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Agricultural Producer Perceptions of Climate Change and Climate Education Needs for the Central Great Plains

Abstract

The Central Great Plains Climate Education Partnership conducted focus groups throughout Kansas to gain a better understanding of farmer perceptions and attitudes towards climate change education. Results indicate concern about climatic changes, even if producers are unsure that "human caused climate change" is occurring. Participants indicated they would like access to information through Web-based programs that allow them to manipulate variables relevant to their area and situation. Participants prefer locally relevant information and identified Extension agents as trusted educators. The study provided an expanded understanding of agricultural producer perceptions that will be valuable to individuals or organizations providing climate education.

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Introduction

Climate is a dominant factor for crop production in the Central Great Plains (CGP). Predicted climate changes include increasing temperatures, larger daily precipitation events, and longer and more frequent heat waves, with related impacts on crop production, water supply, and human health. Climate change impacts on agricultural production in the CGP are likely to affect both the national and global food supply and related social and economic systems (U.S. Global Change Research Program, 2009). Despite this fact, rural citizens' attitudes toward climate change remain mixed. Hamilton and Keim (2009) found that only 48% of respondents from rural Kansas felt that global warming or climate change had major or minor effects on their family or community over the past 5

years. Wilson (2011) found that agricultural producers in North Central Kansas were aware that climate was changing, although they were reluctant to discuss the topic.

The Central Great Plains Climate Education Partnership (CGP-CEP)—which includes climate scientists, learning scientists, and educational practitioners from Kansas State University and the University of Nebraska-Lincoln—was created to empower land managers to make decisions by developing effective, science-based educational programs on climate change, uncertainty, and variability. Fraisse, Breuer, Zierden, and Ingram (2009) suggested the first step in the development of climate change Extension programing in this area should be to assess "farmers' perceptions, attitudes, long-term goals, and other cognitive and decision-making information" regarding climate change. In order to conduct such an assessment, we conducted focus groups throughout Kansas with agricultural producers.

In this article, we describe the methods used in these focus groups and the results from an in-depth analysis of the perceptions expressed by agricultural producers in Kansas. More general results related to a more diverse target group (producers, rural community members, and science teachers) are presented elsewhere (PytlikZillig et al., 2013).

Methods

In order to capture agricultural producer attitudes and ideas for effective program models for climate change education, the study reported here engaged subjects in focus group interviews. Focus group interviews were preferred because they allow the researcher to collect large amounts of data in a short period of time. Group dialogue provides participants an opportunity to share impressions and compare experiences and perceptions (Morgan, 1997). Five focus groups specifically targeting agricultural producers and agricultural industry representatives were held across Kansas.

Participants

Both small- and large-scale crop and livestock producers as well as agricultural professionals were purposefully sought for participation through local county K-State Research & Extension agents. Involvement of local county Extension offices provided a trusted connection between the project and participants that facilitated the participation of established agricultural producers. The focus groups were hosted in Extension offices or facilities familiar to participants. Because of the recruitment methods used, participants may have represented producers who have a strong working relationship with the university Extension system.

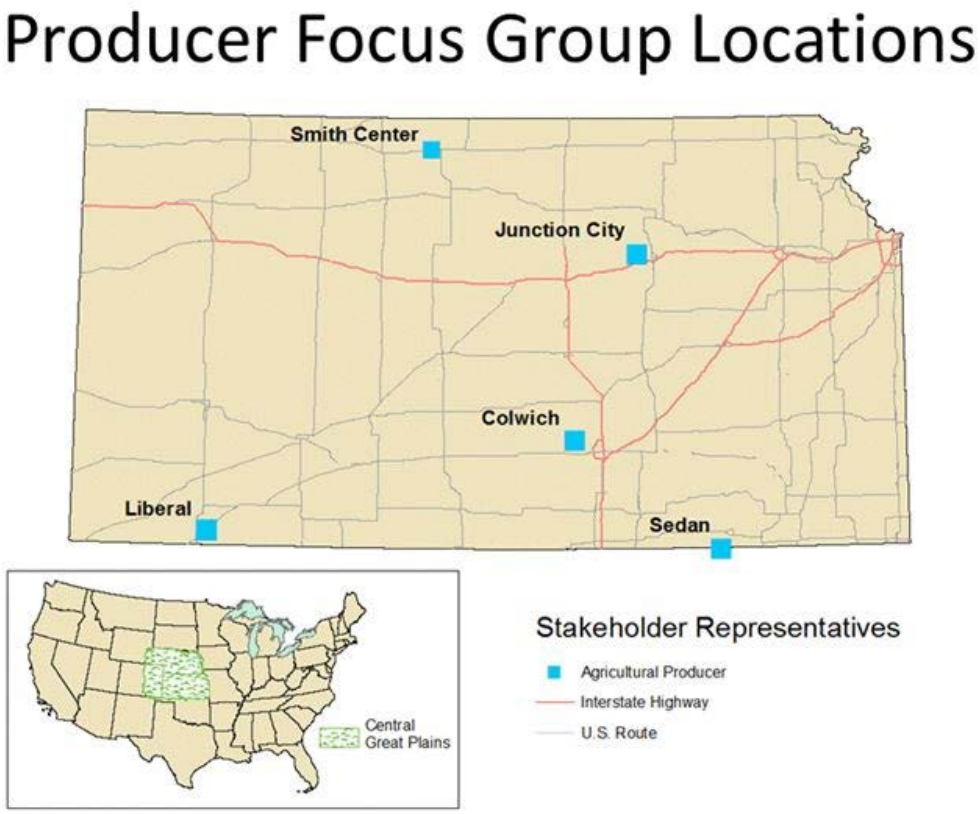
Producer focus group participants (n = 46) were primarily white males (Table 1) with a median age of 56. The sample was similar to population statistics taken in 2007, which found the average age of farm operators in Kansas was 56. Seventy-two percent of principle operators were male, and 99% of them were white (USDA National Agricultural Statistics Service, 2009). See Figure 1 for agricultural producer focus group locations.

Table 1.

Focus Group Participant Demographics

	Gender		Race	
N	Male	Female	White	No Response
46	32 (70%)	13 (30%)	39 (85%)	7 (15%)

Figure 1.
Agricultural Producer Focus Group Locations



Procedures

Focus group meetings involving eight-20 participants were conducted by trained facilitators from Kansas State University's Institute for Civic Discourse and Democracy, who encouraged sharing of distinct perspectives. A member of the CGP-CEP Leadership Team was also present at each of the meetings to introduce the project and answer project-related questions.

Focus group sessions followed a semi-structured protocol that used an established list of questions to ensure comparability of response data across groups. Each 90-120 minute focus group followed a similar structure and script. Focus groups began with an introduction to the CGP-CEP project and the acknowledgment of the diversity of viewpoints on climate change and the need for honest expression of all perspectives.

Prior public opinion studies about climate and climate change (Leiserowitz, Maibach, Roser-Renouf, Smith, & Hmielowski, 2011) suggest participants would represent a range of potentially conflicting viewpoints. Accordingly, we asked participants to engage in an exercise in which they self-reported

anonymously where they fell on the Six Americas Spectrum (i.e., alarmed, concerned, cautious, disengaged, doubtful, or dismissive) regarding the topic of climate change (Leiserowitz et al., 2011). The results from the Six Americas exercise were reported on a flipchart to visually illustrate the diversity of opinions in the group. Next, the group responded to a series of open-ended questions concerning observations on climate variation and change, sources of information they trust or distrust, and preferred approaches to learning about climate change. Participants also identified characteristics of climate-centered educational programs they believed would be effective for themselves and their peers. Finally, participants completed a brief, anonymous post-survey about their focus group experience.

Each focus group discussion was audio recorded, transcribed, and coded by a research assistant using axial coding. Axial coding is a qualitative research method designed to sort, synthesize, and organize large amounts of data and reassemble them in new ways (Creswell & Plano Clark, 2007). NVivo8 software was used to relate subcategories, specify the properties and dimensions of a category, and reassemble the data in ways that give coherence to the emerging analysis (Hesse-Biber, & Leavy, 2010). The focus group discussion data, responses to the Six Americas question, written suggestions from the brainstorming session, and responses to the post-meeting survey were examined collectively to identify and interpret themes that were important to the agricultural producers.

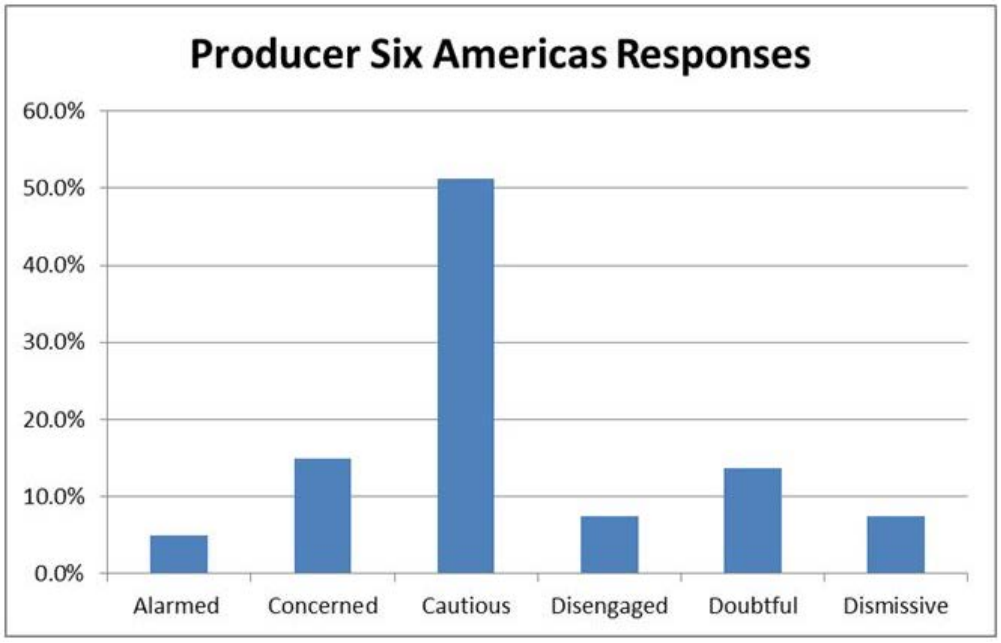
Results and Discussion

Six Americas

Leiserowitz et al. (2011) asked respondents about global warming rather than climate and reported a modal response of "concerned." When we asked focus group participants into which of the Six Americas categories they would classify themselves with regard to climate, the majority responded "cautious" (Figure 2). Individuals classified as "Cautious" within the Six Americas audience segmentation analysis generally believe that "climate change is occurring, but this belief is relatively weak, with the majority saying they could easily change their minds" (Maibach, Roser-Renouf, & Leiserowitz, 2009, p.45). In addition, opinions on causation are mixed, and there is a belief that scientists have significant disagreement on the topic.

Figure 2.

Self-Identified Six Americas Classifications for Agricultural Producers



Perceptions and Questions

Although we only asked participants about their observations of climate impacts (e. g., they were not asked if they "believed in climate change"), participant responses nonetheless provided information about their perceptions of climate and climate change. One participant summarized the views expressed among many participants by noting, "[T]here's really two questions,[is there] climate change, and then if you do think climate is changing, does human activity have any influence on it?" Throughout these discussions it was clear that producers distinguished between observable variations in an environment that is constantly changing and climate change.

Producers noted observing changes in the amount of available moisture, as well as the periodicity, expanse, and severity of storms. Participants also observed increased short-term fluctuations in temperature extremes and drought conditions. They noted that these changing conditions have resulted in greater yield variability, less predictable maturation rates, increased need for pesticides, variation in the timing of available pasturage for livestock, and increased damage to perennial plants.

Focus group participants questioned the scientific validity of climate change for a number of reasons. Many felt they had received mixed or conflicting messages about climate change in the past. Others questioned whether or not they could believe the results of scientific inquiry noting, "Some of the scientists…they have no integrity…trying to decide which one does and which one doesn't is the hard part." Still others felt that observations may be misleading due to changes in measurement. Climate scientists continue to struggle to achieve temperature measurement consistency given changes in sensors that have occurred over time (Lin & Hubbard, 2007).

Among those who felt that the climate was changing, historical variations in precipitation and temperature in Kansas (e. g., 1930's dust bowl drought) lead many people to reject the assertion that increased variation is anything other than naturally occurring climate fluctuation. One participant commented, "I don't think there's that much climate change. I think it's more cycles and we're

seeing the cycles vary more often than what we did years ago." Others felt that climate was beyond human influence either because it was in the realm of a higher power, or simply too large an issue for humans to impact. These sentiments echo the findings from interviews that were done in the late 1990s (Harrington, 2001).

Producer Concerns

Whether or not producers believed in anthropogenic climate change, they expressed concerns related to climate changes. These concerns were generally linked to future productivity and profitability of farming. However, producers expressed greater concern over interannual weather variability. One producer observed, "[W]e don't do our production planning based on what the climate is going to do in 50 or 100 years. We base it on what's going to happen in the next three to six months." Variation in growing conditions from one year to the next is expected. Another participant said, "From year to year we adapt," emphasizing that responding to changing climate and weather patterns was just a part of farming. Interannual variation was noted by White and Selfa (2013) as the most prominent characteristic of Kansas' weather in the minds of producers.

Governmental regulation of agricultural practices related to climate change was also a serious concern for many producers. One noted, "I hear a lot more people that are concerned about potentially being regulated to death over climate than they are [concerned] about climate." Participants' concern over regulation was linked to a fear of policy established by those who are not agriculturally minded. In reference to climate policy development, one commented, "It's scary to think that somebody's going to have that kind of control over our producers here locally."

Responses and Production Changes

Because producers have observed changes in the growing conditions they experience, they are making changes in the ways they manage their land to remain economically viable. Many farmers have either already made management changes or are conducting their own farm experiments. These include testing new crops and cropping techniques, reducing tillage to conserve soil moisture, and/or increasing the efficiency of irrigation systems. Less predictable conditions have also resulted in increased use of crop insurance as well as an increase in the cost of that insurance.

Resource Needs

Focus group participants voiced interest in resources that can help them be more profitable not only to support themselves and their families, but also to enable them to continue to sustain their communities. Producers requested information that would address the impact of climate change on agriculture such as research on methods to achieve higher yields and on potential alternative crops and cropping systems. In addition, they indicated that information on local and state trends for precipitation and temperature would be valuable, especially if it could be provided with the lead time necessary for making farm management decisions. Producers expressed a great deal of faith in the ability of improved technology to adapt to future changes.

Information Sources

Focus group participants indicated they regularly use the Internet via computers and other mobile devices, as well as print and radio sources, to gain information about climate. They also indicated that they consider some sources to be more reliable than others.

Land-grant universities and Extension were among the first sources of trusted information mentioned in each of the focus groups. One producer expressed the value the Extension system provides in the sense that it "doesn't just work with information developed within the University system, but it serves as an evaluator, as an interpreter of the various technology." In a direct reference to trustworthiness and perceived reliability of information, another participant remarked, "Information from Kansas State—I think people out here would be more likely to believe that than stuff that comes from the federal government." This is in part because farmers are concerned about information coming from an unbiased source rather than one with a financial or political motive.

Focus group participants did, however, express trust in the National Oceanic and Atmospheric Administration (NOAA), the National Weather Service, and the United States Department of Agriculture (USDA). Favored print resources include Extension publications and trade magazines such as *Kansas Farmer*, *High Plains Journal*, *Grass & Grain*, and *Midwest Producer*. Radio programs including Extension agent spots were also frequently mentioned sources of information.

Formats and Approaches

In regard to effective educational program formats, participants expressed interest in a variety of approaches that would allow them to have the opportunity to engage with the topic on their own terms and in their own time. One suggested, "[a] website, blog, whatever you want to call it; open format, utilizing the expertise of the various departments within the university system. Be open to questioning… A lot of times more information comes out of responses to questions than a presentation." The ability of producers to access information on their own schedule was important. One participant suggested the creation of "webinars so producers do it at their own convenience." Another suggested programs that were, "web-based, interactive, so I can go to it when I want to."

Producers also value the ability to call on their local Extension agent for information and to discuss their individual issues with them. This sort of interactive approach was much more appealing than a lecture on the topic, especially one premised on the assumption that anthropogenic climate change is occurring. "I don't like it when somebody sits down beside us, comes out and just assumes that we already believe what they believe; show me the proof."

Many producers expressed a desire to work with raw climate data and draw their own conclusions. They are very interested in products that would empower their decision-making. One farmer suggested a tool that would, "Give us the ability to do our own forecasting to some extent. Put some models out there…that we can tweak humidity a little bit or tweak UV or tweak this, and see what kind of impacts it has." Producers would, however, appreciate a consolidation of resources. As one producer lamented, "We're getting so much information…now how do we narrow it down a little bit into specific areas that can be user friendly for us?"

Suggestions for Programming

Caffarella (2002) notes that adult learners have many shared characteristics that influence their learning. For example, adult learners are generally pragmatic in their learning. They want to apply their learning to present situations, and they prefer to be actively involved in the learning process rather than passive recipients of knowledge. All of these adult learner characteristics were evident in how participants described their preferred ways to learn about climate. Educators will be most successful when climate education programs are designed with these adult learner characteristics in mind.

As a "Cautious" audience, producers are likely to believe in climate change, but feel unsure of its causes and are unlikely to view it as personally important (Maibach et al., 2009). As a result, it is important to check assumptions about climate information, clearly cite resources, and frame messages in ways that have personal meaning.

Myers, Maibach, Roser-Renouf, Akerlof, and Leiserowitz (2013) suggest that place-based programming using local data and emphasizing the impact of climate in local contexts has considerable potential to improve public understanding of climate. This is consistent with our research findings. Programming that provides producers with locally relevant experiential learning opportunities helps learners to see how the information provided applies to their lives. Opportunities to work with local weather and climate data helps fulfill producer desire to analyze the available data personally and draw their own conclusions making them active participants in the process.

Myers et al. (2013) noted that, "Turning observable local impacts into experiential learning opportunities often requires that trusted communicators—who have access to large cross-section of the public—provide scientifically accurate interpretations that connect the dots from change in local weather patterns, environmental conditions, and extreme weather events to climate change" (p.346). Our research indicates that Extension professionals are among the most "trusted communicators" for producers. As a result Extension programming has considerable potential in this area.

The design of educational messaging is important. Arbuckle et al. (2013) found that most Midwestern farmers have positive associations with practices aimed at reducing vulnerability to weather variability (i.e., adaptation), but generally do not have the same positive attitudes towards mitigation actions. They suggest that programs emphasizing adaptive practices that also have mitigative potential are more likely to resonate with producer audiences (Arbuckle et al., 2013). Given producer interest in maintaining productivity and profitability, programs that emphasize how to achieve these goals will be more positively received.

Conclusion

Our research in Kansas shows that producers *are* concerned about climatic change. However, they made a distinction between climate variability and anthropogenic climate change. Participants' major concerns included continued farm productivity and profitability in the face of uncertain conditions. They also expressed concern about regulation of their agricultural practices. Many producers were already making adaptive changes in their agricultural practices in response to current conditions.

In order to be most effective in their responses to climatic variability, producers need trusted information sources to provide them with research-based, locally relevant, and timely data. Educational programming that emphasizes adaptive responses and engages producers in dialogue about the climate change were preferred by producer audiences. As trusted communicators of agricultural knowledge with established relationships with producers, Extension educators are among those best suited to engage with them on the topic of climate change.

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References

Arbuckle, J. G., Jr., Prokopy, L. S., Haigh, T., Hobbs, J., Knoot, T., Knutson, C., … Widhalm, M. (2013). Climate change beliefs, concerns, and attitudes toward adaptation and mitigation among farmers in the Midwestern United States. *Climatic Change*, 117(4), 943-950. doi:10.1007/s10584-013-0707-6

Caffarella, R. S. (2002). *Planning programs for adult learners: a practical guide for educators, trainers, and staff developers*. (2nd ed.) San Francisco: Jossey-Bass.

Creswell, J. W., & Plano Clark, V. L. (2007). *Mixed methods research*. London: SAGE Publications, Inc.

Fraisse, C., Breuer, N., Zierden, D., & Ingram, K. (2009). From climate variability to climate change: Challenges and opportunities to Extension. *Journal of Extension* [On-line], 47(2) Article 2FEA9. Available at: http://www.joe.org/joe/2009april/a9.php

Hamilton, L. C., & Keim, B. D. (2009). Regional variation in perceptions about climate change. *International Journal of Climatology*, 29(15), 2348–2352. doi:10.1002/joc.1930

Hesse-Biber, S. J. N., & Leavy, P. L. (2010). *The practice of qualitative research* (2nd ed.). Los Angeles: SAGE Publications, Inc.

Leiserowitz, A., Maibach, E., Roser-Renouf, C., Smith, N., & Hmielowski, J. D. (2011). *Climate change in the American mind: Americans' global warming beliefs and attitudes in November 2011*. Yale University and George Mason University, New Haven, CT: Yale Project on Climate Change Communication. Retrieved from: http://environment.yale.edu/climate/files/ClimateBeliefsNovember2011.pdf

Lin, X., & Hubbard, K.G. (2007). What are maximum and minimum temperature in climatology? *International Journal of Climatology*, 28(3), 283-294. doi:10.1002/joc.1536

Maibach, E., Roser-Renouf, C., & Leiserowitz, A. (2009) Global warming's six Americas 2009: An audience segmentation analysis. Yale University and George Mason University, New Haven, CT: Yale Project on Climate Change Communication. Retrieved from: http://environment.yale.edu/climate-communication/files/SixAmericas2009.pdf

Morgan, D. L. (1997). *The focus group guidebook* (1st ed.). Thousand Oaks, CA: SAGE Publications, Inc.

Myers, T. A., Maibach, E. W., Roser-Renouf, C., Akerlof, K., & Leiserowitz, A. A. (2013). The relationship between personal experience and belief in the reality of global warming. *Nature Climate Change*, 3(4), 343–347. doi:10.1038/nclimate1754

PytlikZillig, L., Steffensmeier, T., Campbell Hibbs, A., Champion, B. L., Hunt, E., Harrington, J. J., … Kahl, D. W. (2013). Fostering climate change education in the Central Great Plains. *The International Journal of Sustainability Education*, 8(1), 161–177.

U.S. Global Change Research Program. (2009). *Global climate change impacts in the United States*. Cambridge: Cambridge University Press. Retrieved from: www.globalchange.gov/usimpacts

USDA National Agricultural Statistics Service. (2009). *2007 census of agriculture: United States summary and state data* (No. AC-07-A-51). USDA.

White, S. S., & Selfa, T. (2013). Shifting lands: Exploring Kansas farmer decision-making in an era of climate change and biofuels production. *Environmental Management*, *51*(2), 379–391. doi:10.1007/s00267-012-9991-6

Wilson, I. E. (2011, May 26). *Perceptions of climate and environmental change in North central Kansas* (Thesis). Kansas State University. Retrieved from http://krex.ksu.edu/dspace/handle/2097/9203
