2-2015

New Atlas Features Corn Belt Farmers' Perspectives on Agriculture and Climate

John Tyndall
Iowa State University, jtyndall@iastate.edu

J. Gordon Arbuckle
Iowa State University, arbuckle@iastate.edu

Tonya Haigh
University of Nebraska

Cody Knutson
University of Nebraska

Lois Wright Morton
Iowa State University, lwmorton@iastate.edu

New Atlas Features Corn Belt Farmers' Perspectives on Agriculture and Climate

Abstract
The *Farmer Perspectives on Agriculture and Weather Variability in the Corn Belt: A Statistical Atlas* is a new publication available online at <<a href="http://www.sustainablecorn.org/What_Farmers_are_Saying/Farmer_Perspectives_on_Ag_and_Weather_Variability_Stat_Atlas.html">http://www.sustainablecorn.org>. The atlas includes maps and tables that make it easy for readers to gauge farmer perspectives within the US Corn Belt. Topics covered include farmer beliefs about climate change, attitudes toward actions in response to increased weather variability, risk perceptions, and experiences with weather extremes. This region-specific information on farmers' climate change and risk beliefs is designed to help Extension personnel tailor the climate adaptation and education programming they offer in their region.

Keywords
climate adaptation, statistical atalas, farmer beliefs, risk, Cornbelt, Natural Resources and Ecology Management

Disciplines
Agricultural and Resource Economics | Civic and Community Engagement | Demography, Population, and Ecology | Other Ecology and Evolutionary Biology | Rural Sociology

Comments
This article is from *Journal of Extension* 53 (2015): 1TOT9. Posted with permission.

Authors
John Tyndall, J. Gordon Arbuckle, Tonya Haigh, Cody Knutson, Lois Wright Morton, Linda Stalker Prokopy, and Melissa Widhalm

Journal of Extension
www.joe.org

February 2015
Volume 53
Number 1
Article # 1TOT9
Tools of the Trade

New Atlas Features Corn Belt Farmers' Perspectives on Agriculture and Climate

Abstract

The *Farmer Perspectives on Agriculture and Weather Variability in the Corn Belt: A Statistical Atlas* is a new publication available online at <http://www.sustainablecorn.org>. The atlas includes maps and tables that make it easy for readers to gauge farmer perspectives within the US Corn Belt. Topics covered include farmer beliefs about climate change, attitudes toward actions in response to increased weather variability, risk perceptions, and experiences with weather extremes. This region-specific information on farmers' climate change and risk beliefs is designed to help Extension personnel tailor the climate adaptation and education programming they offer in their region.

John Tyndall
Natural Resource Ecology and Management
Iowa State University
jtyndall@iastate.edu

J. Gordon Arbuckle Jr.
Department of Sociology
Iowa State University
arbuckle@iastate.edu

Tonya Haigh
National Drought Mitigation Center
University of Nebraska
thaigh2@unl.edu

Cody Knutson
National Drought Mitigation Center
University of Nebraska
Cknutson1@unl.edu

Lois Wright Morton
Department of Sociology
Iowa State University
lwmorton@iastate.edu

Linda Stalker Prokopy
Department of Forestry and Natural Resources
Purdue University
lprokopy@purdue.edu

Melissa Widhalm
Department of Forestry and Natural Resources
Purdue University
mwidhalm@purdue.edu

Introduction

This article introduces an important new resource—*Farmer Perspectives on Agriculture and Weather Variability in the Corn Belt: A Statistical Atlas* (Loy et al. 2014). This atlas was designed to help Extension educators, agricultural advisors, and other stakeholders across the U.S. Corn Belt region understand farmer perspectives and weather trends in their local areas. Region-specific information on farmers' climate change and risk beliefs can help Extension personnel tailor the type or format of programming they offer in their region (James, Estwick, & Bryant 2014).

Climate Change, Agriculture, and Extension

Extension personnel have an important role in helping farmers adapt to more variable weather and mitigate greenhouse gas (GHG) emissions (Fraisse, Breuer, Zierden, & Ingram, 2009; James, Estwick, & Bryant 2014). Extension often serves as an intermediary for communication of scientific research at the intersection of agricultural practices and climate with a focus on available adaptation/ mitigation technology (Susko, Spranger, Tupas, Brown, & Liffman 2013). Extension programming will continue to play a pivotal role in agricultural regions, yet there are a number of challenges in providing climate information to farmers.

The development of effective climate change Extension programs requires a comprehensive understanding of the perceptions, attitudes, long-term goals, and decision-making requirements of farmers and land managers (Fraisse, Breuer, Zierden, & Ingram 2009). The spatial variability in farmer beliefs about climate and weather variability, risk perceptions, attitudes about climate adaptation, and agronomic and conservation practices pose serious challenges to Extension's ability to provide useful information (Prokopy, Morton, Arbuckle, Mase, & Wilke 2014; Susko, Spranger, Tupas, Brown, & Liffman 2013). For example, while farming enterprises variously adapt to shifting weather/climate conditions, the

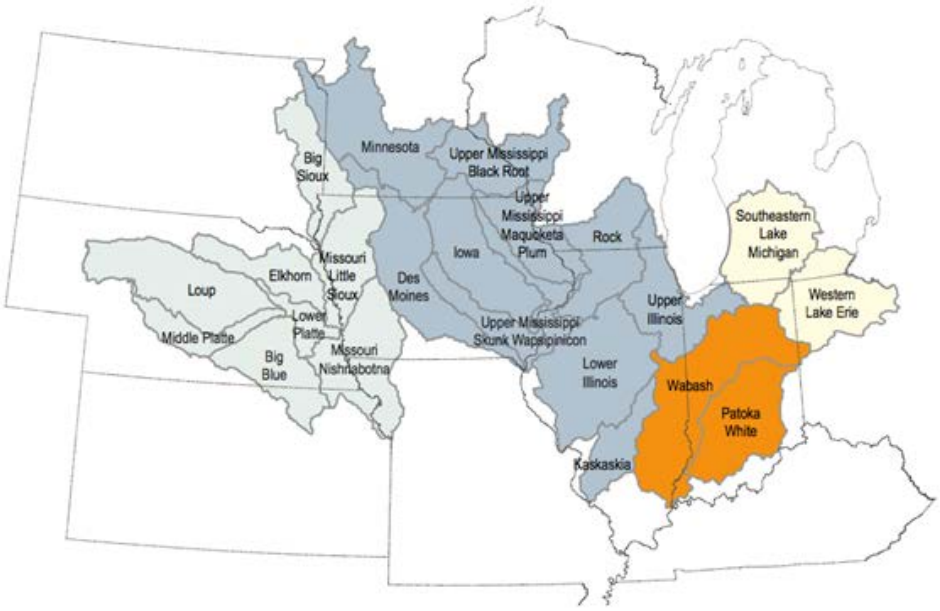
distribution of costs and benefits of adaptation vary considerably depending on farm location, feasible cropping systems, adaptation options, and other factors that differ across operations and regions (Malcolm, Marshall, Aillery, Heisey, Livingston & Day-Rubenstein 2012). Region-specific information concerning farmer beliefs regarding climate change, risk, and farm management in combination with key weather variables and trends will strongly position Extension personnel to better cater the type or format of programming offered in their Extension region to the needs and interests of their constituents (James, Estwick, & Bryant 2014; Morris, Megalos, Vuola, Adams, & Monroe, 2014; Hibbs, Kahl, PytlikZillig, Champion, Abdel-Monem, Steffensmeier, Rice, & Hubbard 2014). The atlas summarized in the next section fills this need.

Farmer Perspectives on Agriculture and Weather Variability in the Corn Belt: A Statistical Atlas

The atlas is a publication of the USDA-NIFA funded Climate and Corn-based Cropping Systems Coordinated Agricultural Project (CSCAP), based at Iowa State University, is available online at <http://www.sustainablecorn.org>, and is the product of a joint effort by the CSCAP and another USDA-NIFA funded project, Useful to Usable (U2U). The atlas summarizes and illustrates a 2012 mail survey of nearly 5,000 farmers that was stratified by 22 HUC 6 watersheds across 11 Corn Belt states—Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Ohio, South Dakota, and Wisconsin (Figure 1), displaying survey results by watershed. The atlas format presents statistical summaries and maps showing the geographical distribution of survey results, making it easy for users to gauge differences in farmer perspectives, as well as various weather-related data across 22 major river basins.

Figure 1.

The Atlas Represents Crop Farmer Attitudes, Beliefs, and Experiences with Climate and Variable Weather in 22 HUC 6 River Basins in the Corn Belt



Complementing the survey data, the atlas also presents various weather maps developed using data from National Weather Service Cooperative Observer weather stations from across the region. The weather maps display (among other things) differences in extreme precipitation, drought, and heat stress by watershed.

The available information includes the following and is further summarized in Table 1:

- Farmer beliefs about climate change
- Farmer attitudes toward potential climate change adaptation and mitigation actions
- Farmer concerns about climate-related threats to farm operations

- Farmer perceived capacity to deal with the predicted impacts of climate change
- Recent experiences with extreme weather events
- Key regional weather data
- Farm characteristics and farmer demographics

Table 1.

Overview of the Information Provided in the Atlas and a Sampling of the Maps Provided

Type of Information Available	Potential Use for Extension
Farmer attitudes toward adaptive and mitigative actions to prepare for or address potential changes in climate (Chapter 2)	Guide Extension in developing the types of programming desired and to frame information in salient ways...
Farmer beliefs about climate change (Chapter 3)	Understand local receptivity to climate change arguments to frame discussions
Farmer concern about climate-related threats to farm operations (Chapter 4)	Identify watershed-specific salient issues and concerns to address
Influence of agricultural advisors on farm management decisions. (Chapter 5)	Help target partners for extension efforts
Perceived personal capacity to deal with the potential impact of climate change (Chapter 6)	Understand perceived coping capacity strengths and needs for programming
Farm and farmer characteristics represented in the surveyed watersheds. (Chapter 7)	Understand clientele and farming systems (or current adaptation efforts)
Key regional weather data (recent and historical) (Chapter 8)	Understand baseline climate and recent weather conditions
Overview of marginal soils (Chapter 9)	Identify vulnerable landscapes for targeted programming
Note: Each Table Row Corresponds to a Specific Chapter of the Atlas.	

The watersheds represented account for more than half of all U.S. corn and soybean production. Farmers selected for the survey were those who grew corn and who had more than $100,000 in gross farm income in 2011; these larger-scale farmers cultivate approximately 80% of the farmland in the region. Watersheds were chosen because many of the impacts of increased weather variability are hydrological, and, accordingly, biophysical science research is increasingly conducted using watershed boundaries. Furthermore, water quality management programs and regulatory requirements (e.g., Total Maximum Daily Loads) are typically scaled to HUC 6 or smaller basins. Grassroots associations centered upon local and regional environmental quality management are routinely organized at watershed scales to facilitate broad stakeholder engagement and empowerment (e.g., Lant 1999); such associations are on the rise in the US Midwest and are increasingly partnering with Extension professionals (Morton, Selfa, & Becerra, 2011).

Conclusion

The atlas developed by Loy et al. (2014) provides a unique look at how farms and farmer characteristics climate change beliefs, adaptation attitudes, and experience with extreme weather events vary across the Corn Belt. The CSCAP-U2U survey results and supplemental data are summarized for the 22 survey watersheds in both graphical and tabular form, which provides the reader at-a-glance overviews of regional variability as well as the ability to make in-depth comparisons between watersheds. Such detailed information can guide Extension personnel in developing more effective localized

climate change programming in the region. The atlas can be a tool for Extension personnel to engage their clientele in discussions about weather variability and adaptation.

Acknowledgements

The statistical atlas of Midwestern corn producers was developed through a collaboration of two United States Department of Agriculture National Institute for Food and Agriculture-supported projects, Cropping Systems Coordinated Agricultural Project (CAP): Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems (Award No. 2011-68002-30190) and Useful to Usable (U2U): Transforming Climate Variability and Change Information for Cereal Crop Producers (Award No. 2011-68002-30220). We would also like to acknowledge John Hobbs and Adam Loy, the lead authors of the Atlas for their editorial suggestions.

References

Fraisse, C. W., Breuer, N. E., Zierden, D., & Ingram, K. T. (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

Hibbs, A. C., Kahl, D., PytlikZillig, L., Champion, B., Abdel-Monem, T., Steffensmeier, T., Rice, K., & Hubbard C. (2014). *Agricultural producer perceptions of climate change and climate education needs for the Central Great Plains. Journal of Extension* [On-line], 52(3) Article 3FEA2. Available at: http://www.joe.org/joe/2014june/a2.php

James, A. A., Estwick, N. M., & Bryant, A. (2014). Climate change impacts on agriculture and their effective communication by Extension agents. *Journal of Extension* [On-line], 52(1) Article 1COM2. Available at: http://www.joe.org/joe/2014february/comm2.php

Lant, C. L. (1999). Introduction human dimensions of watershed management. *Journal of the American Water Resources Association*. 35(3): 483-486.

Loy, A., Hobbs, J., Arbuckle Jr., J. G., Wright Morton, L., Stalker Prokopy, L., Haigh, T., Knoot, T., Knutson, C., Saylor Mase, A., McGuire, J., Tyndall, J., & Widhalm, M. (2014). *Farmer perspectives on agriculture and weather variability in the Corn Belt: A statistical atlas*. CSCAP 0153-2013. Ames, IA: Cropping Systems Coordinated Agricultural Project (CAP): Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems. Retrieved from: http://sustainablecorn.org/What_Farmers_are_Saying/Farmer_Perspectives_on_Ag_and_Weather_Variability_Stat_Atlas.html

Malcolm, S., Marshall, E., Aillery, M., Heisey, P., Livingston, M., & Day-Rubenstein, K. (2012). Agricultural Adaptation to a Changing Climate. *Economic Research Service, Economic Research Report*, (136).

Morris, H. L., Megalos, M. A., Vuola, A. J., Adams, D. C., & Monroe, M. C. (2014). Cooperative Extension and Climate Change: Successful program delivery. *Journal of Extension* [On-line], 52(2) Article 2COM3. Available at: http://www.joe.org/joe/2014april/comm3.php

Morton, L. W., Selfa, T., & Becerra, T. A. (2011). Shared Leadership for Watershed Management. In *Pathways for Getting to Better Water Quality: The Citizen Effect* (pp. 29-39). Springer New York.

Prokopy, L. S., Morton, L. W., Arbuckle Jr, J. G., Mase, A. S., & Wilke, A. (2014). Agricultural stakeholder views on climate change: Implications for conducting research and outreach. *Bulletin of the American Meteorological Society*. DOI: 10.1175/BAMS-D-13-00172.1

Susko, E., Spranger, M., Tupas, L., Brown, J., & Liffman, M. (2013). The Role of Extension in Climate Adaptation in the United States Report from the Land Grant –Sea Grant Climate Extension Summit. USDA- NIFA/ NOAA-NSGCP. March 13-14, Silver Spring, Maryland.