



Crop advisors as climate information brokers: Building the capacity of US farmers to adapt to climate change



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ABSTRACT

This paper examines the role of crop advisors as brokers of climate information to support US corn farmers to adapt to climatic change. It uses quantitative data collected from a broad survey of crop advisors in the US Corn Belt to examine the factors that shape advisors' use of (and willingness to provide) climate information to their clients. Building upon a general model of climate information usability we argue that advisors' willingness to provide climate advice to farmers is influenced by three main factors: their information seeking habits and behavior, their experience with innovation in the past, and how climate information interplays with other kinds of information that they provide—especially agronomic advice. We find that advisors' willingness to provide climate related information depends both on factors at the individual and organizational level and on the type of advice they provide. First, at the individual and organizational levels, advisors who work in supportive organizations and who collaborate with other advisors are more likely to provide climate information. Second, advisors are more likely to provide climate information if it does not interfere with their main profit making business (e.g. provision of agronomic advice). Third, there is a significant positive relationship between trust in a greater number or sources of information and use of climate information. Fourth, the way advisors perceive short- and long-term risk also influences their willingness to provide climate information; the more concerned they are about long-term climate-related risks to farming, the more likely they are to provide (or want to provide) advice based on climate information. Differently from other empirical work in the literature, our analytical model suggests that neither negative experiences with climate information in the past nor the high level of uncertainty characteristic of climate information appear to influence advisors willingness to provide climate information in the future.

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Introduction

In the United States, climatic variability represents an increasing threat to the corn economy, especially in the Midwest, where farmers grew approximately 88% of US corn in 2012 (USDA-NASS 2012). In the 2012 growing season, nearly half of the US corn crop experienced extreme or exceptional drought (USDA ERS 2013), with losses of some four billion

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bushels (EIA 2012). Scholars have often suggested that increasing the use of climate information that allows farmers to plan and prepare could mitigate such losses and support successful adaptation (Hammer et al., 2001; Meinke and Stone, 2005; Klopper et al., 2006). However, the actual use of climate information by farmers remains stubbornly small (Hu et al., 2006; Anwar et al., 2013). Traditionally, agricultural advisors have played a vital role not only in the dissemination of new information, practices and technologies but also in helping farmers to adopt them (Prokopy et al., 2013). In this article, we argue that the ability and willingness of agricultural advisors to include climate information in their advice portfolio is an important step to build the capacity of farmers and agricultural systems to adapt to climate variability and change. We speculate that, at a minimum, exposure to climate information can increase awareness about climate variability and change impacts among farmers. In other cases, farmers may be actually able to benefit from long-term climate information such as ENSO forecasts to plan ahead and mitigate negative impacts of drought. In this context, we believe that there is a critical need to better understand the factors and conditions that either drive or constrain advisors' ability to include climate information in the advice they provide to farmers now and/or their willingness to do so in the future.

Empirical research has shown that, overall, farmers resist using climate forecasts for two primary reasons. First, many farmers, especially those in less developed regions, place climate related concerns at lower priority than other needs such as basic farming inputs and technologies. Second, farmers often think that climate information does not fit their needs because they perceive it to be inaccurate (spatially and temporarily) and unreliable (having high levels of uncertainty) as well as unavailable when they need it. Some farmers also point out prior negative experience with forecasts as a constraint to continued use (Ingram et al., 2002; Patt and Gwata, 2002; Artikov et al., 2006; Hu et al., 2006; Klopper et al., 2006; Vogel and O'Brien, 2006; Roncoli et al., 2009).

More recently, a growing body of research has focused on understanding how to address these constraints and how to increase climate information usability, that is, how make information more useful and usable for different decision-makers (e.g., farmers, water managers, and urban planners), especially those interested in preparing and adapting to climate variability and change (Lemos et al., 2012). Evidence from this research suggests that producer-user interactions increase use by both building trust and by promoting a better understanding of each other's context (Lemos and Morehouse, 2005; Roncoli et al., 2009; Lemos et al., 2012; Kirchhoff, 2013; McNie, 2013). Interaction also alters users' perception of information fit, that is, how information matches their decision needs (White et al., 2010; Kirchhoff, 2013), critically contributing to greater uptake of information. For example, better explanations of how climate information is produced, the sources and extent of scientific uncertainty, decision-making tools, and how the information can be used in the particular decision contexts increase usability (Rice et al., 2009; White et al., 2010). Yet, despite its potential effectiveness, close interaction can have high transaction costs, not only in terms of human and financial resources but also in terms of reaching out to a broader clientele. In this context, the role of trusted intermediaries or brokers that efficiently customize and repackage information for users can be critical (Wolf et al., 2001; Womack, 2002). Indeed brokers can both increase the supply of climate information and influence demand by introducing farmers to the advantages of early adaptation planning.

In this study, we focus on crop advisors who are public and private intermediaries acting as brokers of information, looking particularly at their role in narrowing the climate information usability gap (Lemos et al., 2012). While farmers' use (or lack thereof) of climate information (mostly seasonal climate forecasts) has received robust attention in the literature, there has been less attention to understanding what drives uptake of climate information by crop advisors and the implications of that uptake on the diffusion of climate information to agricultural producers (but see Haigh et al., *in review*). Moreover, research in this area has mostly relied in single, qualitative case studies. Building upon an existing conceptual model of drivers and constraints of climate information usability (Lemos et al., 2012), we examine the factors that shape advisors' use of (and willingness to provide) climate information to their clients in the US Corn Belt. We use quantitative data from a broad survey of public and private advisors to explore some of the assumptions advanced in the literature as well as to further develop a theory of usability. Practically, we seek to inform efforts from scientists and practitioners to increase the use of climate information in adaptation.

We identify drivers of climate information use (or willingness to use) by advisors across two sets of variables: the way they seek information (their profile as innovators) and the way their decision-making environment supports their efforts to adopt new information. We argue that advisors' willingness to include climate information provisioning in the portfolio of services they provide to farmers is influenced by three main factors: their information seeking habits and behavior, their experience with innovation in the past, and how climate information interplays with other kinds of information that they provide—especially agronomic information. In addition, we argue that advisors with more supportive organizations/decision environments are more likely to provide climate advice to their clients.

We organize our article as follows. In the next section, we describe the conceptual model that supports our analysis and review the literature, focusing in particular on empirical research exploring opportunities and constraints for climate information use and the different factors that influence climate information dissemination. Section three describes our research methods and analytical framework, including sampling, data collection, and dependent and independent variables included in the statistical model. In section four, we discuss our model results, how they support or challenge the existing literature and speculate on their implications for scholarship and practice.

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