EMERGING NICHE CLIENTELE FOR CLIMATE SERVICES: ORGANIC FARMERS IN GEORGIA (US)

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1. Introduction

During the last decade, significant advances in climate predictions have occurred. These have centered on the correlation between sea surface temperatures (SSTs) in the Pacific Ocean and seasonal climate variability around the world, the phenomenon known as El Niño-Southern Oscillation (ENSO) (Goddard et al. 2001; 1996). Research that has documented the impacts of ENSO phase on crop performance (Hammer et al. 2001; Hansen et al. 1998; Phillips et al. 2002) has generated considerable optimism about the potential of ENSO-based climate forecasts for improving farmers' capacity to manage risk and optimize gains (Hammer et al. 2001; Hansen 2002; Meinke; Stone 2005). The Southeast Climate Consortium (SECC), a collaborative, interdisciplinary research project including universities in Georgia, Florida, Alabama, and North Carolina, aims to develop climate-based decision-support tools for application in agriculture and natural resource management in the southeastern United States (www.seClimate.org). For example, El Niño conditions, characterized by above average Pacific SSTs, typically bring more rainfall and cooler temperatures to the southeastern USA in the fall and winter months, whereas La Niña, characterized by below average Pacific SSTs, brings warmer and drier conditions in the fall, winter, and spring (Baigorria et al. 2008). The SECC's main outreach mechanism is an interactive website, *AgroClimate*, which provides seasonal climate outlooks, climate services for agricultural extension and producers, and other related information (Fraisse et al. 2006; Paz et al. 2007). Central to the SECC approach is the integration of end-users into research agendas and tool development through close partnership with agricultural extension in assessment and outreach efforts (Breuer et al. 2008; Crane et al. 2010; Jagtap et al. 2002; Rohmsdahl; Pyke 2009).

Previous research on conventional producers in Georgia (Crane et al. 2010) and Florida (Breuer et al. 2008) explored the potentials and constraints for the application of seasonal climate forecasts in agriculture, through an analysis of the social and cultural contexts of information management and decision making strategies. This research found that, rather than simply promoting climate forecasts as technical inputs, climate application efforts must build on an understanding of farmers' risk management strategies and on partnerships with farmers' trusted social networks. In this study, we seek to complement this previous research by focusing on organic farmers, a group that has distinctive knowledge management processes, values and goals, and decision making strategies that drive agricultural decisions. Unlike conventional producers, organic farmers gear their production toward niche markets, have small landholdings, and are a more diverse farming population, including a greater percentage of women and minorities than conventional producers in the southeastern U.S. (see: Breuer et al. 2006 for a review of the multiple definitions).

The USDA reports that organic farming has been one of the fastest growing agricultural sectors in the U.S. for more than a decade and is now present in all 50 states. According to the 2007 Agricultural Census, organic food sales more than tripled, from $393 million in 2002 to $1.7 billion in 2007. In Georgia the market potential for organic products far exceeds the cropland currently under production (Connett 2003). This interest in organic foods has sparked a growth in the number of farmers' markets that feature Georgia grown produce exclusively (from only 9 in 2003 to 65 in 2009). Seasonal climate outlooks and client services offered by the SECC can help organic farmers cope with climate variability, thereby avoiding fluctuations in production and better satisfying the expanding market demand for organic products.

This paper is based on a study that constitutes a first step toward developing communication strategies to reach this increasingly important clientele (see: Furman et al. 2009 for a more complete review of this research). Following an overview of the research methods employed, we describe the social profile of selected organic farmers that participated in the study, what motivates them to farm organically, and the main features of their farming operations. The next sections describe how farmers access and assess agricultural and technical information, with particular attention to weather and climate forecasts, what factors shape their agricultural decisions, and the farming and marketing practices that help them manage climate risk. Based on these data, we highlight some key recommendations for the production and dissemination of climate information. The conclusion discusses opportunities and challenges that climate application effectors face in reaching this particular clientele.

2. Methods

The research methodology combined quantitative and qualitative methods. Quantitative data were collected through an online survey conducted in January 2009 through Survey Monkey and was completed by 40 respondents. In addition, semi-structured interviews with 31 participants yielded rich contextual information. Research questions focused on participants' agricultural management systems, and their knowledge, use, perceptions, and attitudes about weather and climate predictions. In addition, six informal interviews at farmers' markets and organic farms were conducted for further contextual information.

Efforts to communicate scientific climate information to lay audiences have revealed the importance of intermediary (boundary) organizations that facilitate the translation and transmission of messages to target audiences (Cash et al., 2006). Therefore, in order to gain entry and to ensure a greater level of credibility and legitimacy among organic farmers, we partnered with a key boundary organization, *Georgia Organics*, a non-profit organization that includes producers, consumers, and food-related businesses in Georgia. Georgia Organics has compiled the largest database of organic and sustainable farmers in the state and was instrumental in recruiting participants for this study and implementing the online survey. For this study, "organic" refers to producers that are certified organic, in transition to certification, or farmers who practice sustainable agriculture and organic farming without certification.

3. Social profile of organic farmers and characteristics of their farming operations

Organic farmers are more diverse than the general farming population, particularly in terms of age and gender. Participants in a previous SECC study among conventional producers in Georgia were mostly Caucasian, middle-aged, and male (Crane et al. 2010). In the research reported here, most respondents were also Caucasian (90%) but one-third (35%) of survey respondents and two-thirds (68%) of interviewees were between 20 and 40 years of age (Figure 1). Further, more than one-third of those surveyed (38%) and interviewed (39%) were female. However, interviews revealed that only half of women were the primary farm operators, while the other half shared the farm work with their husbands, managed marketing, equipment, volunteers, and kept financial records.

Compared with the general farming population, organic farmers have more education, with 75% of those interviewed and 80% of those surveyed having at least a bachelors' degree (Figure 1). Among farmers studied, 40% of interviewees and 46% of survey respondents had studied agriculture, while others studied related subjects, such as ecology, biology, and geography. The rest of them exhibited a considerable diversity of background, including social sciences, business, engineering, and mathematics.

With respect to conventional producers in the southeastern U.S., organic farmers are less likely to come from farming families or to have grown up on a farm. Half of those surveyed and 55% of those interviewed have been farming for five years or less (Figure 1). The median age of participants who have been farming for 5 years or less is 30 for survey respondents and 35 years for interviewees. Some of them had taken up farming after college or after a career in a different sector. Among interviewees, 84% were full-time producers. Part-timers included a university professor, restaurant buyer, landscaper, carpenter, and restaurant owner.

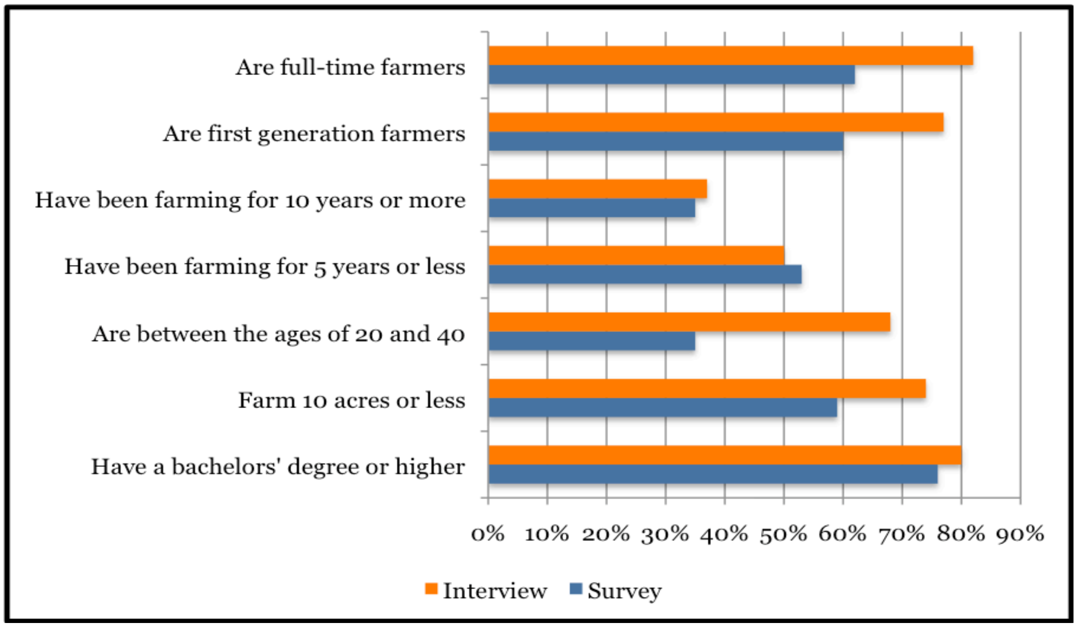

Figure 1: Social profile of interview and survey respondents

Organic operations in Georgia generally consist of small landholdings devoted primarily to growing fresh produce, which is highly vulnerable to weather and climate extremes. Most of the farms in this study are family owned and managed. Total farm landholdings range in size from 0.5 to 100 acres of productive land and the majority of farms were 10 acres or less (Figure 1). Of those farms in this study, the majority specialized in growing a wide variety of fresh produce. Some farms also specialized in: flowers, herbs, livestock, and value added items such as honey, mushrooms, jam, and grits.

Argued elsewhere, the particular goals and values that farmers have influence the types of agricultural decisions they make, how climate information is managed and utilized, and determine the risk management strategies they employ (Adger et al. 2009; O'Brien 2009). Crane, el al. (2010) noted that the agricultural decisions made by conventional producers, who generally come from several generations of farmers, are shaped by their cultural values and their goals to preserve their way of life. As such, their risk management strategies prioritize the farm's stability and viability overtime rather than striving for short-term maximization of yields and gains.

Organic producers, on the other hand, are relatively new to farming and chose this profession because of a commitment to their community, the environment, or both. Farmers interviewed explained that preserving their own health and the health of their customers was the primary driver that prompted them to become organic farmers. While a few farmers had experienced personal health problems that induced them to eat organic food, most of those interviewed were simply averse to eating and selling food laden with chemicals that they deemed unsafe or poisonous. Environmental motivations include the perception of organic farming as being more sustainable as well as the belief that it has potential for mitigating climate change. This commitment to local community and global ecological integrity influences how information is gathered and used to manage climate risk. As discussed below, predictive information is best received when it comes from trusted sources that share these similar ethics.

4. Information Processing

The diverse social backgrounds and worldviews of organic farmers translate into an eclectic style of knowledge management. Their philosophical orientation, environmental ethic, and intimate involvement with the land translate into a particular appreciation for local, practical knowledge, attention to natural signs, and reliance on intuition, instinct, and inner voice. In addition, many organic farmers are highly educated, computer literate, innovation-oriented, and interested in experimenting with new ideas and tools. They value technical expertise, empirical observation, and on-farm experimentation and are keenly interested in new technologies. However, before adopting innovations, farmers cross-check the suitability of these technologies and techniques against their specific circumstances and against the experience of other farmers who might have used them.

Farmers interviewed indicated that the most trusted sources of information are other producers because they have specialized and localized knowledge concerning organic practices. These exchanges also include conventional producers, who are respected and consulted for their long-term, place-based experience and knowledge. Organic farmers have a strong sense of community, 33% of those interviewed noted sharing information on weather patterns, growing techniques, and marketing opportunities. Some organic farmers, who distinguish themselves for their innovation, leadership, economic success, commitment to the organic movement, and willingness to help other organic farmers, function as "information nodes" and mentor those who are new to the business.

Most organic producers (80%) use organizations such as Georgia Organics as a conduit to share information either at conferences or online. Study participants (respectively 73% and 40% of survey and interview respondents) mentioned conferences and workshops among sources of agricultural and technical information that are most often trusted and used, because they provide opportunities for group interaction and asking questions (Figures 2 and 3). Internet resources are also widely used and trusted. However, not all organic farmers are computer literate and not all like to spend time working on a computer. Some farmers who reside in rural areas do not have access to high-speed internet and still use slow dial-up connections, which make it difficult to use interactive sites. Farmers also trust information from printed media, especially the farm press, agricultural associations, including Georgia Organics, customers, and suppliers.

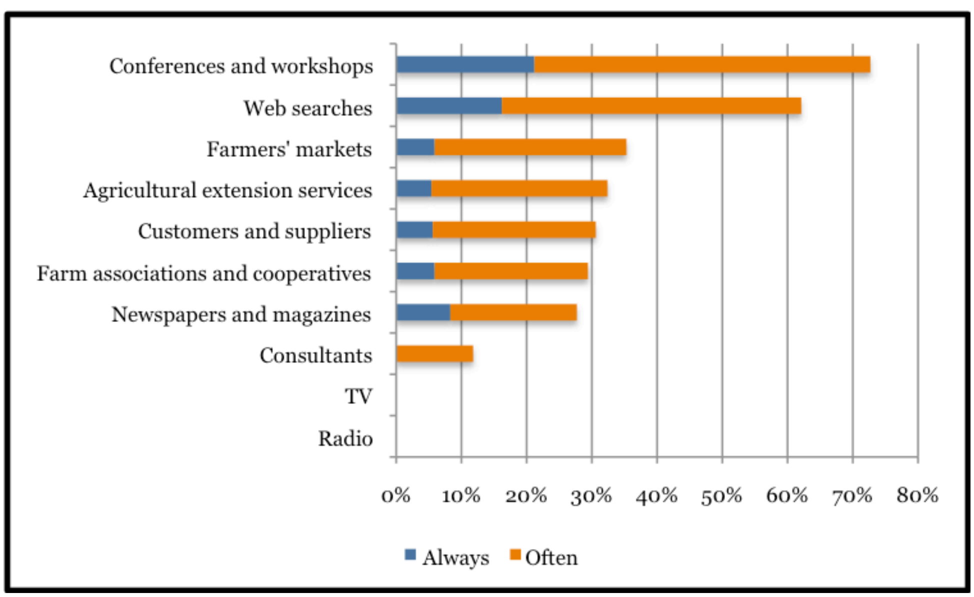

Figure 2: Where organic farmers get agricultural and technical information (N=38)

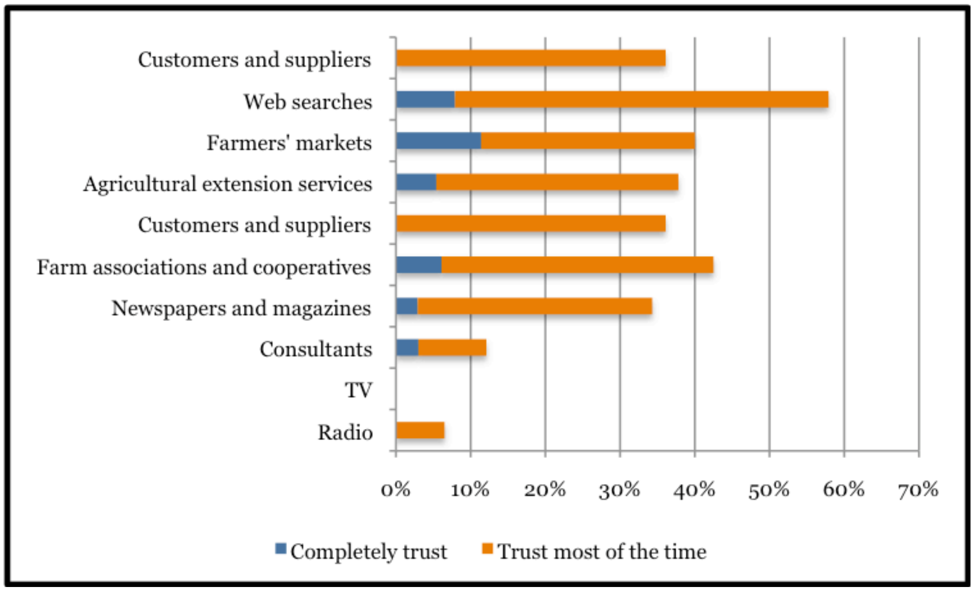

Figure 3: Sources of agricultural and technical information organic farmers trust (N=38)

Survey results demonstrate that all farmers seek weather information frequently. Among sources of information, the Weather Channel and Weather.com were the ones most often mentioned by farmers interviewed. Some also reported visiting NOAA's website for weather forecasts and other information, including water vapor and jet streams, and *Georgiaweather* for real-time weather information. Climate information, on the other hand, is used less often because trust in all forecasts diminishes according to the predictive timeframe. Interviewees expressed doubts about predictions beyond 10 days and, therefore, were skeptical about seasonal climate forecasts, even though the latter are based on a different forecasting methodology. However, most respondents recognized that El Niño/La Niña phases have significant effects on climate variability in the southeastern U.S. Most farmers (70-73%) could correctly identify the rainfall effects of El Nino/La Nina in Georgia, though not temperature effects: almost half (44%) expected higher temperatures than normal during El Nino and over one third (38%) expected lower temperatures than normal during La Nina.

5. Risk Management

All interview respondents view small-scale organic production strategies as better suited to adapting to climate risk than conventional agriculture, yet they still recognize they are susceptible to climate risk. Being mostly produce farmers with small acreages, farmers interviewed do not rely heavily on insurance instruments for risk management. Rather they manage climate risk by using production strategies like staggered planting and technologies such as drip irrigation, mulching, greenhouses, and hoop houses. This approach is contingent on the small-scale diversified nature of organic farms. Their small acreage promotes their ability to apply soil and water conservation technologies and utilize integrated pest management strategies. Likewise, crop diversity helps producers make rapid adjustments based on actual or expected weather patterns, such as delaying planting or switching to a different crop or variety at the last minute. Limited farm size and the labor-intensive nature of their technologies allows organic farmers to be intimately involved with their operations so that they are able to observe subtle shifts in their fields and in their environment that alert them to the risk of crop stress or disease.

Marketing mechanisms also help organic farmers manage risk due to the personal relationship they develop with their customers through Community Supported Agriculture (CSA). A CSA consists of a network of individuals who commit to support a farm operation for a season or a year. Members pay ‘dues’ in advance, which helps cover farm expenses. In return, members receive weekly baskets of products, typically ranging from 6 to 10 items per box. Many farmers establish a CSA as a way to get start-up capital while avoiding risky loans and even mitigating losses. Given that CSA agreements often require customers to partly share in the losses faced by the farmers, CSA members sometimes accept receiving fewer items rather than a full box, if the farmer has been affected by severe weather events.

Of those surveyed 92% indicated that weather and climate factors are often or extremely important to making agricultural decisions. Weather information is used for making short-term agricultural decisions like deciding when to plant, where to irrigate, and whether to hire labor. Climate information is integrated into longer-range decisions, such as planning when seeds are started in green houses or hoop houses and determining which beds need irrigation infrastructure. The farmers who were interviewed identified the following potential application of seasonal climate forecasts: 1) planning whether, where, and how much to irrigate, 2) selecting what types of crops and crop varieties they should plant, 3) deciding whether they should invest money and time in growing high value specialty crops, 4) deciding how much winter grass to plant and whether to buy extra hay for their animals, and 5) determining whether they should set aside money to buy additional produce from other farmers or wholesalers to supply their CSA members, or whether they should reduce their number of CSA members for that season.

Survey research shows that the organic producers who use climate information in making agricultural decisions are those that are mid-range in terms of farming experience (Figure 4). This is may be explained by the fact that new farmers have a lot to learn and are therefore less receptive or attentive to additional information that is perceived as less essential in the immediate. Those that have been farming for more then 10 years are also less likely to use climate forecasts, possibly because they have already established tired-and-proven risk management strategies and are not keen to modify them based on tools that they are less familiar with.

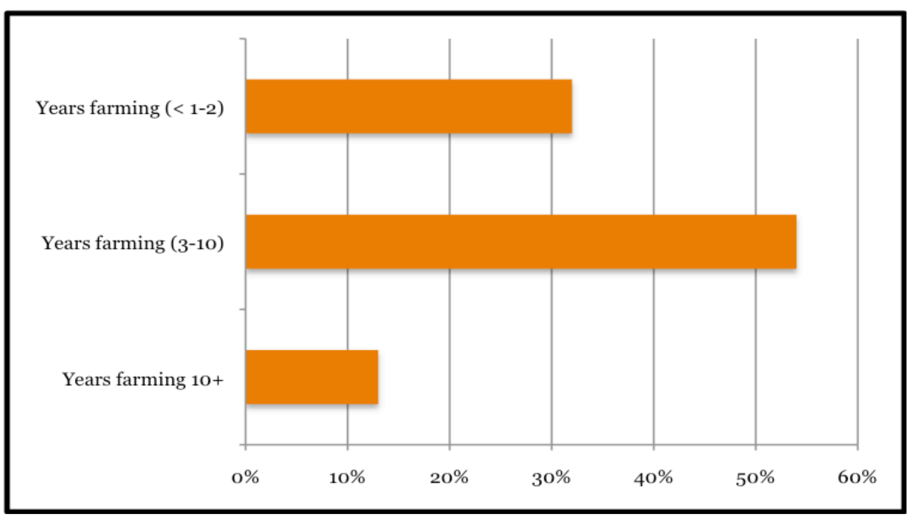

Figure 4: Farmers who always or often take climate forecasts into account when making agricultural decisions (N=15)

6. Climate Change

Interviews revealed that organic farmers do not make a clear-cut distinction between climate variability and climate change, as was also noted among conventional producers (Crane et al. 2010). Discussions of climate variability consistently evolved into discussions of climate change, and anomalous weather events, such as early or late frost or temperature swings, which were also sometimes attributed to climate change. In general, research participants expressed high levels of concern with climate change, not surprisingly given the environmental orientation of many organic farmers.

More than half (60%) of the respondents strongly agree that climate change is happening, and another one-third (31%) somewhat agree. As for the causes of climate change, the majority of survey respondents (72%) attributed it to a combination of both human activities and normal cycles. However, interviews revealed that there are differences in what participants know or believe: some are not entirely clear on or convinced about all aspects or effects of climate change. Of the farmers interviewed, four (all over the age of 50) voiced skepticism about the role humans play in climate change. For one farming family interviewed, the topic of climate change was a point of contention between the parents, who ascribe it to natural cycles, and the children, who blame human action.

Among farmers surveyed, more than half (54%) reported that climate change considerations affect decisions concerning their farming operations. Most (90%) interviewees reported using farming practices that seek to reduce their own carbon footprint such as: limiting their use of heavy machinery, reducing the distance both their produce and agricultural inputs travel, and producing many of their fertilizers on their farms. The ability to implement practices that reduce emissions and sequester carbon varies among farmers. For example, smaller farms are easier to manage with manual tools than larger farms and new farmers may be less likely to afford the extra labor and costs required by strategies that seek to reduce carbon emissions.

7. Recommendations

The farmers who were interviewed as part of this study expressed interest in both practical and analytical tools. Practical tools help farmers make agricultural decisions, while the latter can assist them in better understanding weather and climate patterns in their areas, comparing their own observations with scientific records and outlooks.

Given the way they integrate seasonal and short-term planning in managing risk, the scientific distinction between climate and weather forecasts has little meaning to organic farmers. Rather, they would benefit if forecasts for different temporal scales were given at the same time, such as real-time weather information, short-term weather forecasts, seasonal climate predictions, and climate change projections.

Interest in climate change among organic farmers constitutes an important entry point that can help capture their attention and channel other kinds of climate information to them. Several farmers interviewed requested a carbon footprint tool to be integrated into climate services for farmers to assess whether their farms can be registered as carbon sinks.

Given the high level of diversification and whole-farm approach that make up organic farmers' management systems, predictive information must be presented in ways that link various options and outcomes rather than as disconnected tools. Climate services should focus on crops and crop families that are popular among organic farmers. They should provide ways to predict and monitor key climatic variables, such as freezes, droughts, or hurricanes, and associated crop-related threats, such as pests and diseases.

Information needs to be presented in an accessible and attractive format and timely disseminated through appropriate and trusted channels. Workshops and online training sessions can enable farmers to learn hands-on and experiment with tools and outlooks. Updates and alerts should be sent via email, which organic farmers frequently use, but also disseminated in other ways for those who do not have access to the internet. Training opportunities should be offered during the winter months when farmers have more free time and forecasts should be delivered with sufficient lead time for farmers to be able to respond.

Credibility is established in different ways for organic farmers than it is in scientific circles. Detailed explanations of theoretical assumptions and research methods on which tools are based should also incorporate evidence of a commitment to environmental sustainability, community building, and participatory processes. As they embrace an explicit value-based practice and a holistic vision of the earth, where climate is understood as inseparable from land, water, and health, organic farmers may be put off by approaches that oversell technical, specialized expertise.

Collaborating with key boundary organizations that have established credentials among organic farmers will help build legitimacy. Just as the Cooperative Agricultural Extension Services have been instrumental in reaching conventional producers, cooperation with organizations such as Georgia Organics and the Southern Sustainable Agriculture Working Group (SWAG) will be essential to serve organic farmers. In addition, our research revealed the key roles that farmers themselves play in information processing and transmission. To be incorporated into organic farmers' portfolio of risk management practices, climate services will require vetting by fellow farmers and testing against farmers' experience. Publishing a track record for climate predictions would also allow farmers and others to compare climate predictions with their own observations and to assess them in relation to their own circumstances.

8. Conclusions

Organic farmers constitute an important target group for climate services because of the growing importance of the sector and because of the unique characteristics of the population. Three attributes of scientific climate information have been identified as critical to its uptake by end-users: 1) salience, or perceived relevance and usefulness; 2) credibility, or perceived reliability and accuracy; and 3) legitimacy, or perceived objectivity and authority (Cash et al. 2006; Stone; Meinke 2006). Salience requires understanding users' practices, priorities, and time horizons. Credibility must be built on a consideration of how truth and trust are culturally constructed in different user communities. Legitimacy relates to the degree to which users believe that their interests are well served and is therefore based on the development of appropriate relationships (between users and scientists) and representations (of science to users). These aspects transcend the scientific validity of climate-based information and tools, being embedded in users' values, beliefs, goals, and habits. To serve this increasingly important clientele, it is essential that climate services be firmly grounded in an awareness of the social practices, philosophical principles, ethical considerations, and political stances that define the ways scientific knowledge is understood, assessed, translated into decisions.

Acknowledgements

The SECC is multi-institutional, multi-disciplinary program with principal funding from the National Oceanic and Atmospheric Administration Climate Program Office (NOAA/CPPO), the US Department of Agriculture (USDA) Risk Management Agency (RMA) and USDA Cooperative State Research, Education, and Extension Services (CSREES). We thank Julia Gaskin, Whitney White, Leslie Walton, Ashley Askew, Pam Knox, Keith Ingram, and Jeffrey Glover for comments and contributions to the study. We are extremely grateful to Georgia Organics for donating staff time and organizational support to this research. Last but not least, we express our heartfelt thanks to all of the farmers who took valuable to participate in the survey and interviews.

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