%
Climate change is not happening.	8	4%	99%
Humans can reduce climate change, and we are going to do so successfully.	2	1%	100%

[a]Number of respondents was 213. [b]Number of respondents was 205.

Combining responses in the "extremely important," "very important," and "somewhat important" categories, we found that about two thirds of respondents (65%) rated climate change as important to them personally (Table 3). In contrast, when asked what priority level climate change should be for (a) the president and Congress and (b) Extension, about one third of respondents thought it should be a low priority for both entities (Table 4). Combining responses in the "very high" and "high" categories, we found that only 18% of respondents rated climate change as a high priority for the president and Congress and only 24% rated it as a high priority for Extension (Table 4). The low priority that respondents suggested be placed on climate change by these two entities may indicate a preference for personal responsibility over governmental or institutional responsibility. When asked what amount of action citizens themselves should be taking to address climate change, a combined 56% of respondents answered "more" or "much more," 33% said citizens were "currently doing the right amount," and 11% answered "less" or "much less."

Table 3.

Personal Importance of Climate Change

Level of importance	*f*	%	Cumulative %
Not at all important	18	9%	9%
Not too important	55	26%	35%

Somewhat important	90	43%	78%
Very important	43	20%	98%
Extremely important	4	2%	100%
Total	210	100%	100%

Table 4.

Priority Level Climate Change Should Be for the President and Congress and for Extension

Group	Priority level	*f*	%	Cumulative %
President and Congress[a]	Low	76	37%	37%
	Medium	92	45%	82%
	High	33	16%	98%
	Very high	5	2%	100%
Extension[b]	Low	65	32%	32%
	Medium	91	44%	76%
	High	41	20%	96%
	Very high	8	4%	100%

[a]Number of respondents was 206. [b]Number of respondents was 205.

A majority of respondents (74%) indicated believing that all, most, or some of their colleagues share their views (Table 5). Of the 147 respondents who held the belief that the climate is changing (the majority response), a full quarter (37 respondents) perceived that their views are shared by only a few of their colleagues or by none of their colleagues (Figure 3). Moreover, although 75% (110) of these respondents perceived that all, most, or some their colleagues share their views, the modal response was "some" (Figure 3). These findings suggest that despite the majority of respondents' indicating belief in climate change, many of these respondents were under the impression that most of their peers did not believe the climate is changing. Additionally, of those respondents who held the belief that the climate is not changing, only seven (19%) perceived that their views were shared by only a few of their colleagues or by none of their colleagues, whereas 29 (81%) perceived that their colleagues shared their views, with the modal response being "most" (Figure 3). Clearly, there is a discrepancy between the beliefs of Extension educators who participated in the survey and their perceptions about the beliefs of Extension educators as a group. This discrepancy may be explained in two ways: (a) It may indicate a bias in those responding to the survey if their perceptions of the group opinion are considered accurate, or (b) it may indicate a magnified minority of educators who do not believe in climate change. This situation could result in a disincentive to express views indicating belief in climate change, which would further distort perceptions of the beliefs of others in Extension by silencing those who acknowledge climate change while encouraging expression of denial. In addition, it may create reluctance to raise the issue with clientele.

Table 5.

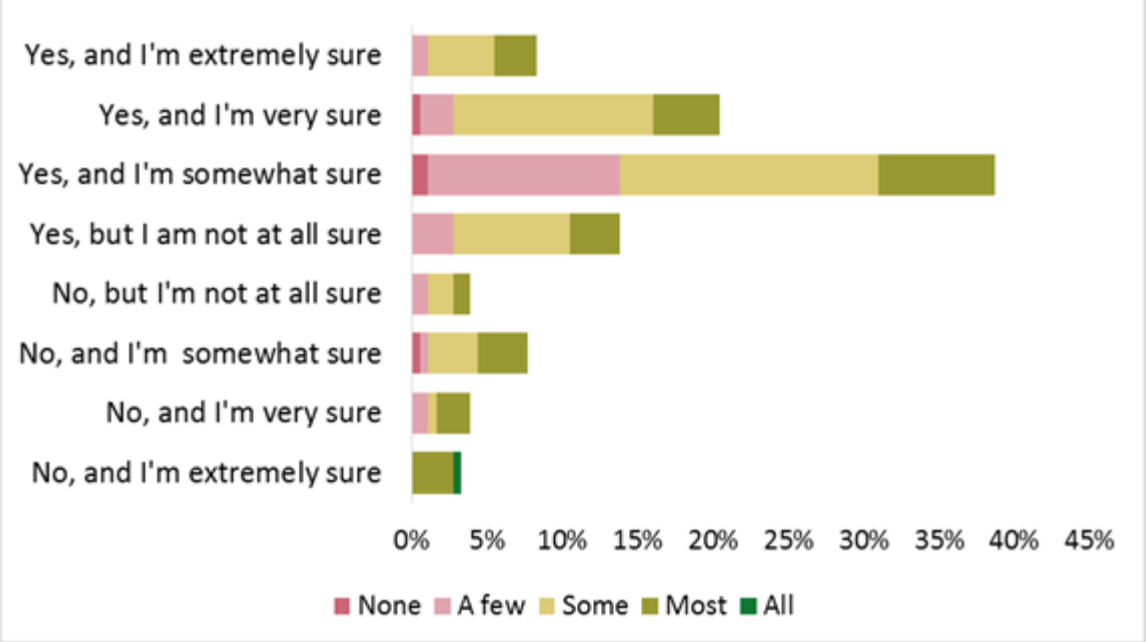
Perceptions of Number of Colleagues Who Share View on Climate Change

Category	*f*	%	Cumulative %
None	5	2.5%	2%
A few	50	24%	26%
Some	96	47%	73%
Most	53	26%	99%
All	1	0.5%	100%

Note. Number of respondents was 205.

Figure 3.

Perceptions of Number of Colleagues Who Share View on Climate Change Relative to Belief About Whether Climate Is Changing



Interactions with Constituents

Extension educators' interactions with their constituents can reveal information gaps between the educators and the constituents—missing information that the educators may need for effective engagement of clientele. The survey included questions about educators' interactions with their constituents on the topic of climate change and the educators' perceptions about their capacity to provide necessary information.

About one third of the respondents (35%) reported that their constituents had raised the issue of climate change. Of those, most (51%) indicated that the constituents had no concern or only a low level of concern about climate change; 13% indicated that the constituents had a high or very high level of concern about it. Respondents also were asked to identify topics of concern their constituents had reported to them, and, interestingly, the topics they identified as being of most concern relate to the effects of climate. According to respondents, the topics

constituents had raised most often were weather variability (82%), agronomic decisions (68%), and grazing management (57%) (Table 6).

Table 6.

Topics of Concern Raised by Constituents

Topic	***f***	**%**
Weather variability (drought, heat, excess water)	169	86%
Agronomic decisions (e.g., crop type, seed variety, tillage, planting dates)	140	71%
Grazing management	117	60%
Alternative management practices	91	46%
Pests	74	38%
Crop insurance	68	35%
Disease	61	31%
Weather forecast information	61	31%
Other range or forage management	59	30%
Regulations	57	29%
Marketing	45	23%
Nutrient loss	38	19%
Soil loss	30	15%
Other (listed as write-in responses)	13	7%

Note. Number of respondents was 196. Respondents were instructed to mark all that apply and to add others as necessary.

Importantly, only a few of the educators surveyed (6%) believed that they had a very high or high capacity to adequately answer constituents' questions about climate change. Roughly one third (30%) believed that they possessed moderate capacity in this area, and the remaining two thirds' majority (64%) believed that they had only low capacity or no capacity to adequately answer constituents' questions on the topic (Table 7). The relatively low level of direct interest from constituents about climate change along with their greater expressed concerns regarding production/economic topics may help explain the low level of capacity of educators regarding climate change: The educators may not have become informed about the topic because the need has not been expressed by their constituents. Clearly, there is a need for professional development opportunities to help Extension educators increase their capacity for addressing questions and concerns related to climate change.

Table 7.

Self-Assessed Levels of Capacity for Answering Constituents' Climate Change Questions

Level	***f***	**%**

Very high capacity	3	2%
High capacity	9	4%
Moderate capacity	61	30%
Low capacity	104	51%
No capacity	27	13%
Total	204	100%

Challenges

Through an open-ended question, respondents identified several challenges they faced in engaging their constituents with climate change information. Primary themes were differentiated into production-oriented and sociocultural components (Table 8). The challenges the educators identified reflect both the obstacles they face in working to assist constituents and the constituents' needs related to informed decision making amid changing weather/climate circumstances.

Table 8.

Challenges Faced in Engaging Constituents with Climate Change Information

Challenge	Production-oriented component	Sociocultural component(s)
Ability to obtain credible information/knowledge	Access to information	Credibility of information Variability of beliefs
Ability to effectively communicate and distribute information to Extension clientele	Resources	
Acceptance of climate change	Weather variability	Local culture
Low levels of concern for climate/weather issues	Production priorities	Relevance
Need for new management practices	Adapting practices	Tradition
Need to create a sense of efficacy	Coping	Feelings of helplessness/powerlessness
Need to address attitudes and perceptions of clientele regarding government involvement in agriculture	Policy, subsidies	Mistrust of government Fear of regulations

Having sufficient reliable information about climate change was one challenge category identified by educators. Related to this category was a question about sources the educators used to find climate change information. Although respondents named a variety of information sources, the number of respondents using any individual

source was rather small; frequencies ranged from 1 to 12. The response given most often by respondents (36) was "none." The infrequent use of reliable information sources may relate to both respondents' views that there is not sufficient reliable information about climate change and their self-reported lack of capacity on the topic.

The topics about which educators reported needing more information closely corresponded with the topics of concern raised by their constituents (see Table 6). Key topics they identified were weather-related concerns and management practices for coping with weather-related issues. Resource formats the educators indicated would be beneficial to their work with constituents were print materials (64%); online resources, including decision aids (61%); presentations at meetings and conferences (54%); webinars (50%); on-farm demonstrations (45%); videos (34%); and podcasts (17%).

Implications

Implications for Extension Education

Our study showed that Extension educators face both production-oriented and sociocultural challenges in meeting the information needs of producers relative to climate change. Production-oriented challenges include the traditional challenge of assembling and distributing information. In our survey, the majority of educators (64%) reported that they had either low capacity or no capacity to address climate change adequately with their constituents. This finding indicates a need for significant capacity-building efforts in this area. Educators also indicated needing accessible, reliable information and more training on the subject of climate change. In addition to topical needs, respondents reported needing resources in varying formats to improve distribution of information to clientele. The resource needs reported by respondents in our study align with key gaps identified by the Great Plains Grazing Project Extension team in its comprehensive review of available outreach resources for the southern plains region (Steiner et al., 2014).

The sociocultural challenges educators face pertain to their own attitudes and beliefs as well as to the perceptions they have of their colleagues' and constituents' attitudes and beliefs. To illustrate, 25% of all survey respondents reported believing that their colleagues do not share their views on climate change. The belief by certain educators that their views are not shared by their colleagues may have a chilling effect on their willingness to seek or share information or to raise the topic with constituents. Moreover, the perceived lack of concern expressed by producers regarding climate change raises the question of whether producers do not view climate change as relevant to them or are generally skeptical of climate change. We should note that although the educators surveyed did not report producers' expressing concern about climate change per se, they did report producers' expressing concern about a host of issues related to climate change. Studies of farmers' perceptions of and attitudes toward climate change indicate that they have concerns about climatic changes even if they are unsure of whether those changes have human causes (Arbuckle et al., 2013; Campbell Hibbs et al., 2014). Skepticism on the part of educators, as well as their perception of skepticism on the part of their clientele, also suggests that educators may need to take a different approach in addressing constituents' needs. Changing the narrative from asking "Is climate change occurring?" to one of asking "How do we respond to changes in weather and climate?" might help move the topic from the political/emotional arena toward a more practical, fact-based response. This idea highlights a unique opportunity to create a professional development training that both increases the technical capacity of educators and strengthens their ability to address contentious issues.

Implications for Research

Identification of both production-oriented challenges and sociocultural challenges mirrors findings of other studies that have shown a lack of trust or skepticism toward science, government, and media as well as a need for technical solutions and locally specific information (Grotta, Creighton, Schnepf, & Kantor, 2013; Haden, Niles, Lubell, Perlman, & Jackson, 2012; Harrington, 2001). However, the recognition that one set of challenges is sociocultural allows educators and researchers the opportunity to add social responses to the tool kit used to address climate change (for example, see Brugger & Crimmins, 2013). Further research efforts related to sociocultural challenges and perceived vulnerabilities are needed at the local and county or multicounty levels rather than on a state or regional scale to provide county educators with insights and tools they can use to meet these challenges (Arbuckle et al., 2013; Brugger & Crimmins, 2013).

Our study raises additional questions about the capacity of Extension educators to address climate change issues. Does capacity vary across regions of the United States? Is a lack of need perceived because constituents are not asking for information? Research that answers these questions would be valuable. Additionally, more research is needed to understand what producers' perceptions, values, and beliefs related to climate change are and how those perceptions, values, and beliefs relate to their decision making and perceptions of risk. Such research will assist Extension educators in developing and delivering information and resources producers want and need.

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