

# **Extension in the 21<sup>st</sup> Century: Promoting Regenerative Agricultural Practices Using the Diffusion of Innovations Theory**

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## **Abstract**

We aimed to answer this year's ENTS senior integrative exercise question, "how should we manage the transition to a carbon-constrained world?" by determining how Extension can best promote regenerative agriculture using the diffusion of innovations theory. We held focus groups with farmers in Stearns and Rice County, Minnesota to assess whether the information networks in the counties support the adoption of regenerative agriculture and what role Extension plays within those networks. Farmers were assigned into adopter categories based on Rogers' (1983) innovation curve--innovators, early adopters, early majority, late majority, and laggards--to determine their position within the information network. Although we were able to assign the farmers to adopter groups, a reexamination of the adopter group revealed that the adopter categories were more complex. Therefore, Extension has the opportunity to reexamine how it approaches farmers at different points along the innovation curve by overcoming network and communication bottlenecks as well as biases. We conclude that Extension can best disseminate information about regenerative farming practices by strengthening local farmer networks through facilitating diverse, inclusive discussions and by integrating farmers into research.

## **Introduction**

*"The vulnerability of agriculture to climate change is strongly dependent on the responses taken by humans to moderate the effects of climate change." --United States Department of Agriculture, 2012*

Today, dominant agricultural practices are energy dependent, rely on fossil fuels, and impose negative externalities on the health of the environment and society. Agriculture is vulnerable to and a causal factor of climate change. Depending on land-use practices, agriculture can either be a significant

source of carbon emissions or actively sequester carbon (Lasalle and Hepperly, 2008). Advancements in research and technology, as well as the rediscovery of old knowledge, bring forth practices that reduce energy inputs and actively repair ecosystems and social structures. Such farming techniques are called *regenerative farming practices*.

We use the term *regenerative agriculture* to define a production system where farm resources are recycled instead of brought in to the farm from outside, and where the land is actively improved through husbandry. A regenerative system sequesters carbon from the air and stores it in the soil, thereby mitigating the impact of global warming, and actively improving our ecosystems and carbon supply (LaSalle and Hepperly, 2008). We would like to extend this definition to include a system of production where community capital and vitality are being actively regenerated on the basis of the idea that what is good for the land is good for communities and vice versa (Bookchin, 1993). Regenerative farming practices restore the health and productivity of the soil, reduce synthetic chemical inputs, and decrease mechanical soil compaction. Regenerative agriculture has a huge potential to combat our current carbon issue. While “the U.S. food system contributes nearly 20 percent of the nation’s carbon dioxide emissions,” regenerative agriculture, if practiced on all available tillable land, “could sequester nearly 40 percent of current CO<sub>2</sub> emissions” (Lasalle and Hepperly, 2008). While the ecological benefits of regenerative farming are numerous, perceived economic and social risks may hinder farmer readiness to adopt regenerative practices.

Formal and informal support structures are essential for farmers to share information, compare techniques, and adopt practices that actively rebuild the environment, the economy, and society from their current fossil fuel dependent state. The agricultural branch of the Cooperative Extension Service (hereafter referred to as Extension) is a United States government program founded to meet community needs with university resources. Based on its position as a boundary organization straddling university research and the public, Extension can serve as an important support structure for farmers. One theory that Extension uses to guide the promotion of new agricultural practices is called diffusion of innovations theory, which suggests that groups of farmers (adopter groups) adopt innovations at different points in time based on certain characteristics (personal, socioeconomic, structural, regional, cultural, etc.)

(Stephenson, 2003; Leeuwis, 2004). Extension uses different tactics to promote innovations, such as regenerative agriculture, based on which adopter group they're interacting with. This theory can be used to stimulate the adoption of regenerative agriculture.

As agricultural practices must be adapted to transition to a carbon constrained world, we ask:

**How can Extension best promote regenerative agriculture using the diffusion of innovations theory?**

## **Information Networks in the Adoption of Regenerative Practices**

Despite well established research into the ecological benefits of regenerative practices (Pimentel et al., 2005), all farmers are not readily adopting such practices. How do farmers obtain information and decide to adopt new methods of production? Economics is often cited as the barrier to changes in farmer decision-making, the idea being that farmers will choose production methods that lower costs and maximize profits (Sassenrath et al., 2010; LaSalle and Hepperly, 2008). Studies have suggested that some regenerative practices, such as organic, have higher production costs than conventional methods, and that this may explain their relatively low level of adoption (Dobbs and Smolik, 1996; Hanson and Musser, 2003). However, in other studies, organic agriculture was found to be more economically favorable (Pimentel et al., 2005). Essentially, evaluation of profitability of different farming practices rests on the factors that are taken into account. Different evaluations yield different results. Thus perception of costs and benefits, which reflect social and ecological values, weigh heavily in perceived viability and adoption of practices.

As described above, other social and ecological factors influence decisions to adopt regenerative practices, so it is important to use an interdisciplinary lens when trying to gain a holistic understanding of farmer decision-making (Sassenrath et al, 2010; Dobbs and Madden, 1987). For example, in a study of farmers in Maine and Alabama, Sassenrath et al. (2010) explore how producers make decisions and their underlying motivations. Using farmer focus groups, the study identifies internal social factors such as regional identity, community support and belonging to a multi-generational family farm as the most prominent factors in production decisions. Communication with other farmers was found to be highly

beneficial: not only do farmers exchange information, but they also exchange materials such as manure and alfalfa to reduce costs. This research highlights the importance of encouraging communication among farmers.

## **Boundary Organization's Role in Information Networks**

Information is not only spread amongst farmers, but also between farmers and university researchers. How do farmers and scientists exchange ideas? Often it is not through direct contact, but through the use of intermediaries called "boundary organizations." Two functions of boundary organizations are:

- (1) To negotiate the boundary between science and decision making, and
- (2) To exist between two distinct social worlds with definite responsibility and accountability to both sides of the boundary (Guston, 1999)

David W. Cash (2001) uses this framework of boundary organizations to study how information is disseminated between researchers and policy makers on a multi-level scale, looking specifically at Extension, a publicly funded government program based in the land-grant universities. Cash concludes that Extension agents have the opportunity to play a significant role in spreading information across a variety of disciplines by acting as the middleman between farmer, specialist, and land-grant scientist (Cash, 2001; Rogers, 1983).

Extension could also serve an important role in supporting communication networks amongst farmers. An example can be found in "Facilitating Farmer to Farmer Networks: An Experimental Approach" where Extension "served as catalysts for the development and strengthening of farmer networks" in Florida (Swisher et al., 1999). Extension used several organizing techniques that included local groups, institutional collaboration, inclusive events, and the expansion of research to build and bolster the small-farm network. This landmark study reveals the potential importance and influence of Extension in rural community development. Expanding opportunities for local civic engagement as well as strengthening social capital--defined as the "features of social organization, such as trust, norms, and

networks that can improve the efficiency of society by facilitating coordinated actions”-- is necessary in order to encourage innovations of regenerative practices on farms and the spread of those practices to surrounding farms (Putnam, 1993). Extension’s regional and county-based system puts it in a prime position to foster local community action.

## **Cooperative Extension Service**

### **Mission**

We have chosen to explore Extension’s role in the adoption of regenerative agriculture because of its status as a boundary organization that is publicly funded and organized at a regional or county level within the state. Extension also links university research and farmers. Based on these factors, Extension may have the opportunity to effectively promote the adoption of regenerative farming practices.

The Morrill Act of 1862 created a nationwide system of agricultural research and education through the establishment of land-grant universities (Cash, 2001). Expanding the reach of land-grant universities, Extension was established by the Smith-Lever Act in 1914. The purpose of Extension was to “diffus[e] among the people of the United States useful and practical information on subjects relating to agriculture and home economics, and to encourage the application of the same” (Seevers, 1997).

Extension has accomplished these goals through publications, instruction, and practical demonstrations to county residents not enrolled in college (Rasmussen, 1989; Cash, 2001). Congress asserted that Extension’s underlying philosophy was to “help the people help themselves” by “taking the university to the people” (Rasmussen, 1989). In order to do this, Extension has responded to the needs of its county residents by providing education, information, and problem-solving programs using research-based information from land-grant universities.

Extension’s mission is threefold:

*“Research and Discovery*

Generate and preserve knowledge, understanding, and creativity by conducting high-quality research, scholarship, and artistic activity that benefit students, scholars, and communities across the state, the nation, and the world.

*Teaching and Learning*

Share that knowledge, understanding, and creativity by providing a broad range of educational programs in a strong and diverse community of learners and teachers, and prepare graduate, professional, and undergraduate students, as well as non-degree-seeking students interested in continuing education and lifelong learning, for active roles in a multiracial and multicultural world.

*Outreach and Public Service*

Extend, apply, and exchange knowledge between the University and society by applying scholarly expertise to community problems, by helping organizations and individuals respond to their changing environments, and by making the knowledge and resources created and preserved at the University accessible to the citizens of the state, the nation, and the world.” (History and Mission, 2012)

In short, Extension’s goal is to take the university to the people by conducting practical, applied research that can be used to improve the lives of ordinary citizens and by ensuring that research is communicated to those communities it serves.

Extension’s regionalization serves to help integrate local farmers into the University system. Extension is set up on a state-by-state basis with the headquarters located at the land-grant university. It is organized by regional and county offices with Extension specialists serving one or two counties. Extension specialists address the needs of county residents by providing them with research-based information. They also report county resident’s problems to researchers at the university, therefore acting as a catalyst for future research ideas (Rasmussen, 1989). All county residents are welcome on a voluntary basis to approach Extension for information. In addition to working with county members, Extension strives to partner with groups inside and outside of the universities such as the 4-H Youth Development Organization and the National Association of County Agricultural Agents to maximize

efficiency and effectiveness, avoid duplication, and strengthen community capital into the future (Rasmussen, 1989).

Since the early 20th century, Extension has played a pivotal role in the nation's survival by adapting to local, state, and national issues during major events in America's history. Such events include the Great Depression, the Dust Bowl, World War II, and more recently, the Green Revolution. By promoting production practices to preserve soil health, increase efficiency and productivity, and decrease pest pressure, Extension has encouraged the flow of the latest agricultural techniques in response to ecological, political, and economic changes (Rasmussen, 1989). As the United States faces the possibility of a carbon-constrained world in the 21<sup>st</sup> century, Extension may have the opportunity to serve a similar role by helping promote regenerative farming practices.

## **Ethics**

Promotion of regenerative agriculture must be ethically justified in order for Extension to have the opportunity to aid in its spread. Is it ethical for Extension to explicitly promote anything? Does promotion of regenerative agriculture conform to Extension's mission statement and duties as a public research body?

Extension is a public service funded by taxpayer dollars, and therefore is subject to higher standards of public accountability than other areas of scientific research (Hightower, 1978). It is appropriate to evaluate Extension services using a utilitarian approach since utilitarianism is implicit in agricultural research's drive towards increased productivity and efficiency (Thompson, 1998). Extension's actions are ethical when they result in the greatest good for the greatest number of people. Extension's research is judged in terms of its usefulness to Extension's clientele, which is the American public.

As part of the utilitarian calculus, three features must be evaluated when determining whether or not to promote a practice: autonomy, equity, and sustainability. Often removed from the equation when focusing primarily on individual profit or yield maximization, these factors are important in avoiding production decisions that do not benefit the greater good; they contribute greatly to social welfare. In

terms of autonomy, would the innovation restrict someone's individual freedom? Promotion should be carried out in a way that does not restrict individual freedom of choice--producers should not be forced to adopt. In terms of equity, are the benefits and harms resulting from the innovation distributed evenly? We argue that because Extension is a publically funded service, it has the obligation to listen to stakeholder input about what research should be carried out and to include stakeholders in the research process. In regards to sustainability, long-term harms must be taken into consideration (Thompson, 1998). Sustainability is inherent in regenerative practices because reduction of long-term costs (economic, social, and ecological) is an explicit goal.

For example, one past innovation that has been criticized for all three factors is bovine somatotropin (Bst), a hormone introduced to increase dairy cow productivity in 1993 (Thompson, 1998). Bst did increase overall productivity, but also created producer dependence (autonomy) and pushed small producers out of the market because they could not afford to adjust to new economies of scale (equity). The product also raised concerns about long-term animal health and environmental problems that could arise out of a reliance on biotechnology (sustainability). This example illustrates the necessity of addressing complete utilitarian analysis when Extension decides to promote an innovation (Thompson, 1998).

As described above, certain ethical conditions should be met before a production practice is promoted or adopted. On a case-by-case basis, regenerative agriculture will likely qualify based on these stipulations. It is not a focus of this study to evaluate how ethically viable each regenerative practice is; however, we argue that a framework exists under which Extension can evaluate these decisions. Actively promoting a beneficial practice--versus only acting as a passive source of information--is not in conflict with Extension's mission.

## **Diffusing New Production Practices**

As previously discussed, agricultural knowledge and innovations already exist that will ease the transition away from high-input, fossil-fuel based systems. However, the manner in which this knowledge is shared and implemented is an extremely important factor in behavioral shifts and adoption.

*Diffusion of innovations theory* is one theory or model that some Extension programs have used to spread new farming practices (Stephenson, 2003; Leeuwis, 2004). After rural sociologists Ryan and Gross (1943) developed this theory, it has since been modified, and the most widely cited version was adapted by Rogers (1983). Diffusion theory is based on the observation that not all farmers adopt a new innovation simultaneously, but cumulative adoption follows an s-shaped curve (Figure 1). The theory splits farmers into groups based on the point in time at which they adopt the innovation: the first to adopt are the innovators, followed by the early adopters, early and late majority, and the laggards. Members of each group usually share certain characteristics (see results section). For example, innovators are often well-educated risk-takers, while laggards are typically skeptics (Rogers, 1983). Diffusion of innovations theory is a transdisciplinary approach to examining farmer adoption practices, allowing researchers to predict farmer adoption behavior based on the interplay of a wide variety of factors such as personal and socioeconomic characteristics, structure of the farm, type of innovation, and timescale (Padel, 2001; Lapple and Rensburg, 2011).

This theory has focused on technological innovations such as seed varieties and types of fertilizer application. Current literature characterizes organic agriculture, the most widely studied regenerative farming practice, as an information innovation because it requires changes in farm management, not just the purchase of upgraded equipment. Despite this difference, research has found that the spread of organic agriculture *does fit* the diffusion model with some modifications (Padel, 2001; Lapple et al., 2011; Diederer et al., 2003). Early organic producers display many of the diffusion model's characteristics of innovators, such as being well-educated and having wide social networks while facing opposition in the local farming community. Yet some characteristics are reversed, with smaller farms tending to adopt organic, whereas innovators of strictly technological innovations generally have larger farms (Padel, 2001; Lapple, 2011).

According to current research on diffusion theory, differences between organic and conventional farmers (personal, farm-related, etc.) should be interpreted as differences between innovators and later adopters, respectively. If this theory is valid, organic practices and conventional farmers can be compatible, and organic practices have the potential to be suitable for all farmers (Padel, 2001). As time

progresses, the characteristics of producers adopting organic practices will change to reflect different adopter groups along the curve (Lapple and Rensburg, 2011; Padel, 2008). This view is contrary to the traditional belief that organic and conventional farmers are intrinsically different, and organic practices only suit a niche population.

One way that promoters of regenerative agriculture could ease the adoptions of such practices is to use the diffusion model. Different adopter groups have different needs and will be receptive to different types of arguments. For example, innovators often express environmental reasons for conversion to organic, whereas late adopters express financial concerns (Lapple and Rensburg, 2011). Other groups also seek and use information differently, with early and late majority adopters relying heavily on farm advisors for reliable advice (Lapple and Rensburg, 2011). Based on these characteristics, in order for Extension to promote regenerative innovations, they should address each group differently by tailoring communication channels, informational messages, and assistance to farmers based on which adopter group they belong to--a strategy called *audience segmentation* (Rogers, 1983).

### **Critiques of Extension's Use of Theory**

In some cases, Extension's application of diffusion theory has been discussed as problematic. Instead of using this theory to directly ease adoption for *all* adopter groups, especially later adopters, Extension has, in many cases, targeted its efforts towards *opinion leaders* (Stephenson, 2003; Leeuwis, 2004). Opinion leaders are farmers that are very integrated into their local communities and are highly respected by their peers. Opinion leaders are early adopters, but not often innovators (who are socially isolated and usually perceived as risk-takers). Opinion leaders are essential when farming communities are heterophilic--i.e. when farmers are dissimilar from each other--passing information between dissimilar groups (Rogers, 1983). Once opinion leaders embrace the innovation, they will pass it along to other farmers in their network (Stephenson, 2003).

Targeting opinion leaders only succeeds when strong networks exist between all farmers in a community, so diffusion can progress unhindered. Unfortunately, this is not always the case, and some farmers not in contact with opinion leaders may not receive the benefit of Extension's efforts where

networks are incomplete or non-existent. Since they are not directly targeted, late adopters, who tend to have lower incomes, less resources, and are not as well connected, are not reached, which deepens inequalities. Because of this insecurity, these farmers will also face the brunt of the economic, ecological, and social burdens associated with uneven development or change (Rogers, 1983). The means of this pattern of diffusion, not just the innovation being diffused, are subject to the same utilitarian ethical considerations. Instead of only connecting with opinion leaders, Stephenson (2003) suggests that Extension could “focus on the tough ones,” farmers that are harder to reach and convince in order to enact the most change and benefit for farmers.

Traditionally, Extension viewed their role as producers of information with the farmer acting as the recipient of knowledge and education rather than as an active participant. This attitude has, in some cases, alienated farmers, whose decision-making processes have an innate socio-cultural component; farmers use a combination of objective, scientific knowledge and subjective personal experiences to make decisions (Davis et al., 2005; Walthall et al., 2012; Sassenrath et al., 2010). Agricultural research often ignores innovations that happen in the field, and it is important to incorporate these into the body of scientific knowledge and to grant farmers autonomy in the research process (Zilberman and Lipper, 1998). Extension can use an adaptation of innovation diffusion theory to integrate a wide variety of farmers.

A final concern with Extension’s use of diffusion theory is that an assumption exists that subsequent innovations *should* be adopted, an assumption known as pro-innovation bias (Rogers, 1983). However, sometimes innovations prove ineffective or unsuitable for a particular farmer’s operation. Because no two farms are exactly the same, when a farmer does decide to adopt an innovation, she/he must often adapt or change the innovation slightly to suit her/his needs. Extension can encourage farmer adaptations and help farmers to modify innovations in order to diffuse them more effectively.

## **Gap in the literature**

The Sassenrath et al. (2010) and Cash (2001) studies demonstrate that many factors go into farmer decision-making, and that Extension serves an important role in that decision-making process as a

boundary organization. Extension has the ability to connect university research to farmers, and farmers to each other (Swisher et al., 1999). Previous literature certainly suggests that Extension plays a vital role in the spread of information. Studies also demonstrate that diffusion of innovations theory applies to one group of regenerative innovations, organic agriculture (Padel, 2001). However, Extension's role in the spread of information about regenerative agriculture using diffusion innovation theory has not been researched. This leads us to our research question: **How can Extension best promote regenerative agriculture using diffusion of innovations theory?** We hope to learn how Extension can promote regenerative agriculture by collecting and assessing farmer input in two Minnesota counties. While the literature has demonstrated that opportunities exist for Extension to build networks and solicit farmer research, we wish to investigate farmer willingness to work with Extension.

## Study area

### Rice and Stearns Counties

Certified Organic agriculture--instead of a more robust definition of regenerative agriculture--is being used to select the counties in our study. We chose Certified Organic because it is verifiable (third-party certification) and it has been measured by both the USDA's 2007 Census of Agriculture and the USDA's 2008 Organic Survey. We acknowledge that certified organic (or even the general term "organic") does not encompass all regenerative practices, and this is a limitation in our research methods.

Expanding on Sassenrath et al.'s (2010) research, we have chosen to study the Midwest because the region has not been examined using these methods. Minnesota is an important study area because of the large ecological impact the state's agriculture industry has on the Mississippi River. Minnesota is the sixth largest agricultural exporting state in the U.S. (Ye, 2012) and is a major contributor of nutrients to the dead zone in the Gulf of Mexico.

We have selected two Minnesota counties for our study--Stearns and Rice counties. These counties represent a diversity of practices with a comparatively large total number of organic farms in

Stearns and a comparatively moderate total number of organic farms in Rice (Figure 2). The two counties are under a two-hour drive from both Carleton College and Hennepin County, where Minnesota's Land Grant University, the University of Minnesota-Twin Cities, is located. By selecting two counties with different numbers of organic farms, we expect to examine communication networks that are different in their degree of development.

## Methods

We used a methodology where the means were consistent with our end goal, which was to bring local farmers together to discuss information networks. In doing so, we learned more about these networks while actively strengthening the farmer networks through conversation and connection. This approach is inspired by Simona Perry's work with communities being impacted by hydraulic fracturing in rural Pennsylvania (Perry, 2011). Perry held local focus groups in an attempt to understand how community members could best heal from the trauma of hydraulic fracturing. Through focus group conversations, she found that people healed when they got together and processed the events. Therefore, the focus groups both provided valuable information on the healing process and served to actively heal the community. While we do not expect our focus groups to need to undergo a healing process, communication and support are important in establishing a vibrant information network and farming community.

Using Sassenrath et al. (2010) as our model study, we held two farmer focus groups in our study areas, Stearns County and Rice County. Our methodology allowed us to consider several disciplines; whereas some studies of farmer decision-making only consider one factor (e.g. economic), Sassenrath et al. (2010) incorporate social, cultural, economic, and psychological factors. With the information gathered in these focus groups, we classified farmers into adopter groups and analyzed their information networks. The focus group was an appropriate method of data collection for this study because it allowed us to observe behavioral differences between farmers that could aid in the assignment of adopter categories.

To include a variety of perspectives, we aimed to have a diversity of production practices amongst the farmer participants. Participants were selected through the “snowball method” (Davies, 2007): using any contacts we had in those counties, we received names of potential participants. Once we had contacted those farmers, we asked them for additional contacts and so on until we had enough participants. This sampling method is appropriate because we are interested in information pathways; noticing “who recommends who” mimics the informal and formal communication networks that southern Minnesota farmers are a part of, a crucial component to innovation diffusion. Seven people participated in the Stearns County focus group and six (four farmers) participated in the Rice County focus group.

In order to encourage participation, we made it easily accessible for the farmers to attend by holding each focus group in the county being studied. We obtained informed consent from each participant by having them sign consent forms, and their identities have been kept anonymous in our report.

Sassenrath et al.’s (2010) discussions were informal and approximately two hours in length. The first hour consisted of each producer getting time to speak about their production system, while researchers asked questions the second hour. Our discussion followed this format. We set the room up so that all participants, as well as the researchers--excluding the note taker--were sitting in a circle. Each producer introduced themselves and their production methods. Then, we moved into prepared questions, although the participants were given some freedom to direct the discussion towards questions that were most interesting and relevant to all participants.

Our questions targeted farmer motivations (economic, environmental, social, etc.), how farmers interact with Extension services, and how/where they obtain information. For a complete list of discussion questions please see Appendix 1. All focus group discussions were taped with audio recorders and transcribed the following week. Transcripts and CDs of the discussion were offered to the participants. This reciprocity was important because the process, not just our resulting conclusions, aimed to build two-way communication between researchers and farmers.

We transcribed the focus group recordings and did a preliminary read through, noting recurring themes in the conversation. These themes were used to develop formal coding categories based on the

type of production practice (regenerative or non-regenerative), motivations behind production decisions, sources of information, and perception of Extension.

We then assessed whether or not the information networks in the researched populations promote the adoption of regenerative agriculture through innovation by diffusion. For the diffusion model to be effective, certain assumptions must be met. First, based on the motivations expressed by farmers, it should be possible to assign farmers specific adopter categories. Second, members within the social network should all be in communication with each other. And third, if the farmer populations are heterophilic--contain different types of farmers at different points on the curve--opinion leaders must exist to help encourage the adoption of innovation. After determining adopter categories we also identified several barriers to Extension's efficacy as perceived by farmers. The following results present the data necessary for making these determinations.

## **Results**

### **Farmer Profiles**

Below are brief profiles of each farmer participant. The names of all farmers have been changed to ensure anonymity.

#### **Stearns County**

**Allen:** Allen is an organic, rotational dairy farmer who practices no-till farming and participates in the Conservation Reserve Program. He began using organic methods when RoundUp, a synthetic herbicide produced by the company Monsanto, stopped working on his farm. He also has experience as a salesman for agricultural inputs, and has made many connections in that business. Allen loves the challenge of farming organically.

**Brady:** Brady is an organic, rotational dairy and crop farmer that uses season-extension technologies such as hoop houses. Brady sees organic farming as a form of rebellion against large agribusiness, and is also

motivated by the health of his cows. He is a venturesome experimenter, enjoys seeking and adapting information from experts, and does not rely on personal networks.

**Catherine:** Catherine is a beef, hog, poultry, and crop farmer that follows rotational, organic methods but is not certified. Catherine is motivated by an environmental ethic, providing for her children, and consumer demand. She is isolated because of her financial insecurity.

**Dan:** Dan is a corn and soybean farmer that uses genetically engineered seeds and synthetic pesticides, and is a leader in his trade association. Dan's high reliance on biotechnology is motivated by economics since he measures success in profit.

**Ethan:** Ethan raises Icelandic lambs, hens, and organically certified crops. He was motivated to pursue organic agriculture after burning out on a previous career and finding the desire to live a fulfilling life. Ethan actively seeks out information about new practices, and is quite risk averse in respect to his animals.

**Fred:** Fred is a crop farmer who grew up plowing corn with horses. He has an organic, permaculture, integrated pest management farm, behind which the initial motivation was to protect pheasant habitat. He is isolated geographically and is skeptical of business and science trying to feed the world. Fred is also highly motivated to discuss ideas with peers and other experts.

**Georgia:** Georgia is dairy and crop farmer. While she tries to use her animal's manure instead to cut down on fertilizer costs, she also relies on high external inputs. Extremely risk-averse and profit-driven, Georgia is not inclined to change a production practice unless it has stopped having an economic benefit.

### **Rice County**

**Anna:** Anna is a wholesale vegetable farmer who follows organic practices and uses season-extension structures like high tunnels. She is concerned with consumer interests and although she is interested in

new marketing tools, she is resistant to production experimentation. Anna is well integrated into her local farming network.

**Brian:** Brian is a fruit and vegetable farmer who uses inputs like pesticides. Brian has a lot faith in university research and believes that agriculture is better and healthier than it used to be. He is skeptical about mass-media sources of information like newspapers.

**Carl:** Carl is a dairy farmer who grows no-till grain to feed the cows. Carl's practices are high input, using genetically modified organisms (which decreased overall pesticide use), pesticides, and hormones. He feels very motivated by his connection to his community and financial security. While Carl used to experiment more when he was younger, he now focuses on practices that he feels will turn a profit.

**David:** David is an uncertified organic vegetable and animal farmer who does not use machinery on his farm. Motivated by the desire to create strong agricultural networks, David relies heavily on these networks to make production decisions.

## **Farmer Motivations and Information Preferences**

In order to help assign adopter categories, farmer motivations and preferences were identified. Based on the interviews, 11 motivations were identified that influenced production decisions:

- Money and profit – 18 references
- Desired or ideal way of life – 11 references
- Living a challenging life – 9 references
- Consumer preferences – 7 references
- Environmental protection – 7 references
- “Doing the best” work possible – 7 references
- Production failure – 6 references

- Predestination – 4 references
- Peer pressure – 3 references
- Health of family or animals – 3 references
- Feeding the earth – 3 references

Many sources of information were also identified as relevant to production decisions. Sources of information were divided into three categories: mass media information, interpersonal information, and Extension. Mass media information—widely available to anyone—is favored by isolated adopters; however, during adoption, interpersonal forms of information—talking in person—are favored increasingly. Four different perceptions of Extension were also identified. Below are the information sources referenced by the farmers, both as negative and positive sources:

- Mass Media Information
  - The Internet: 17 references (some negative)
  - Studies released by universities: 11 references (some negative)
  - Trade association materials: 7 references
  - Print material and mailings: 5 references
  - List servs: 2 references
  - Radio: 1 reference
- Interpersonal Information
  - Peer advisor: 14 references
  - Conference: 13 references (some negative)
  - Neighbor: 10 references (some negative)
  - Extension educator: 9 references (some negative)
  - Agribusiness representative or salesmen: 9 references (some negative)
  - Other boundary organizations: 7 references
  - Workshop/seminar: 5 references

- Veterinarian: 2 references (some negative)
- Perception of extension
  - Good resource: 23 references
  - Behind the curve on the latest innovations: 14 references
  - Biased resource: 8 references
  - Not well connected or out of touch: 7 references

## Adopter Groups

There are five types of adopters: innovators, early adopters, early and late majority, and laggards. Using the characteristics of each group defined by Rogers (1983), we assigned farmers to adopter groups based on their responses in the discussions [see Figure 3]. Under each adopter category, we list the characteristics associated with the type of adopter, name the respondent, and provide examples of how the respondent corresponds with the group characteristics.

### Innovators

*Characteristics: Venturesome, Well-educated, Highly motivated, Empathetic, \*Strong environmental ethic<sup>1</sup>, \*Less profit driven, \*Abstract thinker, Okay with uncertainty, Financially stable, \*Small farm, Favorable attitude towards science, Information seeker, Cosmopolitan, Less local interpersonal networking*

Respondent Brady approaches organic farming as a form of rebellion against agribusiness: “I was experimenting with not using herbicides and antibiotics already so, when I found out about the market in 1999, it wasn't a very big leap for me to jump into organics and I really enjoy it” (Brady, min 5). This desire to experiment reflects Brady’s venturesome and forward-thinking qualities--he was already using an innovation and the market caught up. He is also an information seeker, but does not rely on his local networks for guidance. Seeking out cosmopolites at conferences, Brady enjoys talking to those who he

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<sup>1</sup> \* refers to characteristics specific to organic innovators

believes “are willing to share the negatives, what not to try” (Brady, min 58). To Brady, the most reliable information comes to him when he "seek[s] out the farmers for information that have done it, adapting technology" (Brady min 58), indicating a preference for other innovators.

## **Early Adopters**

*Characteristics: Respected in local community, Well-educated, Empathetic, Abstract thinker, Integrated into local social networks, Localite, \*Commercial, Interpersonal networks, Opinion leaders*

Respondents David, Carl, and Dan are early adopters defined largely by their reliance on and integration into social networks. David’s farming model, a farm accessible to families who otherwise would not have access to a farm, is motivated by the desire to feel integrated into the community, striving to create stronger support systems: “For us a lot of it was driven by the base of people that we actually deal with...families with small children and pets that come. It's more like an agrotourism situation” (David, min 39). He relies heavily on these social networks when it comes to production decisions: “For me, I need to talk to someone” (David, hr 1 min 1).

Like David, Carl also feels integrated into a network of peers, identifying a tension between environmental constraints and the community. Once considering moving to a rotational grazing area “because you can get more money for your end product” (Carl, min 33), Carl decided not to move due to feelings of connection and integration in the community: “I live in a neighborhood I wouldn't trade for anything” (Carl, min 10).

Dan is not only integrated into a peer network but is also an opinion leader within the trade association network. Once the president of his growers’ association, Dan says he "embrace[s] all kinds of operations . . . whatever makes you successful" (Dan, min 7). He redistributes knowledge he gains through his interpersonal networks. Valuing interpersonal networks highly, Dan would “rather hear the farmer’s story” (Dan, min 47). Despite this connection to his community of growers, Dan worries about exchanging too many details with neighbors, who are also, in many cases, his competitors.

As leaders within their communities, Dan, Carl and David all value responsibility and respect. For Dan and Carl, respect is gained through guaranteeing profit. Dan reflects on how agriculture has changed over the years to guarantee profit: "People are going back to organics . . . we [Dan's family] kind of went the other way, kind of went more into technology and to science" (Dan, min 17). Calling RoundUp a "miracle spray" (Dan, min 7), Dan explains that weed pressure and profit motivated the use of intensive input practices. Similarly, Carl reflects on production priorities, saying "we've gotta make money at the end of the day . . . you probably want to be in that second wave of adoption to the new things, but maybe we will let somebody else see if that really worked or not before you spend a whole lot of money on it" (Carl, min 23).

With the financial security of a spouse with a "good job" (David, min 18), David does not feel financial constraints as acutely and focuses mainly on the community aspect of "a social services farm" (David, min 10). While David does not seek respect through profit, he is respected by his community based on social and ecological values: "We treat our land with respect, we treat the animals as our partners and we treat our partners like family" (David, min 17). By promoting these values on his small-scale organic farm, David gains respect based on the values of his specific community.

## **Early Majority**

*Characteristics: Educated, Profit driven, Deliberate, Risk averse, Reliance on interpersonal networks, Commercial, Information gathering*

Anna, Allen, and Ethan are all motivated by the risk of losing profit or not doing the best. For example, Allen's initial adoption of organic was spurred by production failure: "The only reason we started [was that the] chemical RoundUp from Monsanto . . . didn't work anymore" (Allen, min 36).

Ethan believes that his production practices are "not good enough yet to raise animals organically" (Ethan, min 8), revealing his fear of losing animals through production failure. Ethan spends time "getting smarter" (Ethan, min 8) by gathering information from books, mentors, seminars, the Internet, and conferences, which are not affordable each year (Ethan, min 43).

Anna's risk-aversion is connected to consumer interests: "I come at it from more of a financial perspective than other farmers do, 'cause I really want to make money and I think farmers should make money, so I really want this to be a viable business" (Anna, min 19). For Anna, farming is a balance between organic ideals and running a business.

Whereas the early adopters are well-respected and integrated into social networks, those in the early majority rely more heavily on their interpersonal networks to make production decisions and seldom take on community leadership positions.

As a salesman and consultant, Allen has developed networks by visiting farms. Allen describes the experience with his peers as: "it's very educational and you go out to the farmer's place. He teaches you just as much as you teach him. And you take these things home" (Allen, min 24). This investment in learning from others suggests a preference for informational gathering.

Newer to farming, Ethan is less integrated into the social networks but does prefer interpersonal networking to help make decisions. Ethan's initial adoption of Icelandic lambs was at the urging of a neighbor: "On Easter Sunday, [my neighbor] came over, 'you got to see these Icelandic lambs that were just born,' and he was really trying to sell us live lambs . . . which worked" (Ethan, min 8). When given a preference, Ethan seeks out other peers through conferences and list serves over developing new methods of production.

Also an information gatherer, Anna describes a deliberate methodology behind production decisions:

When I want to start a new enterprise I figured out that first I go to the Internet and do a bunch of Googling . . . and then once I get stuff from the Internet and I feel like I actually do want to do it then I actually go to farmer mentors of mine and the farmers in Northfield who I regularly talk to like, 'what do you think about this, is this a good idea, is this a bad idea?' Then I find I generally at that point go back to the Internet and then also talk to people who are selling the products that are related to that enterprise (Anna, min 24).

While Anna may begin her information gathering on the Internet, turning points in her adoption of agricultural innovations are focused around interpersonal resources, such as through talking to mentors

and salesmen she knows. This trend, reliance on interpersonal networks during adoption, increases as an innovation moves through adopter groups (Rogers, 1983).

## **Late Majority**

*Characteristics: Skeptical, Face network pressure, Less educated, Dogmatic, Profit driven, Risk-averse, \*Large farm, Information gathering*

Respondents Georgia and Brian are both dogmatic, though it manifests itself differently in each case. For Georgia, farming is a balance between profitability, risk, and consumer demand. Extremely risk-averse and profit-driven, Georgia is not inclined to change a production practice unless it has stopped having an economic benefit:

“If it ain’t broke, don’t fix it” (Georgia min 40).

“The less the better . . . you have to do what’s best for your operation” (Georgia, min 40).

“Do as little as you can because the cost is there” (Georgia, hr 1 min 2).

“You have to know your bottom line and what it costs to make what you’re making. Because otherwise it isn’t worth it” (Georgia, hr 1 min 24).

This dedication to profit and consumer interest serves as the predominant guiding factor and metric for Georgia in production decisions.

Profitability is less of an issue for Brian, whose spouse has a good job, assuring more financial security. Although positive attitudes toward science are generally more associated with innovators, science serves as Brian’s dogma, manifesting itself in an unwavering faith in science and skepticism of mass media news sources. Brian has a strong faith in university research in particular: “I think if there’s very strong science behind whatever the problem may be, it will be dealt with” (Brian, hr 1 min 36).

Georgia and Brian are also similar in their reliance on interpersonal networks when adopting new innovations. Noting several conferences, Brian enjoys classes and workshops where there are farmers and experts to talk to: “Tom K. at Soil and Water Conservation Service . . . asking people questions at the

farmers markets . . . Organic conference in LaCrosse. . . and networks where you can call people” (Brian, min 48) are all examples of peer support that Brian relies on.

Especially for Georgia, interpersonal relationships cause some stress through network pressure, a characteristic of late majority. In some cases the pressure is from consumers in her network: “in order to have the production you have to keep up with the consumer demands” (Georgia, hr 1 min 2). In other cases Georgia feels pressure to keep up with her neighbors’ production methods, even if it costs her money: “I see that sprayer come and I just cry thinking about the check that I have to write” (Georgia, min 40).

## **Laggards**

*Characteristics: Traditional, Isolated, Less favorable attitude towards science, Suspicious, \*Large farm, \*Subsistence farm, Not information gatherer, Distrust of information, Use media sources, More interpersonal contact during adoption*

On the other end of the curve, Catherine and Fred seem to be laggards. Both Catherine and Fred are isolated: Catherine financially and Fred geographically. Catherine describes this constraint: “you know for me and my kids with the mortgage and you know as a single parent it’s not easy” (Catherine, min 46). Describing the town where he is, Fred says, “not many people know where Roscoe is” (Fred, min 12). Fred in particular is skeptical of agribusinesses trying to use science to feed the world: “Why is everyone trying to increase yield? We are flooding the market, shooting ourselves in the foot” (Fred, hr 1 min 20). Further, Catherine and Fred give no indication of being well integrated into their communities. Fred says, “you gotta know your own land, and that’s the bottom line” (Fred, hr 1 min 8) and admonishes those who “look over the fence” at neighbors (Fred, hr 1 min 8).

## **Discussion**

Our study includes two main points of analysis. The first is examining adopter categories, and the second is evaluating the communication networks the adopters we interviewed are a part of. While all of

the respondents could be assigned specific adopter groups to some degree, a reexamination revealed that four farmers challenged the group distinctions. In terms of communication networks, we found that social barriers exist to promoting fluid communication currently. However, instead of serving to discount the innovation of diffusion theory, these findings serve to enrich the conversation around how it may be used more effectively.

Because farmers may not fit exactly into adopter groups, Extension can benefit from understanding how to approach exceptions. A critique of diffusion of innovations theory reveals several opportunities to reframe the way boundary organizations such as Extension interface and approach farmers. Through an analysis of farmer perceptions, we identified several barriers Extension must overcome to be an effective catalyst of innovation.

## **Reexamining Adopter Groups**

While the farmers in our focus groups fit within the adopter categories, a deeper analysis of some of their personal characteristics challenges the traditional attributes of the groups. In four cases, farmers diverged from or broadened the traditional definition of adopter groups. Three new types of groups were revealed: secret, transitioning, and fluid adopters. If Extension is to effectively apply diffusion theory to farmer populations, these divergences must be considered as part of their outreach method.

### **Secret Adopters: Innovators-In-Disguise**

Above, Catherine and Fred were identified as laggards. However, some of Catherine's and Fred's motivations and experiences indicate that they also have characteristics of innovators. For example, Catherine seeks out non-local experts--other farmers, veterinarians, and agents from boundary organizations like the NRCS, the USDA, and Extension--in order to bring innovations to her farm, acting as a gatekeeper in her region. For example, Catherine reflects on a yearly ritual: "I like to use the NRCS and call 'em up in the spring, what's gonna be new this year to see if it's something we can use" (Catherine, min 45). These practices reveal Catherine's eagerness to adopt new innovations.

Where Catherine serves as a gatekeeper to her community by seeking innovations from experts in a cosmopolitan network, Fred uses experts to discuss and verify the experiments and observations on his own farm. For example, Fred detailed his discovery of a natural pest control method:

I was cultivating out in the field. I got closer to where there was more wild mustard growing and I noticed my beans were a lot higher. So I stopped, got off the tractor, started looking for aphids. I could find no sign whatsoever . . . Now when the guy came with the combine he said, 'what did you do at that end of the field that you're production is way more?' and I said, 'I did nothing. Just let the mustard grow and I guess the bees ate up the aphids. I don't know.' So I been asking around about that and nobody can verify. They're still looking around about that (Fred, min 24).

What Fred described led him to the adoption of a new production practice: “I thought ‘wow’ now these mustards are probably raising these bees that eat up the aphids so, you don’t know, a guy don’t know but it’s just something that I experienced” (Fred, min 24). Whereas other adopter groups may pick risk-aversion over this type of adoption, Fred, as an innovator in this regard, is excited about unraveling new techniques from his experiences. Further, this excitement motivates his production practices saying, “I guess that’s what makes organic farming fun” (Fred, min 24).

Why does the dominant diffusion model fail to characterize Fred and Catherine as innovators? Diffusion theory discusses farmer adoption--the implementation of a certain technology or production behavior on a farm. *Adoption* is different from *adaptation*, which is the augmentation of a technology or behavior by a farmer to fit production needs on the farms. In adaptation, the innovation is changed so much that it becomes distinct. Traditionally, diffusion theory is focused on farmer adoption and does not consider adaptation as a legitimate step on the curve (Rogers, 1983). Innovators disguised as laggards are seen as resistant to adopting innovation because they want or need to adapt innovations to fit their production circumstances. Thus, laggards and their adaptations are actually innovators and innovations on the next innovation curve [see Figures 4 and 5].

## **Transitioning Adopters: Network Integration and Age**

Although Carl was categorized above as an early adopter, a deeper investigation of Carl's motivations reveals innovator-like traits. For example, Carl was among one of the first in his community to adopt no-till practices (Carl, hr 1 min 9). Enjoying speaking with experts, Carl says "you have got to sort out the information that they give you, but they do have a lot of good information to use as well" (Carl, hr 1 min 9). He suggests that farmers are more willing to share information now than they used to be (Carl, hr 1 min 15; Carl, hr 1 min 9). The interest in expert opinion is a cosmopolitan attribute of innovators, but the willingness to share among peers is generally associated with local network integration, which innovators generally do not have. This observation may be an indication that Carl is in the process of transitioning away from innovation, reflected by his sentiment that "as I've gotten older I don't adopt things as quick" (Carl, hr 1 min 3). Why do innovators like Carl transition?

One possible explanation is age. Carl admits that personal innovative behaviors have decreased as he ages: "When you are young and starting you have got nothing to lose and you can do those things a lot easier" (Carl, hr 1 min 4). More so than when Carl was younger, production practices are now decided in terms of risk-aversion, so he says to "let somebody else see if [a practice] really worked or not before you spend a whole lot of money on it" (Carl, hr 1 min 4). However, Carl's interest in experimentation has not ceased completely, admitting to trying new practices on a smaller scale, often keeping them private, calling it "trialability" (Carl, hr 1 min 4).

While age may be correlated with certain adopter groups, the age of a farmer in isolation likely does not *cause* adopter preferences. This argument is relevant in light of Fred who, despite being older than Carl, still presents as an innovator. Other factors generally associated with age, like increased network integration (addressed below) is a more likely explanation.

## **Fluid Adopters: Separating Innovation Curves**

The analysis of secret adopters and transitioning adopters brought up two main questions--why are some innovators hidden and why do some innovators transition? Examining these questions in the

discussion of fluid adopters--represented in our group by Anna--sheds light on this divergence from traditional diffusion of innovations theory.

As a dynamic respondent, Anna's responses were in-depth enough to reveal places on three innovation curves in three different adopter groups. Besides being grouped in the early majority category for regenerative practices as described above, Anna also can be categorized as being an early adopter for marketing innovations and late majority for experimental practices or controversial ideas.

On the marketing innovation curve, Anna is eager to adopt new methods of communication and publicity: "I would say in terms of information, or innovation adoption, I would call myself an early adopter--social media, technology, new marketing methods, different ways to sell your crops and talk to people" (Anna, hr 1 min 2). She is also an opinion leader in the wholesale marketing of organic vegetables both explicitly as a consultant, and implicitly by reputation. David admitted to deeply investigating Anna's farm's website for the week prior to the focus group: "When I sat down here and I looked across and I saw it was you [Anna] . . . it was a little bit of a freak out for me . . . because it was an odd coincidence . . . I've been looking at your website for the last couple of days" (David, min 45). For the adoption of new methods of communication, Anna is very integrated and a leader in the local social network.

On the other side of the curve, Anna falls in the late majority when faced with innovations perceived as controversial or against the mainstream—i.e. new ideas. Explaining that "there is so much risk involved in farming in the first place" (Anna, hr 1 min 2), Anna would rather talk to other farmers who have tried experimental production innovations before bringing it to the farm. Facing strong network pressure, Anna reflects that "the worst insult you can give to a farmer is that they are either lazy or that they are not competent" (Anna, hr 1 min 7). She is afraid of being judged by her peers: "I would not want to do really, highly visible, innovative things because I would be worried about my reputation among my peers in the community" (Anna, hr 1 min 7).

## **Adopter Divergence and Heterophilic Individuals**

The cases of secret, transitioning, and fluid adopters diverge from the traditional diffusion model. While the diffusion of innovations theory is useful in understanding farmer networks, it can sometimes present a simplistic vision of how farmers operate. Not only is Anna in a heterophilic community, Anna is a heterophilic individual, which poses complications when attempting to predict what and when Anna will adopt. For Anna, the drive for success is a balance between innovative, early adopter qualities and the fear of backlash from the community. Understanding both of these perspectives is important in determining how to direct outreach.

Much like Anna, Carl is heterophilic because he is transitioning between adopter groups. Similarly, Carl's transition might have been spurred in part by community integration. Carl reflects how, when innovating by building a high-tech barn, members within the community did not believe he would be successful: "When we built that barn 20 years ago it was the first one for a long ways around. It kind of triggered, 'it would never work.' I mean, you can't believe the rumors and all, this and that that were going around town" (Carl, hr 1 min 4). Although Carl considered moving, as described above, he chose to stay in his community because of the network he had developed (Carl, min 33).

While Carl and Anna's social integration may quell the drive to innovate, Fred's innovations inspire him to reach out to others and develop local networks. Fred argues to "get the local farmers together and discuss what works and what don't. To me it's the most valuable, cheapest information there is" (Fred, hr 1 min 22). This desire to connect locally is not often a characteristic of innovators. Fred's isolation may spark his desire to reach out. He has not been able to exchange his practices and experiments with local farmers, therefore not receiving judgment for innovation. While Fred's isolation does not make him strive to be an innovator in his community, it may save him from the peer judgment felt by those who are more socially integrated.

## **Summary**

Characterizing the adoption behavior of farmers is much more complicated in practice than the diffusion of innovations theory suggests. Farmers are often in one adopter group for one innovation, and a

completely different adopter group for another, even though their personal, socioeconomic, and structural characteristics remain the same. In fact, laggards can in some cases be innovators. Farmers also transition between adopter groups based on changes in factors such as their level of engagement with their local community. An understanding of the increased complexity of divergent adopter groups and heterophilic individuals not only enriches the conversation about diffusion theory, but the information is also relevant to those attempting to diffuse an innovation efficiently. Specific, accurate knowledge of a farmer's adoption behavior is necessary in order to understand how she or he receives and processes information. Extension can use this knowledge to tailor the way that they communicate to farmers so that knowledge is exchanged most effectively.

## **Reexamining Communication Networks**

### **Holes in the Network**

For innovations to spread successfully using the diffusion model, communication networks must be intact. Our analysis of the focus group interviews suggests that there are some barriers to communication within the networks. Such barriers include farmers only talking to like-minded farmers, network pressure, and fear of judgment.

Farmers using similar production systems tend to talk more with each other, especially on a local level. We found this to be especially true for self-identified organic farmers because their market is not saturated. As Anna says, “generally for organic vegetable CSAs and specialty farms, generally organic, we have this culture of where everyone is still helping out each other a lot, and we're like you can have my business plan. I'll talk to you about anything because the market is so wide open” (Anna, hr 1 min 16).

In contrast, conventional farmers, particularly large scale farmers like Dan, have more cosmopolitan networks because neighbors are seen as competitors. Dan explains:

By being affiliated with the corn growers I get to a lot of national conferences and you see what other people across the nation are kinda doing with some of the technology and by seeing that sometimes, you

know, watch your neighbor but your neighbors are still your competitors so I think that a farmer that's five hundred miles away from you is more truthful than the guy five miles from you (Dan, min 47).

These instances where farmers don't exchange information with different types of farmers represent holes in the communication network. These holes are places where innovations can potentially be stalled in the process of diffusion. From our focus groups, it appeared that holes in the network are especially prominent along the organic/conventional divide.

## **Network Pressure**

In the course of the focus groups, many farmers--both organic and conventional--suggested that strong network pressure (i.e. relationship with neighbors) acts as a barrier to innovation. The fact that farmers use each other as resources is a double edged sword, as Anna reflects: "Farmers talk to each other. And I find myself getting to that too, like people who try new things, or take a risk. They are judged all the time" (Anna, hr 1 min 7). The barrier to innovation and adoption is not just that farmers are not talking to each other--it is the way that they are talking to each other. Experimentation is often met with judgment, especially when production changes result in production failure. Anna reflects:

It is like a, oh, those idiots don't know what they are doing, and there is a huge judgmental [attitude] . . . I hide my failures a lot, cause I know people will be like, oh well [Anna], she didn't trellis her tomatoes last year so it was just a mess and she just really doesn't know (Anna, hr 1 min 7).

Anna is fearful of being targeted by her network for atypical behavior in her production decisions.

This feeling of judgment is not unique to Anna. While David does not need to farm for a living, he does feel a strong personal investment in the success of the farm because "I've got to do the work, and then if it doesn't go well, I've got to suffer the personal disappointment" (David, hr 1 min 6). Much like Anna, David feels a social pressure to not fail at the "labor of love" (David, hr 1 min 6) and fears facing peers who have more success on their farms.

Georgia, striving to be economical and conservative in production inputs, feels pressure to add inputs, especially when talking to salesmen and traders: "You're really going to risk losing that much?! I really don't want to but sometimes I'm like oh let's just try it for a week" (Georgia, hr 1 min 19). Instead

of feeling confident in the ability to adapt information and innovations for farm-specific needs, Georgia is peer-pressured into adoption of the mainstream option.

Fear of judgment by others for experimentation may be one of the root causes of innovator marginalization. This fear might not be causing innovators to isolate themselves locally; rather, localities may judge or avoid those trying new practices. Thus, the role of innovators as gatekeepers to innovation is more difficult. While they may be able to bring an innovation into a new area, other adopter groups may be fearful of walking through the gate to adopt. Innovators become more cosmopolitan when seeking those out who are accepting of experimentation and adaptation. In order to diffuse innovations more rapidly, help is needed to usher others through the adoption gate.

### **Opinion Leaders and Overcoming Bottlenecks**

The heterophilic nature of farming communities suggests that the diffusion of innovations among these farmer populations might not be able to progress unassisted, otherwise stalled in the face of network judgment. Thus, leaders are needed to help reframe interactions and create spaces that welcome cooperative discourse instead of competition and shame.

Acting as catalysts, opinion leaders are crucial to helping facilitate diffusion by improving communication. Three of the Rice County farmers referred to the same opinion leader, Dave L., despite being three different types of farmers. In this heterophilic situation, opinion leaders are essential. Although Dave L. is a conventional farmer by trade, he relates to and represents farmers across the spectrum as a community leader: “[He is] very conscious of working across the aisle so to speak” (David, min 42), as David says. Anna also respects the input of Dave L. because they have different practices:

I love Dave L. and, like, he's all corn but he's still, I still value his opinion about certain things even if I disagree with, just because it's another perspective than and there's still some things we can overlap on . . . For me as a person who's not from here I guess I value the he's been here for a long time, he's a community figure so even though we're not talking about tomatoes we're still talking about farming, farm issues . . . I really value and I would actually, like, I would love to learn how to meet more Dave L's. (Anna, min 42)

By bringing together different adopter groups and farmers of different backgrounds, opinion leaders are able to make innovation approachable by repositioning the line of what practices are socially acceptable.

## **Summary**

The farmer populations we investigated included a wide variety of farming practices and farmers within the counties. Such heterophily, even in small geographic areas, leaves holes in the local communication networks, as farmers tend to speak only with other farmers that are similar to them. The judgmental attitude that farmers face when attempting to innovate also stymies the diffusion process. Heterophilic networks benefit from the connecting influence of opinion leaders, who can relate to different types of adopters.

## **Overcoming Barriers**

As explained above, diffusion of innovation theory can be used to effectively spread innovations if adopter groups can be identified and communication networks are intact. Our analysis of the focus group interviews revealed that adopter groups were identifiable, but they require some alterations. Communication networks, while not completely intact, could be repaired by eliminating bottlenecks. Opinion leaders and change agents can bolster these networks by encouraging communication and understanding the spectrum of adopter characteristics.

Dan reports, "I think the Extension is pretty important actually for getting information" (Dan, min 55). The focus group interviews illustrated many strengths of Extension, both as a source of information and as a networking catalyst. Carl describes that Extension's resources serve multiple audiences: "If you are going to branch off and go one way or the other, they can take you either way, so it is up to you if you want to branch off and go to organic or a different way" (Carl, min 53). Allen spoke specifically of information about regenerative practices he valued, saying that "the Ames [Iowa State University] study on rotational grazing was great" (Allen, min 59). Both Ethan and Anna enjoy the online information Extension offers, and Anna describes using "webinars that are put on by [University of Minnesota]" (Anna, min 24).

Besides providing information, Extension also works to make connections, acting as, in Brady's words, a "great facilitator" for gathering experts (Brady, min 58). As Brian describes: "At conferences Extension people lead classes and you can talk to fellow growers" (Brian, min 9). In some cases, Extension reaches out directly to farmers by running studies on their farms. In Georgia's case, "Jim S., we work with him a lot down at the [University of Minnesota]. We've been doing a couple, in fact we've got a study going on at our place" (Georgia, min 54).

Extension specifically has the opportunity to step into the role of a connector; however, several barriers, identified in the focus groups, must be overcome before proceeding efficiently. Analysis of the focus groups revealed farmers using non-regenerative, high-input practices had a more positive perception of Extension over those using mostly regenerative practices. This rift, in the opinion of those we interviewed, stem from the perception that Extension is biased, behind the curve, and poorly connected.

### **Perception of Bias**

For many farmers, the perception that Extension is biased acts as a barrier to trust. As Georgia explains, receiving slanted information is a problem because it hurts the relationship the farmer has with the consumer: "If we have bad information or if we have tilted information...that is not going to help us in the least bit to help the consumers" (Georgia, hr 1 min 1). Through the discussion groups, three types of bias were identified: funding, contextual, and ideological.

A main concern presented amongst all farmers was that using Extension means receiving biased information. Funding bias was brought up eight times between the two focus groups. Farmers suggested that the main source of this bias comes from where Extension and university research get their funding because "there ain't no money otherwise" (Dan, hr 1) and "strings are attached" (Georgia, hr 1 min 11). While farmers like Allen approve of specific university reports, the perception of "slanted" studies funded by agribusiness persists. Regarding research Allen asks, "who paid for it?" (Allen, hr 1 min 6), harkening back to a time of more accountability when "the legislature funded the universities" (Allen, hr 1 min 6). Brady also reflects:

Well sometimes I think that the studies are influenced by who is funding the studies, so that's one of the problems with these university studies, is that if a company is funding it, giving all this money to a university, it's pretty susceptible to the outcomes coming out in favor of whatever they're studying. You just wonder about the study (Brady, hr 1).

Perhaps there is some truth to these concerns. Twenty-six percent of state Extension funding comes from private sources--corporate gifts and grants, private contracting, and private gifts (University of Minnesota, 2013). With each funding proposal, David Werner, the CFO of Minnesota Extension Services says, "Minnesota Extension first evaluates: should we even accept this money? Will we be able to stay in line with our mission statement if we accept this money?" (Werner, 2013). When Extension conducts research that is in part funded by corporations, this information is readily available and published in the research summary (University of Minnesota, 2013). With "less than 0.1% of federal agricultural research dollars and only 0.02% of research acreage in the land-grant system being used for organic research" (Davis et al., 2005), there is a tremendous opportunity for Extension to invest more in regenerative practices. Part of Extension's mission is to address "community problems" and help people "respond to their changing environments" (University of Minnesota, 2013). In addition, Extension has the responsibility to foresee the changing environment and prepare communities through proactive education (Werner, 2013). Therefore, as long as there are community members that are interested in regenerative techniques, which our focus groups confirmed, Extension should be funding this research in regenerative agriculture.

Contextual bias was another concern brought up in the focus groups. For Brady, Extension and university biases exist because they "live in a bubble where it never rains when they cut hay" (Brady, min 59). Or, in other words, university research is perceived as non-transferable and any innovations researched necessitate adaptation during local implementation. Based on these experiences, Brady "somewhat trust[s] some of the people at Extension . . . especially on the soil and the weeds . . . [but takes it with] a grain of salt" (Brady, min 59).

For Anna, Extension's bias is deeply rooted historically at an ideological level. According to Anna, the younger generation of organic farmers associate Extension with a lot of "baggage" (Anna, min 54) when it come to Extension, perceiving a long history of anti-organic measures. She thinks that Extension has only been interested in "get big or get out" (Anna, min 54) agriculture, promoting a farming philosophy inconsistent with the organic agriculture movement. Suggesting that Extension is too political, Anna recounts a family member's experience with educators "teach[ing] that organic is bad and organic milk smells like puke and organic farmers are just failed conventional farms" (Anna, min 32). Because of these negative experiences, Anna believes Extension might not be able to successfully act as a connector in heterophilic networks with younger organic farmers. While our focus groups represent only a few voices, studies indicate that self-identified "organic" farmers have repeatedly ranked university researchers and Extension agents among the least helpful resources for organic production and marketing information, and instead rely on other information systems (e.g. other farmers, organic agriculture conferences, and organic agriculture publications) (Blobaum, 1983; Davis et al., 2005).

## **Out of Touch**

Given recent budget cuts (Werner, 2013), Extension is having a hard time keeping up with agribusiness research and farmers are increasingly turning to corporate crop advisors for cutting edge technology and information. Innovators like Carl and Brady admit that Extension is "not necessarily the leader in what is going on out in the real world" (Carl and Brady, min 55). Further, Ethan worries that funding cuts will disconnect Extension from farmers because the staff is spread too thin. Extension sometimes uses crop advisors as a middlemen, leading trainings and classes to disseminate information to the crop advisors who then share it with farmers (University of Minnesota, 2013).

Relying heavily on agribusiness support for research is problematic. Since agribusinesses make decisions based on profit, they might have less incentive to promote innovations that serve to reduce farmer inputs, as the inputs may be the products they sell. Therefore, Extension's competitive niche, in an effort to stay cutting edge in the research process, can be to listen to all types of farmers and integrate

their interests in the university research agenda even if the research will not lead to the development of a new input, but instead to the development of a regenerative practice that eliminates inputs.

## **Disconnected**

Not only is Extension sometimes out of touch in terms of researching what farmers are interested in, they sometimes also have trouble communicating their research to farmers. Some farmers, like Dan, believe that Extension is a great resource for research-based information, but that they are not well-connected and need to do a better job of getting their message out: “I think there’s probably a way they can get their message out a little better because...if they don’t got your email address...you don’t know if there’s something going on or not” (Dan, min 55). Anna also speaks to this disconnect: “So I am not saying that it is bad to talk to Extension agents. I am just saying it is not what I would think of first, but maybe I really should” (Anna, min 59). Wishing there was the option to text an Extension educator, part of this disconnect stems from Anna’s use of specific information networks. Catherine agreed that if she wants information, she has to seek an Extension agent out, instead of being contacted by an educator (Catherine, min 57).

As described above, Ethan suggests that part of the reason for this is that due to funding cuts. There are not enough Extension educators to reach the population of farmers in their area, so they “are going to have to figure out how to accomplish the same mission but without as many people” (Ethan, hr 1 min 12). However, technological and networking options may exist to fill the gap. Ethan, an early majority farmer, found webinars on Extension websites extremely helpful and a promising venue for Extension to reach a wide audience with fewer employees (Ethan, hr 1 min 12).

## **Extension’s Opportunity**

As described above, a few findings challenged the efficacy of the diffusion of innovations theory in the populations we studied. First, several farmers straddled adopter categories. Second, network pressures exist that may discourage communication, adoption, and innovation. And third, if Extension is to catalyze these networks they must overcome barriers of bias, disconnection, and slow responsiveness to

be effective. However, instead of suggesting that the diffusion model is inappropriate for promoting regenerative agriculture in these networks, the results can be used by Extension to identify the most efficient approaches. Specifically, repairing communication networks and integrating farmers into research would most benefit the flow of innovations throughout these populations.

## **Repairing Networks and Communication Catalysis**

Agriculture is an industry in which different production practices are placed into rigid categories, and these categories are extremely dichotomized: organic vs. conventional, small-scale vs. large-scale, specialty crops vs. commodity crops, to name a few. Farmers currently do not reach very far outside of these circles. The desire to connect more to a diversity of farmers was expressed in both counties. Turned off by conferences that “don't really let you get into discussions” (Fred, hr 1 min 21), Fred reflected on the benefits of the focus group experience, which allowed him to connect to other farmers that share similar land and climate. Social network gaps must be filled by building support structures for diffusion to progress effectively.

Extension has the opportunity to catalyze the rebuilding of these information pathways by bolstering heterophilic networks. Anna is both excited and worried about talking to more conventional farmers: “I'm realizing now that small scale vegetable growers are really comfortable sharing information like rent and cost and many of those things and now I'm like oh god, I probably asked a conventional farmer, ‘well what do you pay per month on that?’” (Anna, hr 1 min 21). Anna refers to a cultural difference between what is socially acceptable to discuss in organic versus conventional groups. By speaking more than one farming language, Extension can be an effective translator.

The week we visited the Rice County Extension office, Mike Donnelly was preparing two events that served to strengthen his information network. The Eighth Annual Organic Crops Day, featuring both a farmer panel and a half dozen workshops given by researchers at the University of Minnesota and USDA, allowed farmers to hear about both current organic crops research and the experiences of fellow farmers. The farmer panel in particular is a great example of how Extension can connect farmers to each other, a means of information exchange that was highly valued by many of our focus group participants.

Mike Donnelly spends about half of his time answering farmers' questions, and one effective method he employs is to refer one farmer to another (Donnelly, 2013). Mike is in communication with a very wide diversity of farmers--a distribution that mirrors the diversity of the research and information that he works to spread.

In addition, Rice County Extension held a Cover Crops 101 workshop that week--a collaboration between the University of Minnesota and the Cannon River Watershed Partnership. This is a great example of how Extension can work to mend the divide between conventional and organic information networks: we found that organic farmers in our focus groups tended to value and utilize Extension less than their conventional peers. However, by partnering with organic organizations, Extension reaches a wider audience and builds a more robust information network. Extension should continue to increase collaboration with organizations such as the Sustainable Farming Association of Minnesota, the Midwest Organic Sustainable Education Service, etc. as an efficient way to build off already established information networks and connect farmers across organic/conventional lines. Extension also partners with crop consultants through their Institute for Ag Professionals (University of Minnesota, 2013). An Extension small grains specialist acknowledges that "there are sometimes contradictions between research-based recommendations and business recommendations...so only by working together can we change behavior over time" (University of Minnesota, 2013). When these dialogues occur and farmers participate, the local information network grows and strengthens.

Collaboration with other boundary organizations is a strategic move on Extension's part, to make scarce resources go a long way. Given Extension's recent budget cuts and feedback from farmers saying that they are not cutting edge, it is essential that Extension increase their collaboration efforts with other local organizations.

### **Integrating Farmers into University Research and Rebuilding Trust**

Extension must overcome the perception of bias towards big business in its research in order to regain a reputation as a credible resource amongst farmers to promote regenerative agriculture. One way that Extension can rebuild this trust and guarantee that it is favoring the interests of the community is by

further integrating farmers into the research process. Regarding a recently released university study on rotational farming, Georgia remarked that the results were essentially common knowledge to farmers, and that “[The University] could have always asked us [farmers]” (Georgia, hr 1).

Due to their marginalization as laggards, farmers like Fred and Catherine may have difficulty disseminating the innovations that they either bring to the region or adapt. Backed by the sentiment that “we pretty much have to seek [Extension] out” (Fred and Catherine, min 57), they may not be able to diffuse their innovations as quickly as other innovators who are in contact with Extension. Fred considers Extension a good resource, but does not necessarily feel he has access to a means of sharing on-farm innovations or observations (Fred, hr 1 min 8). Instead of ignoring laggards and secret innovators, giving them more attention and validating their attempts for innovation might further the applicability of regenerative practices to different types of farms traditionally seen as resistant to change.

By seeing farmers as one of the first steps in research, instead of the last step or receptacle of knowledge, Extension can legitimize farmer input. Extension has traditionally served as a one way stream of information from the university to the farmer. This approach suppresses the spread of agricultural innovation by inhibiting or ignoring the ideas of farmers, which could be a great, natural source for new innovations. Including farmer experimentation and innovation in the body of scientific research not only helps ensure and strengthen farmer autonomy but promotes equity by valuing stakeholder interests outside of the university.

## **Conclusion**

Currently, Extension is not promoting regenerative agriculture as effectively as they have the potential to do. Using feedback from our focus groups to enhance current Extension structure and programming could lead to more effective promotion of regenerative agriculture through a more nuanced version of diffusion of innovations theory. Before Extension can successfully promote anything, they must first overcome the barriers to trust, such as perception of bias, and being behind the times, and disconnection that farmers expressed. Extension should emphasize their strengths as a unique entity that

is publicly funded, has a wide network, and whose mission is to meet community needs with university resources.

Overcoming the negative perceptions that our focus group participants laid out requires making strategic changes, but also, simply better communication of Extension's strengths to their audience of farmers. Every Extension agent and administrator we talked to was friendly, knowledgeable, and willing to share information with us. We were able to access financial information regarding where Extension gets their funding from and hear the process through which they vet grants in order to ensure that they will not be swayed by corporate interests. Extension must address this stereotype and make it a priority because any work that they conduct building information networks will not be effective until farmers in all realms of the network trust Extension and desire to collaborate with Extension. Extension can work to overcome this perception of bias through a transparency campaign where they communicate to the public where they get their funding and how they make research decisions.

Our study revealed the complex nature of farmers' behaviors that may complicate the diffusion of innovations theory. Farmers do not fit neatly into adopter categories as the theory might suggest. Some laggards have the potential to be innovators and do innovate in some cases. Some farmers are transitioning from one adopter group to another, straddling two places on the curve. Farmers sometimes fall into different adopter categories based on the innovation considered.

These discrepancies might seem to limit the ability of the theory to accurately facilitate diffusion of regenerative practices. However, as long as Extension considers these nuances, the theory can still be useful in promoting regenerative practices. Considering new adopter categories can help Extension tailor the way they interact with farmers to best meet their needs.

The regional organization of Extension means that Extension agents form personal relationships with local farmers and therefore are able to employ a nuanced understanding of adopter groups and individuals. Our research highlights the importance of Extension remaining present at the county level, and not moving towards regionalization as recent budget cuts have necessitated (Werner, 2013).

In our study areas, we discovered many challenges confronting the diffusion process. Holes in communication networks, particularly between conventional and organic farmers, prohibit the flow of

information between diverse groups of farmers. This is especially problematic since novel ideas and inspiration are often sparked by communicating with people different from ourselves. Judgmental attitudes amongst farmers towards “risky” innovators also inhibit potential innovation. As a locally-focused program with a diversity of farmer contacts, Extension is uniquely positioned to overcome differences. This can include facilitating inclusive, diverse discussions, such as our focus groups, which many farmers valued as an opportunity to interact with other farmers in their area that they do not normally see. By including farmers in the research process, Extension can encourage adaptation of innovations to best fit the needs and existing structure of the farms they serve.

## **Limitations and Future Research**

### **Organic/Conventional Divide**

One of the limitations of studying regenerative farming is the tendency in the literature to uphold the division between conventional and organic. Traditionally, both in the literature and in policy measures, production practices have been categorized as either “organic” or “conventional.” We believe that this dichotomy is too simplistic: many farms that are organic maintain practices such as monocropping, which depletes the soil, and many conventional farms practice techniques such as no-till, which helps to maintain soil structure and sequester carbon. Instead, we argue that production practices fall on a spectrum of regenerative to non-regenerative. More work must be done to focus on specific production practices and impact, such as low tillage to build soil structure or crop rotation to promote soil health, to delineate where a farming model falls on a regenerative spectrum.

In our study, we also observed the dichotomy between conventional and organic within farmer networks and markets. This rift served to weaken support structures and the flow of information by delineating certain types of information or production practices for conventional or organic. Communication does not flow in between these groups. Therefore, when determining a system of farming practices for a carbon-constrained world, we must move beyond the conventional/organic categorizations,

and instead focus on building a system of appropriate practices that are regenerative to the land and community as a whole.

## **Extension**

While we identify areas where changes could improve Extension's efficacy, more detailed policy recommendations to Extension would be helpful in creating effective change and answering how Extension can promote regenerative agriculture. Extension differs hugely from state to state and in order to understand the effect of geography, state budget, cultural trends, and population, it would be helpful to study Extension in many different locations. In addition, a more in depth historical analysis of the evolution of Extension, in the context of changes in American agriculture would provide insight into how Extension has dealt with crises in the past in order to understand how they should be addressing climate change today.

It would also be beneficial to study other boundary organizations, with different funding sources and missions and of varying size, in order to understand what makes Extension unique. As Extension continues to experience budget cuts, collaboration with other boundary organizations is becoming key to its continued survival and relevance. Just as a healthy information network consists of all sorts of farmers interacting, so too should all sorts of boundary organizations be working in collaboration.

## **Focus Groups**

As individuals, we believe Extension does not only have the opportunity to promote regenerative agriculture, but that it should be doing so, an underlying assumption in the project. We, as researchers, all came into this project from different backgrounds and thus carry different biases. At the start of focus groups we introduced ourselves as young, Environmental Studies majors from Carleton College with experience in hands-on farm work as well as research and policy projects. Just as these social identities surely influenced the scope of this project, they may have also influenced the tone of the focus groups and the trajectory of conversation.

As part-time residents in southern Minnesota, we lacked the established personal connections that could have enabled us to ensure a representative sample of farmers attended the discussions. We

discovered that small, diversified, direct market farms tended to list their emails online or have their own website, which was our most successful method of “snowball” outreach. As a result, these types of production were over-represented in our discussions. We talked to people who are already integrated into information networks and therefore were easy to reach. Our focus group compositions are a reflection of our shortcomings in outreach and also confirm characteristics of the adopter groups. In total we identified six participants as early adopter or early majority, groups which are characterized as “integrated into social networks” while we only spoke to three innovators/laggards--groups that are characterized as “isolated.” Corn and soy farmers were notably underrepresented in our study given our study areas. We had difficulty contacting large corn and soy farmers because without personal connections or Internet networks, we attempted to make contact through cold calls, often on the family farm’s home answering machine, with little luck of response.

The small size of our focus groups meant we could only draw conclusions about these specific farmers. Given a larger sample of farmers within a given community, more conclusions could be drawn about the farmer network as a whole and specific innovations could be tracked as they diffused through the network.

## **Diffusion of Innovations Theory**

In an effort to further complicate the theory, it would be interesting to employ our new groups--the secret, transitioning, and fluid adopters--and see if we could identify these roles in future focus group discussions.

As the diffusion of innovations theory is inherently interdisciplinary--taking into account economic, social, environmental, and other factors when determining adopter groups--we did not analyze our focus group data through another disciplinary lens nor did we collect data through a means other than focus groups. We chose this integrative method because it mirrors the decision making process a farmer faces when deciding whether to adopt regenerative practices. This decision process is inherently an integrated, weighing economic, environmental, social, and other factors to varying degrees, so the open-ended questions of our focus group allowed room for participants to fully express their complex decision making processes. For example, employing tools such as GIS to gather data on farmer isolation levels

would certainly help use assign farmers into adopter groups. While we do not mix and then compare different disciplinary methodologies, it could be interesting to go into greater depth about each of these decision making factors--economic, environmental, social, etc.—through their traditional lenses.

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We would also like to thank all of our peers, both within the ENTS major and without, who have taken the time to discuss our project and give us feedback. Thank you to the ENTS major for helping fund this experience.

# Appendices

## I. Discussion Questions

Below is an example of the questions and an explanation that we sent along with them. Questions in bold are ones that we focused on during focus groups.

*Dear Participant,*

*We are a group of undergraduate Environmental Studies majors from Carleton College in Northfield, Minnesota and we are conducting research on information structures amongst local farmers in your area.*

*As researchers, we are examining the forces behind how farmers decide their production methods. We are attempting to look at how the Cooperative Extension Services of Land Grant Universities (like the University of Minnesota) fit into broader information structures that influence a farmer's production decisions. We wish to identify what core factors motivate your production decisions and what factors influence you to make changes to your production system. In order to understand these factors, we would like to learn about the details of your operation as well as the philosophy you used to determine your production system.*

*We would like to invite you to participate in a group discussion with other farmers in your area. After each producer introduces their core practices and principles, we will have a discussion based off of the questions listed below.*

*Thank you so much for your time! We look forward to hearing from you.*

*Megan Brant, Rose Cherneff, Lindsay Guthrie, and Courtney Halbach  
Carleton College, Class of 2013  
Environmental Studies- Food and Agriculture Majors  
[Megan or Rose's Contact Information]*

### Questions

***Why do you farm?***

***Describe your production, how you got to where you are today, current operations, and long term plans.***

*What are the strongest and weakest aspects of your operation?*

*How do you minimize production risks?*

*What social structures support and/or influence your production methods?*

***What factors (social, environmental, economic, cultural, etc.) influence your production methods?***

*Who do you consult for day to day production related questions and problems?*

***What is the nature of your communication with your extension agency?***

*Do you have contact with your county extension office? If yes, in what context?*

*Do you have contact with your regional extension office or University of Minnesota Campus? If yes, in what context?*

*What role do you see extension agencies playing in your production ideally?*

*How do government and agricultural policies affect your operation and decision making?*

***Where do you hear about new technologies and practices?***

***What factors influence your decision to adopt a new technology or practice?***

*Amongst your peers, are you often one of the first, middle, or last to adopt a new practice or technology?*

## II. Transcribing and Preliminary Notes

We split up each discussion group recording into four sections (20 minutes each for Stearns County, 25 minutes each for Rice County) and each took one of the sections to transcribe. We entered our transcriptions into a collective googledoc for all of us to access.

Next we each read through the transcript and made preliminary notes of recurrent themes and any data of interest. After this we came together and went through our notes to develop formal coding categories. Our coding categories identify bodies of information necessary to answer our research question. The categories that we used were:

- 1) Successful production practices
  - Techniques or innovations that a farmer deemed successful
- 2) Unsuccessful production practices
  - Techniques or innovations that a farmer deemed unhelpful
- 3) Adopter category characteristics
  - Statements that reveal an aspect of the farmer's personality, background, or production that may aid in placing that farmer in an adopter group
- 4) Good information resources
  - Information sources that the farmer uses and finds helpful
- 5) Bad information resources
  - Information sources that are problematic for the farmer
- 6) Extension pro statement
  - Statements about something good that Extension does. Identifying these statements will help us see which farmers/adopter groups utilize Extension and find it helpful.
- 7) Extension critique
  - Statements critiquing Extension, either reasons that the farmer doesn't use or trust Extension, or areas that Extension could improve to better serve the farmer. Identifying and analyzing these statements will help us see which farmers/adopter groups do not use Extension, why, and communication tactics that would better serve their needs.
- 8) Metanetwork +
  - Statements in which the farmer says something positive about the focus group itself. For example, if participants suggest getting together again and repeating the discussion.
- 9) Metanetwork -
  - Statements in which the farmer says something negative about the focus group itself. For example, if participants clash over a certain issue and discussion becomes tense.
- 10) Motives/Ethics
  - Reasons that farmers identify for continuing the occupation of farming and for uses the practices that they do. In addition to the Adopter Category Characteristics category, this category will help us place farmers into adopter groups.

### III. Figures

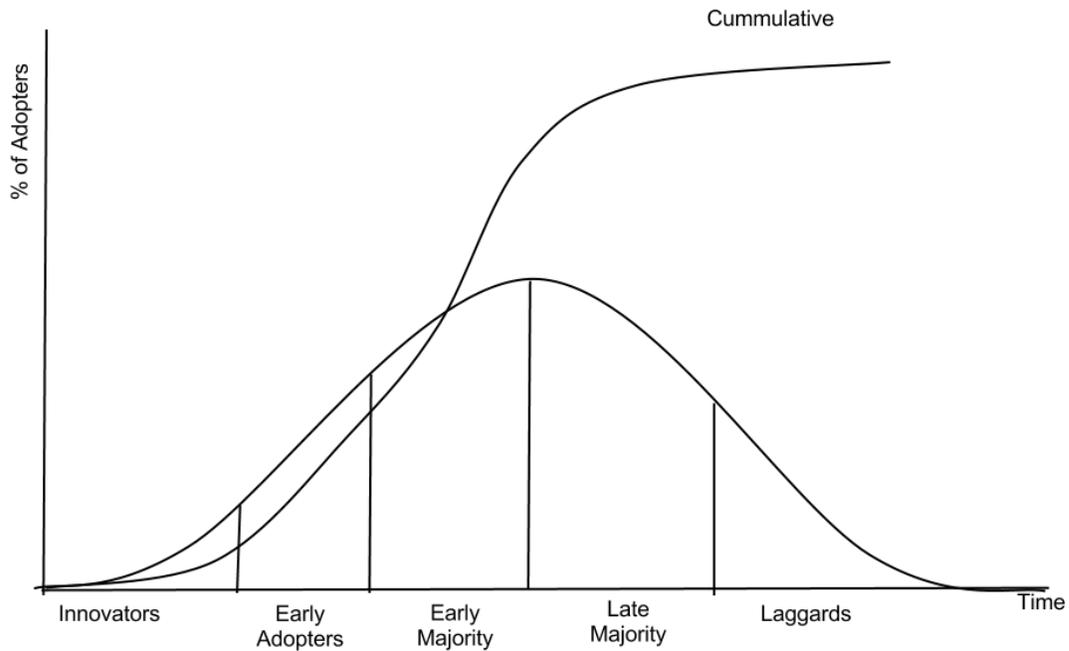
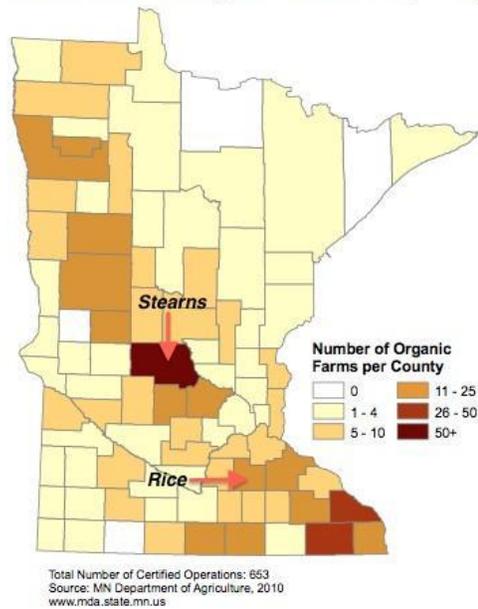


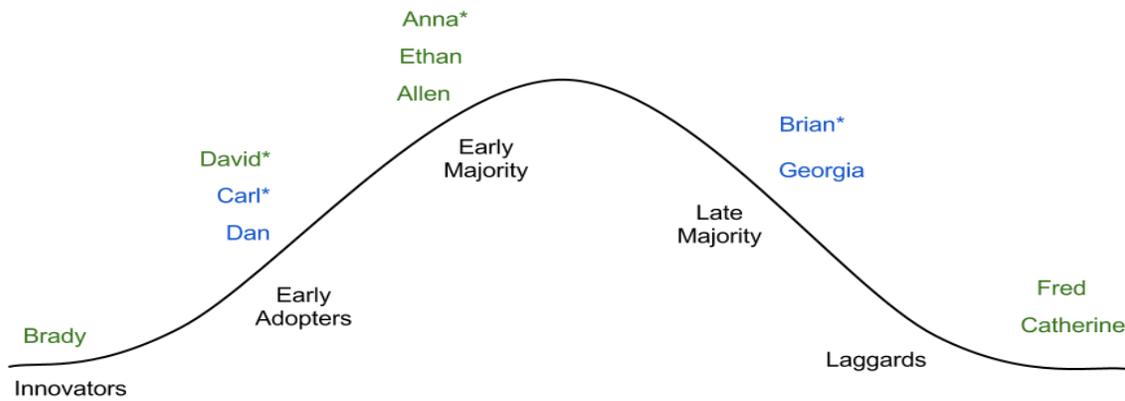
Figure 1: Adoption phases, adapted from Rogers (1983).

**Figure 1:** Adoption phases in diffusion of innovation theory, adapted from Rogers (1983).

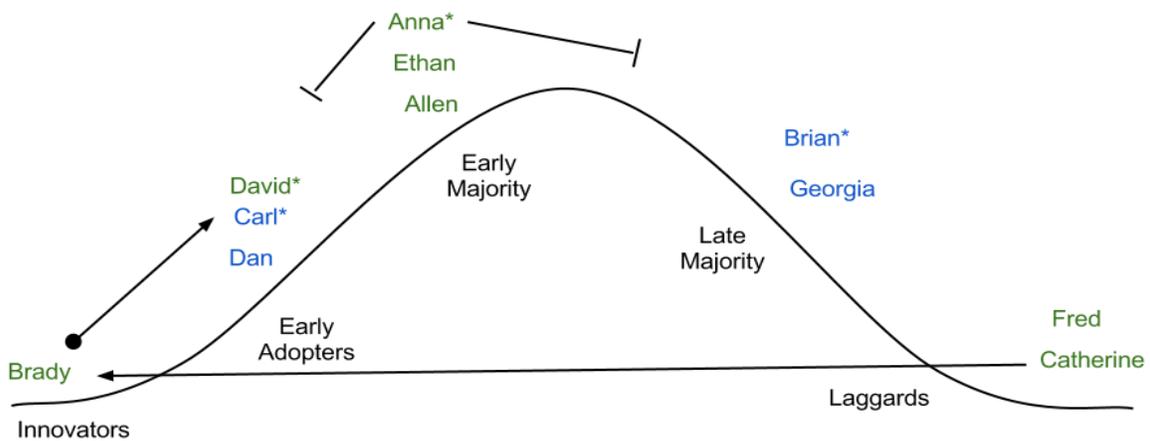
**Location of Certified Organic Farms in MN, by County**



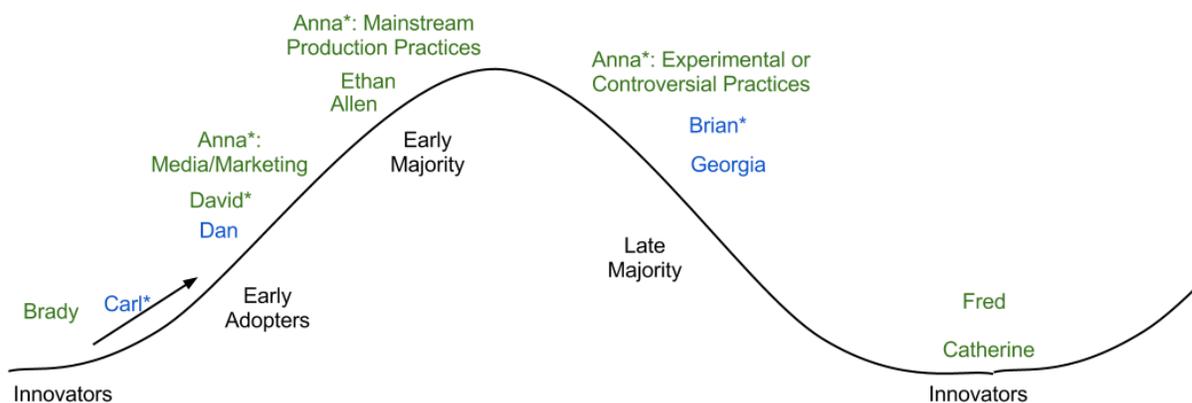
**Figure 2:** Depicts the number of certified organic farms per county in Minnesota with Stearns County having over 50 and Rice having between 11 and 25 organic farms. (Moynihan, 2010)



**Figure 3:** Adoption Curve 1, Adopter groups along the curve, based on Roger’s (1983) adoption categories. Green farmers mostly use regenerative practices and blue mostly use high-input practices. \*Rice County farmers.



**Figure 4:** Adoption Curve 2, this adoption curve refers to the modifications of groups reveals through the analysis.



**Figure 5:** Adoption Curve 3, this adoption curve indicates where farmers sit on our amended curve taking into account how our results challenged the traditional diffusion of innovation theory. Transitioning, Carl sits between two adopter groups, while Anna is three. Instead of being laggards, Fred and Catherine are innovators on the next innovation curve.

## Bibliography

- "About Extension: Creating Stronger Minnesota through Education and Research." University of Minnesota. Last modified 2013. Accessed February 10, 2013. <http://www1.extension.umn.edu/about/>.
- Allen. Interview by the authors. St. Cloud, Stearns County, MN. January 15, 2013.
- Anna. Interview by the authors. Northfield, Rice County, MN. January 22, 2013.
- Blobaum, R. "Barriers to conversion to organic farming practices in the midwestern United States." *Environmentally Sound Agriculture* (1983).
- Bookchin, M. "What is Social Ecology?" In *Environmental Philosophy: From Animal Rights to Radical Ecology*, edited M.E. Zimmerman, 354-374. New Jersey: Prentice Hall, 1993.
- Brady. Interview by the authors. St. Cloud, Stearns County, MN. January 15, 2013.
- Brian. Interview by the authors. Northfield, Rice County, MN. January 22, 2013.
- Carl. Interview by the authors. Northfield, Rice County, MN. January 22, 2013.
- Cash, D.W. "In Order to Aid in Diffusing Useful and Practical Information: Agricultural Extension and Boundary Organizations." *Science, Technology, & Human Values* 26, no. 4 (2001): 431-53.
- Catherine. Interview by the authors. St. Cloud, Stearns County, MN. January 15, 2013.
- Dan. Interview by the authors. St. Cloud, Stearns County, MN. January 15, 2013.
- David. Interview by the authors. Northfield, Rice County, MN. January 22, 2013.
- Davies, M.B., *Doing a Successful Research Project*. New York: Palgrave Macmillan, 2007.
- Davis, J., J. Daniel, J. Dyer, S. Hine, D. Lamm, B. Mailander, and D. Thilmany. "Establishing Dialogue Between Alternative Agricultural Producers and the Land-Grant University in Colorado." *SARE* (2005).
- Diederer, P., H. van Meijl, A. Wolters, and K. Bijak. "Innovation Adoption in Agriculture: Innovators, Early Adopters and Laggards." *Cahiers D'économie et Sociologie Rurales* (2003).
- Dobbs, T., and J. Madden. "The Role of Economics." In *Sustainable Agricultural Systems*, edited by C.A. Edwards, 1987.
- Dobbs, T.L., and J.D. Smolik. "Productivity and Profitability of Conventional and Alternative Farming Systems: A Long-term, On-farm Paired Comparison." *Journal of Sustainable Agriculture* 9, no. 1 (1996): 63-79.
- Donnelly, Mike. Interview by the authors. Faribault, MN. January 24, 2013.
- Ethan. Interview by the authors. St. Cloud, Stearns County, MN. January 15, 2013.
- Fred. Interview by the authors. St. Cloud, Stearns County, MN. January 15, 2013.
- Georgia. Interview by the authors. St. Cloud, Stearns County, MN. January 15, 2013.

- Guston, D.H. "Stabilizing the Boundary Between Politics and Science: The Role of the Office of Technology Transfer as a Boundary Organization." *Social Studies of Science* 29, no. 1 (1999): 87-112.
- Hanson, J.C., and W.N. Musser. "An Economic Evaluation of an Organic Grain Rotation with Regards to Profit and Risk." Working Paper. University of Maryland Department of Agricultural and Resource Economics (2003): 3-10.
- Hightower, J., *Hard Tomatoes, Hard Times*. Cambridge: Schenkman, 1978.
- Lapple and Rensburg. "Adoption of Organic Farming: Are There Differences Between Early and Late Adoption?" *Ecological Economics* 70 (2011): 1406-1414.
- LaSalle, T., and P. Hepperly. "Regenerative Organic Farming: A Solution to Global Warming." Rodale Institute (2008).
- Leeuwis, C., *Communication for Rural Innovation: Rethinking Agricultural Extension*. Oxford: Blackwell Science, 2004.
- Moynihan, Meg. *Status of Organic Agriculture in Minnesota: A Report to the Minnesota Legislature*. Minnesota Department of Agriculture, 2010.
- Padel, S. "Conversion to Organic Farming: A Typical Example of the Diffusion of an Innovation?" *Sociologia Ruralis* 40 (2001): 40-61.
- Padel, S. "Values of Organic Producers Converting at Different Times: Results of a Focus Group Study in Five European Countries." *International Journal of Agricultural Resources, Governance and Ecology* 7 (2008): 63-77.
- Perry, S. "'It's like We're Losing Our Love': Documenting and Evaluating Social Change in Bradford County, PA During the Marcellus Shale Gas Boom (2009-2011)." (2011).
- Pimentel, D., P. Hepperly, J. Hanson, D. Douds, and R. Seidel. "Environmental, Energetic, and Economic Comparisons of Organic and Conventional Farming Systems." *BioScience* 62 (2005): 573-582.
- Putnam, F.D., *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton: Princeton University, 1993.
- Rasmussen, W.D., *Taking the University to the People: Seventy-five Years of Cooperative Extension*. Ames: Iowa State University, 1989.
- "Research More Farmers through Ag Professionals." University of Minnesota. Source. Last modified 2013. Accessed February 23, 2013. <http://www.extension.umn.edu/source/winter-2013/reaching-more-farmers-through-ag-professionals/>.
- Rogers, E.M., *Diffusion of Innovation*. New York: The Free Press, 1983.
- Ryan, B., and N.C. Gross. "The Diffusion of Hybrid Seed Corn in Two Iowa Communities." *Rural Sociology* 8 (1943): 15-24.
- Sassenrath, G.M., J.M. Halloran, D. Archer, R.L. Raper, J. Hendrickson, P. Vadas, and J. Hanson. "Drivers Impacting the Adoption of Sustainable Agricultural Management Practices and Production Systems of the Northeast and Southeast United States." *Journal of Sustainable Agriculture* 34 (2010): 680-702.

Seevers, B., D. Graham, J. Gamon, and N. Conklin. *Education through Cooperative Extension*. Albany, NY: Delmar, 1997.

Stephenson, G. "The Somewhat Flawed Theoretical Foundation of the Extension Service." *Journal of Extension* 41, no. 4 (2003).

Swisher, M., C. Gardener, and M. Swisher. "Facilitating Farmer to Farmer Networks: An Experimental Approach." *SARE* (1999).

Thompson, P., *Agricultural Ethics: Research, Teaching, and Public Policy*. Ames: Iowa State University, 1998.

"History and Mission." University of Minnesota. Last modified 2012. Accessed February 2013. <http://www1.umn.edu/twincities/history-mission/index.html>.

Walthall, C.L., J. Hatfield, P. Backlund, L. Lengnick, E. Marshall, M. Walsh, S. Adkins, M. Aillery, E.A. Ainsworth, C. Ammann, C.J. Anderson, I. Bartomeus, L.H. Baumgard, F. Booker, B. Bradley, D.M. Blumenthal, J. Bunce, K. Burkey, S.M. Dabney, J.A. Delgado, J. Dukes, A. Funk, K. Garrett, M. Glenn, D.A. Grantz, D. Goodrich, S. Hu, R.C. Izaurralde, R.A.C. Jones, S-H. Kim, A.D.B. Leaky, K. Lewers, T.L. Mader, A. McClung, J. Morgan, D.J. Muth, M. Nearing, D.M. Oosterhuis, D. Ort, C. Parmesan, W.T. Pettigrew, W. Polley, R. Rader, C. Rice, M. Rivington, E. Roskopf, W.A. Salas, L.E. Sollenberger, R. Srygley, C. Stöckle, E.S. Takle, D. Timlin, J.W. White, R. Winfree, L. Wright-Morton, L.H. Ziska. 2012. "Climate Change and Agriculture in the United States: Effects and Adaptation." *USDA Technical Bulletin 1935* (2013): 1-186.

Werner, D. Interview by the authors. Northfield, MN February 15, 2013.

Ye, S. *Minnesota Agricultural Profile*. Minnesota Department of Agriculture, 2012.

Zilberman, D., and L. Lipper. "Sustainability and Information." In *Sustainability in Agricultural and Rural Development*, edited by G.E. D'Souza and T.G. Gebremedhin, 193-216. Ashgate Publishing, 1998.