Agricultural Systems 138 (2015) 31–37

Contents lists available at ScienceDirect

Agricultural Systems

journal homepage: www.elsevier.com/locate/agsy

Short communication

Using a team survey to improve team communication for enhanced delivery of agro-climate decision support tools

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ARTICLE INFO

Article history:
Received 29 July 2013
Received in revised form 21 February 2015
Accepted 2 May 2015
Available online 27 May 2015

Keywords:
Interdisciplinary
Climate
Decision support tools
Midwestern United States
Survey
Communication

ABSTRACT

In the Midwestern United States, where a third of the world's maize crop is grown, there are few decision support tools available to help farmers and their advisors plan for an uncertain climatic future. Developing tools that are actually useful and usable to agricultural decision makers necessitates an interdisciplinary team of climate scientists, agronomists, computer scientists, and social scientists. With such diversity come varying levels of engagement (e.g. co-project director, student, technician, etc.) and experience working with farmers and/or serving in an official Extension capacity. Therefore working together to address this challenging issue is not straightforward. This paper reviews how a survey of a large interdisciplinary team working on developing decision support tools to ensure resilient maize production in this region identified differences between team members and helped improve team functioning and communication. Specifically the team survey revealed some important differences in how team members perceive farmers' use of climate information, the types of decisions that should be addressed with a tool, and how such tools should function. These differences can be primarily explained by disciplinary background and project role and have provided valuable opportunities to learn from each other and build consensus on decision support tools developed. The survey as a feed-back tool complements other team communication approaches and reminds the team of the need for continuous communication and frequent discussion of assumptions.

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http://dx.doi.org/10.1016/j.agsy.2015.05.002

1. Introduction

"Interdisciplinary science entails the collaboration of scientists with largely nonoverlapping training and core expertise to solve a problem that lies outside the grasp of the individual scientists." (Cech and Rubin, 2004, p. 1166)

Adapting agriculture to future changes in climate will require technical innovation, robust management strategies, and the integration of climate knowledge into decision making (Walthall et al., 2012). Commonly referred to as the Corn Belt, the North Central Region (NCR) of the United States accounts for about 88% of total U.S. corn production and provides nearly one-third of the global corn supply (United States Department of Agriculture – National Agricultural Statistics Service (USDA-NASS), 2011; United States Department of Agriculture – Foreign Agricultural Service (USDA-FAS), 2012). Though sufficient data are available to create better adaptive models for this region, there are gaps in our understanding of how different farm management decisions and practices can be used to increase resilience to climate variability and change while maintaining economic viability. Furthermore, currently available tools and models are not meeting producers' needs in the NCR, and little is known about the types of information farmers would like to access.

In order to develop tools that could address agricultural needs in the NCR, an interdisciplinary team was funded by the United States Department of Agriculture (USDA) Agriculture and Food Research Initiative (AFRI) in the spring of 2010. This 58 member team has now been working together on a project called "Useful to Usable (U2U): Transforming Climate Variability and Change Information for Cereal Crop Producers" for over three years in an intentionally interdisciplinary manner. This paper outlines how the team used a survey early in the project to identify and reconcile different opinions and beliefs about the project's trajectory. This survey, combined with frequent in-person and telephonic communication, served to ensure that a diverse and interdisciplinary team was able to facilitate achievement of common objectives which is not an easy task in interdisciplinary teams.

Interdisciplinary, multidisciplinary and transdisciplinary are all used in the literature to describe research that covers more than just one discipline. We follow Hicks et al. (2010) in using the term interdisciplinary as "the production of research which crosses disciplinary boundaries" thus covering all these forms (p. 465). The literature on interdisciplinary teams suggests that this type of work is not easy for a variety of reasons, including: publishing difficulties and concerns about the tenure and promotion system at universities (Daily and Ehrlich, 1999; McConnell et al., 2011), power imbalances (Campbell, 2005), lack of understanding of what different disciplines do (Campbell, 2005; Massey et al., 2006), and different language, terminology and research approaches (Jacobs and Frickel, 2009; Massey et al., 2006). Adding to these difficulties, stakeholder-driven research is particularly resource intensive (in terms of both time and money), difficult to sustain over long periods, and presents issues with the politicization of science (Dilling and Lemos, 2011). Notably, diverse team members may define problems differently which makes it difficult for a team to work cohesively together (Anders and Mueller, 1995; Hoogendoorn, 1998). Beyond these challenges of working across disciplines and with stakeholders, the size of a team is also an issue; the larger the team, the greater the differences in terms of roles, positions and experiences. As roles proliferate, hierarchical issues emerge between team members with different levels of seniority in the university setting (from full professors to students) (Müller, 1998).

While large interdisciplinary teams are somewhat new in the United States, they are not new in international development. The literature on international teams suggests that there is a need for teams to "mature" in order to work effectively together (Butler, 1998, p. 205), and it is difficult for team members to reach a shared understanding (Massey et al., 2006). Massey et al. (2006) discuss their experiences with a five person team and note that their first challenge was to identify and discuss differences; they did through an in-depth "talking through" (p. 136). In projects like U2U that are funded to accomplish a specific task, there is not time for this maturing to occur before work begins in earnest nor is it practical to engage in an in-depth conversation between over 50 team members to see what differences emerge. Another finding from this literature is that not only do disciplinary differences lead to communication difficulties; they also lead to different research interests and goals (Hoogendoorn, 1998; Müller, 1998). These findings suggest the urgency of resolving any fundamental differences in project purpose between team members early in a group process. We do not believe any other team has conducted a survey like ours (or if they did, they have not reported on it publically). However, Anders and Mueller (1995) report using the Analytic Hierarchical Process (AHP) to help structure discussions with an interdisciplinary team focused on cropping systems research. The purpose of this short communication is to highlight how the survey benefited the U2U team so other teams might benefit from a similar approach.

2. The project and process

In large interdisciplinary projects, the tendency is for people to compartmentalize by discipline to produce parts of the whole. The whole is cobbled together but is not necessarily enriched by the diversity of perspectives included in the entire project. In contrast, the Useful to Usable (U2U) project was intentionally designed to be integrated from the beginning. The overall goal of U2U is to have resilient and profitable farms in the NCR under an increasingly variable climate (see Fig. 1 for a map of the study area). This goal is being undertaken over a five year period with five objectives:

Objective 1: Conduct climate and crop modeling to determine where climate science can inform decision making;

Objective 2: Understand needs and interests of target audience, including both farmers and farm advisors;

Objective 3: Integrate climate modeling results with needs of target audience to develop decision support tools (DSTs) that they will find useful and usable;

Objective 4: Disseminate these tools across four pilot states and evaluate their uptake and effectiveness, with tool modifications as necessary; and

Objective 5: Disseminate tools and resources across the entire 12 state NCR.

Objective 1 is led by a group of climate scientists/climate modelers who are developing gridded crop models to look at the impact of climate and management scenarios on crop productivity and profitability. Objective 2 is led by social scientists who have conducted surveys of agricultural producers and their advisors (Arbuckle et al., 2013; Prokopy et al., 2013). This group has also conducted focus groups of both producers and advisors as tools are being developed to ensure their usefulness and usability. Objective 3 is jointly led by an agricultural economist and a climatologist with expertise in DST development. Objectives 1–3 working groups, though led by a majority of one discipline, each contain members of different disciplines and research/extension appointments. Objectives 4 and 5 have only started recently and are led by an agricultural economist with a substantial extension appointment.

The original project team comprised 22 co-project directors (co-PDs) located at 10 universities. As co-project directors added individuals to the project, it has now grown to 58 contributors as of June 2014, including 21 co-PDs, a project manager, technicians, graduate students, postdocs, and a 15-person advisory committee. Graduate students, staff and postdocs are all considered to be full team members and engage in team meetings, conference calls and email communications. Communication among all project participants is regular, frequent, and occurs in various formats. The full team and advisory committee