



United States Department of Agriculture
National Institute of Food and Agriculture

IOWA STATE UNIVERSITY
Extension and Outreach

Understanding Farmer Perspectives on Climate Change to Inform Engagement Strategies for Adaptation (and Mitigation?)

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Colorado Ag Climate Working Group
Colorado Department of Agriculture
December 11, 2015

This research is part of a regional collaborative project supported by the USDA-NIFA, Award No. 2011-68002-30190:
Cropping Systems Coordinated Agricultural Project: Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems
Project Web site: sustainablecorn.org



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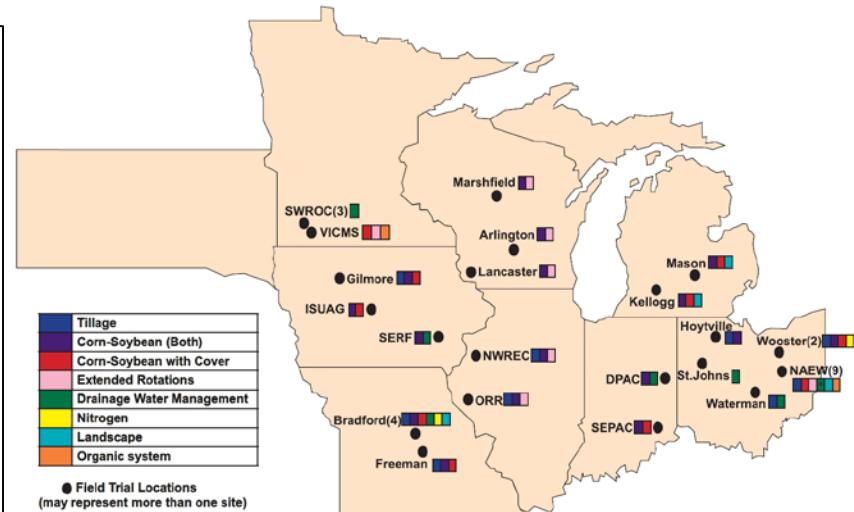
Agricultural
Research
Service

\$20M transdisciplinary project funded by USDA-NIFA:
Creating knowledge to help to guide effective adaptation
and mitigation in Corn Belt agriculture.

- 140-person team of scientists, graduate students and topic-based specialists
- More than 19 disciplines
- 10 Land Grant Universities & USDA-ARS
- 35 field research sites in 8 states
- 20 dedicated extension educators
- 35 graduate students
- 20 advisory board members

Tillage
Corn-Soybean (Both)
Corn-Soybean with Cover
Extended Rotations
Drainage Water Management
Nitrogen
Landscape
Organic system

● Field Trial Locations
(may represent more than one site)



CSCAP social science research: Understanding farmer perspectives on climate change to inform extension and outreach

Rationale:

- Agriculture is both vulnerable to climate shifts and a source of the GHGs driving changes
- Climate-change related threats to agriculture represent threats to society; calls for adaptation and mitigation strategies increasing
- Need to work with farmers and their advisers to support those efforts, but *knew little about what they think about climate change*

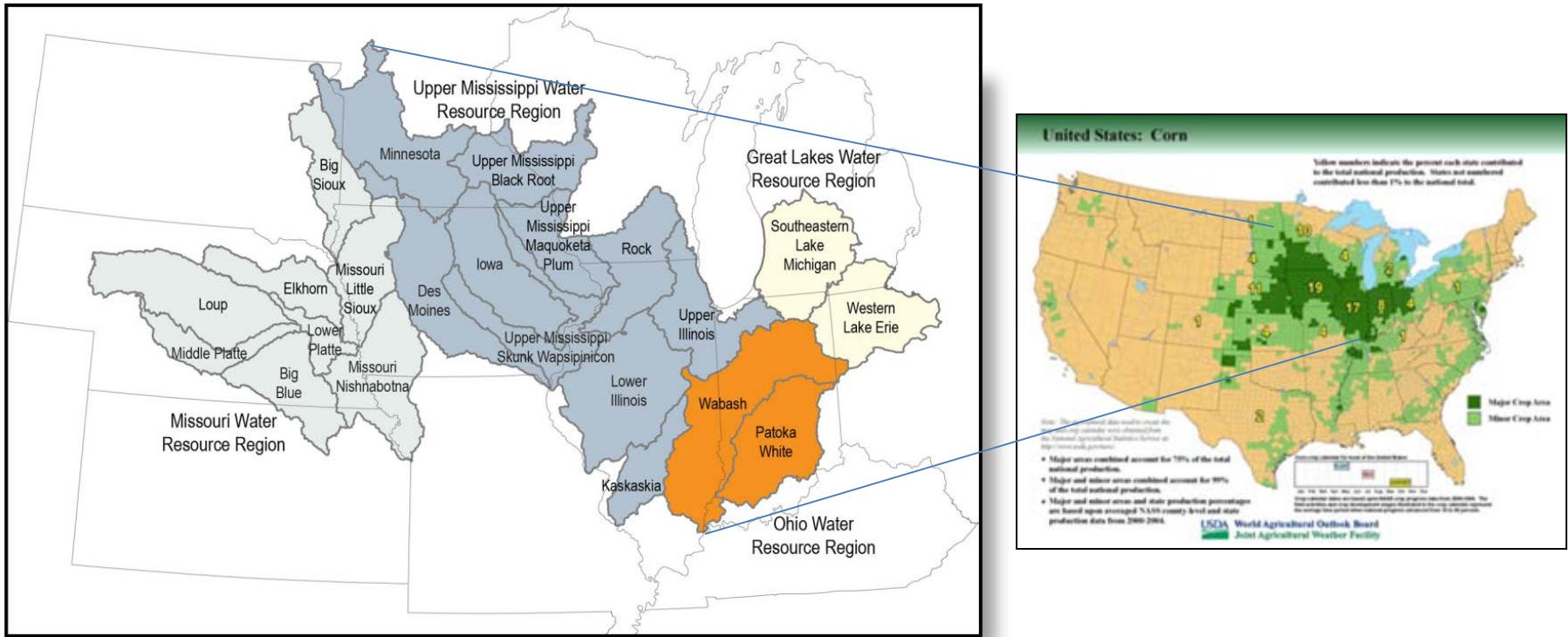
Farmers and climate change?

- What do farmers believe about climate change?
- Are they concerned about increasing weather variability?
- Do they support action?
 - Do farmers think they should change the way they farm?
 - Do they think that universities, farm groups, and gov't agencies should help?
 - What do they think about mitigation (GHG reduction)?
- Beliefs ➡ Attitudes and Risk Perceptions ➡ Behavior change

Research Methods

1. Survey of farmers from across the Corn Belt
2. In-depth interviews with farmers across the region

Survey Scope and Scale



Survey details:

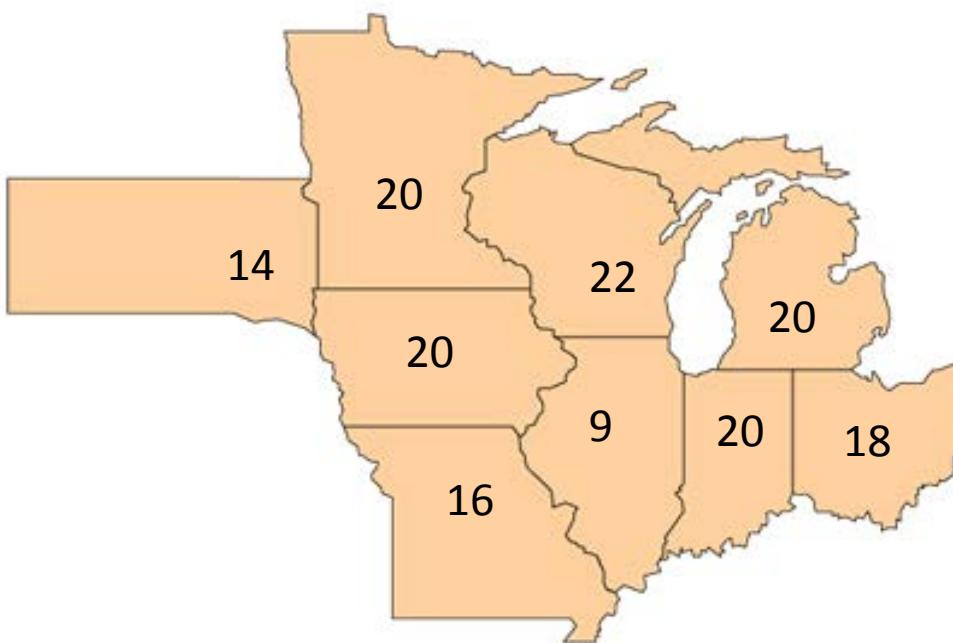
- Partnership with USDA NIFA-funded Useful to Usable (U2U) project, Linda Prokopy
- Larger-scale farmers: \$100k+ Gross Revenue, ~80% of farmland in region
- Sample stratified by 22 HUC6 Corn Belt watersheds
 - Representing ~60% of U.S. corn production
 - USDA NASS conducted survey in February 2012
- Surveyed 4,778 farmers



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SUSTAINABLE
CORN.ORG
CROPS, CLIMATE, CULTURE AND CHANGE

In-Depth Interviews



- Conducted by Extension educators, a graduate student
- Recruited from Extension networks, larger-scale, more conservation-oriented farmers
- 159 interviews, spring-summer-fall 2013
- Data collected:
 - Production systems
 - Conservation practices: Nutrient management, tillage, cover crops, other-motivations and barriers
 - Experience with extreme weather, beliefs about climate change, concerns about impacts
 - Adaptation actions, influences on decision making

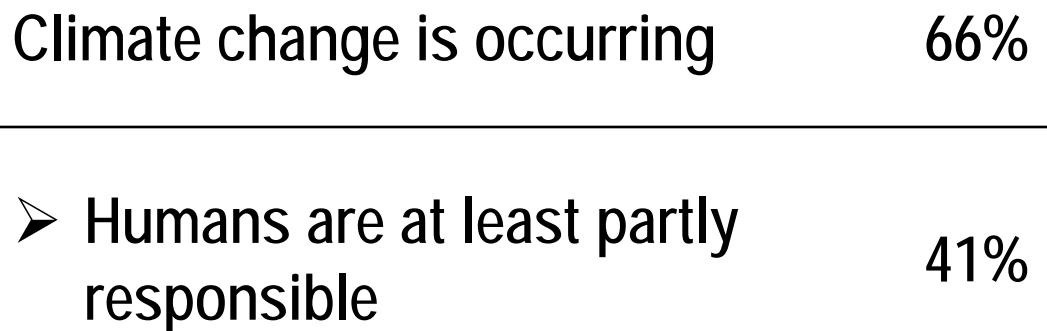
Survey results: Climate change beliefs

“Please select the statement that best reflects your beliefs about climate change”

Climate change is occurring, and it is caused mostly by human activities	8%
Climate change is occurring, and it is caused more or less equally by natural changes in the environment and human activities	33%
Climate change is occurring, and it is caused mostly by natural changes in the environment	25%
There is not sufficient evidence to know with certainty whether climate change is occurring or not	31%
Climate change is not occurring	4%

Most farmers believe climate change is happening, but a minority believe that it is due to human activity

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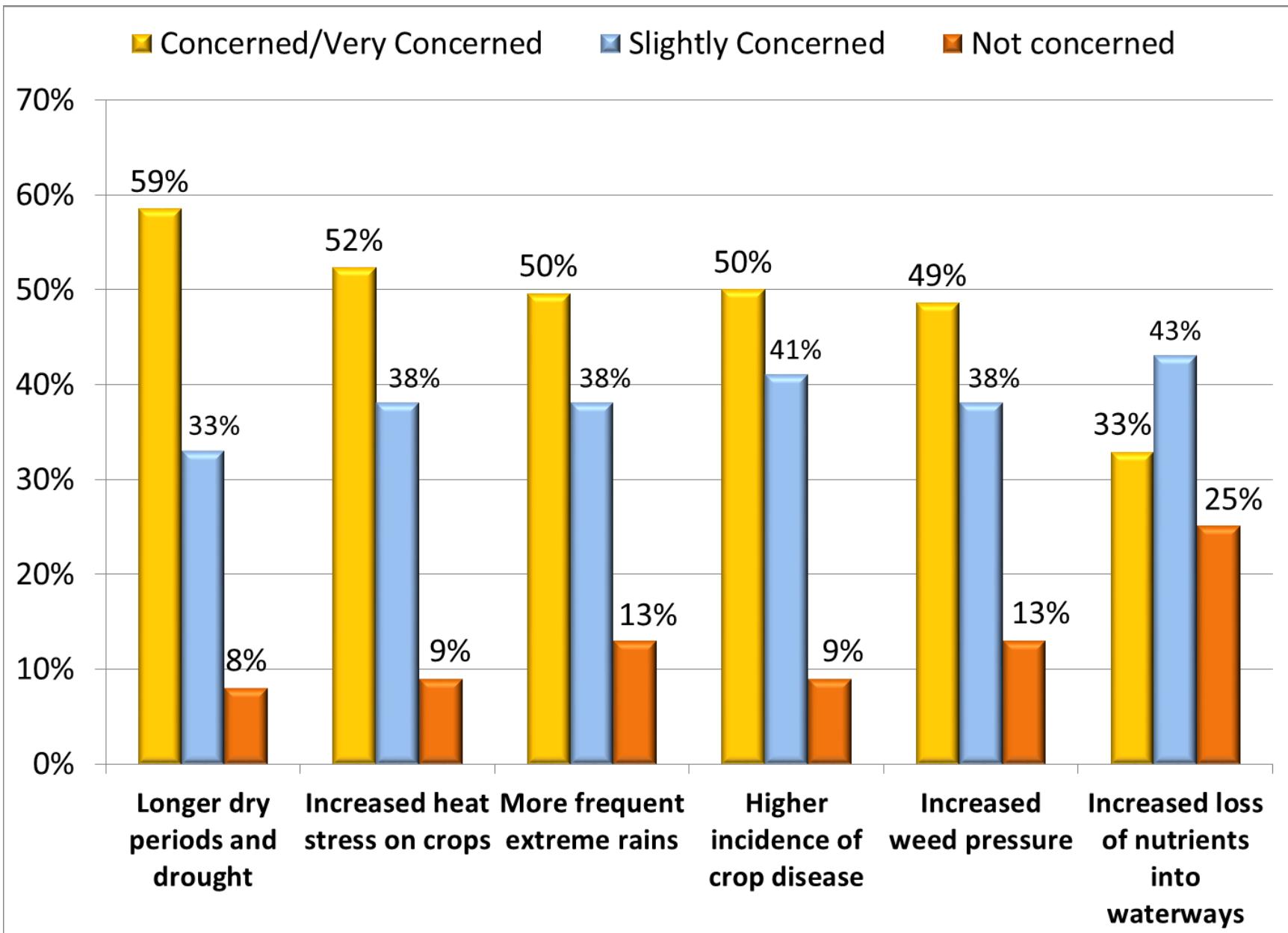


Perceived risks: Antecedents to action

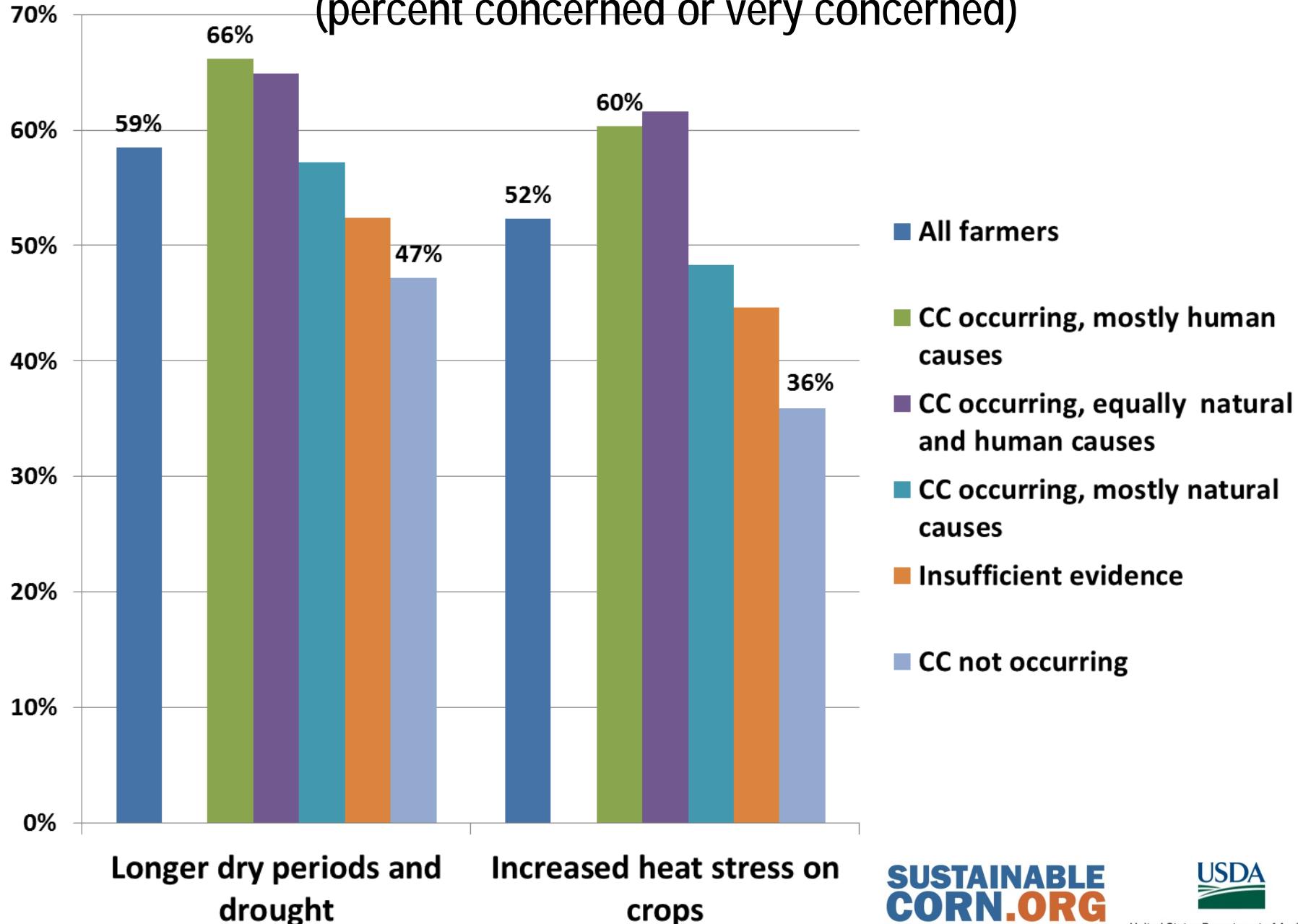
Developed questions based on predicted impacts of climate change on Corn Belt agriculture

- “The following are problems that some Corn Belt farmers have experienced over the past few years. How concerned are you about the following potential problems for your farm operation?”
 - Drought and heat
 - Excess water issues
 - Pest and disease issues

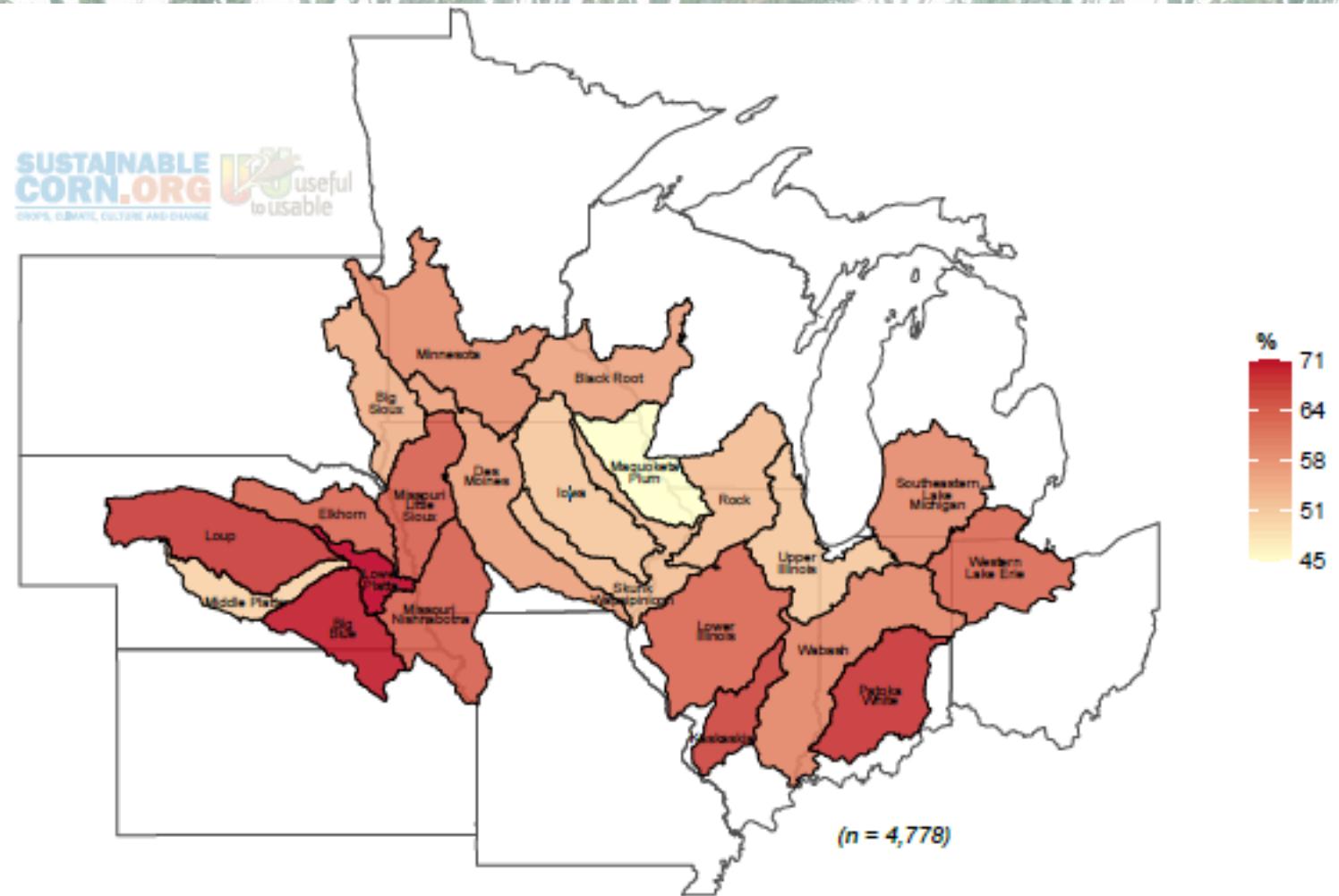
Farmers are concerned about future weather and pest problems



Climate concerns vary by beliefs: Drought and heat (percent concerned or very concerned)



Climate concerns vary across region: Longer dry periods and drought (percent concerned or very concerned)

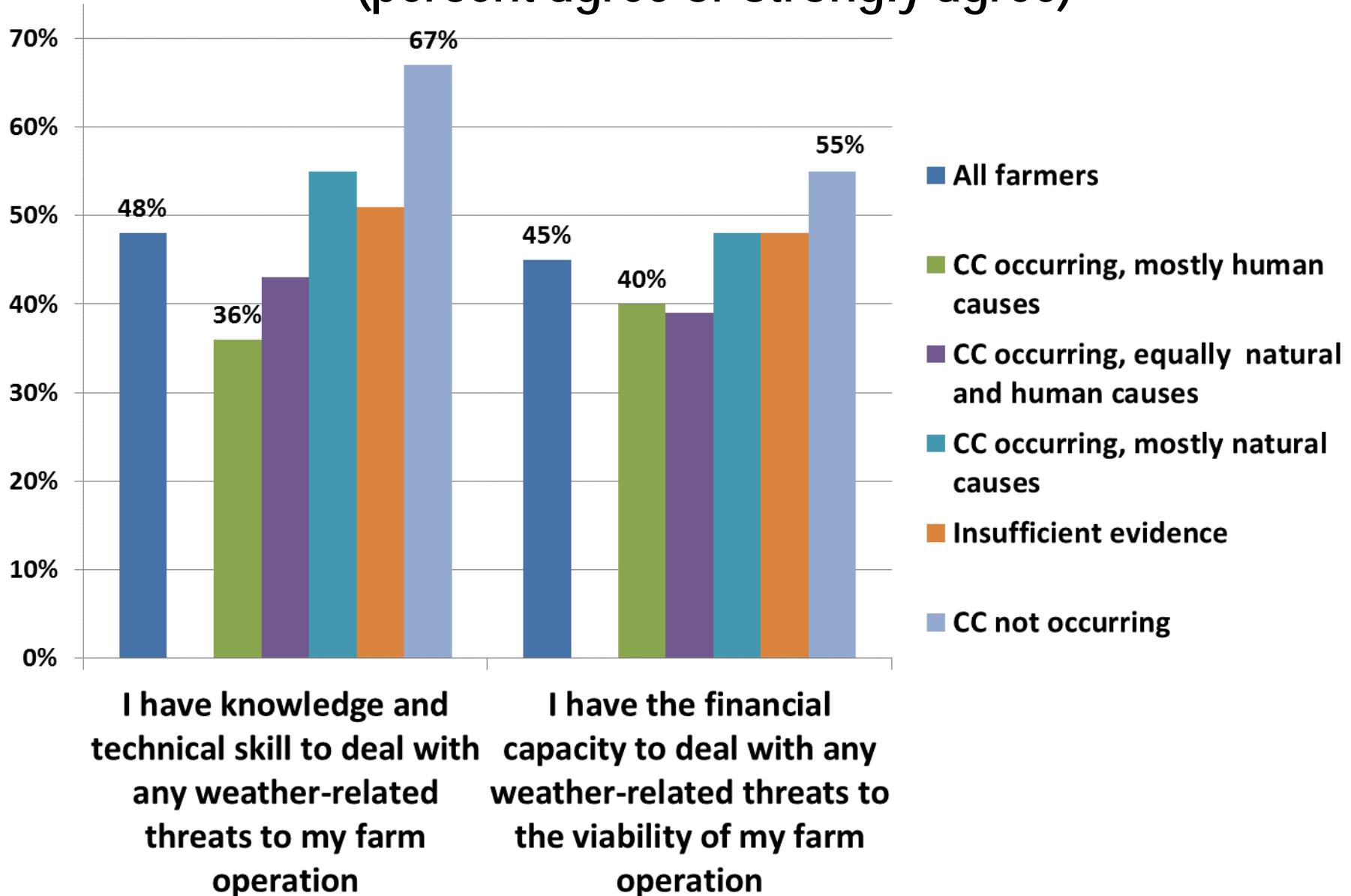


Confidence in capacity to adapt

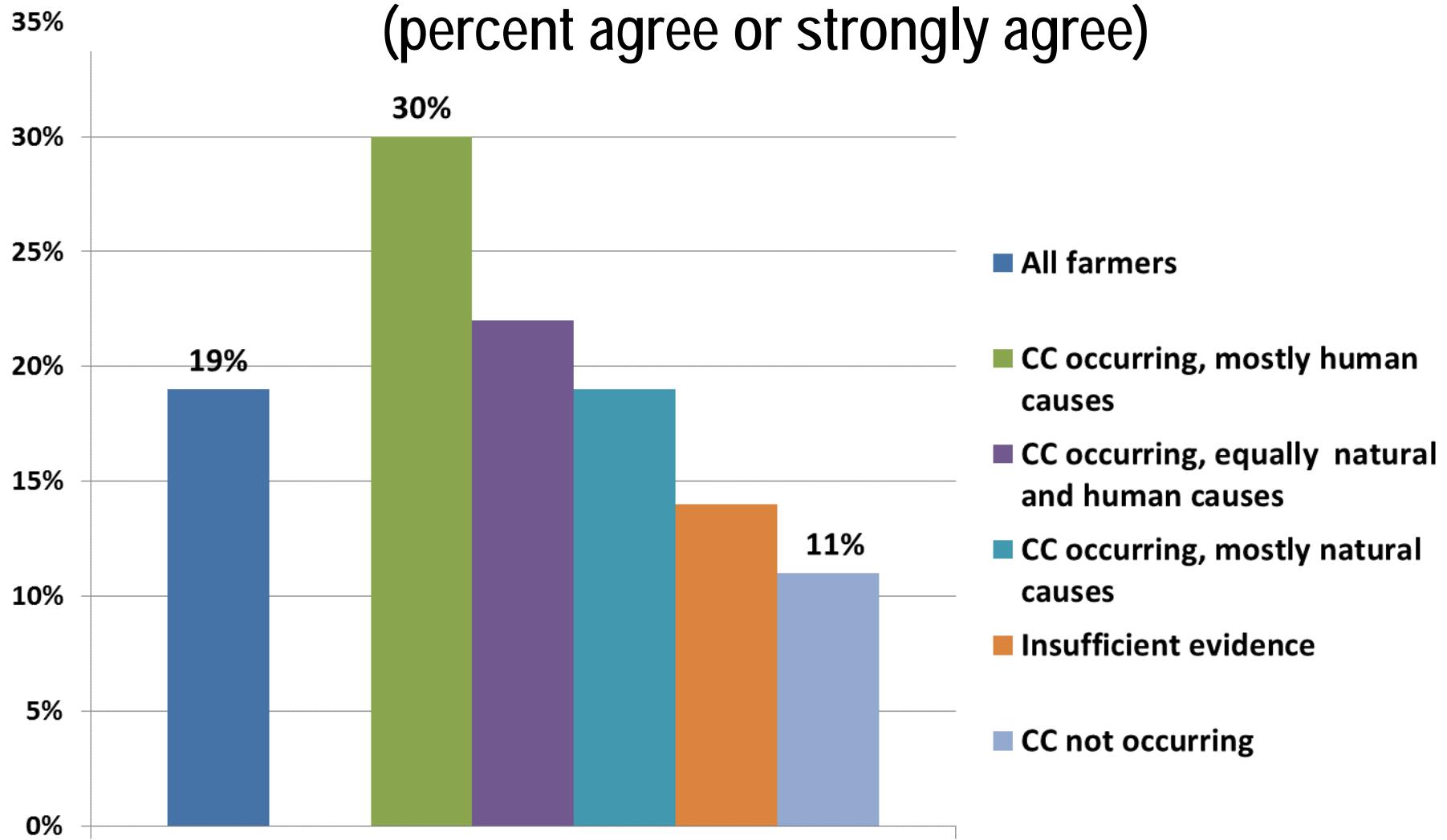
Asked immediately after the climate change belief question

- "Given what you believe to be true about the potential impacts of climate change on agriculture in the Corn Belt, please provide your opinions on the following statements."
- Items focusing on confidence in individual and collective capacity to deal with increased weather variability

Confidence varied by climate beliefs (percent agree or strongly agree)



Climate beliefs and confidence in adaptive capacity (percent agree or strongly agree)



I am concerned that available best management practice technologies are not effective enough to protect the land I farm from the impacts of climate change

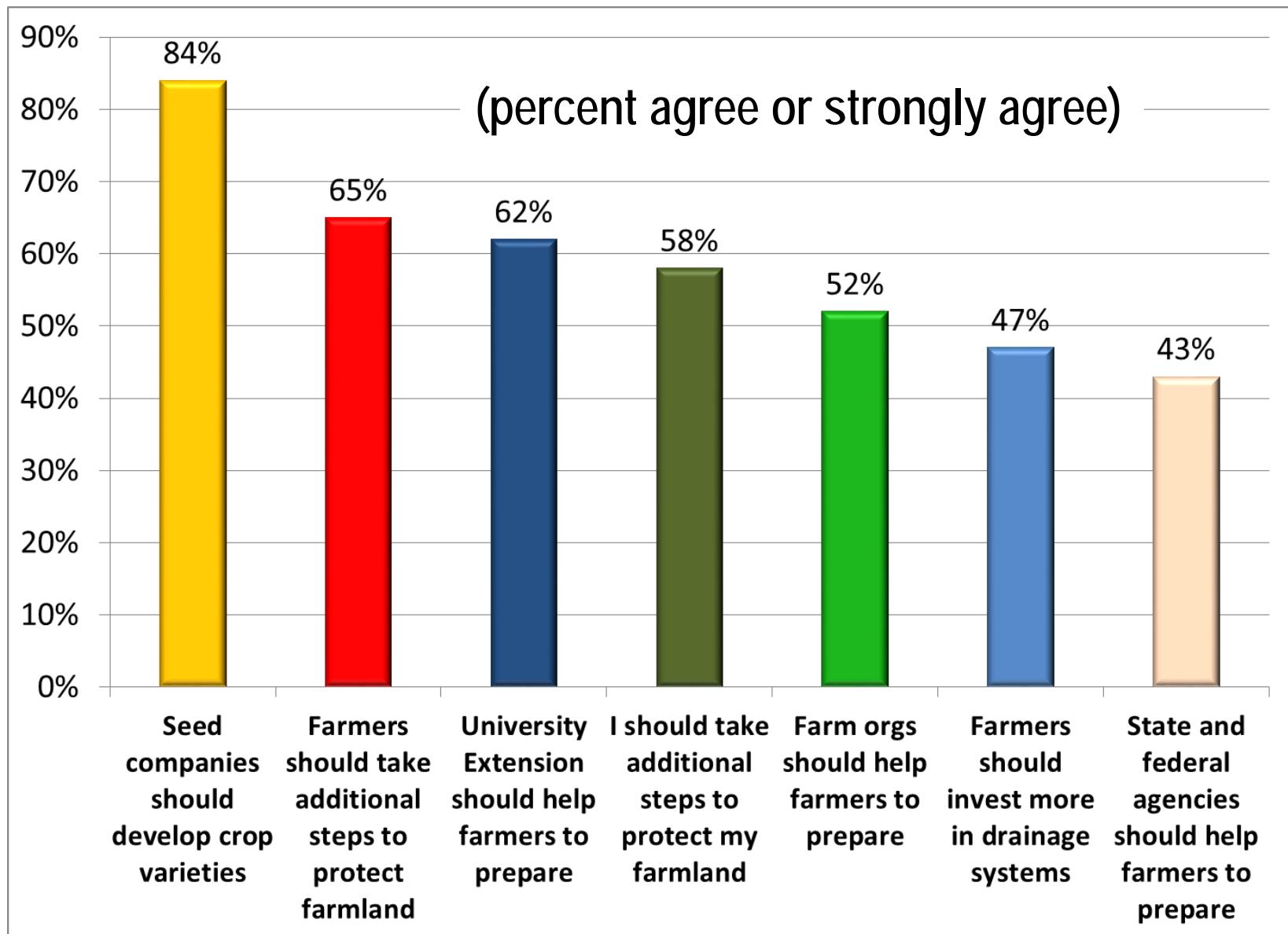
Uncertain=54%

Attitudes toward adaptation and mitigation

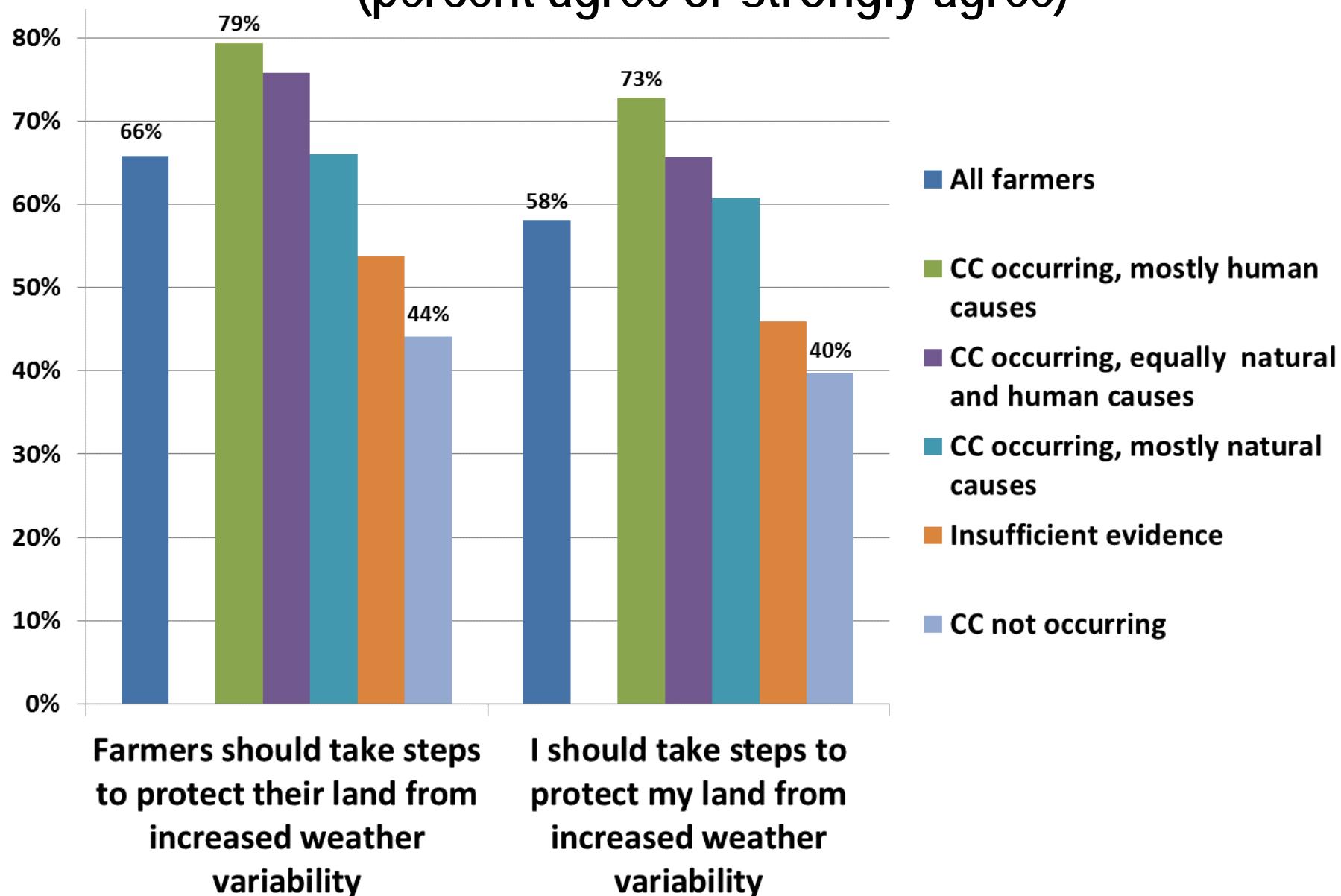
Normative items: What should be done and by whom?

- “Organizations, agencies, and individuals can do a number of things to prepare for or address potential changes in climate. Please provide your opinions on the following statements.”
- Focus on preparing for “increased weather variability”
 - Farmers
 - Government agencies
 - Farm groups
 - Extension
 - Seed companies

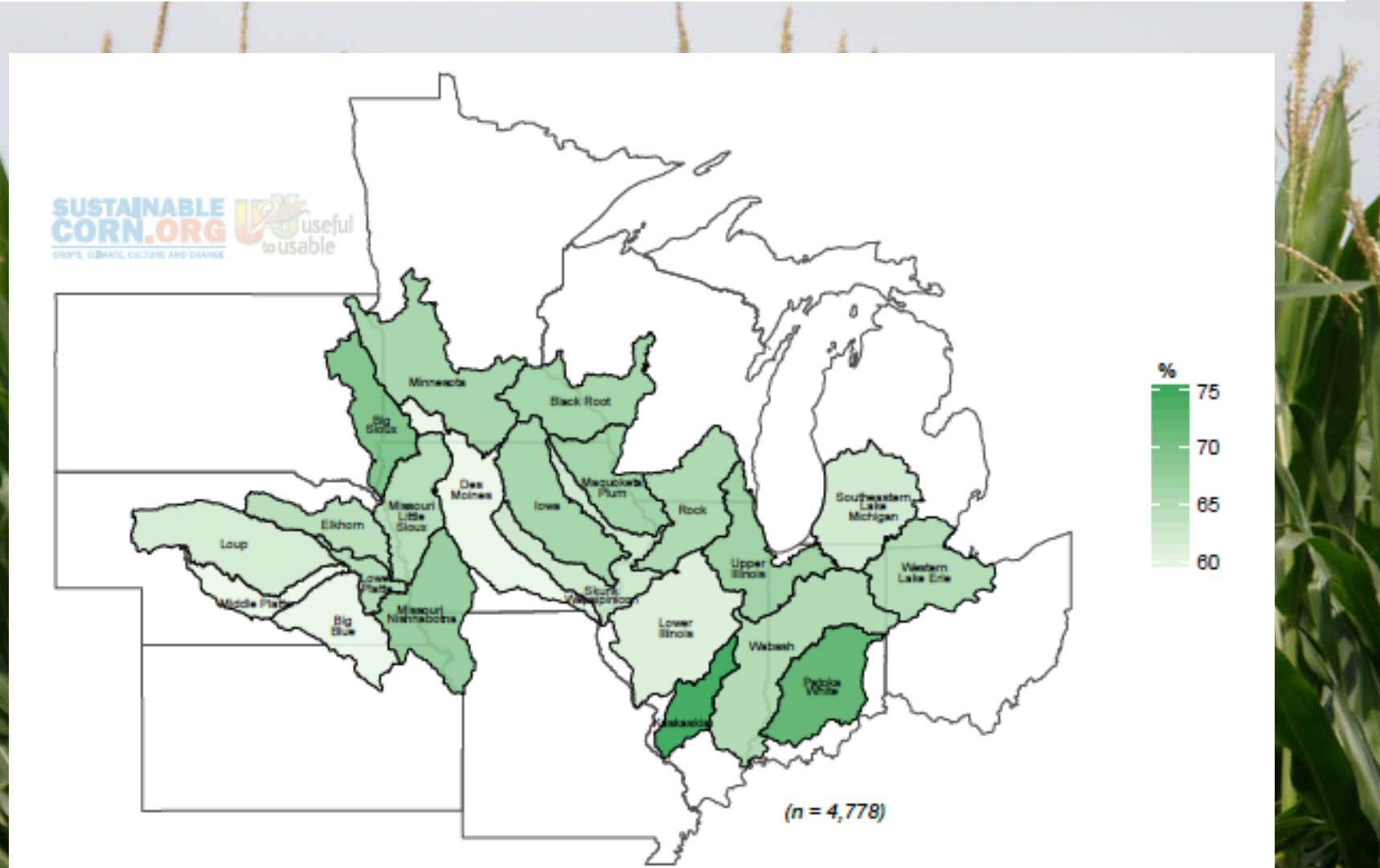
Farmers support action to prepare for “increased weather variability”



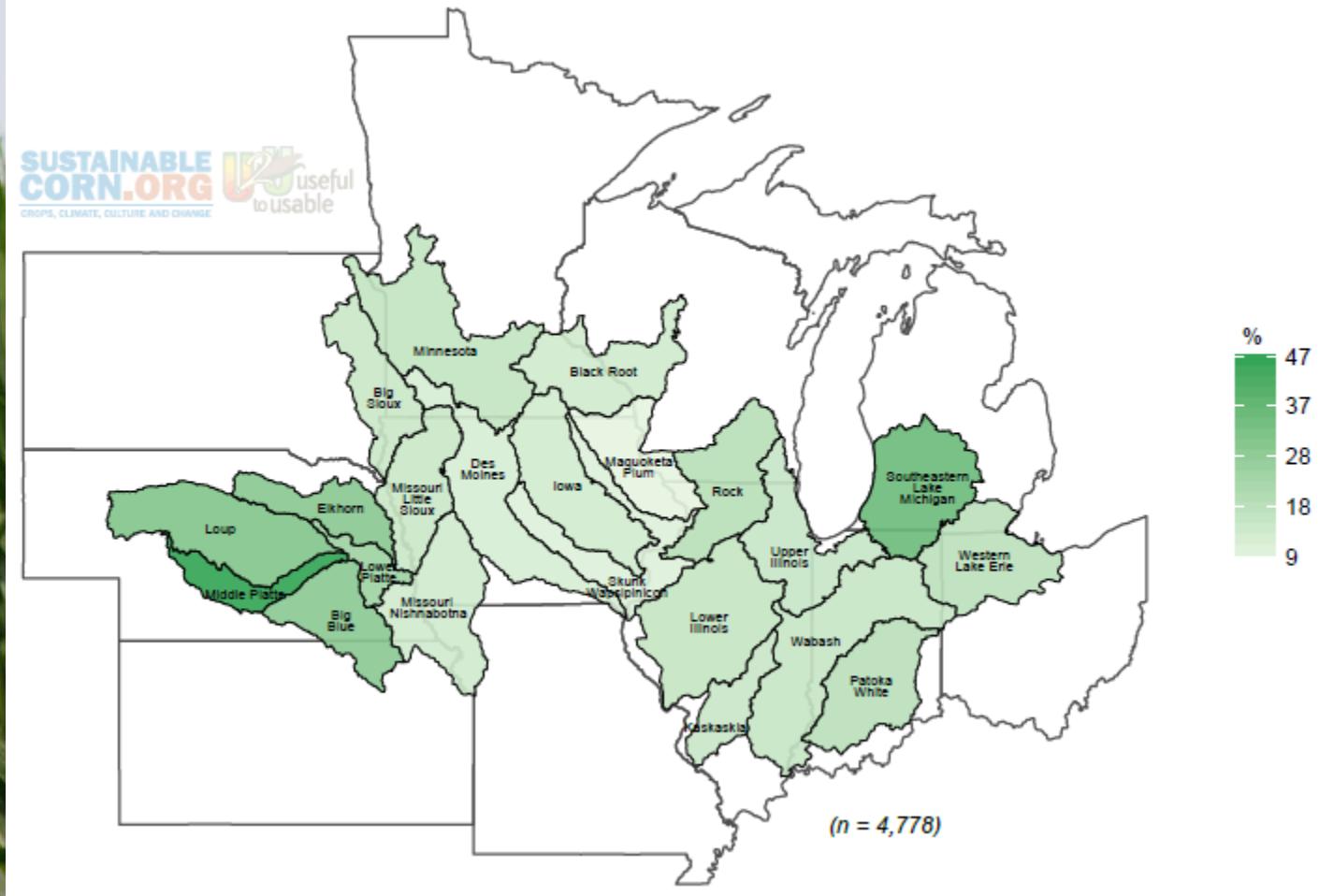
Climate beliefs and support for farm-level adaptation (percent agree or strongly agree)



Farmers should take additional steps to protect land from increased weather variability (percent agree or strongly agree)



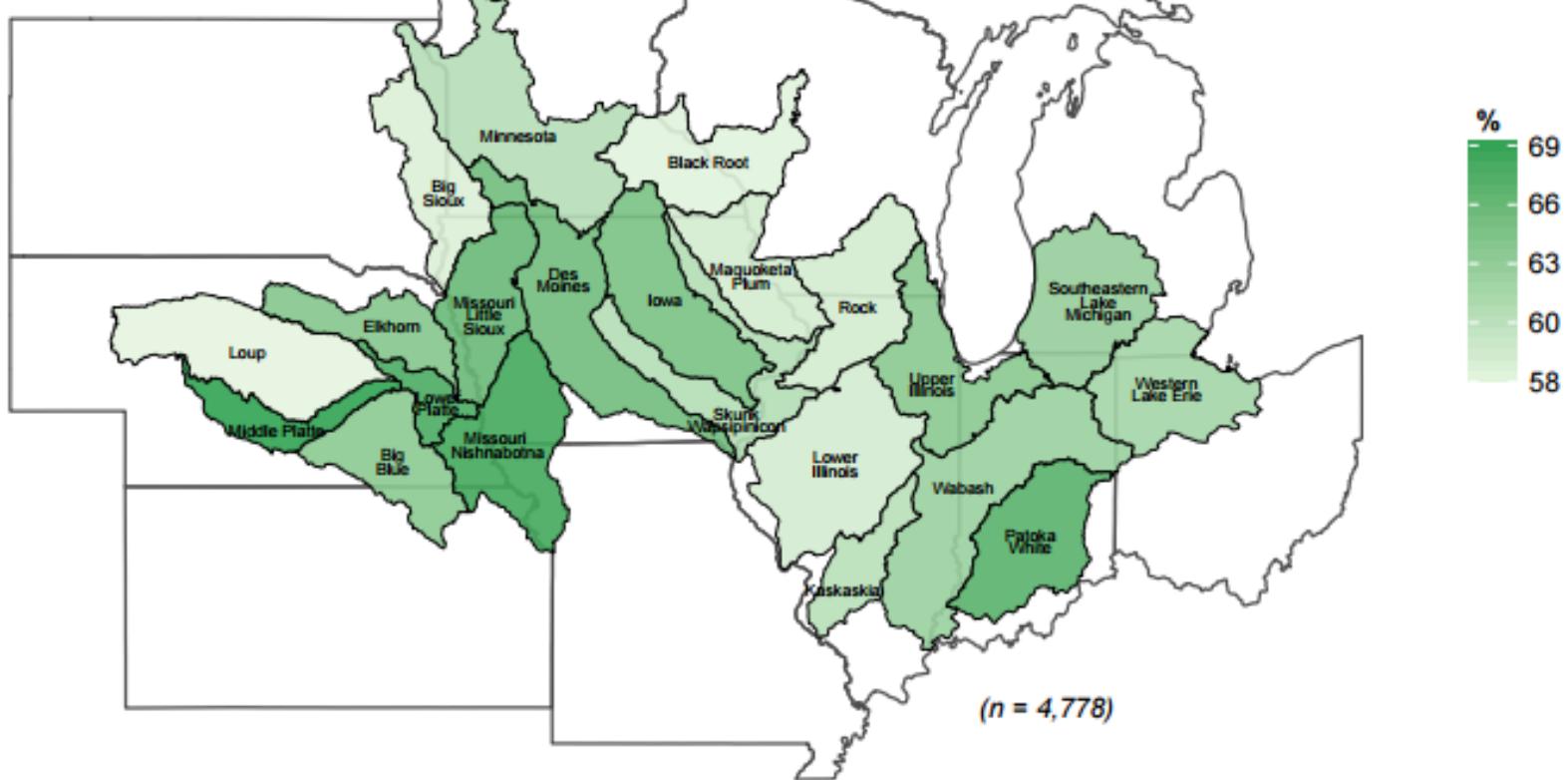
Farmers should invest more in irrigation systems to prepare for more frequent drought (percent agree or strongly agree)



Support for action varies across the region

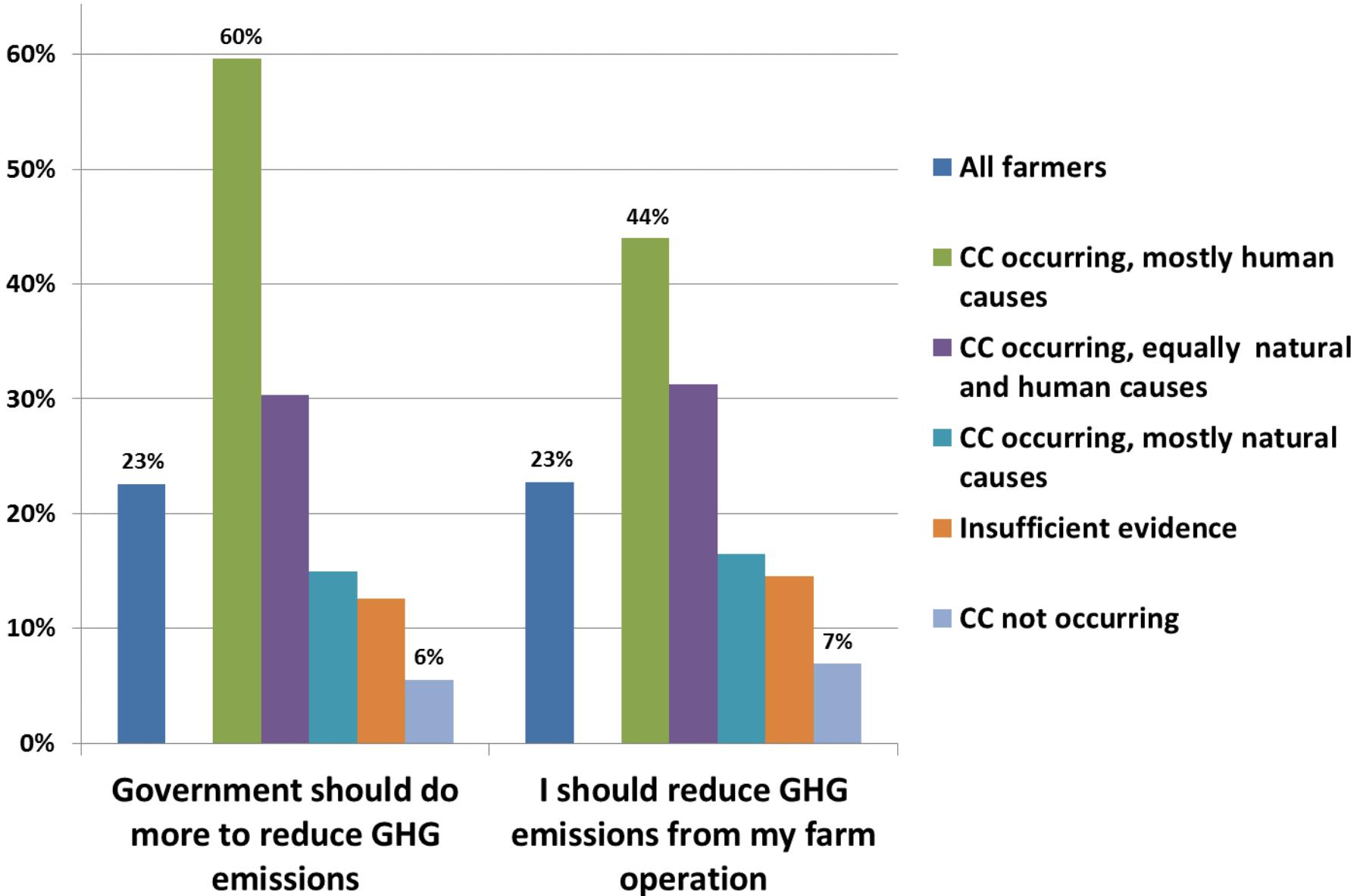
University Extension should help farmers to prepare for increased weather variability
(percent agree or strongly agree)

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70%

Support for government and individual mitigation action varies greatly by beliefs (percent agree or strongly agree)



Publications from the survey data

A photograph of a rural landscape. In the foreground, there is a field of tall green grass and numerous small yellow flowers, likely Black-eyed Susans. To the left, a dense stand of corn plants is visible. In the background, a long, low hill covered in green vegetation stretches across the horizon under a vast, overcast sky filled with dark, grey clouds.

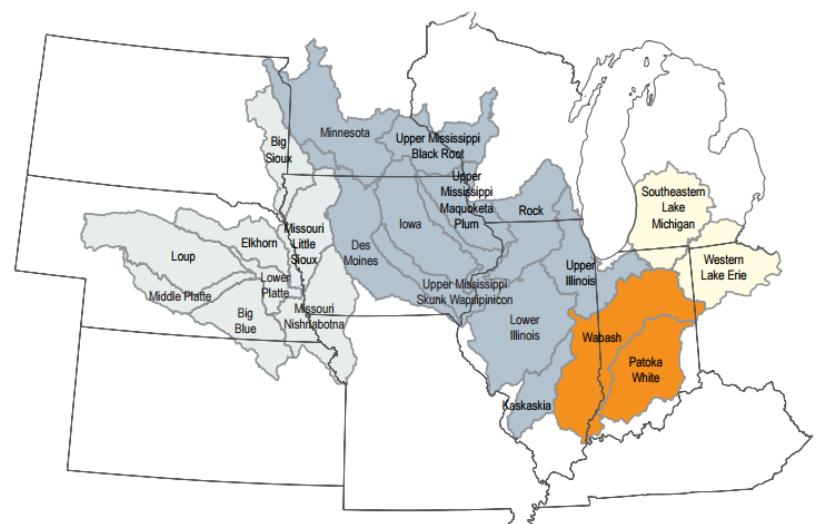
Statistical Atlas: Mapped Survey Results

- Information tool that can be used for planning and engagement of farmers and other stakeholders
- Identify differences and similarities across region

<http://www.sustainablecorn.org>



**Farmer Perspectives on Agriculture and Weather Variability
in the Corn Belt:
A Statistical Atlas, Volume 1**

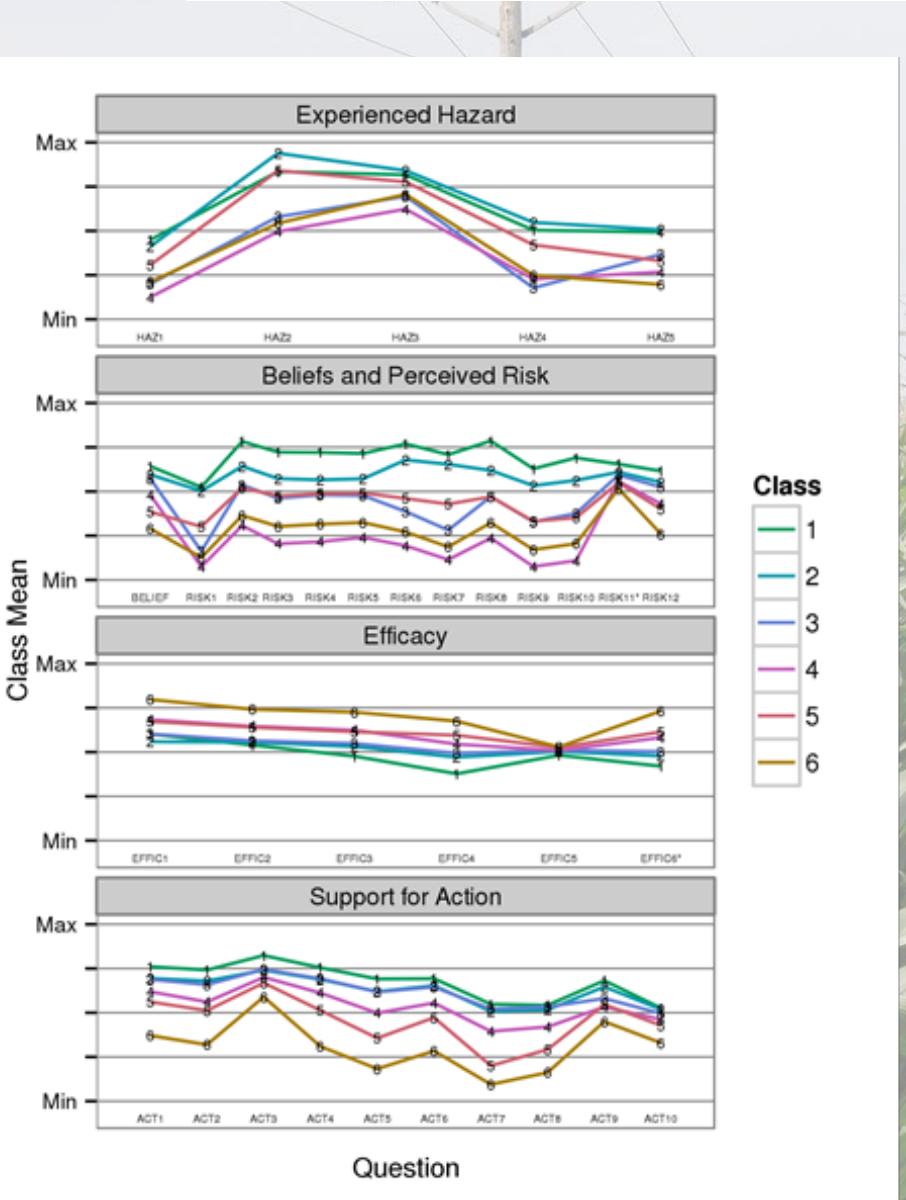


Agriculture's "Six Americas"

- **Research Problem:** Uncertainty about best ways to communicate with farmers about climate change and potential responses
- **Research objectives:**
 1. Understand how farmers might differ in perspectives on climate change
 2. Identify potential common ground
- Followed general *latent class analysis* approach employed in well-known *Six Americas* research (Maibach, Leiserowitz from George Mason-Yale climate change communication partnership)

Arbuckle, J.G. Jr., J. Hobbs, A. Loy, L.W. Morton, L.S. Prokopy, J. Tyndall. 2014. "Understanding Corn Belt farmer perspectives on climate change to inform engagement strategies for adaptation and mitigation." *Journal of Soil and Water Conservation* 69(6):505-516.

Latent Class Analysis: Identified Six Classes

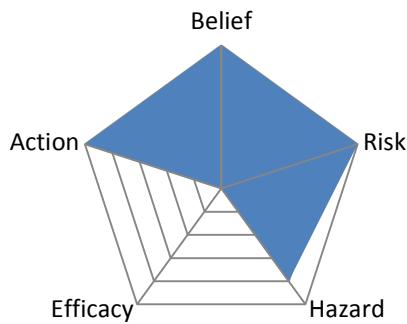


Model using 34 survey items measuring five underlying constructs that are central to understanding farmer perspectives on climate change and agriculture

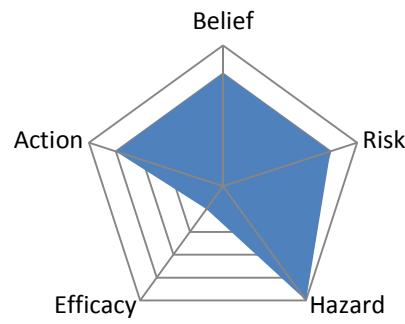
1. Experience of extreme events (e.g., flooding, drought)
2. Beliefs about climate change
3. Perceived climate risks (e.g., concerns about increased drought, heat, disease)
4. Perceived efficacy, or confidence in capacity to respond to challenges (e.g., knowledge, skill to deal with weather-related threats, faith in crop insurance)
5. Support for adaptation or mitigation (e.g., protect farmland, prepare for increased weather variability)

Examining Differences between Classes

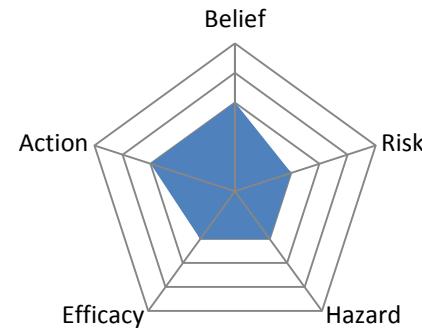
Class 1: Concerned (14%)



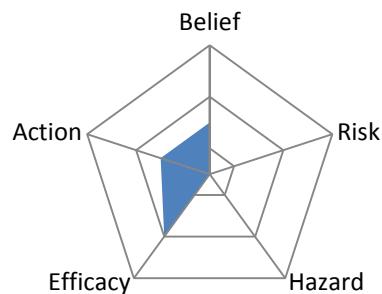
Class 2: Uneasy (25%)



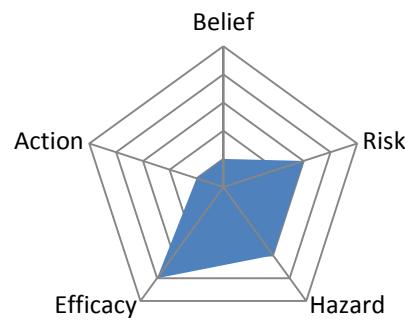
Class 3: Uncertain (25%)



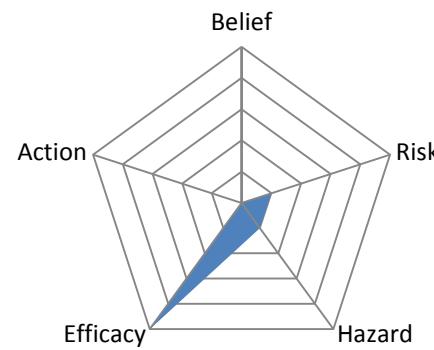
**Class 4:
Unconcerned (13%)**



Class 5: Confident (18%)



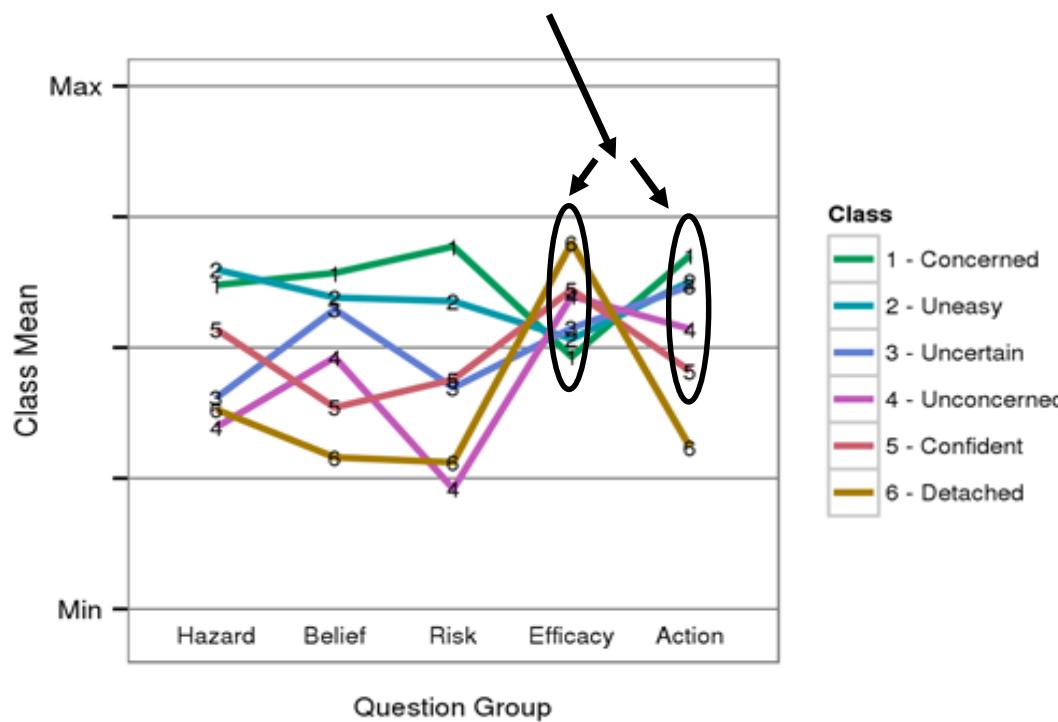
Class 6: Detached (5%)



Seeking Common Ground: Similarities

1. Confidence in capacity to adapt
2. Support for adaptive action in agricultural community
(individual, extension, private sector)

Outreach that appeals to farmers' confidence in ability to adapt to increased weather variability potential approach



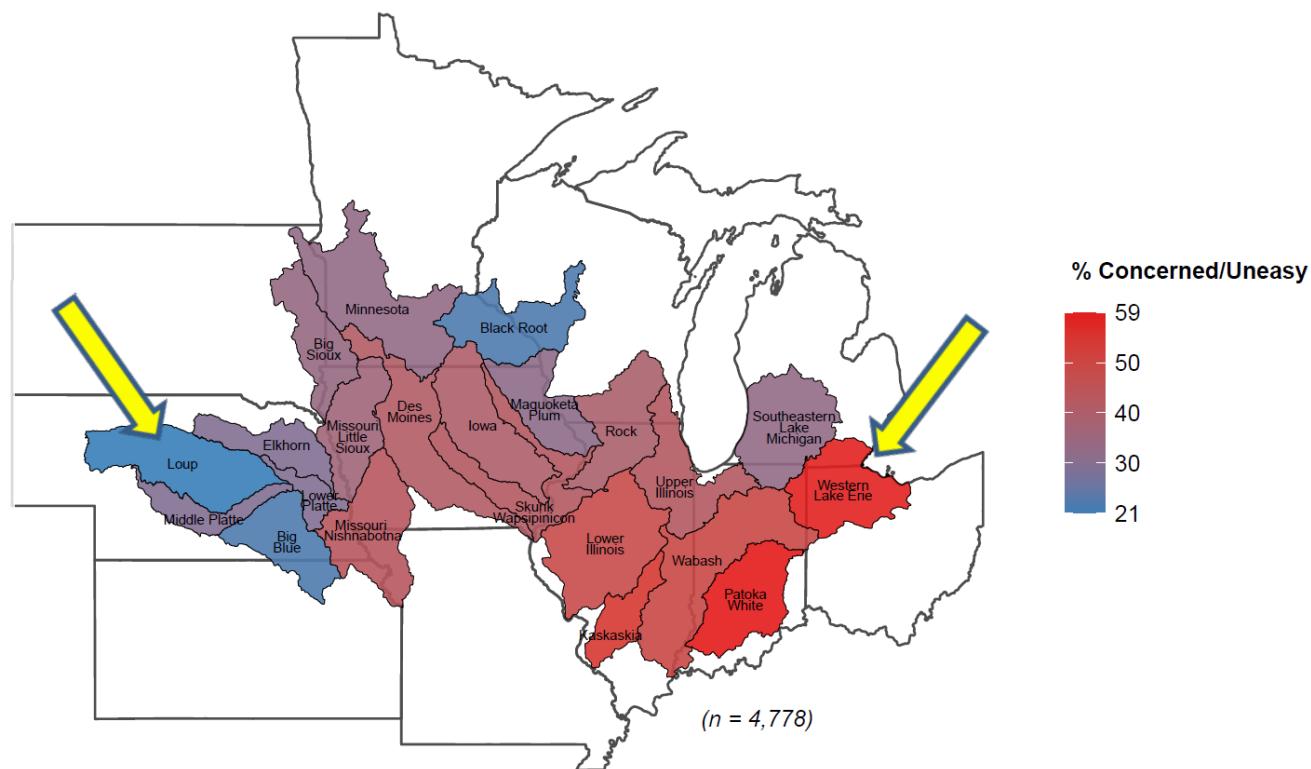
Examining Distribution of Classes Across the Corn Belt: Percent Concerned or Uneasy

Concerned and uneasy 39% overall, but distributed unevenly

Understanding of variation
can inform audience
segmentation

-If 60% of farmers in a watershed are in the “concerned” and “uneasy” groups, can we engage them on both adaptation and mitigation?

-If just 21% are in those classes, maybe better to stick with “weather variability”



Farmers and advisers trust Extension for information on climate change and dealing with extremes



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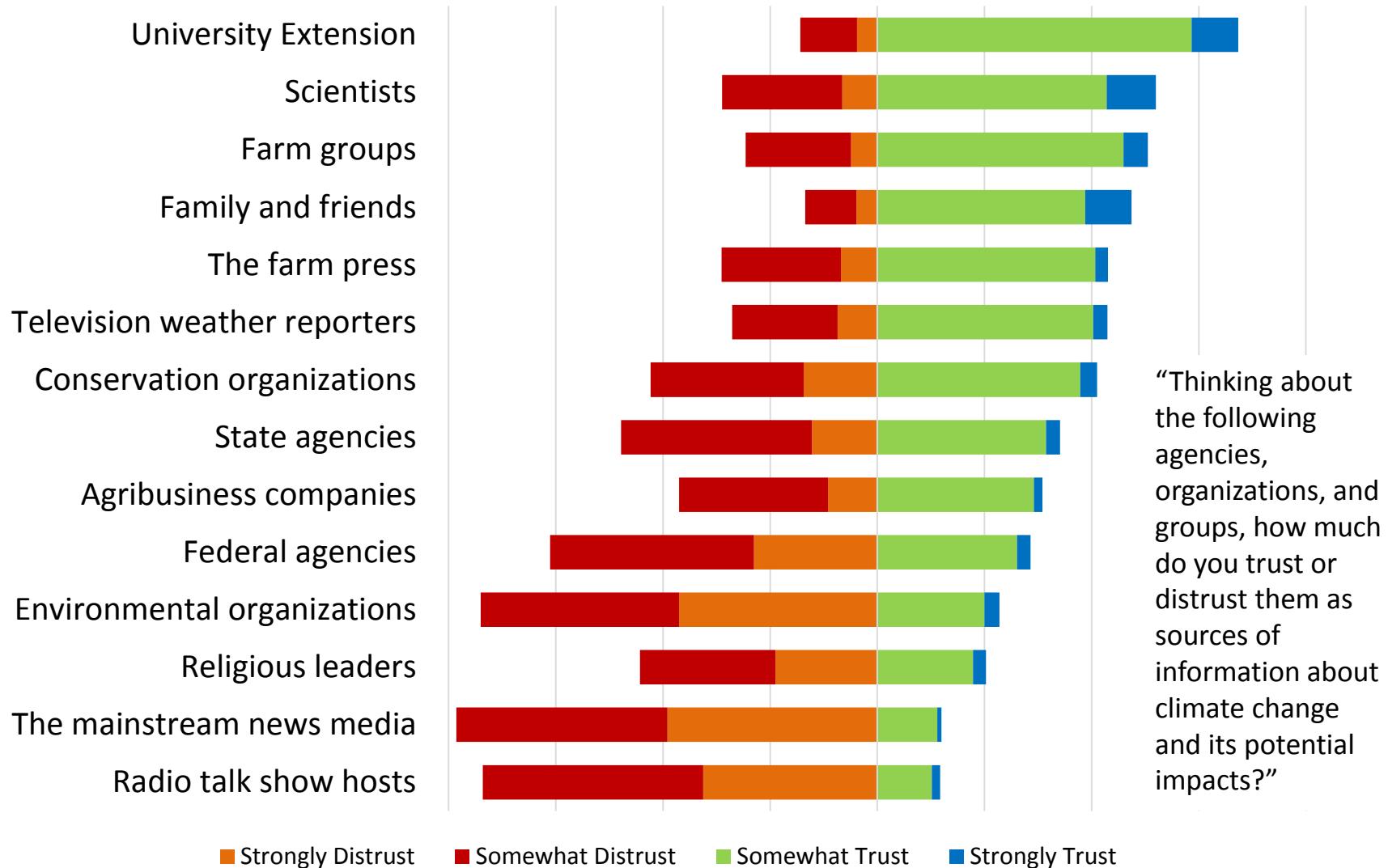
O THE OHIO STATE UNIVERSITY

PURDUE
EXTENSION | LOCAL FACES
COUNTLESS CONNECTIONS

SDSU
Extension

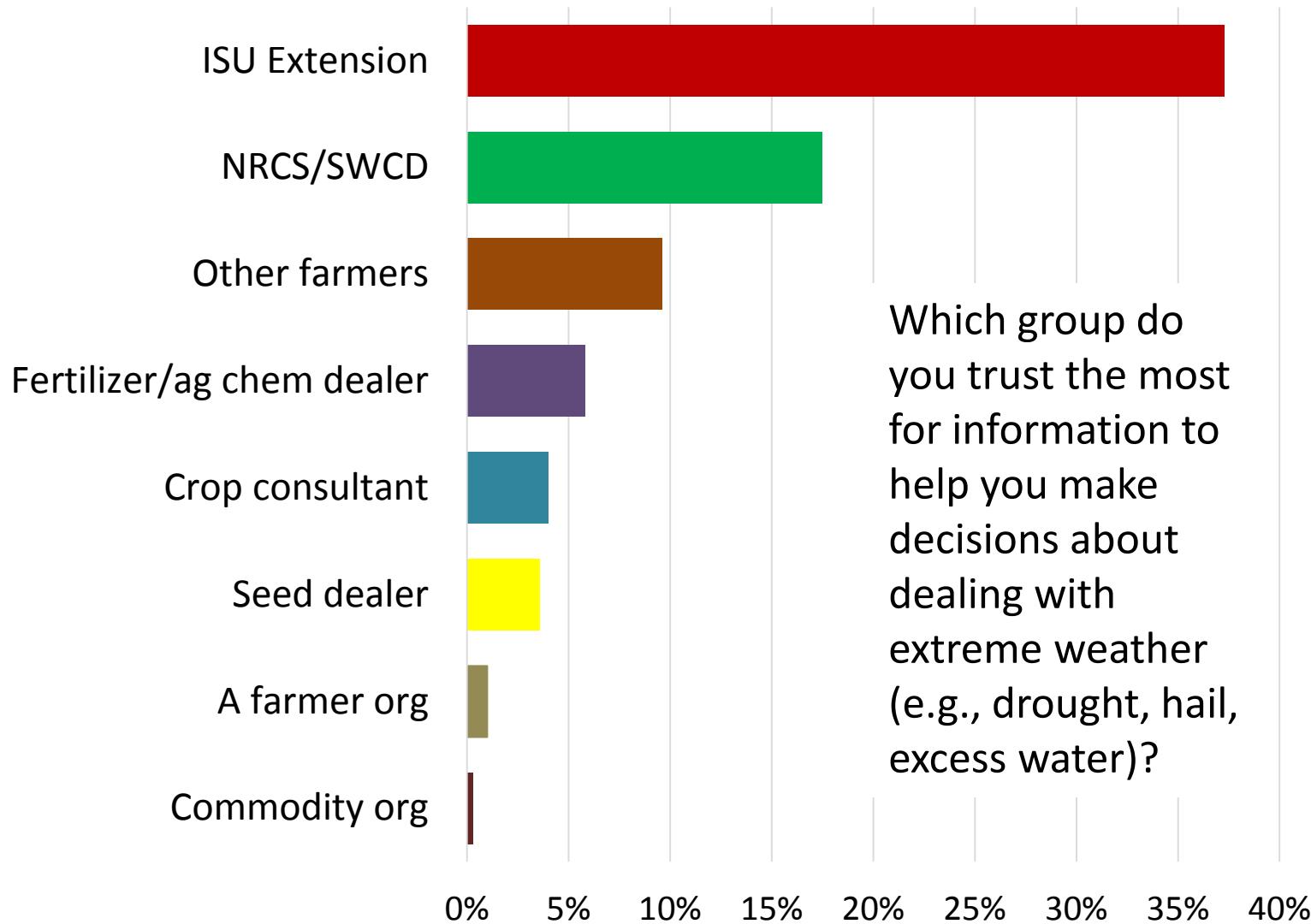
uw
Extension
University of Wisconsin-Extension

Iowa Farmers: Trust in Sources of Climate Change Information



Source: 2011 Iowa Farm and Rural Life Poll

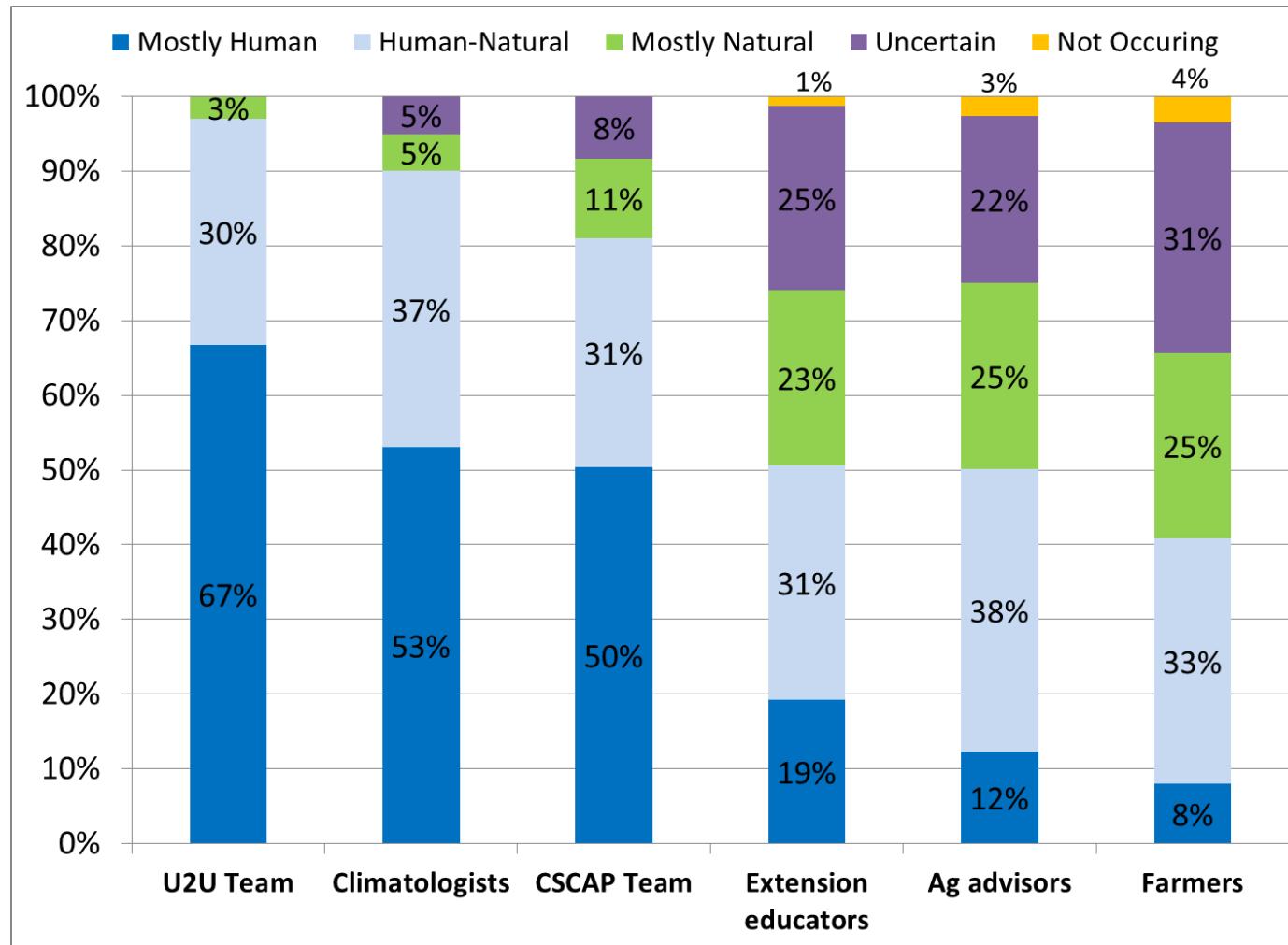
Iowa Farmers: Trust in Information on Dealing with Extreme Weather



Source: 2014 Iowa Farm and Rural Life Poll

Climate change beliefs vary by group

Farmers and advisers (including extension field staff) are closer to one another than to faculty, scientists



From Prokopy, L.S. L.W. Morton, J.G. Arbuckle, A.S. Mase, and A. Wilke. 2015. Agricultural stakeholder views on climate change: Implications for conducting research and outreach. *Bulletin of the American Meteorological Society*. 96:181-190.

Selected In-depth Interview Results

- In-depth interviews with 159 farmers
- CSCAP extension educators recruited participants
- Diverse group of farmers from 9 states
- Themes associated with climate change beliefs, adaptation strategies, and perceived risks
- Thanks to Gabrielle Roesch-McNally for analysis and interview results slides!



Climate change beliefs

Most farmers: Uncertain, human + natural, mostly natural

Well I guess my thought on climate change is it's always going to be changing. I mean, there were glaciers here at one point and, at the moment, we're pretty glad they're gone. That's a big change. So we just have to be adaptable. I mean, if the weather changes, if the climate changes, you just have to be proactive, I think, and looking forward rather than backwards to try to do everything you can do to minimize risk and still grow [a] crop."

(IL farmer)

My thought is it's not really happening. We're just in a trend, a pattern and...I just don't see it. So...I stay away from all the political parties, how it's this party's fault the climate's warming up and I just completely stay out of all that stuff

(MN farmer)

Climate change beliefs

Most farmers: Uncertain, human + natural, mostly natural

I think it's just the cycle that the earth is going through. I don't think it's necessarily man made, [but] I'm sure we have something to do with it.

(MI farmer)

I guess I'm kind of the opinion that our climate is changing. However, I went to Commodity Classic this year. It was in Florida....So I took the train to Florida and, when I'm on the train, I love to eat in the dining room. So when I'm in the diner, you get seated with other people that you might not necessarily know. Well I happened to sit with this one couple. They were from Colorado. He's a former educator, a meteorologist. And so we had a chance to talk about global warming and climate change. And he's of the opinion that we're just in a cycle. And, you know, I guess I would respect that because he's studied it a lot more than I have and so that's his thought.

(MI farmer)

11.08.2014

What have we learned from farmers?

- Farmers are diverse in their perspectives on climate change and what should be done
- Most farmers (66%) believed that climate change is happening
- Majority of farmers (60%) did not believe that human activity is contributing substantially to climate change
 - 25% believed that it is mostly natural, 31% were uncertain, and 4% did not believe
 - **Recommendation:** Because climate change is a politicized issue, direct, in-person outreach to farmers about adaptation (e.g., in meetings and workshops) may be more effective if terms such as "increased weather variability" and "extreme weather" are used instead of "climate change." A direct focus on anthropogenic climate change could alienate some farmer audiences.
 - Many adaptation practices and strategies (e.g., no-till, cover crops) can reduce GHG emissions, so focus on the adaptation side

What else have we learned from farmers?

- Many farmers are concerned about predicted climate change-related threats to Corn Belt agriculture
 - Risk perception varies both within and across region, associated with belief
 - But even farmers who are uncertain about climate change are concerned about increased weather variability
 - **Recommendation:** Because farmers' beliefs, concerns, confidence, attitudes, and practices vary across the Corn Belt, engagement strategies should align with local conditions and contexts and account for differences in farmer perspectives
- Most farmers believe that they should take steps to adapt to increased weather variability
 - They generally support public and private sector action to help them to adapt
 - **Recommendation:** Private and public sector stakeholders should step up efforts to raise awareness and adoption of appropriate adaptive (and mitigative) practices: Focus on risk management, solutions

What else have we learned from farmers?

- Farmers and advisers trust Extension and universities for information on climate change and adapting to increasingly variable weather
 - **Recommendation:** Extension should embrace its role as the most trusted provider of information about climate change and dealing with extreme weather, and ramp up programming for both farmers and advisers. Extension is uniquely positioned to help improve resilience of agricultural systems
- However, Extension field staff (and private sector advisers) tend to have belief structures that are similar to farmers
 - It is difficult for Extension educators to engage in discussion of climate change
 - **Recommendation:** Develop strategies to help extension and private sector agricultural advisers to incorporate the science on climate change, especially adaptation, into programming
 - We found that Extension educators who conducted interviews became much more comfortable with climate change discussion
 - Administrative leadership can provide cover (e.g., Sec. Vilsack USDA policy)

Closing thoughts

- USDA Climate Hubs?
 - Need to learn about other groups of farmers, develop strategies and partnerships for effective outreach
 - Livestock producers (e.g., Great Plains Grazing CAP)
 - Fruit and vegetable growers
- Need better understanding of Extension and private sector ag adviser needs
 - Stronger partnerships between campus and field to develop programming and materials
 - Training on how to talk about risks, adaptation and mitigation?
 - Connect with state climatologists, Regional Climate Center climatologists, Extension climatologists to increase professional climate science knowledge

Closing thoughts

- Important for administrators and leaders (university, agency) to signal that integration of climate science and the science of adaptation and resilience into extension and outreach is a priority
- Very important to understand groups that we want to engage: Where do they stand on issues?
 - Social science research can guide actions
 - Suggest pathways for engagement that do not polarize

Thank you!

Photo by A. MacDonald. Info on prairie buffer strips available at:
<http://www.nrem.iastate.edu/research/STRIPs/index.php>

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