The Pennsylvania State University
The Graduate School
College of Agricultural Sciences

INTERSECTIONS OF KNOWLEDGE, NEW INFORMATION TECHNOLOGIES, AND IDEAS OF GOOD FARMING IN SOUTHEAST PENNSYLVANIA AND NORTHWEST ITALY

A Thesis in
Rural Sociology
and
International Agriculture and Development

by
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ABSTRACT

Farms are spaces embedded in variable social and bio-physical contexts that are dynamic and patterned, shaping how farmers manage their operations. Farmers must continually adapt their practices as farm context changes. This thesis explores how farmers understand the social and biophysical contexts of their farms in relation to their: 1) views on and experiences with diverse sources of knowledge including information communication technology (ICT), local knowledge, and agricultural advisors, and 2) perceptions of good farming. Both topics were explored through empirical research based on semi-structured qualitative interviews conducted with 17 grain farmers and four agricultural advisors in southeastern Pennsylvania, and three focus groups conducted with grain farmers in northwest Italy. Located in close proximity to one another, the Pennsylvania farmers varied in terms of age, views about chemical use and soil management, and farm size. The Italian farmers were all members of farming cooperatives that made decisions about production and marketing collectively. Findings from data collection are organized as three distinct manuscripts in this thesis.

The first manuscript (Paper 1) considers how grain farmers and agricultural advisors in southeastern Pennsylvania describe different sources of knowledge in farming in light of growing use of ICT and concerns over the sustainability of agriculture. Traditionally, farmers’ reactions to technology in agriculture have been studied through an approach with a pro-innovation bias that prioritizes scientific knowledge. Paper 1 departs from this approach to consider the interplay of local knowledge, knowledge exchange between farmers and their advisors, and ICT as a knowledge source for farmers. The study found that participants used knowledge about their own farms and knowledge from their neighbors to make farming decisions. Additionally, while some farmers co-produced knowledge with an agricultural advisor, others expressed a greater dependence on their advisors to make decisions. In relation to ICT, farmers had mixed views about its convenience, and a few expressed concern that greater use of ICT for farming could replace farmers’ human knowledge and skills. Some viewed ICT as less relevant to older farmers; however on the contrary, a few older farmers discussed their desires and efforts to use ICT. The findings suggest that to promote sustainable agriculture, developers of information technologies must identify creative approaches to designing ICT, as well as take into account the different sources of knowledge farmers consider when making decisions.

The second manuscript (Paper 2) takes a lifeworld approach to consider how Pennsylvania farmers’ past experiences, stocks of knowledge, and interpretations of how others farm shape their understandings of good farming. Farmers’ own ideas about good farming are important because of their potential to complicate typically compartmentalized and competing labels such as “alternative” versus “conventional” farming. Findings centered on three primary themes: becoming a good farmer, displaying good farming, and typical perceptions about good farming. One implication of this research is that agricultural paradigms such as alternative and conventional prove difficult to apply at the individual farm level, as farmers meanings of good farming are embedded in their lifeworld, making them complex, dynamic, and sometimes uncertain.
The final manuscript (Paper 3) offers an international comparative perspective on the broad topics explored in Paper 1 and Paper 2. It is based on data from three focus groups conducted with a total of 19 members of farming cooperatives in northwest Italy. Relevant to the topic of diverse sources of knowledge and ICT, main themes included the importance of farming cooperatively and the general absence of smartphone usage by these Italian farmers. The Italian farmers viewed use of ICT as less relevant to farming than some Pennsylvania farmers who viewed it as inevitable. Farmers in both countries shared local knowledge with their farming neighbors; however, the Italian farmers described themselves as highly dependent on one another, especially in being members of cooperatives. In terms of good farming, salient themes expressed by the Italian farmers included the importance of passion and displaying good farming through farm appearance for others to see. In large part, the Italian farmers’ views of good farming were similar to those of the Pennsylvania farmers.
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CHAPTER 1

Introduction

Thesis Overview

Farms are embedded in variable social and bio-physical contexts, which shape how farmers manage their operations. The social and bio-physical contexts of farms are patterned, but also dynamic, so that farmers must continually adapt their practices as farm context changes. Examples of these changing contextual factors include governing regulations, climate, consumers’ expectations, and culture. This thesis explores how farmers’ understand the social and biophysical contexts of their farms in relation to their views on and use of selected technologies and practices in farming. Two broad topics are examined in this thesis: 1) farmers’ experiences with and attitudes about diverse sources and forms of knowledge including knowledge generated by modern information communication technologies (ICT), and 2) farmers’ perceptions of good farming.

This thesis contains two stand-alone papers that are structured as academic journal articles and a third paper that offers an international comparative perspective. Paper 1 explores farmers’ attitudes about different sources and forms of knowledge that are generated locally, by agricultural advisors including Extension educators and crop consultants, and through information communication technologies such as smartphones and laptops. Paper 2 explores how farmers perceive what it means to practice good farming, a concept informed by culture and identity. Paper 3 is a descriptive report based on findings from three focus groups that were conducted in northwest Italy. Participants of the focus groups were grain farmers who were members of farming cooperatives.
The format of this thesis arose from my having the opportunity to conduct qualitative research with Pennsylvania grain farmers as part of my graduate research assistantship, while also being given the flexibility to pursue my individual academic interests. With the exception of Paper 3 that includes data collected in Italy, the two primary papers are based on qualitative data collected in Pennsylvania with a sample that included 17 grain farmers and four agricultural advisors.

This introductory chapter explains how local knowledge as related to information communication technology and good farming were selected as the two central topics for study. It also provides a fuller background on the study area, and establishes the relevance of information communication technology and meanings of good farming for research addressing sustainable agriculture.

**Approaches to Sustainability in Agriculture**

While the use of ICT in agriculture and ideas of good farming are outwardly two very different topics, developing a deeper understanding of both can progress efforts directed toward greater sustainability in agriculture. Before discussing how ICT and ideas of good farming contribute to sustainable agriculture, it is important to explore how the term *sustainability* is conceptualized in the sustainability literature, and which conceptualization underlies this thesis. The United Nations World Commission on Environment and Development (WCED) report published in 1987, *Our Common Future*, is cited overwhelmingly in the sustainability literature, defining *sustainable development* as “development that meets the needs of the present without compromising the ability of future generations to meet their needs” (WCED 1987:43). After
appearing in this report, this broad definition sparked further efforts to define, conceptualize, and provide indicators for both sustainable development and sustainability more generally.

Many basic frameworks of sustainability are variations of the three-legged stool approach that encompasses economic, social, and environmental or ecological sustainability (Young 1997). The idea of the stool model is that if all three legs of a stool are not of similar proportion and weight, the stool becomes unbalanced and cannot support the task for which it is intended. Some argue that the three-legged stool approach is problematic because the three dimensions of sustainability it includes are in fact not equal, and are sometimes embedded within each other. For example, Dawe and Ryan (2003) argue that the economy and social well-being should not be treated as equal to the environment because neither the economy or social well-being would even be possible without the environment as the space within which humans exist. For Allen and Sachs (1992:34), “…nonsustainability is found in the social and economic organization of society in general, replicated and reinforced in agriculture.” In the same vein as Allen and Sachs (1992), others describe social sustainability as the “missing pillar” (Boström 2012) in approaches to sustainability initiatives, pointing to the frequent neglect to address social infrastructure, social capital, and social justice (Cuthill 2009), as well as human well-being, equity, and democracy (Magis & Shinn 2009; Scott 2012). Becker (2012) contributes an ethical approach to the sustainability literature, describing sustainability on the basis of relationships between an individual and other people, future generations, and nature. From a for-profit perspective, corporations seeking to address sustainability through the triple-bottom-line, transcend the traditional corporate perspective that profit is the sole bottom line (Dyllick and Hockerts 2002).

The seemingly endless approaches to sustainability vary significantly and some even view the word sustainability as nothing more than an overused buzzword. According to
Engelman, “We live today in an age of sustainababble, a cacophonous profusion of uses of the word sustainable to mean anything from environmentally better to cool” (2013:3). Because its meanings are so varied, it is important to define sustainability as it relates to agriculture in this thesis. Thus, the underlying definition guiding this thesis is: “A sustainable food and agriculture system is one which is environmentally sound, economically viable, socially responsible, nonexploitative, and which serves the foundation for future generations” (Allen et al. 1991:7). This definition considers the three pillars outlined in the stool model, while highlighting the ethical dimension of sustainability. Additionally it labels sustainable agriculture as being socially responsible, suggesting that it has the capacity to address social problems. This research seeks to provide insight to this definition of sustainable agriculture by exploring intersections of knowledge, new information technologies, and understandings of good farming.

**Paper 1 Background**

The exploration of farmers’ use of ICT in this thesis was motivated through my assistantship work on the research project, *Enhancing Adoption of Web-based Pest Prediction Systems: The Case of Barley Yellow Dwarf Virus*, with the Pennsylvania State University’s Entomology Department. Funded by the United States Department of Agriculture’s National Institute for Food and Agriculture (USDA-NIFA), the project sought to develop a smartphone application that would allow farmers, crop consultants, and Extension educators to predict the presence of an aphid carrying Barley Yellow Dwarf Virus (BYDV), a disease that can reduce a farmer’s yield by up to 58 percent, as well as diminish grain quality (Riedell et al. 1999). A main objective of the project is to model the crop-vector-virus system to provide farmers and advisors with information that can help them make pest management decisions. The information will be
location-specific and be delivered via the internet to users of computers and smartphones. The goal of the information system to is promote an Integrated Pest Management (IPM) approach by maintaining crop yield and profitability while reducing overuse of pesticides. The following section provides a rationale for the technology being developed through the BYDV project by presenting background on the history of pesticide use in the United States (US) and highlighting how pesticide overuse challenges sustainable agriculture.

A Brief History of Pesticide Use in the United States

It is estimated that about 500 million kilograms of pesticides are used in agriculture in the US annually, costing about $10 billion and leading to continuing negative effects on human health and the environment (Pimental 2009). Pests, or organisms that cause damage to crops, have always posed a significant challenge to agricultural production. The nature of pest control, which is “…the set of actions taken to avoid, attenuate, or delay the impact of pests on crops…” has changed over time (Kogan 1998:244). Before the introduction of chemical controls in the late-1800s, methods requiring ecological and cultural knowledge such as crop rotation and strategic planting dates were universally used by farmers (Pimentel 2009; Osteen and Livingston 2006). At the start of the 20th century, synthetic pesticides using elements such as arsenic and mercury were developed and during World War II, DDT was used to control tropical insect-transmitted diseases such as malaria and typhoid (ATSDR 2002; Smith and Kennedy 2002). In the 1960s, DDT was commonly used as an insecticide in agriculture until it was banned for its harmful effects on human health and the environment. From the 1970s to 1990s, pesticide use was the primary, and often solely utilized method for pest control. The availability of chemicals
diluted the need for farmers to develop and maintain ecological knowledge for farming and thus changed the connection farmers had with their land.¹

Agriculturalists eventually came to realize that while pesticide application offered short-term benefits through direct crop returns, it also had significant negative health, environmental, and ecological impacts. First, harmful health effects on humans, such as neurological and reproductive effects, and cancer, have been associated with pesticide exposure (Harrison 2011). In the US, it is estimated that 10,000 to 15,000 cases of cancer linked to pesticide exposure occur per year (Pimentel 2009). Pesticide residue on produce is also a problem. Researchers found that in a sample of eight types of fruits and 12 types of vegetables, 73 percent had traces of pesticides (Baker et al. 2002). Second, chemicals applied to fields often kill non-target insects, eliminating the ecological services that beneficial insects provide. For instance, pesticides are commonly toxic to honeybees leading to reduction in pollination, a service that improves crop quality and yield. Additionally, eradication of an insect population may result in an outbreak of a secondary pest population, which is then treated with yet another pesticide application. Resistance is also an issue that farmers face. Pests eventually become tolerant to pesticides, which pushes the farmer to use increasing amounts of pesticides until they are no longer effective. In both cases pesticide use becomes cyclical and the chemicals end up perpetuating the problem that they are attempting to fix. Excessive use of pesticides also has detrimental environmental impacts, particularly on groundwater and water quality. According to Brewer and Goodell (2012:45), “Between 1992 and 2001, pesticides were detected in nearly 90% of the streams and rivers surveyed in the United States. Pesticides in water and riparian sediment presented a risk to aquatic invertebrates, fish, and humans.” Pesticides can contaminate groundwater as well, posing another risk to human

¹ It is important to note here that not all farmers began to use chemicals and not all farmers were affected in the same way.
health since groundwater is a main water source for one half of the world population (Pimentel 2009). While pesticides have saved farmers billions of dollars in crop damage, a concern is that these specific economic gains may not outweigh wider long-term negative impacts to human health and the environment.

During the 1970s, integrated pest management, commonly known as “IPM,” emerged as a method of pest control (Altieri 1989). IPM addressed negative impacts of pesticides through its premise of using the least amount of pesticides possible and integrating non-chemical measures to combat pests. Prior to IPM, pesticides were often used unsparingly and many farmers conducted their sprayings on a fixed schedule, rather than assessing the ecological conditions of their fields and tailoring and timing the application accordingly. The early framework of IPM called for farmers to reconnect to their land in order to implement biological, ecological, and cultural controls, rather than chemical ones, on their farms. Brewer and Goodell refer to this approach as a “holistic perspective” that was:

…based on using multiple strategies and monitoring activities that provided benefits across pest complexes, environmental quality concerns, and farm and regional scales. This advanced level of IPM required a greater knowledge base of agroecology, expanded community involvement, and new forms of incentives. (2012:44)

The organization Appropriate Technology Transfer for Rural Areas (ATTRA) refers to this approach as “biointensive IPM.” In biointensive IPM, focus rests on using biological controls. This requires farmers to recall the specialized knowledge relied upon during the pre-WWII era, but largely subordinated thereafter. Examples of biointensive knowledge include knowing where a pest came from, how it arrived to the farm, and why a natural predator is not controlling the population (Dufour 2001).
A second approach to IPM eventually developed which placed greater emphasis on market-based costs and values and offered little attention to the integration of ecologically-based methods. According to Dufour, this second approach “has strayed from its ecological roots” and places an “emphasis on using pesticides as a tool of first resort” (2001:2). Kogan concurs with these observations, stating “contemporary IPM programs, including some of the most successful, have been implemented with little consideration of ecosystem processes” (1998:249). The IPM approach uses a mathematically calculated economic threshold to determine the point at which pest damage would cost the farmer if he or she did not spray. Ecological, cultural, and biological knowledge are less central within this IPM approach—rather, farmers who rely primarily on pesticides to grow crops depend on pesticide labels and certified pest control advisers to know when and how to apply the chemicals to their fields (Vandeman 1995; Harrison 2011). In the case of the USDA-NIFA project, through the appropriate development and use of a smartphone application that encourages cultural methods to pest control, aphids could be controlled with fewer pesticides and save farmers money.

The Barley Yellow Dwarf Virus Project and Integrated Pest Management

The smartphone application developed through the USDA-NIFA project was designed as a decision support system (DSS) to assist users with solving highly specialized problems (Lynch, Gregor, and Midmore 2000). The output of the DSS is based on a dependency network that, …is typically used to graphically depict logical relationships between data and conclusions, and hence provide useful shorthand for representing the heuristics of a domain expert during the knowledge elicitation process. In this approach, the goal (i.e. the conclusion) is reached by following paths leading from observations (i.e. data) through the logical connectors (e.g. AND or OR) between and among those observations (Saunders et al. 2005:48).
For the USDA-NIFA project, the goal of the DSS is to predict the risk of aphids carrying BYDV in farmers’ fields and assist farmers with making decisions about managing aphids. One management technique is shifting the planting date of winter wheat.² Strategically planting a crop at a certain time in relation to weather or an insect’s life cycle can be a cultural control for pest management and a alternative to using pesticides. The component of the DSS that assists with making planting decisions about winter wheat advises farmers to either delay planting or to plant immediately and is based on several dependency networks. Examples of data that the DSS uses include: current weather conditions for aphid development; time until migration peak based on suction trap observations; average aphid counts in previous years; average BYDV presence in crop in previous years; average yield loss from BYDV in previous years; and whether or not resistant seeds were planted such as those that are treated or genetically modified. This input data was derived from aphid population predictions or from farmers’ responses to DSS queries. In order to explore whether or not farmers were interested in a DSS that could be accessed through ICT, such as a smartphone, sociological expertise, which I provided, was incorporated into the project to explore how farmers perceive this type of technology. The research question guiding this portion of my work for the project was: how do farmers with varying backgrounds who all grow grain in southeastern Pennsylvania perceive the use of different sources of knowledge for making farm management decisions?

**Paper 2 Background**

In Paper 2, my interest in studying how farmers perceive *good farming* was inspired by Michael Bell’s (2004) agricultural ethnography, *Farming for Us All*. For ten years, Bell and his

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² This series of dependency networks is based on the work of Joseph Walls, a graduate student in Entomology at The Pennsylvania State University, with an assistantship also funded by the BYDV project.
colleagues conducted an ethnographic study about a farmer-led organization with a mission to support farmers in Iowa interested in practicing sustainable agriculture. The objective of the study was to understand why more farmers do not transition to sustainable farming practices. Bell argued that a main reason why farmers do not change their farming practices to be more sustainable is related to knowledge and identity. A key conclusion of the study is that for agriculture to be sustainable, it must be dialogic, meaning that “the broadest possible conversation about agriculture” is sustained (2004:250). More specifically, the differences contained in categories such as “industrial agriculture” and “alternative agriculture” should not overshadow similarities and opportunities for learning. Bell (2004:24) wrote that, “It is tempting to put industrial agriculture (and modernism) on one side of the line, and local knowledge (and postmodernism) on the other side. But this is a temptation we should resist, or where it already exists, seek to overcome.” The conclusion was based on the farmer-led organization’s belief that sustainable agriculture is fostered through open dialogue and open-mindedness. Bell’s book challenges both conventional and alternative agricultural paradigms (Beus and Dunlap 1990), which are posed as rigid counterpoints to one another.

The second paper of this thesis builds on Bell’s argument that open dialogue is key to fostering an agricultural system that is more sustainable by presenting the differences and similarities existing among farmers in a delimited geographical region related to the idea of good farming. In contrast to Stock (2004) who explored perceptions of good farming solely among organic farmers, this study included a sample of farmers with varying commitments and orientations towards organic, chemical-free and more conventional agricultural practices. This sampling approach was intended to shed light on epistemic barriers (Carolan 2006) and potential similarities existing between farmers who may have very different approaches to farming. A
lifeworld approach, which situates individuals within their past experiences, social relations, and stock of knowledge, was used in this thesis to explore the concept of good farming (Schutz and Luckmann 1973). Drawing on their own lived experience, farmers were encouraged to provide explanations of what they perceived to be good farming. The research question that the second paper addresses is: how do Pennsylvania grain farmers’ individual knowledge and past experiences, as well as their interpretations of other farmers’ practices contribute to their perceptions of being a good farmer and good farming practices?

**Background on Data Collection and Analysis**

Data collection and analysis in both papers were approached with a social constructivist worldview, a commonly used paradigm in qualitative research emphasizing the subjective meanings of experiences. Guba (1990) uses the term *paradigm* to describe what Creswell (2009) refers to as a *worldview*. A paradigm or worldview is “a basic set of beliefs that guides action” and in research the paradigm guides how a study is designed and conducted (Guba 1990:17). According to Creswell, “In other words, they [meanings] are not simply imprinted on individuals but are formed through interaction with others (hence social constructivism) and through historical and cultural norms that operate in individuals’ lives” (2007:21). Social constructivism takes an inductive approach to gathering data. Rather than starting out with a theory and testing it, a social constructivist will explore a research question by assuming that meanings are based on cultural and social contexts. Based on these assumptions, qualitative studies that are conducted with a social constructivist worldview will collect data through open-ended questions and observation of participants within their social environment.
The choice to use qualitative social research methods for this study stems from the nature of the research questions and also complements my own social constructivist worldview. Quantitative methods seek to predict human social behavior by utilizing random sampling techniques and relatively large sample sizes to meet statistical assumptions and rules. If statistical procedures are carried out correctly, findings can be generalized to the population from which the sample was drawn. On the other hand, “…one link among qualitative studies is their rich descriptions or narratives of cultural, emotional, and social life, sometimes in a comparative framework” (Goodwin and Horowitz 2002:33). This study considered the cultural and social contexts, and also compared the perspectives of Italian and Pennsylvania farmers, each with distinct contexts. To understand participants’ social environment, I had an active role in collecting, analyzing, and interpreting data, taking into account fine details to provide rich and descriptive findings (Gillespie and Sinclair 2000). For example, an excerpt from the field notes I took pertaining to the social context of a farmer participant’s interview illuminated his everyday routine interactions with his parents and a neighbor:

Scott’s dad came back into the house and I could hear him rustle some papers in the nearby living room. I then heard a loud doorbell and through a small window on the back door and I could see a man with a bushy beard peer into the house. It was a neighbor who had come to use a baler. At around 11:30 AM, an older woman walked in with a load of plastic bags, appearing that she had just returned from the grocery store. Scott’s dad helped her bring in the bags. She put away the groceries, ran the water, and began frying something in a pan. She told Scott that what she was frying in the pan was for an early dinner since Scott had to leave mid-day to go to someone’s house to do a farm-related task.

Indeed, conducting interviews at participants’ homes and farms helped to deepen my understanding of their experiences. This was particularly important for this study, which focused on the social context of place and region. Being invited into a participant’s home or workspace provided a more personal experience, as I then entered into a significant space within the
participant’s lifeworld. The excerpt below describes the simple, quiet character of a Mennonite home that I entered for an interview:

There was a backyard with a lawn that had a few pieces of children’s play equipment scattered on it. A wall of hedges, about four feet tall, bordered the front of the house and the road. The house appeared quiet with a metal fence that wrapped around the front of the house, and no cars or signs of people inside. Old bicycles scattered throughout the property, one was blue and propped up against the old plain-white painted house few windows. Behind the house was a large hoop house that was offset from the road and a shed with massive pieces of scrap metal and wood stacked in a sloppy heap up against it. Eventually the front door opened, and a woman wearing a long dress that covered her arms and neckline fully stood behind door. She motioned for me to come inside. The length of the house stretched far back and a wooden staircase with knitted blankets and cardboard boxes were piled on a few of the steps. To the left there was a living room that had two lazy boy rockers made of faded fabric and sunken cushions. There was also a two-person loveseat with its back to the front windows and a multi-colored woven rug stuffed under it. Above the entrance of the living room there were bunches of purple grapes decaled above its two rounded corners. The color of the walls was off-white. Sometimes during the interview a truck or tractor would pass the house, which was very close to the road, and the house would rumble. Two of the farmer’s sons sat on the couch reading farming magazines. I would hear and see them point and whisper about the information and pictures on the glossy pages. Across the room, next to their father, was a large, torn cardboard box filled with different magazines. The boys would each look at a magazine for about five minutes and then abruptly dart across the room to the box, vigorously shuffling through for a new one to read.

The passage above demonstrates how qualitative research can provide important context for participants’ interpretations, which lead to richer understandings of the workings of their social setting (Gillespie and Sinclair 2000). Due to the inductive character of this research, findings emerged from the data (participants’ perspectives) rather than a pre-existing theory guiding data collection.

In line with my social constructivist worldview, both the physical and social context of place were viewed as having an important role in how farmers constructed their meanings of the world, whether related to good farming or different sources of knowledge (e.g., ICT). Since social context was important for understanding participants’ experiences and attitudes, data
collection occurred in or was closely connected to participants’ natural social settings (Gillespie and Sinclair 2000). In terms of physical and geographical context, the sample of farmers interviewed for this project resided in southeastern Pennsylvania in the Great Valley Region. Due to its high value of sales in grain production, the original plan was to select a sample of farmers living in the same county. However, one key informant, a publically funded agricultural advisor, recommended focusing the study in one specific area, rather than the entire county, due to its large size and varying topography, which included both steep hills and a relatively flat valley. She suggested selecting a study area stretching across the northeast and mid-north areas of the county because this area was understood by locals as a “neighborhood,” and thus provided the basis for a culture-sharing group (Creswell 2013). Participants described the study area as one dedicated to agriculture, which people there prioritized over extensive real estate and commercial development. One farmer said:

What makes it [the area] unique is just that it is an area where a lot of people have dedicated this area to agriculture. Land preservation is a big thing through this area. Even our horse and buggy Mennonite people have sort of started signing up farms to keep it in agriculture. We don’t have that big pressure of development, you know. I’m one of the supervisors in the township for the last five years, too, and we try to keep it that way. We try to keep more agriculture.

The claim made by the farmer above is consistent with that of the key informant’s that there is a “public pride” in the area for agriculture.

Background on Study Areas

The study area focused on a community existing almost completely within one county, with the exception of two farmers in the study who lived near its border in an adjacent county (see Figure 1 below, where the general location of the Great Valley region is circled). The top
crops produced in the primary study county are corn for grain, hay and haylage, soybeans (for beans), corn for silage, and wheat for grain (USDA NASS 2014a).

**Figure 1. Historical Agricultural Regions in Pennsylvania**

Table 1 (below) presents farm and farmer demographic characteristics, comparing the primary study county, state of Pennsylvania, and the US. Data from the 2012 USDA Census of Agriculture for principal farm operator sex, race (percentage white), and average age were very similar across the primary study county, state and national level. There were large differences between the state of Pennsylvania and the US in terms of average farm size. The average US farm size was more than three times the average farm size in Pennsylvania. Average net cash
farm income for the primary study county was more than twice the average for the state, and about 1.5 times more than the US average.

Table 1. Farm and Farmer Characteristics Compared for Primary Study County, Pennsylvania, and United States

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Primary Study County¹</th>
<th>Pennsylvania¹</th>
<th>United States²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Farms</td>
<td>2,039</td>
<td>59,309</td>
<td>2,109,363</td>
</tr>
<tr>
<td>Average Size of Farm (acres)</td>
<td>115</td>
<td>130</td>
<td>434</td>
</tr>
<tr>
<td>Average Net Cash Farm Income</td>
<td>$64,232</td>
<td>$29,593</td>
<td>$43,750</td>
</tr>
<tr>
<td>Principal Farm Operators by Sex</td>
<td>84.5% Male 15.5% Female</td>
<td>85.7% Male 14.3% Female</td>
<td>86% Male 14% Female</td>
</tr>
<tr>
<td>Principal Farm Operators by Race (%)</td>
<td>98%</td>
<td>99%</td>
<td>92%</td>
</tr>
<tr>
<td>Average Farmer Age (years)</td>
<td>54.5</td>
<td>56.1</td>
<td>56</td>
</tr>
</tbody>
</table>

¹ Source: USDA National Agricultural Statistics Service (2014a)
² Source: USDA National Agricultural Statistics Service (2014b)

Seventeen Pennsylvania farmers were included in the study, with the age of participants ranging from 29 to 71 years and their total acreage of rented and owned farmland ranging from 5.5 to 2,650 acres. One farmer operated a fully certified organic farm, another farmer had some land that was certified organic and the one female farmer in the study said she never used synthetic chemicals in her production. Three farmers in the sample identified as Mennonite.

The use of different sources of knowledge and insights about the values and meanings farmers attach to good farming are important for enhancing the sustainability of agriculture. Understanding how farmers perceive and use different forms of knowledge can contribute to the development of ICT that is more dialogic and likely to encourage open communication between academics, ICT developers, agricultural advisors, and farmers. Understanding diverse perceptions of “good farming” can assist with creating pathways between countering agricultural paradigms.
The last component of this thesis is Paper 3, which offers an international comparative perspective on the broad topics explored in Paper 1 and Paper 2. It is based on data from three focus groups conducted in January 2014 with a total of 19 members of farming cooperatives in northwest Italy (see circled region in Figure 2).

**Figure 2. Regions of Italy**

An excerpt from field notes I made en route to one of the focus groups helps to illustrate the physical context of the rural landscape in northwest Italy:
There is a thin layer of overcast in the sky, a sight that has been common during my visit in Italy. The farm fields appear to be diversified with different crops. Some fields are narrow and rectangular, while others are free-form shapes. I see quite a few fields that appear to be freshly cultivated which is apparent by the large clumps of soil sitting on the fields’ surfaces. We pass some large wheat and barley fields, as well as some maize fields covered with dried stalks that had been left in the fields post-harvest. Crops are not planted in a particular alignment and switch between being planted horizontally and vertically. We pass some small vineyards, diversified fruit and vegetable operations, pear, kiwis, apples, and peaches. From the highway we are able to see the rows and how they are covered with some sort of white protective covering. The trees are mostly bare but some dried leaves still cling to branches. The verdant green grass contrasts with the dull trees. In the distance I can make out the snowy caps of the Alps. We pass a large field with 4-5 long rows of solar panels. Fields that are bright or pale yellow, green, and brown contribute to the diverse quality of the farmland.

The passage above helps to visualize agricultural land use and crops in the Italian study area. The appearance of farmland can be compared to that in the study area in southeast Pennsylvania. While some farms in Pennsylvania appeared rustic and suggested a romantic agrarianism, farm fields in the Pennsylvania study area generally presented far less crop diversity than the fields I saw in Italy.

This introduction has provided background to situate and unite the three papers contained in this thesis. Paper 1 and Paper 2 are written and organized as academic articles that might be submitted to a professional journal, while Paper 3 provides a more descriptive account of the fieldwork and results associated with the complementary research conducted in Italy.
REFERENCES


CHAPTER 2

Paper 1: Diverse Sources of Knowledge and the Potential of Information Communication Technologies for Promoting Sustainable Agriculture

Introduction

The widespread adoption of information technology (IT) has brought an abundance of information and new communication opportunities to the fingertips of the majority of people in the United States (US), rethreading the nation’s social fabric. Internet use in the US has risen drastically over the past two decades, increasing from 14 percent in 1995 to 87 percent in 2014 (Pew Research Center 2014a). Following the rapid increase in internet usage, portable and wireless web-based information communication technology (ICT) became available on the market and enhanced users’ abilities to access large amounts of information and communicate locally and globally. Smartphone use is on the rise and in 2012, 46 percent of all adults and over one third of adults residing in rural areas used smartphones in the US (Smith 2013). Statistics related to use of ICT support that effects of ICT use are “being distributed in all realms of social life” (Castells 2011:xxvii) such as the global financial market, communication, and every sector of employment, including agriculture. Use of the term Information Age (Beetham and Sharpe 2013) has emerged as a way of describing the high value placed on the movement of information and use of ICT as a routine, everyday social practice (Bakardjieva 2005; Shove, Pantzar, and Watson 2012).

The potential for smartphones and other web-based devices to connect farmers to information and support systems for sustainable agricultural purposes is significant. Researchers have only just begun to explore the potential of widespread use of ICT in the US to promote sustainability in agriculture, particularly through decision support systems aimed at assisting
farmers with decision-making. Claims have been made that extensive use of such systems has the ability to reduce chemical use in agriculture leading to healthier people, increased profits, and reduced environmental pollution (Turechek 2011; Jørgensen et al. 2008).

There is a rich history of studying the changing role of technology in agriculture over time. Lasley et al. (2001) describe three waves of technological change relevant to agriculture in the US, each of which has been critiqued for challenging the sustainability of agriculture. The first wave included adoption of machines (e.g., tractors) that reduced the need for human and horse-powered labor. The second wave included new inputs such as commercial fertilizer and hybrid seed. The first and second waves of technological change grew following World War II (Dimitri et al. 2005) and ushered in “the structural transformation of farming” in the US (Lasley et al. 2001:110) characterized by fewer, larger, and more specialized farms (Hoppe and Korb 2006). The third technological change includes biotechnology (e.g., genetic engineering) and electronic telecommunication (Lasley et al. 2001). ICT is included in electronic telecommunication and is distinct from the other types of technology that agriculture has experienced in the past, because, tractors, seeds, and fertilizers do not have the capacity to process and transmit information in an immediately and readily usable form.

Technological intensification has been critiqued for its impacts on the social and environmental sustainability of agriculture. Cochrane’s (1958) theory of the treadmill of technology proposes that farmers must adopt new technologies in order to remain economically competitive. Farmers who are first to use new technologies benefit from innovators’ rents, that is, as their farming operations become more efficient they are still able to receive a profit that is not yet affected by an increasing supply (Buttel et al. 1990). As more farmers adopt a technology, operations become more efficient and price is driven down. Without reducing their
cost of production, farmers who do not decide or are not able to adopt an influential technology will not be able to stay competitive, leading to economic hardship. Strange (1988) views the unrestrained use of technology in agriculture as enabling extremely low prices of agricultural commodities. Many technological changes in agriculture have also been connected to negative environmental and health impacts including damage to water, soil, and air resources; wildlife and ecosystem biodiversity (Tegtmeier and Duffy 2004); and harm to human health from pesticides and foodborne pathogens (Harrison 2011). While change towards more industrial and capital-intensive technologies in agriculture has been heavily critiqued, the possibilities to develop technologies that might contribute to the sustainability of agriculture could be significant. Over the past 50 years, the development of new sustainable agriculture technologies has focused on reducing potential negative environmental impacts, ensuring technology’s accessibility to farmers, and increasing agricultural productivity (Pretty 2008). Pretty (2008) calls for a greater emphasis on biological and ecological processes and utilization of local knowledge in the development of technologies for sustainable agriculture. According to Fuchs (2008:306), “Depending on how ICTs are socially designed and applied they can have positive and/or negative effects on society.” Little is known about how the use of ICT may affect US agriculture, particularly from the perspective of farmers and agricultural advisors.

Traditionally, farmers’ responses to new technological innovations in agriculture have been studied through the lens of adoption-diffusion research which was sparked by the rapid spread of hybrid corn seed in Iowa (Ryan and Gross 1950). Intrigued, two rural sociologists used the case to study the diffusion of innovation phenomenon, a “process by which an innovation is communicated through certain channels over a period of time among the members of a social system” (Rogers 1995:5). Stemming from adoption-diffusion research was the diffusion of
innovations theory, comprised of two main ideas (Rogers 1962). First, the theory proposed a five-stage decision process that occurs as potential users consider using a new innovation: acquire knowledge, become persuaded, decide to adopt, implement use, and confirm continued use. Second, the theory asserted that a normal distribution should describe how a randomly selected sample of potential adopters respond to an innovation. Five adopter categories, including their associated social and psychological characteristics, were established at each standard deviation of a normal distribution: innovators, early adopters, early majority, late majority, and laggards (Rogers 1995).

Agricultural institutions, primarily the land-grant university system, Cooperative Extension and the United States Department of Agriculture (USDA), used the adoption-diffusion model to spread new technologies aimed at increasing efficiency of agricultural production to farmers (Lyson and Tolbert 2003). The development of many of these new technologies was based on scientific studies conducted at land-grant universities. According to Lyson and Tolbert (2003), economic rural development emphases in the 1990s shaped the view that farmers should not be manual laborers, but rather managers who use new and innovative technologies. This approach to rural development prioritized the value of scientific knowledge and undermined the value of knowledge farmers already had, perpetuating the view that early adopters of technology (Rogers 2003) were “good managers” and those who did not adopt were “bad managers” (Lyson and Tolbert 2003). Critics of the adoption-diffusion model have noted the limitations of its assumption that scientific knowledge should be prioritized over other sources of knowledge.

Local knowledge is the “…the practical, sensuous, personal skill that develops with careful attention to the distinctive yet dynamic social and physical features of a specific locality and that is fundamentally tied to direct experience of a particular place or activity” (Hassanein
Local knowledge as a resource that farmers use in making decisions has been minimized in many past studies of technological change in agriculture. Knowledge that is shared between farmers and agricultural advisors is another source of knowledge that has often been minimized in studies of technological change or intensification. This is problematic because agricultural advisors can sometimes play a significant role in on-farm decision making (Ingram 2008). Without taking local knowledge and knowledge exchanged between farmers and advisors into consideration when studying technological change, findings will be limited in their applications. For these reasons, this paper departs from traditional adoption-diffusion studies by exploring how farmers perceive and use different sources of knowledge, including that offered by ICT, in making farm management decisions.

This paper draws on qualitative research conducted with grain farmers and agricultural advisors in southeast Pennsylvania to consider the interplay of local knowledge, knowledge exchanged between farmers and agricultural advisors, and the potential impacts of growing ICT use in farming. This paper explores three interrelated research questions: 1) How does local knowledge figure in farming decisions and practices of grain farmers in one Pennsylvania farming community?; 2) What is the nature of how knowledge is exchanged between agricultural advisors and farmers in the community?; and 3) How do farmers and agricultural advisors understand current and future uses, and impacts, of information communication technologies in local farming? The overarching goal of this paper is to advance sustainable technological trajectories in ICT innovations for farming by providing an in-depth perspective on how farmers and their advisors situate their evolving understandings and use of ICTs within a context that includes longstanding and diverse sources of knowledge.
Conceptual Framework and Literature Review

The concept of knowledge functions as the foundation of this study and is discussed in-depth in this section. First, knowledge is conceptualized and the argument is made that the knowledge farmers already have about farming plays a key role in how farmers interpret data and information, and make decisions. Next, the three sources of knowledge that this study addresses are discussed. First, local knowledge (Kloppenburg 1991; Hassanein 1999) builds on the notion that farmers use deep, firsthand knowledge about where they live and farm to make farm management decisions and transform new information into knowledge. The second source is knowledge shared between agricultural advisors and farmers, which I frame in terms of knowledge exchange encounters (Ingram 2008). The third source is knowledge generated by ICT and is the central focus of the study. A brief discussion of deskillings is then presented to show how some scholars have drawn connections between technological change and replacement of human knowledge and skills, points with potential relevance for ICT. To situate this study in the wider academic literature, critiques of adoption-diffusion are explored as further justification for a knowledge framework.

Sources of Knowledge in Farming

The concept of knowledge serves as the foundation for the conceptual framework of this study. Bruckmeier and Tovey (2008:316) challenge the idea that knowledge is generated based on a “standard knowledge hierarchy of data.” The standard hierarchy does not recognize knowledge generated in the past, and supposes that simple facts become information when an individual gives them meaning, and information becomes knowledge when it is contextualized. Contextualizing information, or what Raedeke and Rikoon (1997:146) call constructing
knowledge, “is the process of defining reality and includes the manner in which we recognize and interpret our social, cultural, and material environments.” The standard knowledge hierarchy is visually conveyed by a three-level triangle with data at its base, followed by information in the middle, and knowledge at its peak. In contrast, a reverse knowledge hierarchy proposes that an individual utilizes their already existing knowledge in order to process data into information and ultimately knowledge. Bruckmeier and Tovey (2008) combine these two hierarchies, transforming knowledge generation from a static to dynamic process, arguing that knowledge generation is characterized by a temporal sequence. That is, knowledge that a person already has is used to process information resulting in the generation of new knowledge.

Recognizing that individuals use their preceding knowledge to construct knowledge from new information allows a case to be made that if ICT development is to support the aims of sustainable agriculture, it is first necessary to understand the sources of knowledge farmers already use to make decisions. When individuals are presented with new data, what they already know orients how the data will be translated into information, and how information will be internally processed, understood, and transformed into knowledge. Learning how farmers perceive different forms of knowledge can assist researchers with developing ICTs that are compatible with, and enhance, the knowledge that farmers already have. In order to improve ICTs designed to assist farmers with implementing sustainable agricultural practices, farmers’ perceptions of different sources of knowledge used to make farm management decisions must be explored.¹

¹ Since knowledge is not generated in just one way and is not singular, it is important to understand how farmers perceive and use both scientific and non-scientific sources of knowledge to make decisions. However, it should also be recognized that sources of knowledge are not compartmentalized within rigid boundaries, a point highlighted by Tsouvalis, Seymour, and Watkins (2000) who critique the organization of knowledge into categories, such as expert, lay, or local. This paper acknowledges that boundaries between sources of knowledge blur and overlap, but will use such source categories as a heuristic device to construct an appropriate and meaningful analytical framework.
Farmers use local knowledge to process the academic, scientific, and expert knowledge that is transmitted to them. Scientific knowledge is characterized by Hassanein (1999) as being systemized, specialized, codified, and both socially and ecologically decontextualized from farmers’ experiences and their farms. In contrast to scientific knowledge, local knowledge has been described using terms such as “indigenous” and “traditional,” and while these terms have nuanced meanings, one common point they share is that knowledge is place-based and socially contextualized (Raedeke and Rikoon 1997). Social scientists concerned about the sustainability of agriculture stress that the importance of local knowledge reaches beyond concern with increased productivity and profit (Kloppenburg 1991; Flora 1992; Altieri 1999; Hassanein 1999; Bell 2004). Kloppenburg (1991:528) views local knowledge as shaped by the “unique social and physical environment” of place. He argues that sustainable agriculture must be pursued at a whole-farm level, requiring those studying agricultural problems to recognize and incorporate farmers’ knowledge into solutions, as farmers possess personal and specific pieces of knowledge contributing to a whole-farm perspective. Flora (1992:92) elaborates the idea of the whole-farm further in pointing out that, “Changing one part of a system requires changes in other parts.” For example, through having a deep knowledge of the physical attributes of one’s farm, including ecological and biological attributes, biodiversity can be cultivated (Altieri 1999). In order to promote local habitat diversity, farmers must take into account “local variations in climate, geography, crops, local vegetation, inputs, [and] pest complexes,” all of which are locality specific (Altieri 1999:25). In contrast to scientific knowledge that is regarded as universal, local knowledge is tied to the unique aspects of a place making it difficult to be applied outside of the locality it derived from (Clark and Murdoch 1997). Hassanein and Kloppenburg (1995) argue that although local knowledge is personal and experiential, it is also socialized and can be
generated through interaction with others in the same locality. Recognition of local knowledge by agricultural researchers and advisors is essential for progressing sustainable agriculture, as it provides fuller insight about how a farm functions as a whole system.

Farmers often seek knowledge produced by agricultural advisors, such as Extension educators affiliated with land-grant universities, conservationists employed by the federal government, crop consultants, and agribusiness representatives to make farm management decisions. Agricultural advisors who are change agents (e.g., Extension educators) or technical experts (e.g., crop consultants) have the “role of the expert who disseminates technical information and policy messages as part of the tradition of top-down agricultural extension” (Ingram 2008:407). Knowledge exchanged between advisors and farmers is explored in this study rather than scientific knowledge, per se, because farmers typically receive information grounded in university and industry research from agricultural advisors. Farmers are less likely to interface directly with scientific journals or attend conferences held by scientific societies. In Ingram’s (2008) study, she interviewed 17 farmers, and 31 commercial and independent agronomists in England about interactions between farmers and their agronomists. Ingram identified four possible knowledge exchange encounters (KEE) that describe the role of the advisor in relationships with farmer clients (Figure 1). Two of the four KEEs are considered “expert knowledge exchange encounters” (A and B in Figure 1). The first describes advisors who behave as experts, that is, as “proactive and in a dominant and powerful position,” while farmers are reactive and accept advice (Ingram 2008:409). In this circumstance, the advisor has a strong influence on farmers’ decisions and holds “paternalistic” views in that they have a desire to protect their clients from unwanted outcomes (A in Figure 1). The second type of expert KEE (C in Figure 1) is characterized by an advisor who has a reactive role. In this circumstance, a farmer
demands specific expert advice and advisors are “simply being reactive” (Ingram 2008:411). The farmer “dictates the terms and nature of the advice” (Ingram 2008:411) and advisors are overtly aware that the farmer has the power to make the decision to switch advisors if demands are not satisfactorily met. Ingram also describes two KEEs that are not based on expert knowledge; these types of KEEs are described as facilitative (D in Figure 1) and divergent (B in Figure 1). In a facilitative KEE, the advisor-farmer relationship is treated as a partnership, with both parties holding proactive roles. Roles are more equitable and joint decisions are made between the farmer and advisor who “combine their experience and knowledge” and set objectives together. According to Ingram (2008:415), through “…working collaboratively, agronomists can assist and empower farmers to learn and adapt—processes to be considered critical to achieving sustainable agriculture.” In a divergent KEE, a farmer does not accept the advisors’ recommendations and advisors perceive non-acceptance as the farmer being “uninformed and incompetent” (Ingram 2008:411). Farmer-advisor relationships characterized by divergent KEEs eventually dissolve.
The third source of knowledge that this study explores is that delivered by information technology systems, an umbrella term commonly used to describe all technologies that have the “primary role of processing and handling information using electronic systems and transmission via cable or air” (Esposito and Mastroianni 2002). Information communication technology (ICT) is a type of IT that blends the ability of handling information with communication, and includes but is not limited to: cell phones, computers with an internet connection, personal digital assistants, and tablets (Kozma 2005). Expert systems\(^2\) and decision support systems\(^3\); types of telecommunication such as, Short Message Service (SMS or text messaging), electronic mail (e-

\(^2\) An expert system “solves problems at a level generally recognized as equivalent to that of a human expert or specialist in the field” (Lynch, Gregor, and Midmore 2000:609). Expert systems are highly specialized.

\(^3\) Decision support systems differ from expert systems because they interactively assist farmers in decision-making (Lynch, Gregor, and Midmore 2000).
mail), telephone calls, and social media; and information posted to websites or made available through applications or apps, are all examples of how ICTs can link farmers to digital information.

Little research has been conducted on the effects of ICT on local knowledge. However, there is a body of literature that covers impacts of other technological innovations on farmers’ local knowledge. Braverman (1974) is credited for deskillling, a concept that explains the phenomenon of replacing human knowledge and skills with technology. Jaffe and Gertler (2006:146) briefly discuss deskillling as it relates to commodity farmers, pointing out that technologies requiring a standardized input often “supplant traditional agronomic and mechanical skills.” This process is exemplified by farmers’ widespread referencing of informational labels placed on chemical products for determining when, where, and how a chemical for pest management should be used (Vandeman 1995). Vandeman (1995) argues that since the widespread adoption of pesticides, pesticide companies have gained control of the “intellectual work” of pest management, while farmers have been deskillled to simply use or execute the product. Without the use of local knowledge, managing pests becomes a task isolated from the functions of the whole system of a farm. This is problematic because pests are embedded within an ecosystem.

Fitzgerald (1993) uses the mechanization of industrial work to provide insight on how the widespread adoption of hybrid corn deskillled farmers; however, she also explains that there are limitations to the analogy. While factory workers have often reacted to mechanization in protest, many farmers have adopted new technologies, such as tractors, in part because they reduce the intensity of manual labor. Stone (2007) echoes Fitzgerald’s argument that the influence of technology on pest management differs from that of mechanization in the industrial sector. An
important difference he notes is that since farmers manage entire farm operations rather than specialize as factory workers do, they are at a disadvantage when they are dispossessed of a specific skill. For farmers, the result is that local knowledge is undermined, as well as their ability to innovate. Drawing on local knowledge to make decisions is essential to sustainable agriculture, as most farms exist outdoors in uncontrolled spaces and entire ecosystems must be considered when making decisions.

*Adoption-Diffusion Research*

Technology and agriculture have typically been studied through an adoption-diffusion approach. During the 1970s, rural sociologists became critical of adoption-diffusion research for neglecting sociological theories and utilizing methodologies that were “excessively empirical” and had a “pro-innovation bias” (Ruttan 1996:58). Rather than questioning the effectiveness and desirability of innovations, it was assumed that farmers should desire to adopt them. The bias is apparent in the top-down five-stage decision process that includes persuasion as a stage, instead of, for instance, cooperation. The adoption-diffusion approach tends to omit or minimize farmers’ personal knowledge and experiences. Buttel et al. (1990) highlight two concerns with the adoption-diffusion paradigm: 1) Social benefits of new technologies were not studied and 2) Commercial innovations were studied rather than ones that were focused on conservation and environment.

Perhaps the most striking critique comes from Kloppenburg (1991) who highlighted the need for “bringing the farmer back in” to scientific research. Kloppenburg describes Cartesian reductionism as the dominant ontology guiding scientific research. Cartesian reductionism artificially extracts a problem from its social and natural context and reduces it into parts.
Scientific research leads to the generation of scientific knowledge, and for farmers this can be problematic since farms do not exist in laboratories, but rather primarily outdoors in places and spaces that are embedded in variable social and natural contexts (Reganold et al. 2011). Most farmers have an intimate knowledge about their experience farming in a place, and possess valuable knowledge that is distinct from Cartesian reductionist scientific knowledge. Kloppenburg (1991) highlights that prior to the creation of the land-grant system in 1862, farmers were the only generators of agricultural knowledge. He calls for a refocus on farmers as knowledge producers, emphasizing the importance of what he calls local knowledge.

Bruckmeier and Tovey (1997) highlight the important role that preceding knowledge has in how humans attach meaning to information and generate new or transform existing knowledge. Therefore, to provide a fuller, contextualized account of farmers’ attitudes about ICTs, this paper explores farmers’ local knowledge and knowledge exchanged between farmers and advisors in a community located in southeastern Pennsylvania. The following section outlines the methods for studying the interplay of these sources of knowledge.

**Research Methods**

This study used qualitative social research methods to gain in-depth insight about farmers’ perceptions and experiences of diverse sources of knowledge, with the objective of understanding more about the use of information communication technologies (ICTs) in farming. In this section, I explain how phenomenology and ethnography guided the research methods. This is followed by an explanation of how participants were selected and recruited, and how data was collected and analyzed.
The study was approached with a phenomenological lens and incorporated ethnographic elements. The use of diverse sources of knowledge to make farming decisions is a phenomenon; it is something that occurs and can be experienced (i.e., the experience of making farming decisions) (van Manen 1990). Phenomenological research seeks to understand the essence of how a phenomenon is experienced by a group of people (Creswell 2013). Gaining insight about the processes of an individual’s mind and their internal world as related to the phenomenon is the primary objective of the approach and requires the researcher to be empathetic. Ethnography seeks to explain the behaviors and shared beliefs of a culture-sharing group, which has interacted over a substantial period of time, and thus has established social patterns and norms, consisting of behaviors, language, and artifacts (Creswell 2013). These approaches are appropriate for this study because farmers’ unique perspectives about ICTs are more likely to be obscured in large survey research studies. By combining aspects of phenomenology and ethnography, this study sheds new light on the topic of farmers’ use of ICT as related to other sources of knowledge important in agriculture.

The culture-sharing group comprising the study’s sample included farmers and agricultural advisors living and working in the Great Valley Region of southeastern Pennsylvania, which includes parts of the counties of Franklin, Cumberland, Dauphin, Lebanon, Lancaster, Berks, Lehigh, and Northampton. In total, 17 farmers and four agricultural advisors were interviewed. Historically, the Great Valley Region has been the region in the state that is most agriculturally productive in cropland (PHMC 2014). Due to its size and hilly topography, climatic conditions vary. According to PHMC (2014):

The growing season ranges from 121 to 180 days, but averages around 150 in most places. Annual average precipitation ranges from 40 to 42 inches. Mean annual temperatures are in the low 50s Fahrenheit. Summers are relatively hot and winters cool.

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4 Pennsylvania Historical and Museum Commission
The region is large and stretches 150 miles through the state (PHMC 2014) (See Figure 1 in Introduction). The valley is relatively level and is bounded by steep hills on either side.

Within the Great Valley Region, data collection focused on one specific community. The community was contained within the northern area of one specific county, the main study county, with two of the farmers living near the border of an adjacent county. The two publicly funded agricultural advisors who were interviewed had not grown up in the area but had worked with the agricultural community there for 20 and 10 years, respectively. Through recommendations farmers provided when they were asked to refer their neighbors to the study, it became evident that many participants were familiar with one another.

The specific study area was selected based on a recommendation from Sarah\(^5\), a publicly funded agricultural advisor who ended up being a participant in the study and, as an outsider to southeast Pennsylvania, served as my “orienting figure” (Weiss 1994:20). Sarah identified the study area as a rural “neighborhood” which had a high number of grain farmers relative to other areas in the state. Grain farmers were sought out because they are common in Pennsylvania and have operations of varying scales and approaches to farm management. Selecting grain as a common characteristic among participants allowed for variety in the sample while allowing for meaningful comparisons. The study area offered a culture-sharing group that could provide insight about the research questions. Sarah was willing to provide assistance in gaining access to the farming community.

Sarah identified three other agricultural advisors serving the area and 12 farmers in the targeted study area whom she was familiar with who also grew small grains. Of those on Sarah’s list, all three advisors and seven farmers participated. The remaining 10 study farmers were identified through snowball sampling, a technique that involves asking willing participants to

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\(^5\) To protect the confidentiality of participants, all names used to refer to study participants are pseudonyms.
make referrals (Weiss 1994). To invite participants to the study, I contacted them by one of the following methods: letter via post, e-mail, or phone. Before each interview, all participants were asked to read an informed consent form and sign it to agree that they understood their participation in the study. Prior to the start of the study, an application to conduct this research was approved by the Pennsylvania State University’s Institutional Review Board. The goal of this study was to provide an in-depth account of how farmers in one rural Pennsylvania community perceive different sources of knowledge to understand their use of ICTs more fully. Because of the purpose driving the study, random sampling was not used and therefore the findings of this study cannot be generalized to the Pennsylvania farming population. Data was collected through semi-structured interviews (Smith and Osborn 2008) that were conducted during October and November 2013, and February 2014. All interviews took place at participants’ homes with the exception of interviews with two agricultural advisors that were conducted at their professional offices.

Table 1. Pennsylvania Sample Farmer and Farm Characteristics (N=17)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean = 48; Median = 43; Min = 29; Max = 71</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer age</td>
<td>Mean = 596; Median; Min = 5.5; Max = 2650</td>
</tr>
<tr>
<td>Farmer gender</td>
<td>16 male; 1 female</td>
</tr>
<tr>
<td>Total land farmed (acres)</td>
<td>Mean = 241; Median = 178; Min = 0.5; Max = 800</td>
</tr>
<tr>
<td>Farmland owned</td>
<td>Mean = 357; Median = 114; Min = 0; Max = 2500</td>
</tr>
<tr>
<td>Farmland rented</td>
<td></td>
</tr>
</tbody>
</table>

Source: Background questionnaire

The average age of farmers included in the sample was about seven years greater than the average age of farmers in the main study county (USDA NASS 2014a), as well as the state and country more generally (USDA NASS 2014b). Figure 2 (below) presents the numbers of study farmers in each age group, by ten-year increments. Farmers in their twenties and fifties were less represented in the sample, with just one farmer in each age group. Farmers in their thirties
comprised almost one-third of the farmer sample (n=5). Despite efforts to include more female farmers in the study and 15 percent of farmers being female in the primary study county (US Census of Agriculture 2012), only one female grain farmer could be recruited to participate in the study, despite efforts to identify others. Additionally, three of the study farmers identified as Mennonite, a religious group that follows varying customs limiting the use of specific modern technologies and has had a long presence in the study area.

Figure 2. Number of Farmer Participants by Age Group (N=17)

Source: Background questionnaire

One farm was very large at 2,650 acres, thus skewing the mean for the study sample. The median number of total acres of land farmed was 400, about eight times the median farm size in the main study county (about 50 acres) (USDA NASS 2014a), and five times the national median farm size of 80 acres (USDA NASS 2014b). Study farmers were not asked to indicate their net cash farm income. However, the average net cash farm income per farm in the main study county is about $64,000 (USDA 2014a). Almost all of the farmers grew wheat, and the three who did not grew closely related grain crops like barley, spelt, and rye. Reasons that farmers grew wheat included straw for bedding, animal feed, and for sale to the local mill. Corn and soybeans were the other two crops that were most commonly planted by farmer participants with 14 farmers
claiming they planted at least one of these. Hay was produced by 10 of the farmers. In addition to barley, heritage grains like spelt, and rye, less commonly raised crops by the farmer sample included alfalfa, oats, and diversified vegetables.

After participants provided their informed consent, the interviews were conducted and audio recorded. Digital files were then uploaded to a computer and submitted to a professional transcription service to be transcribed. Using the qualitative software package, *NVivo 10*, double coding, holistic coding, and focused coding were used to analyze the data (Saldaña 2009).

**Research Findings**

Research findings are organized into three sections. The first section about local knowledge describes how the farmers in this study considered distinct characteristics of their farms and communities when making decisions about how to manage their farms. Type and quality of soil, topography, and the presence of local mills represented types of local knowledge that farmers incorporated into their farm management. The second section explores the nature of knowledge exchange between agricultural advisors and farmers. Themes here include advisors as experts, advisors as reactors, and advisors as learners. The last section examines participants’ perceptions of ICT. Themes here are the relevancy of generation (e.g., youth) to use of ICT; convenience and immediacy; inconvenience and inefficiency; and inevitability of widespread adoption. Analysis draws on interviews with both farmers and local agricultural advisors.
Local Knowledge

Because every farm, or locality, is distinct in ecological and sociocultural terms, knowledge about individual farms has a particular and contextualized aspect. Local knowledge refers to this specificity. Therefore it is important to understand how farmers perceive the distinct physical qualities of their farms, as well as how they incorporate these distinctions into their farm management decisions. Local knowledge is also generated through the exchange of knowledge linked to place among people in the community, an observation made by Hassanein and Kloppenburg (1995) while studying rotational graziers in Wisconsin.

The information farmers provided about the physical characteristics of their farms was something that farmers indicated they took into consideration when making decisions about managing soils, crop rotation, and planting. Farmers described unique soil qualities in the local area and on their farms and worked these into how they managed their soil. For example, some farmers explained that they had “shaley” ground, which made it a challenge to grow corn because of the soil’s inability to retain necessary moisture levels. Noting his “shaley” soil, Bruce stated that he would “have to deal all the time with the fact that my soils drain instantly.” This was sometimes beneficial for him because he never had muddy or soft areas in his fields, but also problematic because when the soil became dry, it was “ferociously dry.” In contrast, Harold, who lived several miles east of Bruce, spoke highly of his deep soils as “productive” and “drought tolerant.” In fact, of the 30 years he and his wife had been farming on the land, they had never experienced complete crop failure and “don’t bother with crop insurance” because of their soil. Rocky soil was also an immediate farm feature that farmers mentioned. One farmer decided

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6 To protect the confidentiality of participants, all names used to refer to study participants are pseudonyms.
to manage his soil using no-till because of the thousands of dollars of damage done to ploughshares as a result of cultivating rocky soil.

Topography was another aspect farmers described as being unique to their farms. As with soil, the descriptions they provided were nuanced. Farmers explained how ground in the valley was fairly level, while farms in the surrounding hills had ground that was rolling. Wayne described how he had “rolling clay knobs” that influenced his crop rotation, while another farmer talked about how he had both flat and hilly ground that led him to have two different planting styles. An organic dairy farmer, Jacob, stated that he had incorporated grazing into some of his fields but had to leave the steeper hillsides in permanent grass. Another farmer explained that because of the hills on his farm, soil was more subject to erosion and it was necessary for him to adjust his tillage practices accordingly. The unique physical characteristics that the farmers elaborated on about their farms and land illustrate how local knowledge cannot travel far since it is embedded in a particular geographical place. All of the participants in this study lived and farmed relatively close to one another; however, they dealt with soil and topography issues on their farms in very particular ways. While Harold had deep soil that was drought tolerant, just a few miles away Bruce dealt with soil that could become “ferociously dry.” Jacob highlighted steep hillsides on his farm, while Wayne mentioned rolling clay knobs. The Pennsylvania Department of Conservation and Natural Resources (PA DCNR) identifies 23 physiographic sections in the state of Pennsylvania that differ topographically in terms of form, local relief, underlying rock type, geologic structure, elevation, drainage pattern, boundaries and origin. In the Great Valley Region, local relief, which expresses the difference in elevation in a specified area, ranges from 140 to 1,100 feet. In the northwest part of the region there is shale and sandstone, slate at the east end, and limestone and dolomite in the southeast (PA DCNR 2000).
This variation in physiographic features that affect agriculture in the Great Valley Region suggests the importance of having an understanding of farmers’ local knowledge.

In addition to physical context, the local social context of the study area influenced farm management decisions. For example, Frank, who was 71 years old and had grown up on the land he currently farmed, described a typical way of rotating crops that was influenced by the history of farming in the area. He described how in the past farmers in the area would rotate between corn, oats, wheat, and sod. He conveyed the evolution of local knowledge stating, “You know, I mean, it's the old word cows, C-O-W-S, corn, oats, wheat, sod. But we're corn, soybeans, wheat and hay. But we don't rotate every field. Now here in the hills [that are subject to erosion] we rotate from corn to wheat because wheat has a good root combination and it holds the ground.” Frank used the phrase “here in the hills” to differentiate between farming practices in the valley and on the hills that surround it. Sarah, a publicly funded agricultural advisor, explained that historically farmers in the study area always grew small grains, supporting Frank’s claim that wheat is typically planted after corn. However, she continued to say that even though planting wheat after corn is common in the area, “Now, our plant pathology people [scientists] would say that’s not really the best rotation, and that’s because of disease pressure.” In this example, the social norms and historical context of the study area had a heavier influence on crop rotation practices than the scientific knowledge now being extended from the universities.

Crop rotation was also influenced in part by the presence of two local mills that compelled farmers to grow wheat on their farms because of the convenience of their proximity. However, over the past few years, the quality standards that the mills established for wheat had become very strict and were mentioned frequently by farmers. The FDA provides guidelines for the level of vomitoxins that is acceptable in wheat but does not enforce them as regulatory limits;
they are issued “as a prudent public health measure” (National Grain and Feed Association 2011:8). Because there are guidelines and not regulations on vomitoxin levels, mills develop reputations based on how stringent they are. The testing of wheat had implications for some farms in this study. For example, Harold described his experience with the local mill:

I always had trouble selling the wheat because of this—I’m not sure what the technical term is [vomitoxins] or whatever. My wheat was always contaminated with that and I just had an issue selling it. So now I gave up growing wheat. Now, this year I have some barley and I have some rye and triticale, stuff like that I’m growing and I use that for straw now…Plus the elevator that buys wheat in the area is only seven miles from here, they’re just a tough customer to do business with for me anyway I thought. So I don’t know if that was part of it, but I just give it up for the hassle.

When Harold called the local mill a “tough customer,” he was referring to their strong commitment to rejecting wheat with certain levels of vomitoxins. The passage above from Harold shows how his choice to remove wheat, a crop that he had grown for twenty years, from his rotation was motivated by local social-economic circumstances. Harold’s account was not an exception in the study. Many farmers discussed the impact that the stricter regulations on the level of detectable vomitoxins allowed in wheat had on their ability to grow the crop and receive a profit. They also demonstrated their local knowledge of how implementation and impacts for their farm varied depending on the particular mill.

The socialization of local knowledge is a phenomenon that emerged from interviews with farmers in this study. One farmer stated, “Yeah, we all share information. There's no secret. You couldn't keep it a secret if you tried.” Most farmers in this study indicated that farmers were open and willing to share information with others. “It's a community. It's not—it's not...Yeah, it's a community. It's not just you trying to farm the best you can with no help from the outside. You know, we all help each other.” However, while the organic farmer Bruce noted that he is “good neighbors” with the “conventional farmers” around him, he also distinguished between the
“organic” and “conventional” communities in the study area. He explained that his interactions with organic farmers were “extremely useful” but with conventional farmers, whom he also referred to as “chemical farmers,” he found interactions “useless.” Bruce’s account demonstrates that while local knowledge can be socialized through knowledge exchange among farming neighbors, some farmers will seek to interact with farmers holding similar agricultural ideologies as them.

Not all of the farmers in the study sought information from their neighbors. Frank shared that he preferred to keep a “low profile” because if “you talk about anything, then they [other farmers] think you want to know something and they think you're nosy and everything else, you know. So I just stay to myself and fly under the radar, you might say. I don't want anybody to know I exist, that way they don't come looking for you to borrow something.” The perspective that this farmer shared aligned with another farmer’s perception about farmers from an older generation in the area being more “tight-lipped” about sharing information.

This section on distinct characteristics of farmers’ land and the study area demonstrates that local knowledge is involved when making decisions about managing a farm. These findings provide a foundation for understanding farmers’ attitudes about using information communication technology (ICT) in farming. The following section provides findings related to how knowledge is exchanged between farmers and their agricultural advisors. Advisors are another important source of knowledge for farmers and understanding the nature of this knowledge will also contribute to a fuller understanding about farmers’ attitudes about use of ICT in farming.
Knowledge Exchange Between Agricultural Advisors and Farmers

Every farmer in the study consulted with at least one agricultural advisor to assist them in making farm management decisions, whether it was a crop consultant, Extension educator, or a representative from a chemical company. In this section, findings are organized by Ingram’s (2008) concept of knowledge exchange encounter (KEE) and two of its expert types, reactive and proactive. The section ends with findings that exemplify facilitative KEEs.

Experts possess specialized technical knowledge and can play a role in informing farmers’ decisions about managing their farms (Ingram 2008). Relationships between experts and farmers fall on a continuum with more proactive experts on one end and more reactive experts on the other (See Figure 1). Farmers in this study described examples of having relationships with advisors who took on either a proactive or reactive expert role, while some farmers described advisors who exhibited aspects of both proactive and reactive experts. Advisors and farmers both have more proactive roles in a facilitative KEE. Agricultural advisors themselves described having KEEs in which they had either a proactive or facilitative role.

Some farmers suggested that their advisors responded to their expressed needs and concerns, exhibiting more reactive roles. These farmers viewed themselves as able to reject their advisor’s knowledge if they did not like it or deem it appropriate. For example, Collin expressed this attitude when describing his relationship with his advisor, an independent crop consultant, stating, “Yeah, he does soil samples for me and then gives me his advice and I take it and either use it or don’t use it.” In this example of a reactive expert KEE, Collin’s advisor reacted to his request to sample his soil and provided him with recommendations. Collin then compared his consultant’s recommendations to his own knowledge about soil in order to decide whether or not he would implement his advisor’s suggestions. Collin made it clear that he retained his role as
the decision maker, while his crop consultant provided him with support. Another farmer, Scott, also described himself in a manner where he had more of a proactive role, explaining that every other year he hired a crop consultant to sample his farm’s soils. The crop consultant would sit down with Scott and share with him details about the test results and their implications for his farm. Scott’s account suggests that he retained a sense of control in how his farm was managed through being informed by his advisor about the meaning of the soil test results. With this knowledge, Scott was able to have agency in the decisions made about his farm, exhibiting a reactive expert KEE, with Scott playing more of a proactive role.

If one were to consider the same example, but as a proactive KEE, the crop consultant might complete the soil test and then provide the farmer with a prescribed management plan accompanied with little to no explanation, and the farmer’s input and local knowledge would not be considered. This approach to advising farmers can diminish farmers’ own local knowledge about their farms and farming, as well as their farming skills. Such replacement of farmers’ knowledge and skills with those of an advisor, particularly in terms of pest and soil management, emerged from interviews with some farmers in this study. The erosion of farmers’ own knowledge vis-à-vis the advisor’s knowledge was reflected in the uncertainty of responses that some farmers gave to questions about specific farm management questions. For example, Wayne began to answer a question about pest challenges on his farm and then quickly focused the conversation on the crop consultant Larry, who was hired “to be my [Wayne’s] eyes.” He stated, “My advisor’s coming here in an hour. He could tell you more because he graduated from college and he does a lot of agronomy work. We grew up together, about the same age.” Wayne also admitted that Larry scouted for pests more often than he did and described him as his “right-hand man when it comes to that kind of stuff.” Some farmers in this study, including Wayne,
rarely made it out into their fields to scout for pests, which was a responsibility they had turned over to their crop consultant. For Wayne, this gave him more time to focus on other tasks that needed to be done on the farm. He explained, “…with a lot of the other stuff that I’m doing here I can't get in the fields enough to scout because I have other things going on, so I rely on him a lot to be watching.”

Nate was another farmer who described his crop consultant as influential for his farm management decisions, stating that when a problem arose, his “immediate response” was to contact his consultant because “he is very knowledgeable…If he recommends, ‘Put this [a specific chemical], this, and this in,’ I put it in.” Nate’s comment expresses his confidence in and dependency on his crop consultant, indicating that if his crop consultant tells him to do something on his farm, he does it.

In describing how he viewed his role as an advisor, Steve demonstrated his desire to protect his clients from making mistakes and his concern that they try new practices. Ingram (2008) describes this as characteristic of proactive expert KEE. Steve said that emotion and economics were the two main drivers that farmers identified as driving the decisions they made about managing their farms. When asked to elaborate what he meant by “emotion,” Steve noted that recently he had noticed that the decision to plant cover crops in the area had become emotionally charged. The crop consultant discussed his concern about a client who planted 500 acres of cover crops at fifty dollars an acre, something Steve did not think was a good economic decision. He explained:
And you ask him. You say, “Okay. Why did you do it?” “Well, I did it because I think it helps the soil and soil benefits, and dah, dah, dah.” And I said, “How about the economic side of things?” And he just kind of looked down, shook his head, and smiled. He goes, “I don’t know.” I said he has no real data to say that, “I spent this $50 on cover crops, and I got $60 back.” And he made that decision based off of emotion. You know, he made it based off of a lot of things that he perceived to be better but he has no real data to prove that it’s economic. And so I worry about that. I worry about the decisions that they’re [his clients] making because that’s $2,500 that could have gone to 15 other things on the farm.

Here, the dialogue presented between himself and the client suggests Steve’s concern about his client and his desire to protect him. While the farmer described by Steve made an independent choice to plant 500 acres of cover crops, Steve played a more proactive role in the KEE. Steve suggested to his client that he did not see value in the reasoning for planting the cover crops because it was not supported by “real data,” undermining his client’s capacity to make independent decisions about his farm.

Farmers, Wayne and Nate, and the crop consultant Steve, described engaging in KEEs in which the advisor had a proactive expert role. In managing pests, Wayne and Nate had almost complete dependence on their advisors for making decisions. Steve’s client may be discouraged from making planting decisions in the future without consulting with his advisor. These accounts resemble the phenomenon of deskilling, a concept often referred to in the case of industrial labor; however, authors such as Stone (2007), Vandeman (1995), and Fitzgerald (1993) argue how technological change in agriculture has in some circumstances led to the deskilling of farmers. This study provides a non-technological example of how farmers can experience deskilling, as it shows how proactive expert KEE between farmers and advisors can sometimes replace farmers’ knowledge and ability to make farm decisions, making it difficult for them to learn more and adapt to changing social and environmental conditions.
Knowledge is exchanged between farmers and advisors through encounters. In other words, an advisor might exhibit more of a proactive role on one occasion and more a reactive role on another. This scenario was exemplified by one of the farmers in the study, Allen, who when asked about pest challenges during his interview, responded, “Well, my agronomist would probably say, I guess, <laughs> cereal leaf beetle. I don’t know.” Here, Allen defaulted to the knowledge of his advisor suggesting the strong dependency he had on his advisor and an example of a proactive expert KEE. But elsewhere, Allen explained a situation in which he prioritized information from a television show called Ag PhD (featuring the “Hefty Brothers”) over his advisor’s knowledge in making a decision: “I’m watching Ag PhD and they’re talking, they said, ‘Never, ever, ever use 2, 4-D in your soybean program.’ So Larry [the crop consultant] will say, ‘Well you can use 2, 4-D if you want.’ But I’m like, ‘Ah, I don’t know.’ You know, the Hefty Brothers say, ‘Don’t do it.’” This second example illustrates that while Allen depended heavily on his crop consultant for managing pests, in other areas of farming like weed management, he freely turned to knowledge from other sources to inform his decision.

Allen’s mixed experience with both reactive and proactive KEE with his advisor demonstrates the complexity of how farmers access and use knowledge.

Three of the four agricultural advisors in this study conveyed that they not only saw their role as educators and advisors, but also as learners, an approach to knowledge exchange encounters described by Ingram (2008) as facilitative. When Sarah, a publically funded agricultural educator was asked about her sources for agriculture-related information, she responded that conversations with her co-workers and a local farming newsletter were helpful. She continued to say that learning from farmers was a significant resource for her as well:

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7 An herbicide used to for broadleaf weed control in crops including corn, soybeans, spring wheat, hazelnuts, sugarcane (Gervais 2008).
So, you know, it’s important to just not like sit in your office, but you’ve got to get out there and see what’s going on, on the farm, at meetings, you know, hear conversations, talk to farmers. Because a lot of it is if farmers know you and have a relationship then they’re going to tell you stuff or they call you up and ask for stuff, or they’ll just tell you things are crazy or “that’s stupid.”

Sarah’s perception about the importance of learning from farmers demonstrated how as an expert, she relied not only on scientific knowledge to form her recommendations to farmers, but also on knowledge shared from farmers. She also acknowledged that by establishing rapport with farmers in the county, she was open to hearing if her ideas were “crazy” or “stupid.” This indicated Sarah did not see her expert knowledge as necessarily superior to the local knowledge possessed by farmers. Sarah talked about having dialogic relationships as something she desired, bringing the value she placed on farmers’ local knowledge to the surface.

A publicly funded conservationist, Paul, offered an advisor’s perspective that directly addressed the tension between scientific and local knowledge. Paul had explained that there are not many farmers who grow commercial crops and simultaneously keep pollution under control. When asked whether or not he thought it was his job to change these farmers and make them conserve more, Paul offered an answer that complicated the scientific reductionist paradigm described by Kloppenburg (1991). He said:

Yeah, there are farmers who change me too. Because science always is not one side; it's both sides. There are a lot of things, which I learn from farmers. There are a lot of things, which I teach them. Even if we teach them some scientific, academic things, there is a point where that doesn't practically work for the farmer. Then they give you some suggestions.

An example that Paul provided of a farmer giving a suggestion happened the day before the interview, when he was helping a farmer design an animal walkway. The farmer did not agree with the plan Paul had made because its placement would obstruct the farmer’s ability to maneuver a large piece of machinery used for cleaning manure off the walkway. In response,
Paul said he worked together with the farmer to fix the problem and through this approach both sides were able to learn and teach and ultimately change each other. That is the point in which “understanding comes,” Paul noted.

This theme of advisors learning from farmers and valuing their local knowledge was not limited to the publically funded agricultural advisors. It was also evident in remarks made by the young crop consultant Steve, who had grown up in a surrounding area and operated his consulting firm independently. When asked if he had seen a change in the presence of women in agriculture in the area, Steve gave the example of a couple who had no previous farming experience, but had left Boise, Idaho to move back to one partner’s family farm in Pennsylvania to grow raspberries in greenhouses. He explained:

> It’s just amazing what they’ve been able to do [here]. And to go from zero farm background, and I grew up on a farm, and now they’re teaching me about raspberries. And it happened <snaps fingers> like that. So it’s been fascinating. I love going to their farm to learn about raspberries and to learn from them what to do.

Steve emphasized that not only does he like learning about raspberries, but he likes learning from them, these farmers, about what they do. When asked about farmers in the area whose farming practices he respects, he gave the example of a farmer who planted half of his wheat after corn. Farmers are typically advised against this particular ordering of rotating crops since the organic matter left behind by corn can cause fungus problems for wheat planted after it, reducing productivity. However, Steve said that this particular farmer has “shown me over the past couple of years that it is just as productive [as not planting after corn].” This crop consultant’s interest in his client’s farming practices, ability to listen and empathize, and work collaboratively, demonstrates a facilitative KEE, in that both the client and advisor had proactive roles in
exchanging knowledge. Through co-producing knowledge, both expert and local knowledge were considered and perhaps led to more informed farm management decisions.

The theme of agricultural advisors learning from farmers speaks to the point made by Tsouvalis, Seymour, and Watkins (2000) that forms of knowledge are not distinct, and should be understood as “knowledge cultures.” Knowledge cultures are based on the idea of “knowing-from-within,” a knowledge that stems from the individual, as well as the individual’s place within a society and its culture. In the cases of Sarah, Paul, and Steve, all individuals who have strong connections to the study area and provide expert knowledge to farmers, it is clear that their expert knowledge is not completely scientific, universal, and positivist, but is also based on local knowledge. These findings are consistent with Ingram (2008) who found that some agricultural advisors approached their roles in KEEs with clients as facilitators. Farmers’ knowledge was explained as an important resource for them and was blended with their own knowledge when giving advice.

Knowledge exchange encounters with agricultural advisors are an important source of knowledge for farmers’ decision-making. Both advisors and farmers can play a proactive role in KEEs; however, roles are often imbalanced and advisors can take on either more of a proactive or reactive role. Farmers and advisors can engage in facilitative KEEs, as well. Facilitative KEEs occur when both farmers and their advisors contribute proactively to knowledge production and consider sources of local and expert knowledge to inform decision-making. In combination with findings about local knowledge, this section assists with offering a fuller understanding of farmers’ attitudes about information communication technologies (ICT). Unlike other technologies that have become widely adopted in US agriculture, ICTs transmit information immediately and readily. Farmers interpret and use this information drawing on other sources of
knowledge. To design ICTs for effective use in farming, researchers and developers must understand the sources of information farmers already utilize to inform farm management decisions.

Understandings of Uses and Impacts of Information Communication Technology in Local Farming

This section considers farmers’ perceptions of uses and impacts of ICT, to offer insight on how ICT might be socially designed to promote sustainable agriculture. Participants talked about their views related to age and the use of ICT in ways that both agreed with, but also countered the stereotype that older adults are not connected to ICT. Following the pattern that a larger proportion of young people use web-based technologies than older people\(^8\), participants in this study connected age to their understandings of who could and would use ICT as a source of farming knowledge. The crop consultant Steve explained why few of his older farmer clients had smartphones:

…[when] you get a mid-sixty aged guy with big thumbs trying to work some of these screens, [it] doesn’t work out all the time. And these larger phones, they’ll just break them because they’re dropping them on equipment or who knows what they’re doing to them. But they just break them a lot. So, you don’t see a whole lot of, in the older generation, you don’t see a whole lot of smartphones.

Here, Steve depicted older farmers as being somewhat inept when it comes to operating ICTs and keeping devices from breaking. Steve contrasted farmers in their sixties with those who were in the thirty to forty year range. He said that middle-aged farmers he worked with were more likely to have smartphones and use them for obtaining grain market prices; however, he said they

\(^8\) The US Census Bureau (2014) calculated the following statistics about internet use by age group: 25-34 years, 88.1%; 35-44 years, 86.2%; 45-64 years, 78.4%; and 65+ years, 53.1%. Statistics for smartphone use by age group include: 25-34 years, 70.6%; 35-44 years, 62.3%; 45-64 years; 40.2%; 65+ years; 14.5%. In west England and South Wales, Sewlyn (2004) found in a random survey of 1,001 adults over 21 years old, that age was significantly negatively correlated with whether a person would access and use ICTs.
would not use applications that made predictions about pests. Regarding some clients in their twenties, Steve said that, “I never talk to them. I just get texts. That’s great. That’s fine. But that’s what works best for them.”

Older adults are subject to stereotypes that they are “unable, unwilling, or afraid to use technology” (Mitzner et al. 2010:1719). This is an important stereotype to consider when designing ICT, as the average age of a farmer in the US was about 58 in 2012, with one third being 65 years or older (NASS 2014). While some farmers saw age as an influence on who uses ICT for farming, some older farmers in this study countered this perception through expressing interest in learning how to use ICTs or describing experiences they already had with them. For example, Jack explained:

I kept saying I was too old to learn it and I kept saying, “I'm not going to buy a laptop. I'm not going to buy a laptop.” Like I say, in spring I'm going to be 70 years old, and all of a sudden I kept thinking you know what, during the winter months I do have time, I should be able to just learn a little bit of the basics.

Jack’s account shows how an older farmer who had internalized the belief that older adults couldn’t work with ICT, eventually realized that he was interested in learning, despite such assumptions. Another farmer challenged the view that using ICTs is second nature to young adults. Matthew, a 30 year-old farmer, described himself as “not real computer-literate, or as much as I should be.” He saw his lack of computer knowledge and his preference to find information in magazines as reasons for not utilizing online tools for farmers. Statistics show that there are clear differences in the proportion of youth, younger adults, and older adults using the internet and smartphones. However, over half of adults age 65 and older are using the internet and 14.5 percent are using smartphones. Additionally, about 12 percent of young adults are not using the internet and 30 percent are not using smartphones (US Census Bureau 2014). These
statistics support the views of Jack and Matthew, both of whom do not fit into the age stereotype of technology users.

Some farmers who owned information technology stated that they did not always use it to its fullest potential and attributed this pattern to their age, particularly being older. For example, Allen who was in his forties, described himself as being “a little bit old school,” noting that information technologies were not used when he was younger to the extent that they are today. For this reason, Allen said he would “fall back on magazines” occasionally, even though he has a tablet that was included in an expensive subscription to a virtual farming information service. Similarly another farmer, Wayne, also in his forties, said that even though he had a global positioning system (GPS)9 that could store information about site-specific locations on his farm, such as yields and soil properties, he did not use that function of GPS. He admitted that both he and his uncle were “slow on wanting” to use GPS to collect and keep track of precise information, but noted that, “I’m not saying the next generation won’t.” Wayne’s reference to “the next generation” suggested that he associated his own hesitation in using GPS to collect data about his farm with his place in an older generation.

The theme of younger family members being more competent in the use of ICT than older family members also emerged from the interviews. Scott, a middle-aged farmer in his forties, mentioned this generational aspect of the use of ICT, describing ICTs as second nature to his young nieces and nephews because they learned how to use them growing up. Even though Scott knew how to “play around” with ICTs, he saw his nieces and nephews as able to run the technologies better than he could. As a fifth generation farmer in his thirties who operated a 2,500 acre field crop farm with his father, Nate had the responsibility of applying chemicals on

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9 In this study, GPS is not considered an ICT because it does not have the ability to allow users to communicate with each other. GPS is included in the larger category of IT; however, since all devices in the IT category share similar characteristics, farmers’ experiences with GPS are relevant to that of ICT.
the farm and laughed as he explained, “My dad wants nothing to do with the sprayer, just because it’s a complicated piece of machinery with a lot of computer technology. So I’ll tend to it and then I also tend to deal with all the computers.” To Nate, his father, and the older generation more generally, were not using information technology in farming because they lacked the younger generation’s comfort with these devices. He described young people as moderately computer literate and as having the ability to easily adapt to new technologies. He stated that “…we can go in and figure out the menus and ‘boom, boom, boom,’ I could have it set up. My dad is, ‘Write it down. Tell me what buttons to push, where.’” Nate thought that the use of IT on his farm, such as the use of smartphones, tablets, and GPS, increased the efficiency of his operation. Because of this, Nate considered farmers of the older generation who are “completely oblivious to the computer and don’t take advantage of that technology” as at a disadvantage, stating that today farmers need to know how to use information technology. However, older farmers who have children that plan to take over the farm may gain ICT familiarity through those very children. According to Nate, “As the younger generations are coming on board, I do know a couple younger farmers, they are adapting the technology as well. And pushing their parents to, ‘Hey, look at this.’” In an interview with another farmer in his forties, Denny, and his father, the importance of cross-generational influences on ICT use again came up. Denny’s father explained that the only reason that he owned a smartphone was because his other son had bought a family plan and “hooked the whole family up.” The views expressed here point to an important role that youth can play in narrowing the digital divide (Mitzner et al. 2010), the gap that exists between those who may use a new technology (youth) and those who may not use it (older adults).
Associated with the theme of ICT inconvenience, some farmers also identified difficulties accessing knowledge generated by ICT, particularly in light of the abundance of information offered by smartphones. Scott explained that he limits his computer usage to times during lunch or in the evening and says this way he could avoid “goofing off” and prioritize his time better—“it’s easy to get sidetracked,” he said. The biggest challenge was sifting through computer-generated information to find pieces that were relevant to what he was looking for. “We sort of get bombarded and it almost seems to be, there have to be better ways to organize it or sift through it for the relevant information that works for me, works for what I need.” Another farmer, Bruce, echoed Scott when he said, “I don’t do too much with looking stuff up on the internet. I usually find everything except for what I’m actually looking for when I go on the internet. If I’m looking for something specific, I don’t generally seem to find it normally.” Laura, the one female farmer in the study, further touched on the challenge of excess information with ICTs when she discussed her familiarity with smartphone applications.

I know there are a lot of apps, millions of them it seems, but because I’ve never had one, I only hear about them and see them advertised. I’ve never used one. I think I’ve used my brother’s smartphone once, but that was about it. They’re really neat. They’re really incredible, but it’s a whole other world that I haven’t really taken the time to get into, but I know it will happen.

While Laura showed enthusiasm for learning about applications designed for smartphones, she saw these elements of ICT as existing in a “whole other world.” For Laura, the millions of options were “neat” and “incredible,” but she also implied that learning what they are and how to use them would be time consuming. Denny expressed frustration about not knowing more about the application of the information generated through his GPS. He explained that the GPS produced color-coded maps of his farm indicating the yield of specific areas on his farm. The result was that, “I get a yield map, it's neat to look at but there's not much you can do with it
really, it's just, it's there. The first years I buy these things, they're really cool but they don't—
I'm not sure there's a lot of—what do you do with the information I guess is the problem.”

The overabundance of information referenced by farmers in this study also corresponds
to a phenomenon studied in the information technology field and referred to as information
overload\textsuperscript{10}. Information overload is “the simple notion of receiving too much information”
(Eppler and Mengis 2010:326). In the management field, information is studied to assist with the
decision-making process, and studies find that there is a positive correlation between the amount
of information a person has and their ability to make adequate decisions. However, the positive
correlation is applicable only to a certain point and after this point, decision accuracy actually
declines (Eppler and Mengis 2010). Proposed reasons for this decline include too much
information leading to confusion, negative effects on the ability to prioritize, and increased
difficulty of recalling information.

Although some farmers mentioned inconvenience and inefficiency, others in this study
spoke favorably of the convenience and immediacy they experienced in using knowledge
generated by smartphones and computers. Wayne said, “You know, all that technology makes
things a whole lot easier and a whole lot faster, and I think that’s why our world is so much
faster. I mean things happen in a click where years ago it would take a couple days. Well, it’s
[information] right there.” He explained that using a smartphone made ordering parts easier
because instead of going to a store to place an order, he could bring up a part on the screen of his
phone, describe it to his “parts guy” over the phone, and receive it the next day. Collin, a farmer
in his thirties, offered examples of how using a smartphone in farming was convenient for him.
When he needed to know conversion ratios, such as converting pints to quarts, instead of using a

\textsuperscript{10} Eppler and Mengis (2010:326) list other terms that are used to describe the overabundance of information which
include: “cognitive overload (Vollmann, 1991), sensory overload (Libowski, 1975), communication overload
(Meier, 1963), knowledge overload (Hunt & Newman, 1997), and information fatigue syndrome (Wurman, 2001).”
paper chart or finding someone to ask, he said, “I ask my phone in three seconds.” Collin also explained how ICTs enabled him to make a decision to cut hay in the morning while he was sitting and eating breakfast. Rather than waiting for a weather forecast to be broadcast on television, he could use his phone to reference hourly forecasts or the radar.

The inevitability of widespread adoption of ICT was a perspective shared by a couple of farmers. Wayne described himself as someone “not big on the computer” but acknowledged that the use of ICT is proliferating. He stated, “So that kind of technology is just, it’s growing and you’ve got to be on board. You can buck the system for so long and then you fall behind. So it’s here to stay. It’s not going away.” Wayne’s comment that you can “fall behind” if you do not adopt ICT suggests Cochrane’s theory of the treadmill of technology that proposes farmers must adopt new technologies in order to stay competitive. While it is beyond the scope of this paper to establish whether or not the technological treadmill applies to ICT, it is important to note that Wayne saw ICT as a technology farmers must use. Deciding not to use ICT, in Wayne’s view, would have negative consequences for farm viability.

One of the Mennonite farmers in the study, Sam, shared that the group of Mennonites he associated with “kinda shun the modern technologies.” He said that, “I kinda say with all that technology, it takes the fun out of farming. <laughs> It’s now becoming business and high tech and still I mean, actually part of the fun is putting the seedling down and letting the rain and the sun grow the product.” Sam viewed the experience of growing crops naturally as a source of enjoyment. For him, overemphasizing business aspects of running a farm or utilizing information technologies detracted from what he liked about farming. Coupled with his religious views, these were reasons why Sam chose not to utilize ICTs on his farm.
A theme emerging from the interview data, the replacement of farmers’ knowledge with ICT-sourced information, offers some parallels to Braverman’s concept of deskilling (1974). When asked what he thought to be the most important abilities to have as a farmer, Jack mentioned having basic skills and knowledge for making agronomic decisions and fixing and operating equipment. He explained that it was not until he began supervising his nieces who started to help him on the farm that he realized that he had been taking these very abilities for granted. However, Jack also pointed out that “there’s so many resources now. It’s like one neighbor said, ‘You know any dummy with a smartphone can farm now, because he can get all the information he wants.’” From Jack’s perspective, having fundamental farming knowledge and skills might be less important now than in the past due to the vast body of information that can be accessed on the internet. His neighbor’s comment suggests that because farmers can troubleshoot virtually on an as-needed basis, their individual knowledge and skills that are informed by experience and trial-and-error are undermined. Laura, who managed about five acres of diversified vegetables and grain, expressed a concern that being incredibly dependent on smartphones could lead to less capable humans and farmers and “totally counter trying to figure things out yourself and doing it the more old-fashioned way when there wasn’t any of that.” She stated that as smartphones become more popular, people could become too dependent on them. While Laura saw issue with replacing human capacity to make informed decisions with smartphones, she also thought that having a balanced use of them could allow a farmer to “get ahead.” She suggested regardless, farmers should be able to do “apps in your head rather than on your phone.” Sean, a farmer in his early twenties who used two smartphones, commented that without his smartphones, his farm would be lost. He explained that he could find anything out on his smartphone as long as the battery was not drained.
Collin, the farmer in his thirties, talked about how the skills needed to farm had changed with the availability of information technologies such as GPS tools and smartphones. He explained that when he first started farming, he planted corn by following markers with a six-row planter but “… now we have, you know, twelve-row corn planters with GPS and auto-steer and you can be fiddling with your phone or looking at AgWeb or sending an e-mail until you hear the beep at the other end of the field that says it's time to take your eyes off your phone and turn the tractor around, you know.” In this example, Collin notes that the skill of planting corn in straight lines has been replaced by GPS and auto-steer tractors. While Collin saw the technological change occurring on his farm as significant, he was passionate that information technology did not reduce the hard labor that is required for farming. He said:

Just because there's iPhones and smartphones and magazines and the Internet, you still have to be dedicated to it [farming] and you still have to work your ass off…farmers were always, you know, working with dirt and dirty and grungy and it was hard work. It still is. You just have a lot of accessories to make it a little less hard. I don't think he [a farmer] can go in thinking it's a walk in the park, because it's not. It takes hours of dedication to it, especially if you have a big farm, especially if, you know, you got beans, corn, wheat, barley, rye, you know, some kind of dairy or some kind of beef, you know, hogs, chickens, you know. You add all that all together and it still takes extreme, hard work. It doesn't matter how many applications there are. They only help you make it easier and help me make better decisions. It's still hard work.

For Collin, technology cannot replace the inherent skills and work ethic a person must have in order to farm. Additionally, IT cannot fully replace a farmer’s ability to make decisions and thus, has limitations on the help it can offer to farmers.

Some of these limitations relate to the value of local knowledge, the specificity of place, and their implication for using ICT to make farm management decisions. Scott discussed how the conditions of a physical attribute of his farm, soil, could not be easily predicted.
It seems like soil conditions locally can change so rapidly and be so localized, it's almost easier [than using an app that provides soil-moisture data] just to check my own fields as far as moisture and things like that, especially since you can go six miles from here and you can be in limestone soil, and they are way too wet to get in for two days and, you know, we can be out in the field.

Collin also doubted the use of ICT to assist him with making decisions on his farm, at least in terms of pest management. He thought that a smartphone would not help him with managing pests unless his fields were either very wet or very dry. The youngest farmer in the study, Sean, also thought that pest issues were best managed through obtaining information locally. Even though he was highly dependent on ICT to help him manage his family’s farm, he considered his crop consultant Steve as his “number one” in order to keep management directed “more towards our local pest issues here.” Another farmer, who had not “fussed too much” with information technology, thought that if there is anything unique about his farm “it’s just experience really. Over the years, we’ve learned what works and what doesn’t work…”

These findings illustrate the complex perspectives that farmers have about using ICTs to make decisions in farming. Farmers and agricultural advisors in this study explained that they thought that older farmers were unable or unwilling to utilize ICTs in their farming operations. Both older and middle-aged farmers expressed the view that young farmers were the most likely to use ICTs in farming. However, despite perceptions linking age to ICT use, middle-aged and older farmers talked about how they owned ICTs and were learning to use them, or had an interest in doing so. One way that older people were becoming aware of or learning how to use ICTs was through young family members or neighbors. A young farmer referred to himself as “illiterate” when it came to operating a computer, countering the dichotomous perception that young people are willing and able to use ICT and older people are not. Farmers had mixed attitudes about the convenience of using ICTs for farming. While some expressed that they
favored the immediacy of receiving information through their smartphone outdoors, others talked about how they thought smartphones were too small to do anything meaningful on them. Also, some farmers spoke about feeling challenged by having too much information available to them, a phenomenon called information overload. The widespread use of ICT in farming was an inevitability that a few farmers in the study saw. Eventually, they thought that they would need to embrace ICTs and utilize them in their farming operation to stay competitive. Some farmers expressed attitudes that had some parallels to the concept of deskilling, but one farmer passionately stated that no ICT could fully replace the work ethic and experience one needs in order to farm.

**Discussion and Conclusions**

In this paper, I have examined perceptions farmers and agricultural advisors expressed about the use of three sources of knowledge including: local knowledge, knowledge exchanged between agricultural advisors and farmers, and information communication technologies. Related to local knowledge, farmers used their knowledge about the soil and topography of their farms, historical farming norms, as well as knowledge from their neighbors, to inform some aspects of their farm management decisions. Farmers spoke about the relationships they had with agricultural advisors, particularly independent crop consultants and local Extension educators, who behaved either more reactively or proactively. Some farmers described situations where their advisors played more proactive roles, but other times behaved more reactively. Insights offered by three of the agricultural advisors suggested that they sometimes had facilitative roles where they saw value in farmers’ knowledge and used it to determine effective solutions. Themes related to perceptions of ICT were age, convenience and immediacy, inconvenience and
inefficiency, inevitability of widespread ICT use, and replacement of human knowledge and skills. Some farmers expressed that because of particular and changing local conditions, utilizing ICTs to predict weather, soil, and pest conditions did not always offer accurate results.

Local knowledge is experiential, place-based and embedded in social and cultural contexts. Participants in this study described local knowledge that sometimes figured into their farm management decisions, with some suggesting ICTs cannot or should not replace farmers’ experiential local knowledge. Even those farmers who strongly depended on ICT for informing their decisions utilized local knowledge. This finding suggests that ICTs should be designed with the intention of offering farmers useful tools to guide their decisions, recognizing that farmers’ local knowledge has an important role in making informed farm management decisions. Doing so is beneficial for researchers and developers because if farmers are encouraged to be fully dependent on ICT, sometimes inaccurate predictions and information could be off-putting or problematic. However, if farmers are informed that they should compare information that they source from ICT with local knowledge and knowledge from their advisors, better decisions could be made, improving attitudes about ICT use in farming. For farmers who avoid exchanging information with neighbors, an ICT allowing them to connect with farmers virtually and access information could be of potential use. The perspectives shared by the farmers in this study emphasized the importance of considering local knowledge for developing technological solutions to sustainability problems in agriculture. Some of the farmers in this study preferred to utilize local sources rather than knowledge generated by ICT because they understood conditions as variable and capable of changing quickly depending on the locality. This finding supports the notion that ICT that promotes sustainable agriculture should function to support and enhance local knowledge, and avoid seeking to replace it.
Many farmers in this study were heavily reliant on recommendations provided by their hired crop consultants, a practice that could hinder the use of ICTs promoting sustainable agriculture. Since farmers frequently receive knowledge from advisors, with some advisors playing a significant role in the decision making on a farm, it has been important to study how farmers perceive and experience advisors. Such knowledge exchange encounters are important for understanding how farmers might incorporate ICT into their decision-making process, as some decisions are made by solely by farmers, while other decisions are heavily determined by advisors. A decision support system designed to assist a farmer with making a decision he or she does not typically make is not likely to be utilized by farmers.

Information communication technologies such as computers and smartphones have the potential to contribute to the sustainability of agriculture by: connecting farmers to information that can reduce environmental impacts while maintaining profitability and providing outlets for farmers to share information virtually. Additionally, ICTs serve the benefit of making information available quickly, whereas knowledge from human sources can take longer to obtain. As noted earlier however, in order to pursue sustainability goals, diverse sources of knowledge must be integrated into the design of ICTs. Since scientific knowledge drives scientific research, transitions to sustainability will need to shift into a new sustainability paradigm that situates ICT use in farming within specific social, cultural, and natural contexts.

As noted by Kloppenburg (1991) and Bell (2004), sustainable agriculture does not require scientific knowledge to be replaced with local knowledge. Instead, this shift requires scientists, researchers, and ICT developers to engage in facilitative knowledge encounters with farmers, seeking to learn from them and engage in dialogic ways of learning. Additionally, since ICTs require a user to interface with an electronic device rather than a human, developers of
technologies will need to come up with creative approaches for contextualizing recommendations and information, as well as taking into account the different sources of knowledge farmers consider. ICTs also offer farmers access to the world wide web and new modes of communication. As the use of ICTs in the US continues to grow, a great opportunity is offered to connect farmers with knowledge to advance sustainable agriculture. Scientific knowledge on its own cannot accomplish sustainability goals since reductionist approaches to science isolate agriculture from its local social and natural environment. ICTs that complement or enhance the knowledge farmers already have—local knowledge—have the best chance of promoting sustainable agriculture.
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CHAPTER 3

Paper 2: Farmers’ Understandings of Good Farming: Contributions of a Lifeworld Approach

Introduction

Approaches to agriculture are often framed in terms of rigid, dichotomous categories with clearly opposing ideals and values attached to each. Sociocultural paradigms that are relevant to agriculture express prevalent and collective worldviews in terms of sharp conventional and alternative categories. Emphasis tends to be placed on points of divergence, making it appear that those identifying with either conventional or alternative agriculture hold competing “views of what constitutes ‘good’ agriculture” that are “at odds with one another” (Beus and Dunlap 1990:609). The conventional-alternative dichotomy for agriculture (Beus and Dunlap 1990) describes worldviews at a societal or regime level. At a macro-level, institutions (e.g., governing bodies, universities) may follow trajectories that are guided by a paradigm; however, at a micro-level, an individual makes decisions within the context of their lifeworld, which is more variable, subjective, and contextual (Walter 1997). Because of the dynamic conditions of the lifeworld, attempting to understand the attitudes of farmers through more rigid, macro-level paradigms can stifle transitions to sustainable agriculture, as polarization can obscure similarities and common interests, making people think that they live in a different world from people whom they believe to be different from them (Herndl et al. 2011).

Throughout American history, a good farmer narrative has been projected by media outlets, creating a popular image of the good farmer. The good farmer has been framed in terms of agrarian mythology (e.g., hardworking), agricultural industrialization (e.g., innovative), and as alternative to industrialized agriculture (e.g., community-based) (Walter 1997). In the 1900s,
Thomas Jefferson declared that, “Those who labor in the earth are the chosen people of God” and farmers are the “most valuable citizens” (Jefferson 1900:532). Jefferson’s views on smallholder agrarianism promoted the preservation of rural virtues that included “integrity, morality, common sense, and popular democracy” (Beus and Dunlap 1994:465). These virtues stood in contrast with those of the French Physiocrats, whose agrarianism emphasized efficiency and advocated for increasing farm size to enhance the commercial success of farms (Beus and Dunlap 1994).

A more Physiocratic rhetoric of good farming is reflected in the views of Earl Butz who served as the US Secretary of Agriculture during the 1970s. Butz encouraged farmers to “get big, or get out,” (Beus and Dunlap 1990:601), thus promoting a view of good farming as synonymous with high production and advancing the idea that a relatively small group of Americans could and should be responsible for feeding the nation. Also during the 1970s was the release of Wendell Berry’s book (1997), The Unsettling of America: Culture and Agriculture, that called for a “healthier agriculture” that countered the “get big, or get out” ideology. Berry’s vision of agriculture was based on “ecological integrity, nutrition, technological appropriateness, social stability, skill, quality, thrift, diversity, decentralization, independence, [and] usufruct” (1977:217). With the passage of the Organic Foods Production Act during the 1990s, an “alternative” vision of good farming gained prominence and focused on the value of sustainability in agriculture (Winter and Davis 2006).

A popular commercial that aired in 2013 (Arend 2014:68) drew on Paul Harvey’s 1 1978 speech So God Made a Farmer (originally delivered at the Future Farmers of America Convention2). Harvey’s original speech provided a poetic account of what Burton, Kuczera, and

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1 Paul Harvey was a politically conservative radio host who was popular during the 1970s.
2 Future Farmers of America officially changed its name to the National FFA Organization in 1988 (FFA 2014).
Schwarz (2008) call the “mythical good farmer,” describing a farmer as a man\(^3\) who was a caretaker of the earth; had an extremely strong work ethic, yet made time to regularly attend church and be an active member of the community; and was tough enough to wrestle a calf, but sensitive enough to be a devout husband. Beneath the audio in the 2013 commercial, there were traditional farm and rural images of an old country church, a father and his son, men looking tired from hard work, American flags, vast monocultural fields, and large combines. The commercial illustrates Beus and Dunlap’s (1994) claim that the dominant agrarian paradigm promotes a traditional industrialized agriculture while simultaneously endorsing contradictory Jeffersonian ideals of small-scale agriculture. Throughout American history, meanings of good farming have been promoted through public policy and popular media (like the 2013 commercial based on Paul Harvey’s earlier speech); however for farmers, perceptions of good farming are also shaped within a specific context that is both personal and social.

This study considers how farmers themselves understand good farming in terms of traits, skills, and approaches to farm management practices. More specifically it explores how farmers’ individual knowledge, past experiences, and interpretations of other farmers’ practices contribute to their current and evolving perceptions of good farming. Using a lifeworld approach (Schutz 1962; Natanson 1970; Schutz and Luckmann 1973; Schutz 1966; Berger and Luckmann 1966) as a guiding framework, I explore how farmers growing grain in southeast Pennsylvania perceive good farming. A person’s lifeworld is understood as the “province of reality which the wide-awake and normal adult simply takes for granted in the attitude of common sense” (Schutz and Luckmann 1973:3). A lifeworld approach draws on the subjective experience of the individual including past and immediate experience, and takes into account social reality shaped by the

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\(^3\) Dominant agrarian discourse has been socially constructed to be centered on men and has neglected to portray the contributions of female farmers, farm daughters, and farm wives fully or accurately (Sachs 1996).
intertwining of individuals’ subjectivities—i.e., intersubjectivity. In the remainder of this paper, I review the social science literature on good farming and the lifeworld approach and describe my research methods. A findings section presents how farmers in this study drew on their experiences growing up on a farm, interpreted farming practices of their neighbors, and constructed typical understandings of different farming approaches, to inform their perceptions about good farming. I conclude by distilling the central findings of the study, discussing study limitations and offering some suggestions for future research.

**Conceptual Framework and Literature Review**

This section reviews how the concept of good farming has been studied at both paradigmatic and individual farmer levels. The lifeworld approach is then presented to explain how this study will explore good farming. The section ends by bringing the concept of good farming and the lifeworld approach together in a brief discussion of three studies that have used the lifeworld approach to address topics related to sustainable agriculture.

**Good Farming**

Research closely related to the specific concept of good farming was first published by Walter (1996) who studied the American ideology of the “successful farmer” in popular farming magazines from 1934-1991. Walter (1996:604) found that regardless of the time period, popular farming magazines consistently portrayed successful farmers as being “aggressive pursuers of higher production, greater efficiency, and often, more farmland or livestock.” In another study, Walter (1997) surveyed 68 Illinois farmers to determine how their values about farming and farming practices corresponded to four successful farmer types. Based on the popular successful
farmer images from his 1996 study, the four types included: 1) Stewards (farmers who exhibited environmental stewardship); 2) Managers (farmers who were good managers); 3) Conservative (farmers who were financially conservative); and 4) Agrarian (farmers with agrarian values who stressed the importance of family). Walter found that 40 percent of the sample could not be identified as any one of these types of farmers. This finding demonstrates that relying on agricultural paradigms projected by popular media to understand farmers’ constructions of what it means to be successful (or good) at farming is limiting at the individual farmer level.

Howden and Vanclay’s (2000) study also showed the limitations of relying on discrete agricultural paradigms to explain individual farmers’ attitudes and behaviors. In focus groups conducted with Australian farmers, participants were asked to identify different farming styles on a note card. The note cards were then used to facilitate discussion about the styles. Participants tended to exaggerate the negative aspects of farming styles (e.g., “Traditional,” “Diesel Burner”) that were generally not accepted by the community and promoted farming styles (e.g., “Progressive,” “Innovative”) that were generally accepted. How farming styles were described represented farmers’ ideas of good farming which the authors suggested were “socially constructed and defined through interaction among farmers, through participation in extension activities, and through rural media” (Howden and Vanclay 2000:297). Some farmers in the study expressed that they thought farming styles were not distinct and mutually exclusive. Using the styles identified in the focus groups, a different sample of farmers was interviewed and asked to discuss how similarly or differently they thought a farming style described their own way of farming. Farmers expressed that they found difficulty identifying with just one style and usually selected multiple styles. One farmer even identified with two strongly contrasting styles, “progressive” and “traditional.” Findings from these studies show that more macro-level or
general typologies that seek to explain individual farmers’ views of good farming tend to simplify farmers’ complex understandings which are often more blended and responsive to changing social conditions.

From the perspective of individual farmers, good farming has most commonly been studied through identity and cultural approaches. Different from Walter (1997) and Howden and Vanclay (2000), these studies recognize the importance of local social context in shaping perceptions of good farming. In an ethnographic study (Gray 1998) conducted with Scottish farmers about their perceptions of family farming, growing up as a farmer was tightly linked to participants’ farmer identities. Two phrases that were commonly spoken by participants were: “farming is bred into you” and “good farmers come from farming families” (Gray 1998:354).

The small network of organic Illinois farmers interviewed in Stock’s (2007) study expressed their concern about the environment, health, and well-being of customers and the general public through their farming practices. Stock found that family-based organic farmers in Illinois took a “moral stance through their actions as good farmers” by exercising their values as reflexive consumers on their farming operations. Using identity control theory, McGuire et al. (2012) studied how a community of field crop farmers in Iowa constructed and reconstructed their farming identities and the influence this had on their conservation behaviors. The theory suggests that individuals have multiple identities that are arranged within a hierarchy, with some identities being more salient than others. Every farmer has an overall “good farmer” identity standard that social behavior is compared to and is supported by productivist and conservationist sub-identity standards. In the community that served as the case study for McGuire et al.’s study, farmers were informed that surrounding farms had polluted a creek in their watershed. When farmers with salient “conservationist” identities took action, farmers with salient “productivist” identities
also responded, elevating their less salient conservationist identities to a higher status. This shifted their overall “good farmer” identities so as to incorporate greater awareness and concern for the environment.

Burton (2004) used a cultural approach focused on the meaning of symbols in farmers’ identities in his qualitative study of farmers who were part of a valley community in England. Participants perceived the quality of the physical appearance of crops as differing between “good farmers” and “bad farmers.” Farmers judged farm quality based on a crop’s color and height, as well as the density of planting, straightness of crop lines, and crop yield per acre. Burton found that because of the openness of farm fields, their appearance provided an informal means for others to judge the quality of the farmer. Farmers whose fields appeared in ways perceived poorly by other farmers were by extension themselves considered to be lazy. Burton’s research shows that farm appearance can serve as a social credit or debit for one’s identity as a good farmer. Silvasti (2003) also took a cultural approach to study how Finnish farmers perceive their relationship with nature, and while doing so addressed farmers’ views about good farming. Similar to Burton (2004), Silvasti (2003) found that participants based their perceptions of what it means to be a good farmer on farm appearance. Tying the significance of field appearance to Weber’s concept of the Protestant work ethic, she stated that, “The public reward for hard work is community recognition through the tangible appearance of the farm—that on this farm there lives an industrious and hardworking, that is, decent and moral farmer” (Silvasti 2003:145). The reason some farmers care about farm aesthetics is not solely because they want their fields to look good, but because others will perceive this as symbolic of their own character. Using cultural and social capital as a conceptual framework, Sutherland and Burton (2011) conducted a case study within a Scottish farming community related to exchange of equipment and labor
among farming neighbors. They found that farmers who could “produce symbols of good farming,” such as maintaining farming equipment, had “a greater ability to exchange machinery or labour” (Sutherland and Burton 2011:249). On the other hand, those who were not able to appear to their neighbors as good farmers missed out on opportunities to participate in the local informal exchange economy.

These studies show how literature related to good farming has focused at both more macro and micro levels. Research that considers social context illuminated farmers’ more nuanced and rarely compartmentalized views, while studies privileging paradigmatic or typological approaches tended to obscure the richness of individual farmers’ perspectives. The present research recognizes the importance of social context in orienting farmers’ values by embedding their views in the temporal and spatial dimensions of social context through a lifeworld approach.

*The Lifeworld Approach*

The lifeworld is “the world of the natural attitude of everyday life” and is at the core of phenomenology, the study of human lived experience (van Manen 1990:7). A person’s lifeworld is premised on intersubjectivity, meaning that individuals interpret the world not only through their own experiences, but also through explicating the behavior of others (Schutz and Luckmann 1973). Bell (2004:132) articulates intersubjectivity in the simplest of terms, stating that, “A huge proportion of what we know we learn from others. It must be this way. Who has time to try to learn everything for herself or himself?”

Phenomenologists refer to a person’s intersubjective world as their common-sense or everyday lifeworld. This world is one that is for the most part taken for granted and is “the arena
of social action; within it men [sic] come into relationship with each other and try to come to
terms with each other as well as with themselves” (Natanson 1973:XXVII). The common-sense
lifeworld is comprised of three main components: biographical situation, stock of knowledge,
and temporal and spatial dimensions (Natanson 1973).

First, biographical situation includes an individual’s unique combination of personal
characteristics and experiences such as special interests, desires, ambitions, and religious or
ideological preferences. A main aspect of biographical situation is how one was raised and
socially conditioned to perceive and experience the world. The second aspect of a person’s
lifeworld is their stock of knowledge. Typifications inform knowledge and are “recipes” through
which meanings of the world are constructed, and are based on one’s interpretations of the
behavior of humans who have lived in the past, now, and in the future, and who live near or far
away (Natanson 1973:XXIX). How one perceives what is typical is developed through lived
experience and according to Schutz (1962:59), “the unique objects and events given to us in a
unique aspect are unique within a horizon of typical familiarity and acquaintanceship.”
Overgaard and Zahavi (2009:102) explain that, “objects in the life-world are not simply unique,
individual entities, but ‘mountains’, ‘trees’, ‘houses’, ‘animals’, and ‘persons.’” In other words,
people attach typical meanings that are taken for granted as commonsense. For example, in
agriculture, farmers might be typified along the lines of espousing “conventional” or
“alternative” agricultural paradigms. Each of these typifications is associated with different
meanings. Despite the fact that a person may have never met a farmer who grows or raises the
food he or she eats, this person still carries an idea of what the “typical” farmer is like. How
farmers themselves typify different farming practices is important for understanding “good
farming,” because attitudes about what is considered good farming are associated with each type
(Beus and Dunlap 1990). Burton and Wilson (2006) support this notion, stating that a person’s notion of the “other” contributes to the defining of oneself. How farmers typify other farmers and farming practices will be explored in this paper to illuminate perceptions of good farming.

The third aspect of the lifeworld includes social relationships based on spatial and temporal dimensions, what Schutz and Luckmann (1973) refer to as “coordinates of the social matrix.” These dimensions are brought to bear in the concept of intersubjectivity. Berger and Luckmann (1966) describe spatial and temporal social relations as a continuum. One end represents those who exist in the “here and now” and includes people in an individual’s “inner circle.” The other end includes those who are highly anonymous and would be impossible for the individual to meet face-to-face. The term zone of operation describes the spatial dimension of a person’s lifeworld that can be influenced through direct action. An individual’s primary zone of operation (Schutz and Luckmann 1973:37) is “…the sector of the world that is accessible in immediate experience.” In the primary zone, an action is physically linked to the person that acted.

In the lifeworld, four main designations of social relationships are identified based on how an individual and another individual relate to each other primarily in terms of time and space: predecessors, contemporaries, consociates, and successors (Natanson 1973). These social relationships are outlined in the context of farmers in Table 1. A predecessor is a person who lived before an individual and whose actions are subject to interpretation (Schutz and Luckmann 1973). A contemporary is a person that shares a temporal reality with an individual, but does not necessarily live in the same place. Consociates make up an individual’s inner circle and share both temporal and spatial coordinates with the individual. They “are mutually involved in one another’s biography” and “are growing older together” (Schutz 1962:16). Successors are people
who live after an individual passes away and were not known to this individual during their time lived on earth.

Table 1. Farmers’ Social Relationships (based on current temporal and spatial dimensions)

<table>
<thead>
<tr>
<th>Social Relation to Farmer</th>
<th>Time</th>
<th>Place</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contemporaries</td>
<td>Shared</td>
<td>Shared</td>
<td>Farming neighbors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not shared</td>
<td>Farmers in different state one has never met</td>
</tr>
<tr>
<td>Inner Circle</td>
<td>Shared</td>
<td>Shared</td>
<td>Fellow-farming friends, family</td>
</tr>
<tr>
<td>Predecessors</td>
<td>Not Shared</td>
<td>Shared</td>
<td>Farmers’ great-grandparents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not shared</td>
<td>Historical figure from outside community</td>
</tr>
<tr>
<td>Successors</td>
<td>Not Shared</td>
<td>Shared</td>
<td>Farmer’s children</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not shared</td>
<td>Future generations from outside community</td>
</tr>
</tbody>
</table>

Adapted from Schutz and Luckmann (1973)

Figure 1 provides a visual representation of an individual’s lifeworld. In the bottom right corner, the individual is represented and exists on a spatial coordinate within their immediate environment (or zone of operation). Space expands to the uncertain boundary of the individual’s surrounding world. In relation to the individual, the temporal continuum spans from the precedent world, to immediate world, to subsequent world. The point where these temporal and spatial boundaries (or social coordinates) intersect defines social relationships in the lifeworld.
The next section explores how past studies related to farming have used the lifeworld approach as a framework.

*The Lifeworld Approach as Related to Values Associated with Farming*

No studies have been identified that use a lifeworld approach to study farmers’ perceptions of good farming and very few studies have been conducted that take a lifeworld approach to understanding issues related to sustainable agriculture (Schneider et al. 2010; Kings and Ilbery, In press). Oberkircher and Hornidge (2011) used a lifeworld approach to understand how farmers in Uzbekistan perceived water and its management and thereby address inefficient irrigation. They explained “the lifeworld functions as a personal encyclopedia of meaning and action” and described how farmers in their study described different types of water, people, and
land (Oberkircher and Hornidge 2011:403). Kings and Ilbery (In press) considered “contextual life histories” of farmers in a comparative phenomenological study exploring how “organic” and “conventional” farmers in central-southern England understood and experienced being either an organic or conventional farmer. A study conducted by Schneider et al. (2010) used the lifeworld approach to study how Swiss farmers accepted or rejected soil conservation practices. In these studies, use of a lifeworld approach allowed researchers to gain an in-depth understanding of how farmers came to perceive certain topics in different ways. The present paper builds upon these previous studies to consider how participants’ lifeworlds inform and shed light on their perceptions of good farming.

**Research Methods**

In this section, I explain how a phenomenological lifeworld approach and ethnographic components guided the research methods. This is followed by an explanation of how research participants were selected and recruited, and how data was collected and analyzed. To understand farmers’ perceptions of good farming, I used a qualitative, phenomenological lifeworld approach with ethnographic elements. In the lifeworld, spatial dimensions have a significant role in shaping farmers’ social relationships. Thus, place was a key component of this study. Constructions of good farming are rooted in local understandings, including those people have of regional history. Ethnographic research studies culture-sharing groups, including their perceptions as based on intersubjectivity and common understandings of behaviors, language, and the gap between what people do and ought to do (Creswell 2013).

The culture-sharing group comprising this study’s sample included 17 farmers and four agricultural advisors living and working in the Great Valley Region of southeastern Pennsylvania
(PHMC 2014b). Geographically, the Great Valley refers to a large valley that stretches from Northampton County down through Franklin County and into the state of Virginia and is “bounded on the north by long, narrow, steep ridges, penetrated by gaps and given various names along its route” (PMCH 2014b: 9). Within this region, what one key informant referred to as a rural “neighborhood” was identified. The Great Valley Region has long been seen as part of eastern Pennsylvania’s grain belt. This was an important consideration for this study, which focused on grain farmers. Grain farmers are fairly common in eastern Pennsylvania and importantly, operate farms of varying scales under diverse management approaches. These characteristics permitted some variation in the farmer sample, while also allowing for meaningful comparisons among farmers growing one common crop. The goal in this qualitative research was to select a purposive sample that maximized range, ensuring that atypical cases were included and that the data captured both diversity and nuance in farmers’ perceptions and experiences.

The sample was selected by first enlisting the guidance of a key informant, an “informed insider” (Weiss 1994:20), who was also interviewed as an agricultural advisor in the study. With their assistance, I gained access to seven grain farmers and three additional agricultural advisors who provided services to grain farmers in the area. The remaining 10 grain farmers were recruited through snowball sampling, a technique that involves asking willing participants to make referrals (Weiss 1994). Before each interview, all participants were asked to read an informed consent form and sign it to agree that they understood their participation in the study.

4 For this study, farmers were understood as individuals who were primary decision-makers and managers of farming operations that sold or used grain commercially.

5 A sample that maximizes range differs from random sampling because while the objective of selecting participants randomly is to provide a representative account of the population, the latter is focused on “displaying significant variation” (Weiss 1994:23).
Prior to the start of the study, an application to conduct this research was approved by the Pennsylvania State University’s Institutional Review Board.

Semi-structured interviews (Smith and Osborn 2008) with a total of 21 participants were conducting during the fall of 2013 and winter of 2014. Interviews with farmers usually took place inside their farmhouses, with the exception of four that happened in barns, and one that took place outdoors. Advisors were interviewed in their offices, either at home or place of work. Conducting interviews in participants’ familiar social settings gave me a deeper understanding of contexts shaping their everyday experiences.

Table 1 and Figure 2 display key characteristics of the study farmer sample. These data are based on basic background information about participants and their farms collected through a questionnaire administered at the conclusion of the interviews.

Table 2. Pennsylvania Sample Farmer and Farm Characteristics (N=17)

<table>
<thead>
<tr>
<th></th>
<th>Mean = 48; Median = 43; Min = 29; Max = 71</th>
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<tbody>
<tr>
<td>Farmer age</td>
<td>Mean = 48; Median = 43; Min = 29; Max = 71</td>
</tr>
<tr>
<td>Farmer gender</td>
<td>16 male; 1 female</td>
</tr>
<tr>
<td>Total land farmed (acres)</td>
<td>Mean = 596; Median; Min = 5.5; Max = 2650</td>
</tr>
<tr>
<td><em>Owned</em></td>
<td>Mean = 241; Median = 178; Min = 0.5; Max = 800</td>
</tr>
<tr>
<td><em>Rented</em></td>
<td>Mean = 357; Median = 114; Min = 0; Max = 2500</td>
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Source: Background questionnaire
The average age of farmers included in the sample was about seven years greater than the average age of farmers in the main study county (USDA NASS 2014a), as well as the state and country more generally (USDA NASS 2014b). Figure 2 presents the numbers of study farmers in each age group, by ten-year increments. Farmers in their twenties and fifties were less represented in the sample, with just one farmer in each age group. Farmers in their thirties comprised almost one-third of the farmer sample (n=5). Despite efforts to include more female farmers in the study and 15 percent of farmers being female in the primary study county (US Census of Agriculture 2012), only one female grain farmer could be recruited to participate in the study. Additionally, three of the study farmers identified as Mennonite, a religious group that follows varying customs limiting the use of specific modern technologies and has had a long presence in the study area.

All 21 interviews with farmers and the agricultural advisers were audio recorded and professionally transcribed with informed consent of participants. Transcripts were then imported into NVivo 10, a software program designed to analyze qualitative data. The coding techniques that were used included double coding, holistic coding, and focused coding (Saldaña 2009). Throughout the coding process, codes were collapsed and the data were themed to identify
shared meanings. Passages that corresponded to more than one code were double coded. Holistic coding allowed for the data to be analyzed inductively by allowing passages of text to be coded in context, rather than isolating ideas by coding individual sentences. Once salient themes were identified, focused coding was used to explore those themes further.

**Research Findings**

Research findings are organized into three sections. The first section is related to the notion of becoming a good farmer and discusses how participants drew on their biographical situations to describe their views of good farming. The second section shows the importance of social context in meanings of good farming, as well as the social relations attached to farmers’ immediate environments. Finally, farmers’ interpretations of other farmers’ approaches to farming, such as “organic” and “conventional,” are analyzed in order to deepen understandings of what good farming means.

**Becoming a Good Farmer**

Some farmers viewed becoming a good farmer as a process that is part of a person’s biographical situation, with youth as the most informative stage. In contrast to other participants who viewed solid business management and financial skills as the most important indicators of good farming, these participants explained that good farming was connected to specific personality traits and values that were best learned through the experience of growing up on a farm. Most of the farmers in the sample had been farming since they were young. The traits that Frank associated with good farming echo the views of Thomas Jefferson who constructed his image of the small-scale good farmer around a strong work ethic. Frank considered having a

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6 To protect the confidentiality of participants, all names that appear in this study are pseudonyms.
strong work ethic that included a willingness to get dirty and work long hours as an important quality of the good farmer. He explained that a farmer learns a strong work ethic growing up on their parents’ farm, stating, “You don’t make a farmer, you raise a farmer…that’s basically what I was raised in.” He attributed his own strong work ethic to his experience being raised around animals on his parents’ poultry farm where he had the responsibilities of feeding their turkeys and chickens twice a day, and putting them in at night. Frank explained how having these responsibilities as a young boy instilled in him the characteristics that he said were important for a farmer to have. Similar to Frank, Henry explained, “…I grew up on a farm…There’s a lot—you’d almost have to work with a farmer, be his right-hand man to really get into it.” Here, Henry’s ideas of important skills for farming were intertwined with his experience growing up on a farm and echo another farmer’s view that “growing up on the farm you learn things about farming that you don't even know you learn.”

One of the farmers in the study, Jack, described how what he had learned while growing up on a farm informed a more recent farm management decision to go “100 percent no till.” He sold his brand new John Deere tractor at the time and bought a smaller tractor to prevent soil compaction. To justify his decision to sell his large tractor, Jack, who at the time of the interview was 71 years old, reflected on his experience as a youth working on his father’s farm. “When I was young we were out in the field with a little, you know, a small tractor, an open tractor, and now they got these great big four wheel drives. Well that's creating more soil compaction, these great big combines, than we used to do years ago.”

Sam, a Mennonite farmer who had grown up farming, emphasized fathers being responsible for raising sons to become good farmers. He recalled a phrase his father used to say about families who encourage their sons to pursue off-farm employment: “…so we never had
jobs away out in the workforce but other families did and my poppa always said, ‘you can't raise a farmer by sending him off to a building that builds buildings.’ <laughs> So I guess we became farmers because pop made the provisions that we could work farms.” Sam credits his father for making it possible for him to become a farmer. He illustrated his point in an example with a farmer in the area whose father was a postmaster in a major city. Sam explained that since the father of the farmer did not farm, the son was not able to fully acquire important farming traits like “being a jack of all trades.” Sam felt that a father must provide his son with the hands-on experience of manual labor and decision-making. Through this approach, a son could learn to love farming and “grow into being a farmer.”

Another farmer also stressed that to learn how to be a good farmer, youth raised on farms must be included in farm management decisions. When asked what he thought were the most important skills for a farmer to have, Scott explained that these had changed over time beginning when he took over his father’s role as the main decision maker on the farm.

**Scott:** That's what it is, but it's different when you're working for somebody, and I was always helping Dad. Then suddenly the roles switched. They changed. So, that came to the forefront a little.

**Interviewer:** Okay. The roles switched, as in—what do you mean by that?

**Scott:** Well, Dad always made the decisions. He was the boss. Then when I took over the farm, then that switched. Now I make the decisions, and so all those things—it looks different on the other side.

Scott recognized that his father previously had the role of primary decision maker on the farm, while he was his helper. Now that Scott was in the position to make farm management decisions, he found his new role challenging. He described that now, as the primary decision maker, he was “on the other side.” Being raised to become a farmer is not limited to growing up on a farm, but from the perspective of some of the farmers in this study, requires a youth to be included on the farm as both a laborer and a decision maker.
As one of the three farmer participants who had not grown up on a farm, Allen’s evolution in becoming a good farmer was in some ways different from those who had been raised on farms. Both his parents had grown up on farms but neither had pursued farming as adults. Allen became aware of his desire to farm during one year of study at a Mennonite college that did not offer any programs in agriculture. At that point, Allen recognized that formal education did not “jive” with him and that he was “more of a hands-on learner.” Allen emphasized passion as important for good farming: “‘Do we do it for the money?’ ‘No. We do it because it’s just, it’s something you love to do and it’s just…’ You know? I mean, most people, if there was a drought or whatever, they’d be like, ‘We’re done. We’re out of here.’” Allen commented that farmers do not farm solely to make a profit, a claim that he supported by explaining that most people would not see the obstacles that farmers face (e.g., drought, long hours, getting dirty) as worth the relatively low economic return. As an adult now in his forties, he supposed that it would have been a good idea to receive formal training in farming; however, in his next thought explained that, “But for me, I think experience is everything, so I think working on it, being more hands-on [are the most important skills for farming].” Similar to those farmers who had grown up farming, Allen thought that experiential learning was important for being a good farmer.

The account of Bruce, a certified organic farmer, reflected the views of the farmers in Gray’s (1998) ethnographic study, which found growing up as a farmer tightly linked to participants’ farmer identities. Bruce explained that he had decided to become a farmer because he “…grew up on a farm. And it really never left me. I left it, but it didn’t leave me…it [farming] was in my blood. I just love it.” Bruce attributed his decision to leave his corporate career to
become a farmer to having grown up on a farm 20 years prior. The statement that farming was “in his blood” suggests that Bruce viewed farming as part of his identity.

From these farmers’ perspectives, human qualities such as a strong work ethic and passion are traits that are linked to a farmer’s biographical situation, which according to the lifeworld approach, provide guiding elements for becoming a good farmer. The next section explores themes related to how farmers use their immediate environments or zones of operation (Schutz 1962), their farms, to display good farming.

\textit{Displaying Good Farming}

Farmers’ in this study described their farms as physical spaces that they perceived as important to maintain aesthetically. Reasons for maintaining a farm that “looked good” were associated with different values participants associated with good farming like pride, care, hard work, and environmental stewardship.

Gary, a crop consultant who also farmed, saw the desire to have a farm that looked good as having an influence on how his clients made decisions about managing their farms.

…I guess it's a source of pride, and they want—I mean, I like nothing better than to look out and see crops that look—I always think farmers tend to be more perfectionists than they should be, and it's in part because they want that to look—I like nothing better than to look across those fields and see perfect crops. Perfection doesn't often happen, but yeah. Some are more perfectionist than others, but I think at the end of the day everyone appreciates looking at a good field of whatever—a good crop.

He explained that spider mites are pests affecting the study area during hot and dry weather, making it important for farmers to scout under these conditions. However, Gary thought that some farmers avoided scouting because of the visible tracks tractors leave in crop fields, explaining that, “…for some people, it is just a mindset of that they just can't stand the thought of
driving through that field with anything. It goes to that perfection thing.” Gary explained that 20 years ago 30- to 45-foot sprayer booms were common and now 90 or 120-foot sprayer booms are common. The larger the boom, the fewer passes a farmer would need to make, thereby reducing the visibility of tracks in their fields. The crop consultant noted that it was not his intention to “make it sound like farmers are a bunch of perfectionists” and stated that another reason for farmers not wanting to drive through their fields is because they could potentially run over and damage their crops. Wayne, another farmer, echoed Gary’s view through his perspective that it was inevitable for a field with high-quality wheat to have visible tractor tracks, but added that:

…yet that’s one thing we don’t like to see is tracks through our fields. Guys are going to larger booms meaning thick, bare swaths with less traffic through the fields, you know, we used to have 45 foot booms. Now we’re at 60 [foot] and some guys are going to 90 [foot], so less tracks, but you’re going to see it. But I love to see the wheat just waving out there nice and bright and yellow. No weeds.

Both Gary and Wayne provided insight about how farmers display symbols of good farming. From this perspective, having few visible tractor tracks in fields is one way that farmers can shape their “good farmer” image, which includes being proud of one’s farm.

Jacob, a young farmer who had recently transitioned to organic production, referred to a famous predecessor, Winston Churchill, to describe how he perceived the appearance of a good farm. He emphasized that a good farm was diverse, meaning that it had, “Not just cows or crops, but both.” Jacob viewed farm management and appearance as interrelated, conveying that a farm should be well-managed through practices focused on environmental stewardship like preventing soil erosion. Unlike most of the other farmers in the study, for Jacob, a good farm did not necessarily need to be free of weeds. He also suggested that it was important for farmers to spend time in their fields, stating, “And I'm just going to give a little quote of Winston Churchill, he

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7 A boom, or sprayer boom, is used to apply pesticides to a field by delivering chemicals to nozzle tips to be sprayed onto crops (Klein and Kruger 2011).
said, ‘Some of the best fertilizer land can get is the footprints of its farmers.’ While Jacob’s reference to Churchill illustrated his view that good farmers need to spend time in their fields in order to be good stewards of the land, other participants in the study provided contrasting perspectives that associated the absence of equipment tracks (e.g., a tractor) with the standard for displaying good farming.

Frank’s view on displaying good farming suggested that how a farm looks reflects the character of the farmer who manages it. He explained, “Well that's [having a farm that looks good] important to me because how you keep your farm is how you basically keep your life, you might say. If you want to be a slob, then be a slob…” Frank described his perception of what a good farm looks like with a trip he took to Austria after hearing how neatly and cleanly kept the farms were there. This is an example of how Frank’s contemporaries, people in his lifeworld with whom he shared time but not place, contributed to his perceptions of what a good farm looks like. “And basically what I heard is true, they take very good care of their land [in Austria] and so forth…And they kept the fence rows cut back pretty good, you know, they kept things pretty neat, the fields were clean.”

In addition to fields, farmers also talked about how farm appearance in the maintenance of farm buildings and equipment was an important symbol of good farming. As the largest farm in the study, Nate’s farm included 2,650 acres, mainly corn and soybeans, with some small grains. He thought that it was very important to have a farm that looked good and saw the value he placed on a good-looking farm as something he had inherited from his grandfather and father. He reflected on growing up as a young boy and seeing his grandfather frequently polishing his tractor. Today, Nate and his father polish all of their equipment, even during the winter—he
admitted that “some people probably think we’re nuts.” Nate shared that sometimes his father would question him when he found something that was not clean:

You know, and my dad will remind me if maybe <laughs> you know, “Why haven’t you cleaned your truck in a while?” “Well, I’ve been busy.” And he knows. He might be kidding. But he also will be saying, “Hey, get that cleaned.” <laughs> “It don’t look good.” Or this or that. A lot, you know, the small things like the store, the spider webs go around the lights in the front.

Nate agreed with his father that it is important to keep farm equipment and fields looking clean. He thought it was important to project a professional image and made this a source of pride:

Not to pick on our neighbor down the street, but you go there, everything’s raggedy, the tractors are rusty. We’re very particular about the image of our farm. We want people to say, “Wow, Judson’s, wow, they have…” or they might say, “Whoa, they got all the new equipment,” or whatever. But we want people to understand that we’re proud of what we do and we’re a professional business and our wheat fields are, <laughs> we think, are the nicest ones around. And we’re pretty proud of what we do.

In this example, the process of becoming a good farmer informed Nate’s understandings of displaying good farming. Being raised as a farmer, Nate learned from his father and grandfather that good farming included showing through the appearance of the farm that he cared for and was proud of his farm.

Farmers focused on the importance of displaying good farming through field appearance in part because of how competitive it was to rent land in the study area. In an interview with a father and son, the father viewed “pride and money in the bank” as the reason why it was important for him to have a farm that looked good. The son followed up with, “You feel good about it and you feel like you did a good job and the landlords are happy…they don’t want to see a mess out there, you know?” As an organic farmer growing diversified vegetables and heritage grains, Laura also viewed keeping her farm as neat and weed-free as possible to be important. She noted that even on a small farm, what she referred to as a “farmstead,” it was very easy to let
things go. She pointed out that keeping fields looking good was especially important in her rented plots:

In our rented plots, we spend as much time keeping the perimeter weeds under control as we do trying to work on the crop so that it looks nice, so that it looks neat and it looks like somebody cares. I think that’s important…so we try our best over the course of a year to keep things under control because I think that impression shows that you really care. That’s the way we look at it.

Similar to some of the farmers in Burton’s (2004) study, which analyzed symbolic meanings in farmers’ identities, Nate explained that having a farm that looked good provided him a social credit, a competitive advantage in renting land in the study area:

...we have a pretty good reputation that we’re a pretty good farmer. And we do think that helps. And then we are paying as competitive as the next guy, or if not more in rental rates, and we can to try to keep up with the, you know, trying to gain land. I mean, not to pick on our neighbor. Our neighbors down the street here; they’re a small, smaller farm. Maybe they farm one thousand acres. But they have hogs and a small orchard, and they do all this little stuff, but they don’t do everything very well and they’re all older and driving very old equipment and it’s always, “Woe is me.” And so one parcel came up for rent that they were farming, the person [landowner] came to us, said, “Hey, we’re kind of tired of them. Do you want to…” <laughs>

In this example, from the perspective of Nate, his neighbors did not display symbols of good farming. Because they did not meet the norm of what a good farm should look like, their landlord was no longer willing to lease the land to them. The landlord approached Nate, who claimed to have the “nicest farm around,” to lease the land. Here, Nate demonstrates how displaying good farming can have important advantages for renting land.

Findings in this section demonstrate how some farmers present their meanings of good farming with symbolic display on their actual farms. In this study, farmers were concerned with the appearance of their fields, which included whether weeds were present, how straight rows were planted, visibility of tractor tracks, color of crops, and maintenance of farm buildings and equipment. Displaying good farming operated as a means of showing others that the owner of the
farm was a “good farmer.” The following section explores how farmers typified organic and conventional farming approaches to gain deeper insight about the perceptions and experiences of good farming.

Typical Perceptions About Good Farming

Typifications, preconceived notions about what things, people, actions, and situations are “typically” like, are used to construct meaning in one’s lifeworld and define oneself. Beus and Dunlap (1990) write that the views of farmers situated at opposite ends of the conventional-alternative (or organic) agriculture spectrum about what is and what is not good farming diverge. While some farmers in this study identified with one extreme end of the spectrum, others expressed uncertainty about whether or not they perceived different types of farming negatively or positively. Some farmers described meanings of good farming through personal past experiences, as well as through the “experiential access” (Overgaard and Zahavi 2009:101) they had to their farming contemporaries, most commonly their farming neighbors. Participants explained that gaining access to others’ farming experiences led them to question the attitudes they held toward different types of farmers, and sometimes reinforced them.

In the study area there was a relatively large Mennonite population and Nate’s view of “organic” was that within the area, organic agriculture was typically practiced by farmers who identified as members of that group. He associated organic produce with smaller farms, “that little farmers’ market,” and lower quality. He said, “We can’t produce enough organic crops <laughs> to feed everybody.” Nate had the largest farm in the study at a total of 2,650 acres. In addition to corn, wheat, and soybeans, he also grew 50 acres of sweet corn, which was sold at the farm store located at his family’s main farm. Through direct marketing of the sweet corn,
consumers were part of the immediate environment of Nate’s lifeworld. Their concern for buying non-GMO\textsuperscript{8} produce had led Nate to plant only non-GMO verified sweet corn, despite the fact that he prefers GMO sweet corn over standard sweet corn that is sprayed with chemicals. He explained, “You know, people ask about organic sweet corn. I says, ‘Well, do you realize what you’re asking for? You’re asking for basically a worm in every ear that you’re going to have to cut off.’ And they hear that and they’re just like, ‘Well, no. We don’t want that.’” Nate’s typifications of organic shed light on what he views as part of good farming—high production and high quality accomplished through the of planting GMO seed.

Another farmer, Harold, also referred to some farming contemporaries, in this case people who existed in the same temporal dimension as him but whom he has never met, in his typification of organic. Similar to Nate, Harold did not see organic agriculture as a “way to feed the world” and rather saw it as going “backwards.” The rhetoric that Nate and Harold used about “feeding the world” is part of what McDonagh (In press:2) refers to as an emerging “‘new productivist’ ethos promoted by some governments and national agencies.” The use of GMOs to address issues of global food security is at the core of a revived and now refashioned productivist discourse around the character of the good farmer. During my participant observation at a 2013 field day attended by 200 field crop farmers from southeastern Pennsylvania, a speaker on the topic of GMOs told the crowd, “The farmer should feel privileged to be a part of what he’s doing. Don’t bow your head when someone asks you about GMOs, be proud.” His admonishment suggests that a new popular image of the “good farmer” is emerging as new technologies make it possible to produce food at a scale larger than ever before. Like Nate, Harold also believed that the Mennonite population in the area was associated with organic

\textsuperscript{8} Genetically modified seeds are commonly referred to as GMOs, standing for genetically modified organisms. GMO sweet corn is far less widely planted in the US than GMO field corn.
farming and that organic produce had lower quality, using the same example of “nobody wants to share their corn with a worm.” He thought that organic crops also had lower yield, thus making it impossible to “feed the world.”

Some farmers in the study who were not farming organically were not as sure as Nate and Harold about whether or not they perceived organic farming as a good approach to farming. Frank’s typical understanding of organic was that crops raised organically could not attain yields as high as crops raised using synthetic chemicals such as fertilizers and pesticides. He drew on his biographical situation and previous experience as a youth helping his uncles out on their farm in the 1950s to inform his typical view of “organic.” Back then, he explained, “…we didn't even use the term ‘organic,’ that's just the way you did it back then, it was manure and—going to the corn crib. I remember my grandfather getting cobs from the corn crib and shoveling them off and that's what you planted, last year's crop for this year's crop.” Frank’s reflection on his childhood revealed that he typified ‘organic’ with farming practices that were used when he was a youth in the 1950s and 1960s, practices that many people today do not consider to be modern. Frank demonstrated that his perception of whether or not it was good to farm organically was conflicted. He said, “But organic has its place. I gave it some thought already, but it's labor intensive and it can be a pain. And I was raised on this stuff [with chemicals] so it didn't hurt me any as far as I know.”

Through his experiences with fellow-farmers, Jack provided various examples of how his typifications of organic agriculture wavered. He paid particular attention to the restriction on the use of genetically modified seeds in United States Department of Agriculture certified organic agriculture.

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9 Also known as a cornhouse, a corn crib is a granary used to store corn.
10 In the United States, 90 percent of all corn planted in 2013 was of a genetically engineered variety (USDA ERS 2013). Since genetically modified seed is patented, it is illegal for farmers to plant seed from the previous year. New seeds must be purchased every year.
agriculture (Hubbard and Hassanein 2013). Jack explained that even though he planted a lot of GMO corn and soybeans, and was even the first farmer in his neighborhood to plant GMO alfalfa, he was not entirely sure if GMOs were safe, stating that, “I would rather eat organic food, I guess, than the other.” Yet he also thought that typically, organic crops could not have as high a yield as GMO crops: “I do not know if we can feed the world totally organically.” Jack came to this view about organic by comparing his corn and soybean yields to the yields of a neighboring certified organic farm. While Jack had a GMO corn test plot that yielded 230 bushels per acre, his neighbor yielded 80 bushels per acre of organic corn. Jack’s typical conception of organic was further reinforced after a discussion he had with the manager of the local organic community gardens. Jack was hired to cut the lawns at the gardens where he would intentionally wear a shirt that promoted pesticides to playfully tease the manager. The manager had purchased sixty bales of straw from him to manage weeds, an alternative to using herbicides, which informed his typical view of organic. Jack’s view was that organic was not a feasible approach to agriculture, because if all farmers used hay to prevent weeds, there would not be enough bedding for animals.

Jack provided two examples where the behaviors of organic farmers he knew reinforced his typical view of organic agriculture. Still, later in the interview, Jack discussed his fascination with an organic dairy farmer in his area who used an intensive grazing approach.\textsuperscript{11} He had attended a farmer field day that took place at the organic farm and explained that he was intrigued about their grazing method. He shared that, “…my brother and I were basically high herds in the county and yet here’s this organic and grazing man who’s down producing a lot less milk and he’s very happy, but his expenses are minimal, too.” Jack’s account reflects the

\textsuperscript{11} Intensive grazing is a controlled grazing system where a pasture is sub-divided and ruminant animals are stocked at a high density and rotated at set intervals through the pasture sub-divisions.
findings of McGuire et al. (2013) who found that farmers construct their good farmer identity out of sub-identities that include identities based on both production and conservation. Farmers constantly compare their own farming behaviors and performance to those of their contemporaries, ranging from farmers they have never met to farmers that are part of their inner circle. Through interacting with fellow-farmers in his lifeworld, Jack’s perception of the value of organic farming was both elevated and lowered.

According to participants, there were few organic farms in the study area. Jacob, Bruce, and Laura were the three participants in this study who farmed organically. They all talked about their experiences interacting with other farmers in their immediate area who did not practice organic agriculture, expressing that neighbors had a range of reactions to how they farmed. Laura described how planting a heritage grain, emmer, had piqued the interest of her neighbors who farmed on a much larger scale. She described that the year prior, she had planted emmer in a plot across the street from her home. Farmers in the area wondered what the crop was because emmer resembles wheat, but is not of the common wheat variety.

_Laura:_ It was like, “What are you doing there?” And then when they saw my dear husband out there with his scythe cutting it, we had a couple people stop because it was like, “What the heck?”

_Interviewer:_ What kind of things did they say?

_Laura:_ Well, I guess they laughed mostly because it was so retro and so small and so different. It was kind of amusing to them. I mean in a nice way. It wasn’t derogatory, but it was just like, “What are you doing here?” So that field was just too little to get a combine in, so there was no way to harvest it otherwise. But it was kind of like a source of just interest and amusement I think to other people.

Laura’s story provides insight about how people with varying subjective farming realities and different attitudes about good farming experience one another in their everyday lifeworlds. She viewed farmers in the area whom she typified as “conventional,” as a type of “other” in her lifeworld, who did things “on a totally different scale.” Laura stated that she shared information
with conventional farmers and respected a farming neighbor who grew 40 acres of squash stating that, “I mean, I think that’s incredible, but he has a farm and tractor trailers and lots of help and he has a huge amount of resources that are completely out of the scale of what I’m doing.” In this way, Laura and her neighbors’ everyday experiences with one another help shape their typifications of labels like organic and conventional.

Jacob was an organic dairy farmer who grew wheat and “was conventional ‘til two years ago.” His strongest motivation for transitioning to organic was to take advantage of stable organic milk prices due to high demand. Jacob also thought that it was important to be “a good steward of the land and produce healthy soil, healthy food, and healthy people.” He said that when he transitioned to organic, he experienced attitudes from other farmers that he did not expect. Some farmers, Jacob explained, were “quite nasty about it” and while he was not trying to condemn “conventional farmers,” he thought that a lot of them felt threatened by his move into organic agriculture. He recognized that “conventional” farmers had their own lifeworld, stating that “They’re doing the best they know how.” Those part of Jacob’s inner circle, such as his family and veterinarian, had expressed opposition to his transition to organic; however, similar to Jack, these individuals began to question their understandings of good farming by observing the success of Jacob and other organic farmers in the area and seeing that “it can be done.” Jacob described how “conventional” farmers have “a healthy interest [in organic], it’s just kind of at arm’s length at this point.”

Bruce, a farmer who grew soybeans in addition to small grains, shared that when he decided to become certified organic he became “the laugh of the community.” During his first year growing organic soybeans, “the weeds were much more productive than the soybeans were.” However, after five to seven years, which is about the time it takes to get soil and fields
“into shape,” Bruce showed his “chemical farmer” neighbor that organic was a viable approach to farming. He explained, “…we had adjoining fields, my neighbor and I, that were both in soybeans at the same time. And he came over one time late in summer and said, ‘I don’t understand this. I spent all this money on sprays, and your fields look better than mine do.’” Over time, as Bruce’s non-organic neighbor saw Bruce’s fields improve, his typical view of organic changed.

The typifications that farmers who grew organically had about farmers who grew using GMOs or pesticides, and vice versa, demonstrate how others, especially contemporaries, in a farmer’s lifeworld help shape ideas of good farming. Because social interaction and observation are constantly occurring and typifications are based on these, meanings of good farming can and do change.

Discussion and Conclusions

Farmers use their past experiences, knowledge, and interpretations of how others farm to shape their meanings of good farming. The objective of this paper was to explore how grain farmers in southeastern Pennsylvania understand what it means to be a good farmer and practice good farming. The lifeworld is comprised of both farmers’ individual subjective knowledge and experiences, and the interplay of these subjectivities as individuals interact. Intersubjectivity occurs through social relationships based on temporal and spatial circumstances, and among those living in the past, currently, and in the future, as well as those immediately near or far away.

A deeper understanding of how grain farmers in southeast Pennsylvania perceive good farming was developed through the use of the lifeworld approach. There were some limitations
to this study. First, the perspectives shared by participants could not always be contextualized in their lifeworld, particularly if they did not reveal enough details. If a participant simply listed important farming skills (e.g., financial management) and did not elaborate understandings or context, it was difficult to analyze these responses using the phenomenological lifeworld approach. A second limitation was that the study area was located three and a half hours away from the researcher’s residential location in central Pennsylvania, making it infeasible to schedule a more desirable set of multiple interviews with each study participant. Commuting to the study area was particularly difficult during the winter, which is typically one of the best times to meet with busy farmers, yet also the season of particularly unpredictable driving conditions. A third limitation was that male perspectives heavily outweighed female perspectives in this study. This reflects the actual gendered patterns in area grain farming, but also limits a more gender balanced view of perceptions and experiences of good farming. Further research should make a strong effort to explore how female farmers perceive good farming.

Despite the limitations to this study, through analyzing how farmers used their past experiences and knowledge, as well as their experiences of others to describe meanings they attached to good farming, rich and in-depth perspectives were brought to the surface. Through the use of a lifeworld approach, three salient themes emerged from the interviews.

First, in a farmer’s lifeworld, the biographical situation is important for understanding the values associated with farming. This finding highlights how fundamental farming knowledge was engrained in the understandings and practices of most of the farmers in this study. It is important that research and programs directed toward making changes in agriculture recognize and seek to understand this learned aspect of farming. Many farmers suggested that a good farmer is an identity that one grows into by learning virtues, like a strong work ethic and passion,
a process typically accomplished by a son working alongside his farming father. This perception of what it means to be a good farmer excludes farmers who did not grow up in a farming family or did not have a parent to teach them, specifically a father. With the exception of one farmer, all the farmers interviewed in this study were male. Masculinity was implied in their responses about being raised as a farmer, as farmers suggested that fathers pass down knowledge, virtues, and experiences relevant to farming to their sons, with no mention of farming mothers or daughters, or female relatives. This finding supports the notion that girls and women often are not recognized for the contributions they make to family farms headed by males. Future research should explore how farming women perceive good farming, paying particular attention to how they draw on their biographical situations in similar or different ways. Additionally, future research should also examine how farmers who did not grow up in farming families perceive good farming.

Second, the role of intersubjectivity, or the interplay between farmers’ unique lived experiences, occurred through the display of good farming in farmers’ immediate environments, their farms. Many farmers described farm appearance, including maintained fields, buildings, and equipment, as being symbolic of the quality of a farmer or farming practices. A farm appearance that symbolized good farming was often described as having no weeds, straight rows, uniform crops with a distinct color and height, and an overall look of tidiness. This finding has important implications for the sustainability of farm management practices, as such a farmer may be willing to take less risk with pests than a farmer who is less concerned with projecting the social norm of good farming. On the other hand, a farmer who has a different view on what a good farm should look like may take more risks such as allowing some weeds to grow in a field
in order to promote biodiversity and take advantage of the biological benefits incurred from using smaller amounts of chemicals.

Lastly, farmers’ typified understandings of “types” of farmers sometimes challenged the idea of agricultural paradigms, agreeing with Bell’s (2010) study which demonstrated that often farmers do not fall precisely on one end or the other of the conventional-alternative (or organic) agriculture spectrum. Some farmers in this study who proudly grew GMO corn or produced crops organically provided examples of how they were surprised or interested in how “other” farmers approached farming. Because of social interactions and observations between a farmer and others, some participants demonstrated how meanings of good farming could be negotiated and re-evaluated, challenging the stereotype that farmers are resistant to change.

This study provided insight on ideas of how grain farmers in southeast Pennsylvania perceive good farming and how these understandings are shaped. Ideas of good farming and what it means to be a good farmer are constructed, in part, through the process of becoming a good farmer, displaying good farming, and typifying how others farm. Participants show that the idea of good farming is embedded in both the subjectivity and intersubjectivity of farmers’ lifeworlds. To contribute to the development of effective policies focused on encouraging farmers to adopt more sustainable agricultural practices, further research should explore how farmers perceive the meanings of good farming in other communities and how these meanings change, or do not change, over time.
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CHAPTER 4

Paper 3: A Comparative Perspective from Northwest Italy

Introduction

The perceptions and experiences of Italian farmers provide a comparative perspective in this thesis research. Agriculture in Italy and the United States (US) differs in terms of political context and farm characteristics, yet in both countries farmers grow grain and face decisions about technologies and practices to use on their farms. Italy also has a particularly strong food culture that is closely linked to geographical food consumption patterns (Alexander 2000). Agriculture in Italy is governed by the Common Agricultural Policy (CAP) of the European Union (EU) (OECD 2008), while agriculture in the US is strongly shaped by federal legislation, known as the Farm Bill (Johnson 2008). The EU has had strict regulations on genetically modified organisms (GMO) and pesticides while comparatively, regulations on both of these in the US have been more relaxed. The average size of farms in the US is much larger than in Italy, and proportionate to population, the US has fewer farms than in Italy.

This chapter presents descriptive analysis based on data collected from three focus groups with farmers that were conducted in northwest Italy in January 2014. The focus groups examined the same broad topics of diverse sources of knowledge, particularly information communication technology (ICT), and good farming. The perceptions of the farmers who participated in the focus groups in Italy are compared to those offered by farmers from Pennsylvania as presented in Chapters 2 and 3. According to Mills et al. (2006:621), “Comparisons not only uncover differences between social entities, but reveal unique aspects of a particular entity that would be virtually impossible to detect otherwise.” Through an exploration of Italian farmers’ perceptions
about good farming and use of ICT, the objective of this chapter is to extend and enrich insights on Pennsylvania farmers presented earlier in this thesis.

This chapter first presents background on agricultural policy, farm characteristics, and farmer demographics for both Italy and the US. Next, research methods are discussed, covering procedures for sampling participants and collecting data. There are two findings sections, the first corresponding with Paper 1 and the second corresponding with Paper 2. The first section explores how Italian farmers see different sources of knowledge within their farm management practices. The second findings section explores Italian farmers’ perceptions of good farming. Both findings sections address broad lines of similarities and differences between the perceptions of these Italian farmers and the grain farmers studied in southeast Pennsylvania. The chapter offers some concluding observations and discusses the limitations of the data collected from the focus groups, and ideas for future research.

Comparisons of Agriculture in Italy and the United States

To situate findings from the focus groups with Italian farmers, this section provides an overview of agricultural policy and the social context of farming in Italy. Italy is a member of the EU, an intergovernmental organization that consists of 28 member states across the continent (EU 2014). In this way, agriculture in Italy is very different from the US, as the Common Agricultural Policy (CAP) is followed by all member states. The long-term objectives of CAP are focused on “viable food production, sustainable management of natural resources and climate action and balanced territorial development” (European Commission 2013:2). The US and the EU differ significantly in their approaches to some major politically charged environmental issues, such as the use of genetically modified organisms (GMO) and pesticides in farming
The EU is regarded as having “probably [the] strictest regulations in the world for the presence of GMOs in food and feed,” (Davison 2010:94) while the US has the greatest area of GMO crops in the world at 173 million acres (almost twice as much as Brazil, ranked second) (ISAAA 2014). The European Commission (EC), the governing body of the EU, also developed mandatory standards for farmers based on an Integrated Pest Management approach (commonly known as IPM) (Hillocks 2012). Examples of these IPM standards include: prohibition of aerial spraying, compulsory inspections of application equipment, restrictions of pesticide application on some areas, and promotion of minimal pesticide use. Also, as a result of the Colony Collapse Disorder, a disorder affecting honeybees exposed to neonicotinoid pesticides, the EC banned three commonly used pesticides, which are not restricted in the US (EPA 2013).

Italy’s agricultural landscape differs substantially from the US in terms of number of farms and average farm size. While the US has more than five times the population of Italy, it only has a quarter more farms (NASS 2014a; ISTAT 2010). In the US, the average acreage per farming operation is 418 acres, while in Italy it is estimated to be about 41 acres (NASS 2014a; INEA 2012). In the northwest region of Italy, where the focus groups were conducted, the average farm operation is 70 acres, much larger than the national average. The larger farm size in the northwest is attributed to industrial agriculture (e.g., intensive inputs, heavier equipment), particularly the presence of industrial pig and poultry businesses (INEA 2012). The average farm acreage in the primary study county for the Pennsylvania research is 115 acres, drastically smaller than the US national average (NASS 2014b). Compared to states in the US Midwest, Pennsylvania agriculture can be characterized as smaller-scale and more diversified. The average
estimated farmer age in both Pennsylvania and Italy is about 56 years (NASS 2014b; Loughrey et al. 2013).

Durum wheat is the leading cereal crop in Italy and comprises 40 percent of total cereal cropland. After corn, soft wheat follows accounting for 17 percent (Baldi 2012). About 70 percent of durum wheat is grown in southern Italy. The strong presence of wheat within cereal production can be attributed to the fact that Italy is the largest producer and consumer of pasta in the world, and that product is often made with durum wheat. Soft wheat, on the other hand, is grown under climatic conditions more conducive to the northern region of the country. Seventy percent of soft wheat grown in Italy is grown in the north. The majority of soft wheat is milled into flour for human consumption, while a quarter is used for animal feed (Baldi 2012).

Pasta consumption is embedded in Italy’s distinctive food culture. The time that flour-based dough noodles made their debut in Italy is contested and there are various legends about pasta’s national origin. Some say Marco Polo brought it from China and introduced it to Italy in 1298. Others believe that North African caravans imported spaghetti in A.D. 1100. The vibrant pasta tradition has had a significant influence not only on food consumption patterns, but also on agricultural production. According to Alexander (2000:556), “Consumption has historically depended on a diversified system of domestic production which supported cultural and social patterns of eating that were rigid enough to border on the coercive.” A diversified system of wheat agriculture is contingent upon its geographical significance—each region has its own way of preparing pasta, as well as other traditional dishes. The nuances in Italian pastamaking are tied to the nation’s history of civil war prior to its unification in the 1860s. “The paradox of an old country but a young nation has been reinforced by centuries of campanilismo, adherence to one’s own village,” Alexander writes about the prevalence of localism in Italy (2000:555). The focus

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1 Total cereal production accounts for 25-30 percent of total cropland area in Italy (Baldi 2012).
groups in this study were conducted in three different small towns or “villages” and all
participants were farming land that had been in their families for many years. The next section
describes the study’s sample of farmers and how data was collected.

**Participant Sample and Data Collection**

The focus group participants were selected with the assistance of Dr. Piero Caciagli\(^2\), a
scientist with the Institute of Plant Virology (*Instituto di Virologia Vegetale*), affiliated with the
National Research Council (*Consiglio Nazionale delle Ricerche*), located in Torino, Italy. Dr.
Caciagli connected me to three *assistenza tecnicas* and *coltivare direttis*, in English known as
agricultural technicians or advisors, who managed farming cooperatives. Dr. Caciagli explained
that “young and motivated” individuals are usually drawn to careers as agricultural advisors and
their role is to provide knowledge to farmers about the production, marketing, and distribution of
local crops. In total, four agricultural advisors were consulted as key informants, three of whom
participated in interviews. The key informant interviews occurred at local Extension and
cooperative offices, providing an opportunity to explore the social context of farming in the
study area more deeply. The three focus groups, referred to as Focus Group 1 (FG1), Focus
Group 2 (FG2), and Focus Group 3 (FG3), took place in three different villages located near the
city of Torino. During the two-week study trip, Dr. Caciagli coordinated two farm visits,
including one trip to a dairy farm that grew grain for animal feed and supplied milk to a company
that processed hazelnuts for making truffles. More details about agriculture in the study area are
included in Chapter 1 of this thesis.

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\(^2\) Dr. Piero Caciagli was a collaborator on the grant that funded my assistantship: *Enhancing Adoption of Web-based Pest Prediction Systems: The Case of Barley Yellow Dwarf Virus*, funded by the United States Department of Agriculture National Institute of Food and Agriculture.
In total, 19 farmers participated in the three Italy focus groups. Characteristics of the farmers that participated in these focus groups are presented in Table 1 below, and compared with this study’s Pennsylvania farmers. The average farmer age for Italy (52 years) and Pennsylvania (48 years) farmers was similar. Like Pennsylvania, female farmers were underrepresented in the Italy focus groups, with only two of farmers in the three focus groups being female. The average farm size of the sample, measured in acres, was much smaller in Italy (179 acres) compared to Pennsylvania (596 acres). The largest farm included in the sample of farmers in Italy was 471 acres and in Pennsylvania it was 2,650 acres. On average, Pennsylvania farmers rented much more land than they owned, while in Italy, the farmers rented less than they owned.

Among the Italy focus groups, FG1 had the highest mean age at 56 years, while FG2 and FG3 included participants that were somewhat younger. Participants in FG3 farmed land on a much larger scale on average than the farmers in FG1 and FG2. Compared to farmers in the other focus groups, on average, those in FG1 rented more land than they owned. The main crops that farmers grew were wheat and corn, and in FG3, farmers also grew rye for biofuel production. As noted in the background section, wheat is the leading cereal crop in Italy and has a long history in the country.
Dr. Caciagli served as the interpreter since I did not share a common language with the majority of the participants, who spoke local dialects and Italian. Prior to arriving in Italy, I drafted a focus group protocol and at the Instituto di Virologia Vegetale, Dr. Caciagli and I went through the protocol together and I explained each question to him. He then translated these questions to Italian. Dr. Caciagli provided interpretations during the focus group sessions, which were audio-recorded.

The focus groups were held at the offices of the farming cooperatives located in their respective small towns. The passage from my field notes below provides an example of social and physical context of the focus groups:

<table>
<thead>
<tr>
<th>Table 1. Pennsylvania and Italy Sample Farmer and Farm Characteristics</th>
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<tr>
<td><strong>Italy Focus Group 1</strong></td>
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<td>No. of Participants</td>
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*Source: Background questionnaire.
*Note: Italian farmland figures have been converted from hectares to acres to facilitate comparison.
The room was narrow with a conference table taking up most of its space. It had lime green walls, one of which had a window and through it I could see bags of fertilizer stacked outside. Another wall had a calendar with a tiger on it. The farmers congregated in the hallway, there were six, and Dr. Caciagli and I entered into the conference room and planned on where to sit. The agricultural technician had set up three “executive chairs” on one side of the table with six less comfortable chairs on the other side. There was a large bottle of water in the middle of table, as well as a holder containing some pens and a calendar. We dispersed ourselves around the room as to not create an overly formal and interrogative environment. The farmers filtered in and found a seat and we shook each person’s hand as they entered the room.

Each focus group began with Dr. Caciagli providing the participants with background about the USDA-AFRI research project. He then outlined what participation in the focus group involved and emphasized that participation was voluntary. All participants gave their verbal consent to participate. Participants then filled out the same background questionnaire that the Pennsylvania farmers did, with the exception that it was translated to Italian. Dr. Caciagli translated farmers’ responses to English during the interview. Sometimes I would ask him to pose a follow-up question to the group. Upon returning to the US, I transcribed Dr. Caciagli’s audio-recorded English translations. Dr. Cristina Rosa, a native Italian speaker at the Pennsylvania State University who was also a collaborator on the USDA-AFRI project, listened to the audiotapes and added additional interpretations. The focus group transcripts were coded by hand. In the remainder of the paper, I describe findings from the focus groups on the topics of farmers’ attitudes about diverse sources of knowledge, and good farming.

**Findings Related to Perceptions of Diverse Sources of Knowledge**

This section includes findings related to Paper 1, which considers the topic of diverse sources of knowledge. The research question explored here is: how do farmers in northwest Italy use different sources of knowledge to inform their farm management decisions? Focus group
participants did not typically use smartphones. As members of farming cooperatives, focus group participants commonly talked about their neighbors as important sources of information.

**Farming Cooperatively**

An important difference between grain farmers who participated in the interviews in Pennsylvania and those who participated in focus groups in Italy, is that the Italian farmer participants were all members of farming cooperatives. According to Di Falco, Smale, and Perrings (2007:4), “A cooperative is a voluntary group of individuals who derive mutual benefit from the coordination of production decisions, shared access inputs, including seed, enhanced market power, and more effective lobbying capacity.” In Italy, farming cooperatives are common and account for one third of agricultural production in the country (INEA 2012). Farming cooperatives are particularly prevalent in the northern regions; 42 percent of cooperatives are located in northern Italy, which accounts for 80 percent of total cooperative turnover. Compared to the south, northern farming cooperatives are comprised of farmers operating on a larger scale and contribute 86 percent of cooperatives’ supplies (INEA 2012). In the south, the smaller cooperatives target mostly domestic markets. Main benefits of belonging to a cooperative are that farmers have access to production, processing, marketing, and distribution information through advisors, and at a lower cost than farmers who are not members of a cooperative. Agricultural advisors deliver information to members collectively, such as at meetings or through mass text messages, and also on an individual basis. Membership in a farming cooperative strongly shapes how farmers use different sources of knowledge for making farm management decisions.
Similar to many of the farmers interviewed in Pennsylvania, the Italian farmers in all three focus groups suggested that they were heavily reliant on agricultural advisors for their information. In FG1, participants discussed that over the past 20 years, technicians affiliated with farming cooperatives had become prevalent sources of information for farmers and in FG3 participants stated that their cooperative’s technician was their most important source of information. Participants in FG2 put the greatest emphasis on the importance of their advisor in making farm management decisions. While farmers in Pennsylvania consulted different agricultural advisors, the participants in each Italian focus group worked with the same advisor based on their membership in their particular cooperative. In FG2, when farmers were asked what sources of information they found most helpful for making decisions about managing pests, one farmer joked, “Telephone Franco,” a comment that some farmers reacted to with light laughter. In this phrase, not only was Franco’s (the agricultural advisor for the cooperative) knowledge emphasized, but it also highlighted the means by which he communicated information to cooperative members—the telephone.

Text messaging, what the farmers in the focus group referred to as SMS (short messaging service), was a common method of communication between them and Franco. Dr. Caciagli’s interpretation of the participants’ discussion on this topic was:

“Franco is the warning system. He is the “smartphone app” and the farmers like him more [than a smartphone] because he goes around and when he sees a problem, even if in just one [farm], just one place, he will send out a message to everybody. “Be aware, go there, look if you have it. If you have it then you can do this, and that. If you don’t, just keep an eye on it.”

The farmers had a preference for information received from Franco for two main reasons. First, as explained by Dr. Caciagli, as cooperative members, the participants knew that, “Franco is not working for anybody, but for them.” Therefore, since farmers were not competing with one
another and Franco offered services only to farmers in the cooperative, they trusted him to work in their interest. While crop consultants in the Pennsylvania study were sources of local knowledge for farmers, the Pennsylvania crop consultant, Steve, had explained that consultants needed to be somewhat reserved about the information they shared with clients about others’ farms, as they had to be aware of tensions between social cliques in the community. He sometimes found it difficult to “stay above the fray,” with disputes and hostility between farmers even affecting who he took on as clients. The Pennsylvania crop consultant said:

I work with Buck Bently and Fritz Naylor. They’re very friendly with each other. And everybody that they’re friends with, I work with. But they’ll tell me about this guy over here who they don’t really like. And guess what? I’m not working with him [the guy that Buck and Fritz don’t really like] for whatever reason. I know him. And I’ll talk to him through time. But for whatever reason, I just don’t work with him. I find that there are cliques in the community. And if you get into one clique, you’ll work with everybody in that clique. And it may prevent you from working with their unfriendly clique.

This consultant’s account demonstrates the more individualized approach to farming in the Pennsylvania community. In northwest Italy, technicians did not state conflict prevented them from working with farmers in the area. This may be linked to the nature of the cooperative model—all members are voluntary and it is in the organization’s interest to have more members as this increases bargaining and lobbying capacity.

Another attribute of a farming cooperative is that members make decisions together. For example, in FG2, participants described how their cooperative functioned. The cooperative started with 20 members 15 years ago, and now has 200 members. Most decisions about production and marketing were made together as a cooperative including what crops to grow, how to grow them, and where to sell them. Members coordinated to buy chemicals and equipment that allowed them to benefit from lower prices. As a cooperative, they agreed on

3 To protect the confidentiality of participants, all names used to refer to study participants are pseudonyms.
which mill to sell their grain to and where to have it processed. Similar to the farmers in Pennsylvania, the Italian farmers perceived sharing information with farming neighbors as something they did often. As a member of a cooperative, sharing information is expected. The interpreter explained farmers said that in the past they did not share with other farmers problems that they were having with farm management. Dr. Caciagli described that participants’ attitudes about sharing information had shifted over time: “Farmers almost kept problems to themselves [in the past] because they were ashamed of having them. It was kind of shameful… Now if farmers have a problem, they say to the other people, ‘Have a look!’ Because if they have it, perhaps others have it.” Participants in FG1 echoed the claim that how farmers share information with one another has changed over time. In the past, farmers in their area would imitate what their neighbors did based on observation, rather than engaging in conversation. According to the participants, farmers in their area no longer imitate each other but compare “what to do and when to do it” through conversations. Farmers in FG3 described that sharing information was characteristic of all farmers in the area, not just ones that were members of a cooperative.

Unique to the Italian farmers was a perspective a farmer in FG2 shared about the importance of exchanging knowledge with other farmers about new regulations issued by the European Commission. This farmer was worried about what implications a regulation proposed by the EC requiring the use of renewable energy would have on his farm. Dr. Caciagli described how the farmer had stated that “understanding the process [of adopting renewable energy] is important and can be done through dialog with his peers.”

As a business model, farming cooperatives are based on member agreements and collaborating is key to the cooperative’s success. The farmers in Italy shared that other farmers
and the agricultural advisors affiliated with their cooperative were important sources of farming knowledge for them. Another source of knowledge, ICT, was also explored in the focus groups. Only a few farmers in the focus groups owned smartphones; this finding is described further in the next section.

*Lack of Smartphone Usage*

Owning a smartphone was not common among the farmers who participated in the Italy focus groups. Of the three focus groups, only FG3 included farmers who owned smartphones. The devices were not typically used for agricultural purposes other than to look up weather forecasts and market prices. One exception was a farmer in FG3 who used a smartphone application linked to a camera inside his biogas plant that allowed him to monitor it remotely. The application could also alert the farmer via text message if the system were to malfunction. During this focus group, the other participants gathered around the farmer’s smartphone with curiosity as he described and showed the application.

One reason a farmer in FG2 provided for not using a smartphone was that he even though he was intrigued by smartphones, he also found them to be intimidating. This farmer’s view of there being a steep learning curve associated with learning how to use the new technology was similar to the view of Laura, the female farmer interviewed in Pennsylvania who grew diversified vegetables, organic wheat, and heritage grains. Like the Italian farmer, Laura had expressed enthusiasm for learning how to use programs on her computer; however, she also explained that the process of learning how to use them was stressful for her: “Just two weeks ago I put together my very first PowerPoint presentation. I don’t know. Maybe that’s something you
[the interviewer] do a lot of, but I had never done this before…PowerPoint is something else. It was like, ‘Oh my Gosh!’ I was like sweating through this trying to put it together.”

In FG1, when asked if any of them owned a smartphone, all the Italian farmers responded negatively. Their reasoning for not using smartphones was interpreted as, “The telephone is for phone calls and text messaging, and the computer is for everything else.” Farmers in FG1 viewed a phone as having a sole purpose, to communicate with others. They did not seem to see a smartphone’s ability to process information (other than what is used to communicate) as useful, and reserved accessing information to their computers.

One Italian farmer who managed a farm with his father shared an age-related perception. He explained that his father was not as good at using ICT as he was. For example, his father had difficulty communicating with text messages and because of this, the farmer said that he took care of technology-related responsibilities on the farm. Dr. Caciagli stated that the farmer saw age and use of ICT in farming as connected and despite that older farmers recognized the value in ICT, they were not as able to use it. Some farmers in the focus groups stated that youth were using smartphones in Italy, but not for farming. In the interviews with farmers in Pennsylvania, age was commonly discussed by participants as being linked to whether a farmer used ICT and their ability to operate it.

A reason farmers in FG2 preferred flip phones over smartphones was because compared to smartphones, they were very cheap. The interpreter explained that farmers in the focus group stated that, “If you work in the field, if you work in the stable, when you go to care for the animals…you throw it [the flip phone] away, you don’t worry about it. You can go and buy a new one. With a smartphone you are in trouble.” A farmer in Pennsylvania also shared this concern over the susceptibility of phones to breaking in the course of farming work.
Farmers in FG2 suggested that they preferred receiving information from their advisor, Franco, over ICT, because he was a source of both expert and local knowledge. The interpreter explained that the farmers in the focus group said that, “…it’s also the fact that he’s [Franco] working locally. So they know exactly that, the news that comes from his messages, they are really for these areas. Not generic forecasting or whatever. It’s for this area.” Farmers in FG1 talked about how weather forecasting tools were useful; however, the weather in the area was difficult to predict. The interpreter said, “The problem in this area, as I know, I agree with them, it is very difficult to forecast for because of the many valleys. They [ICT developers] just push the things [software] and then it’s [the forecast] very different [from reality] and it’s sometimes really difficult to get a real nice consistent type of weather forecasting. What they do is to take the minimum risk.” Because farmers were not able to obtain accurate weather forecasts, they approached management preventively. For example, if there is a somewhat good chance that it will rain outside, farmers in the area still water their fields because the forecast is not reliable.

Another reason farmers preferred Franco as a source of knowledge is because through an interactive text messaging service offered through the cooperative, farmers could respond to Franco’s text messages and receive replies from him. The theme of preferring the local knowledge of agricultural advisors over information generated from ICT also emerged in the Pennsylvania interviews. For example, the youngest farmer in the Pennsylvania study, Sean, said that pest issues were best managed through obtaining information locally from his crop consultant.

Findings related to farmers’ attitudes about different sources of knowledge demonstrate that the farmers in the Italy focus groups viewed the agricultural technician of their respective cooperatives as the most valuable source of knowledge. As farming cooperative members,
participants also viewed fellow members as important resources. The use of smartphones and the internet in farming was not common among these farmers, with a strong theme being that conditions in their area were localized, making it difficult to utilize predictions from ICT tools effectively.

Findings Related to Perceptions of Good Farming

Themes related to the topic of good farming are presented in this section and coincide with Chapter 3 of this thesis. Farmers in the Italy focus groups associated having a passion for farming and innovating in moderation with good farming. Like the farmers in Pennsylvania, some participants in Italy also suggested that farm appearance played a role in how they perceived farmers as “good” or “bad” farmers.

Passion for Farming

Being passionate about farming is a quality that farmers in both FG1 and FG2 thought was important. Farmers perceived that it was important for a farmer to like farming because the monetary return on its own was not enough to motivate someone to farm. “It’s not the money you’re striving for. It’s the passion for the land,” said one farmer. He provided an example of his son who ten years prior had found himself unhappy working a factory job and left it to work on a farm. The farmer said he thought that this change in professions had made his son happier. The perception of being passionate as an important quality for farming was prominent in the interviews conducted with farmers in Pennsylvania as well. The quote offered above by an Italian farmer was very similar to Allen’s perspective featured in Chapter 3, when he said: “Do we do it for the money?” ‘No. We do it because it’s just, it’s something you love to do and it’s
just…’ You know? I mean, most people, if you would have a drought or whatever, and you’d be like, ‘We’re done. We’re out of here.’” Farmers in FG2 conveyed Allen’s point simply, as the interpreter translated the meaning of their words as, “Either you like farming or you don’t.” Farmers in this focus group described farming not as something you do, but as something that you feel. One Italian farmer said, “It’s almost a disease. It’s like you get addicted!” What this farmer viewed as addictive was helping other farmers for no compensation and just for the sake it, a value that was embedded in the culture of the cooperative. The interpreter quoted the farmer, “He said, ‘We were very lucky to be able to set up this group. It wasn’t just out of will, but out of luck.’”

*Meanings Associated with Farm Appearance*

A farmer in one of the focus groups shared a popular Italian saying that was translated as, “If the yard in front of the farmhouse is ordered, then the whole farm is in order—inside and out. If the yard is a mess, then the whole farm is a mess.” Like this farmer, other farmers in the focus groups explained that they felt that the appearance of one’s farm revealed the level of order it was in, and for some this was linked to the economic worth of the farm. The interpreter stated that, “…in their [focus group participants’] experience, when a farm is out of order, even their accounting is in disorder. The business, the money, the profit.” A farmer in FG1 stated that maintaining farm equipment encourages economic gain since not taking care of equipment could lead to it breaking and getting it fixed could be costly. Farmers in this focus group also thought that it was important for good farmers to “not innovate too much” and spend money on unneeded equipment. A farmer elaborated on this quality by providing an example of tractors. He
described that farming equipment can be overwhelming and purchasing larger tractors is not necessary for the small-scale farming that was characteristic of the study area.

Italian farmers shared a perception similar to that of Frank, a farmer from Pennsylvania, about having a farm that looked like it was a good farm. Frank indicated that what his farm looked like was important to him because, “… how you keep your farm is how you basically keep your life you might say. If you want to be a slob, then be a slob…” Some participants in FG2 echoed Frank’s perspective explaining that a good farm looks ordered and this is important because it is a reflection, in the words of the interpreter, of the mind of the farmer running it. A farmer in FG1 viewed farm appearance as an indicator of a farmer’s passion, an attribute that some farmers had described as being the most important quality for a farmer to have. The perspective shared by these farmers indicates that for them, farm appearance ran deeper than the quality of the crops growing by signaling to other farmers the quality of the farmer who was maintaining the farm. This was a prevalent theme emerging from the focus groups. In FG1, one farmer explained that “farmers that do not care about their farm often are unreliable and do not follow a set of unspoken rules.”

Farmers were asked what their thoughts were when they drove past a farm that did not meet their expectations for having a good appearance. One farmer responded in a loud, passionate voice that it made him ashamed to be a farmer. The interpreter translated a female farmer’s reaction, “She says that her first thought is, ‘Let me go there and have them put it clean!’” The strong perspectives that farmers shared in FG1 about farm appearance exhibit the theme of pride that also emerged from the interviews with farmers living in Pennsylvania.

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4 This perception was not translated from Italian to English until after the interview and therefore I could not ask the farmer what he meant by an “a set of unspoken rules.”
Some farmers in FG3 shared perspectives that were different from those shared in FG1, explaining that how farms look is very important; however, factors affecting the appearance of one’s farm, such as soil or weather conditions, cannot be completely controlled by the farmer, and therefore farm appearance does not always reflect the quality of the farmer. This was also how Sean in Pennsylvania perceived farm appearance. He was asked if a poor appearance of a farm influenced his opinion about how a person farmed and his response was, “I mean, a lot of that’s weather. That’s something we just don’t have enough control on that crop [wheat].” Like some of the farmers in FG3, Sean perceived farm appearance as being related to uncontrollable factors such as weather and did not see the farmer as fully accountable for a farm that had a poor appearance.

A farmer in FG3 had a similar perspective to a Pennsylvania farmer, Jacob, who thought that crop diversity was an important characteristic of a good farm. The Italian farmer in FG3 valued crop diversity as well, indicating that he liked diversified farms because such farms were more strongly linked to the local and natural environment. Instead of growing just one crop like cereals, this farmer preferred the idea of growing a diverse range including barley, fruit orchards, and timber. However, he also saw this approach to farming as one that he could not afford to spend time or money on maintaining.

Farmers in FG1 perceived maintaining the borders of fields and making sure they were free of weeds as particularly important. A farmer in FG3 described that it was important for him to have nice-looking fields because his farm was located on the route to the office of the farming cooperative. He explained that, “Everybody that goes there will pass by my field and see the mistakes I made, so I need to be [spend time making his fields looking nice]! I cannot afford to have a bad looking field because they [fellow-farmers] will all know.”
Methodological Reflections

The most challenging part of conducting this complementary research in Italy was being on the receiving end of Dr. Caciagli’s interpretations, which were very thorough and thoughtful; however, in a focus group it is impossible for one person to directly translate what each individual is saying, especially when they are playing a dual role as interpreter and co-facilitator. Participants would sometimes have side conversation or voices would overlap, making it difficult to capture the full range of views being shared by farmers. It was also difficult to be sure that everyone in the focus groups had an opportunity to weigh in on a question when they had something to say. Most everyone in the focus groups offered something, but I noticed that sometimes they would get cut off and after the conversation surrounding the question had ceased, no one added any comments. Dr. Caciagli prompted the group with the question, “Is there anything anyone would like to add?” at the end of the focus groups. Usually participants took this time to ask the research team questions about Pennsylvania.

As someone unable to speak the native language, I was probably focused more on observing body language, group dynamics, and facial expressions. There was not a time where I observed or sensed that there was disagreement within the group. Sometimes everyone would nod in agreement or other times someone would say something, a few people would nod, and a few others would remain quiet.

In relation to the challenges of translation, my depth of understanding of the focus group materials cannot be as deep as it was for the research conducted in Pennsylvania. This is because in Pennsylvania, I could hear and recognize each word and think about participants statements immediately, rather than having the information pass through the filter of an intermediary before reaching me. Since the Italian farmers’ words could not be translated verbatim, farmers’ thoughts
are also paraphrased, leading to a more generalized understanding of the situation. Prior to the focus groups, Dr. Caciagli was provided with some basic methodological information about these forms of qualitative data collection. We read over them together and they seem to have been helpful when conducting the research.

**Discussion and Conclusions**

This paper offered an international comparison, examining farmers’ attitudes toward diverse sources of knowledge for farm management decisions and meanings of good farming in northwest Italy and southeast Pennsylvania. Other than geographic location, the main difference between the two sets of farmers was that the participants in Italy were all members of farming cooperatives, while in Pennsylvania, the farmers were not selected on the basis of possible cooperative membership nor were they questioned about any such affiliations. As members of local cooperatives, the farmers in Italy had access to each other and the same agricultural advisor and informational literature produced by the cooperative. In contrast, each individual Pennsylvania farmer sourced information in substantially different ways. For example, some farmers were heavily reliant on ICT to manage their farms, while others relied more on a crop consultant or chose to source knowledge from local Extension educators or sustainable farming organizations. Because access to information is a primary benefit of being a member of a farming cooperative, future research could compare how farmers source knowledge and information as members and non-members of farming cooperatives.

A main difference between the farmers interviewed in Italy and Pennsylvania was that the farmers in Pennsylvania were more familiar with smartphones. In Italy, farmers did not talk about wanting to learn how to use ICT, while in Pennsylvania the desire to learn ICT was a
theme found in the interview data. One factor may be that ICT usage is not as common in Italy as it is in the US. Based on 2013 survey data, the *Our Mobile Project* estimates that 56.4 percent of US adults and 41.3 percent of Italy adults own and use smartphones (Google 2013). Future research should examine how ICT adoption among farmers compares to that of the general population.

Attitudes that farmers in Pennsylvania and Italy had about good farming were similar. Being passionate about farming was an important quality for good farming that was shared by farmers in both countries. Farmers in Italy and Pennsylvania viewed farm appearance as symbolic of being a good farmer. In both countries, maintaining a farm that appeared to be well-kept also showed that a farmer cared about their work and was proud to be a farmer.

The international component of this research was exploratory and allowed for broad comparisons to be made between farmers in southeast Pennsylvania and northwest Italy. Findings from this study initiated several areas for future research. First, usage of smartphones in this study among Pennsylvania grain farmers was more common than in Italy. A question for future research is: do grain farmers in the US use ICT at higher rates than those in the EU, and if so, how does that affect their farm decision making, particularly decisions that have implications for environmental sustainability? Second, participants in Italy were members of farming cooperatives while those who participated in Pennsylvania were not. How do farmers in Italy who are not members of farming cooperatives view diverse sources of knowledge and good farming? Third, the theme of age as it relates to use of ICT was relevant in both the Italy and Pennsylvania components of this research, provoking the question: How does age correspond to farmers’ current attitudes to and uses of ICT in farming and how does this relate to different farmers’ capacities for and interests in developing and learning new ICT uses?
REFERENCES


APPENDIX A

Promoting Sustainability in Agriculture with Information Communication Technologies: Recommendations for Developers

Any new technology in agriculture should be designed and evaluated for its broad impacts on farmers and agribusinesses, the environment and society. Ideally, balancing these impacts through a whole-systems approach to farm management solutions would result in a more sustainable agricultural system. Depending on its design, information communication technology (ICT) has the potential to promote or challenge sustainability in agriculture. In this report, sustainable agriculture systems are understood as “environmentally sound, economically viable, socially responsible, nonexploitative, and serve as the foundation for future generations” (Allen et al. 1991:7). Based on the findings from this study, Table 1 summarizes some recommendations for ICT developers, to increase the likelihood that the technologies they develop will contribute to improved sustainability in agriculture.

The table presents four key dimensions of sustainability that businesses and researchers can address to develop technologies conducive to the kind of sustainable agriculture that Allen et al. (1997) describe. The recommendations in this report are organized by social sustainability, environmental sustainability, technological sustainability, and economic sustainability. For social sustainability, recommendations focus on incorporating the place-based knowledge farmers already use to inform their farm management practices (i.e., local knowledge) into the development of ICT. Environmental implications of ICT are closely tied to the objectives of a specific product (e.g., a smartphone application that predicts risk of barley yellow dwarf virus) and therefore broad recommendations are provided for addressing ecological sustainability. Related to the technological dimension, recommendations focus on the usability of ICT, a topic
that was frequently discussed by participants in this study. Finally, economic sustainability broadly concerns the affordability of ICT to a farmer, as well as economic benefits from its use.

Table 1. Recommendations to Developers for Designing Information Communication Technology (ICT) that Promotes Sustainability in Agriculture

<table>
<thead>
<tr>
<th>Dimension of sustainability</th>
<th>Recommendations</th>
</tr>
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<tbody>
<tr>
<td><strong>Social</strong>&lt;br&gt;Incorporate farmers’ knowledge</td>
<td>• Blend local, academic, expert, and scientific knowledge in design&lt;br&gt;• Recruit farms to participate in ICT development process&lt;br&gt;• Emphasize in marketing that the intent of product is not to replace farmers’ knowledge, experience, and skills&lt;br&gt;• Collaborate with crop consultants who take a more facilitative approach to exchanging knowledge with farmers&lt;br&gt;• Provide training to farmers about how technology works at local and regional agriculture-related events, such as field days and meetings&lt;br&gt;• Encourage or incentivize retailers to provide individualized training&lt;br&gt;• Allow farmers to input farm-specific details into device</td>
</tr>
<tr>
<td><strong>Ecological</strong>&lt;br&gt;Support ecosystem services</td>
<td>• Ensure that the outcomes of technology are holistically ecologically sustainable, not ecologically destructive&lt;br&gt;• Link with appropriate academic, agency and NGO researchers to monitor improvements in critical ecological and environmental indicators that the technology purports to target</td>
</tr>
<tr>
<td><strong>Technological</strong>&lt;br&gt;Usability</td>
<td>• Make technology user-friendly, convenient, and durable&lt;br&gt;• Design and market to farmers of all ages, with special encouragement for farmers who among older age groups&lt;br&gt;• Avoid information overload by providing appropriate and accessible instruction to farmers about how to understand and use long-term data</td>
</tr>
<tr>
<td><strong>Economic</strong>&lt;br&gt;Affordability</td>
<td>• Strive to make the product affordable to all farmers&lt;br&gt;• Avoid making technology available to only an exclusive group of farmers&lt;br&gt;• Demonstrate economic benefits</td>
</tr>
</tbody>
</table>

Adapted from Fuchs (2008)
First, ICT should be developed to support social sustainability through drawing on diverse sources of knowledge for its development and use. Traditionally, farmers’ views have been left out of academic land-grant university driven research directed at advanced technological innovation in agriculture (Kloppenburg 1991). When top-down technologies are utilized as the sole or primary approach to addressing a farm-level problem, they often fail to take the unique social and physical context of farms into account. Doing so requires creative efforts from developers; some examples of how farmers’ experiences can be included in the development and use of ICTs are offered in Table 1. Developers should include diverse farmers’ views in the designing of new technologies, and emphasize in any marketing plans that the product is not designed to replace farmers’ knowledge and skills, but rather to enhance and complement them. As shown in this study, some farmers allocate aspects of farm management to crop consultants, an outsourcing of effort that could also have the effect of making those farmers more detached from the ecosystems of their farms. Through a socially sustainable ICT, farmers who have reactive relationships with their advisors could become more proactive, through reorienting themselves to the ecology of their farms, potentially reducing chemical use and enhancing cultural management approaches.

Second, ICTs should be ecologically sustainable meaning that they should assist farmers with making decisions that will support ecosystem services (e.g., soil biodiversity, pests and predators) on their farms and surrounding areas. For example, a decision support system that runs on a smartphone could potentially lead to a reduction in pesticide use by suggesting low risk conditions for pest threats, making farmers feel more confident in their decisions not to spray crops preventively. Some effort to assess the ecological and environmental impacts associated with adoption and use of ICTs for agriculture is critical for understanding whether technologies
are having their intended consequences or generating unintended consequences that should be addressed through technology redesign, public policy or individual actions.

Third, technological sustainability in terms of usability is also important for developing technologies with the ability to promote sustainable agriculture. Devices that are difficult to learn or have an impractical physical design will not be useful to all farmers. Developers of ICT for use in farming must recognize that farmers of all ages will use their products, taking note that the average age of a farmer in the United States is 56 years (NASS 2014b) and older farmers comprise a large proportion of the farming population in Italy (European Commission 2012). Also, ICT designed for use in agriculture must offer appropriate accessories to withstand the rough nature of many agricultural work settings and specific work activities.

Finally, ICT should be offered to farmers in a way that is economically sustainable, that is, so that many farmers can afford the product and using it offers benefits that outweigh its costs. For example, decision support systems available through low-cost smartphone applications can allow many farmers to access specialized information and depending on the scope of the app, result in economic gains for users. Businesses seeking to promote sustainability in agriculture through technology should have the goal of making their product as widely available as possible to farmers. Offering access to solely a small segment of farmers could contribute to a potential technological treadmill effect (Cochrane 1958), ultimately countering efforts to promote sustainable agriculture. If only a small segment of farmers that have a strong influence on the market adopt a technology, these operations become more efficient and price is driven down. However, without reducing their costs of production, those who do not adopt the new technology are not able to stay competitive, which could lead to economic hardship or challenges continuing
to farm. Declining numbers and diversity of farmers could impede some social sustainability priorities.

To pursue these recommendations, ICT companies must be willing to embrace a business model that transcends “the bottom line” and seeks to address and to the extent possible, integrate the four sustainability dimensions outlined in Table 1. Efforts that companies put forth to address sustainability are typically referred to as being part of their social responsibility, most commonly discussed in terms of “corporate social responsibility” or CSR. Some argue that businesses do not have the capacity to address social (and environmental problems) and that this responsibility is better left up to government entities (Carroll and Shabana 2010). Other arguments against the practice of CSR include: addressing social problems dilutes the primary purpose of a business and gives the private sector substantial influence over social policy. Arguments that support CSR offer advantages for both businesses and society. Businesses can benefit from practicing socially responsible behavior because “if business is to have a healthy climate in which to function in the future, it must take actions now that will ensure its long-term viability” (Carroll and Shabana 2010:88). Practicing social responsibility allows businesses to be in a proactive position in dealing with social problems rather than reacting to them, and can also bolster positive public perceptions. Finally, businesses have diverse types of capital (e.g., social, human, natural) to implement initiatives for conducting business more sustainably. ICT companies that promote sustainable agriculture will design technologies that support, rather than degrading ecosystem services, and that add social and human value to the communities they operate in (Dyllick and Hockerts 2002). ICT companies venturing into the important space of the food and agricultural system should assess their business plans to identify how they can function within the four realms of sustainability outlined in this report.
REFERENCES


APPENDIX B

PENNSYLVANIA INTERVIEW GUIDES

Interview Guide for Pennsylvania Farmers

Background

1. How did you decide that you wanted to farm?
2. Why have you chosen to grow wheat/spelt?
   • For farmers not growing ‘common wheat’: Why have you chosen to grow spelt opposed to common wheat varieties?
3. What changes to agriculture have you witnessed since you have lived in this area? (e.g., type of crops grown, size of farms, farm exits, females as primary operators, presence of Amish/Mennonite farmers, organic)
4. What are some of the biggest pest challenges affecting your wheat/spelt fields? (If not currently growing wheat, what about last year?)
   • How familiar are you with Barley Yellow Dwarf Virus?

Information Technology Systems

Current practices

5. What sources of information do you rely on the most to help you make decisions about managing pests?
   • What are some unique things about your farm and land that influence decisions you make about your farm? (e.g., Are there certain areas of the farm that drain poorly? What is the quality of the soil like?)
6. What role does the local mill have in how you make decisions about producing your wheat? What about crop consultants?

Experience with ITS

7. What experiences have you had with websites that provide data for farmers to make predictions about field conditions? (For example, ipmPIPE.org provides information on counties in which soybean rust has been observed.)
   • If not used: What are some reasons why that you don’t use these websites?
8. How familiar are you with smartphones? What experiences have you had with using smartphones in farming?
   • If not used: What are some reasons why that you don’t use apps?
9. If farmer uses websites/apps [if not skip]: How has your use of websites and/or smartphones in making pest management decisions influenced the type of information you seek from other farmers, if at all? [Can you give me an example?]
**Youth**
10. How do you see your kids using information technology (such as smartphones/websites) in agriculture? *If farmer does not have kids, ask “How do you see farmers’ kids around here…” Can you give me an example of that?*

Now I want to shift to some more general questions about your farming practices and farm culture.

**Farming practices and culture**
11. Can you tell me about who helps out on your farm and what they do? (focus on family)
12. What do you think are the most important skills to have as a farmer?
13. Is there a farmer in this area whose farming practices you especially respect? If so: What is it that you like about how this person farms? How would you say others in this area see this farmer?

**Farm appearance**
14. What do you think a good wheat farm looks like? What do you think a good wheat field looks like?
   - When you drive past a wheat field with a lot of weeds and discoloration, what kind of thoughts come into your head?
   - How important is it for you to have a farm that looks good? *If important: How does this influence how you manage your farm?*

**Farm Community**
15. What are some of the ways you interact with other farmers in this area? (Do you share information? Equipment? Labor? Do you socialize informally (e.g., dinner, community programs))
16. How useful do you find these interactions in making decisions about managing your farm?

**Extension**
How interested would you be in attending a summer Extension program related to the use of prediction websites and apps in Integrated Pest Management? How do you like to learn new information (e.g., field day, PowerPoint, group discussion)?
Interview Guide for Pennsylvania Agricultural Educators

**Background**

1. How long have you been working as an Extension educator in this area? (About how many farmers do you work with in the area? About how many grow wheat? Is it common for farmers growing wheat in area to use Extension services? How often and in what ways do you communicate with farmers during the growing season? When you first started working with farmers in this area, how easy or difficult was it to become established within the farming community?)

2. What changes to agriculture have you witnessed since you starting working with farmers in this area? (e.g., type of crops grown, size of farms, farm exits, females as primary operators, presence of Amish/Mennonite farmers, organic)

3. What do you consider to be the biggest pest challenges currently facing farmers who grow wheat in this area?

**Information Technology Systems**

4. What sources of information do you rely on the most to develop program content and provide farmers with recommendations about managing pests?
   - What kinds of unique information that farmers already have about their farm and farming do you use to provide advice, if at all?

5. What experiences have you had with websites that provide data for farmers to make predictions about field conditions? (For example, ipmPIPE.org provides information on counties in which soybean rust has been observed.)
   - If not used: What are some reasons why that you don’t use these websites?

6. How familiar are you with smartphones? What experiences have you had with using apps in your work as an Extension educator?
   - If not used: What are some reasons why that you don’t use apps?

7. What experiences have you had with clients who use websites or apps to make decisions about managing pests? [Can you give me an example of when you experienced that?]

I would now like to move on to a different topic about social characteristics of wheat farmers in this area.

**Perspectives on the culture (beliefs/knowledge/values/rules) of local (wheat) farming**

‘Good farming’

8. Is there a farmer in this area whose farming practices you particularly respect? If so: What is it that you like about how this person farms? How would you say others in this area see this farmer?
Influence of peers and mill on farmers

9. In your experience, how much of farmers’ decisions about how to manage their farms do you find are influenced by what their neighbors are doing?

10. What role, if any, do you see the local mill playing in how farmers are producing wheat? What about crop consultants?

11. In your experience working with farmers in this area, how much influence does field appearance have on farmers’ decisions about how to manage their wheat fields (e.g., seed selection, weeds, chemical application)?

12. What experiences have you had with farmers who are open and willing to try new farming practices? [Can you give me an example?]

Extension

13. Based on your experience as an Extension educator in this area, how interested do you think farmers in this area would be in attending an educational program this summer related to the use of prediction websites and apps in Integrated Pest Management?
Interview Guide for Pennsylvania Crop Consultants

Background
1. How long have you been working as a crop consultant in this area? (About how many clients do you have in the area? Independent/small business/corporate? About how many grow wheat? Is it common for farmers growing wheat in the area to hire crop consultants? How often and in what ways do you communicate with clients during the growing season? When you first started working with farmers in this area, how easy or difficult was it to become established in the farming community?)

2. What changes to agriculture have you witnessed since you started working with farmers in this area? (e.g., type of crops grown, size of farms, farm exits, female as primary operators, presence of Amish/Mennonite farmers, organic)

3. What do you consider the biggest pest challenges currently facing your clients who grow wheat in this area to be?
   - How often do you give your clients recommendations to growers about how to manage Barley Yellow Dwarf Virus, if at all?

4. In your work with farmers around here, how do farmers explain their reasons behind their decisions about how to manage their farms? [Can you give me an example when a farmer mentioned that?]

Information Technology Systems
5. What sources of information do you rely on the most to base your recommendations to farmers? (e.g., internet newsletters, materials provided by Extension or pesticide companies)
   - What kinds of unique information that farmers already have about their farm and farming do you use to provide recommendations, if at all?

6. What experiences have you had with websites that provide data for farmers to make predictions about field conditions? (For example, ipmPIPE.org provides information on counties in which soybean rust has been observed.)
   - If not used: What reasons do you have for not using such prediction websites to assist with your work?

7. How familiar are you with smartphone applications? What experiences have you had with using apps in your work as a crop consultant?
   - If not used: What reasons do you have for not using apps to assist with your work?

8. What experiences have you had with clients who use websites or apps to make decisions about farm management? [Can you give me an example of when you experienced that?]
   - In your experience working with Amish or Mennonite farmers, how have you seen them using information technology, if at all? [Can you give me an example of when that happened?]

I would now like to move on to a different topic about social characteristics of wheat farmers in this area.
Perspectives on the culture (beliefs/knowledge/values/rules) of local (wheat) farming

‘Good farming’

9. Is there a farmer in this area whose farming practices you particularly respect? If so: What is it that you like about how this person farms? How would you say others in this area see this farmer?

Influence of peers and mill on farmers

10. In your experience, how much of farmers’ decisions about how to manage their farms do you find are influenced by what their neighbors are doing? [Can you give me an example when a farmer mentioned that?]

11. What role, if any, do you see the local mill playing in how farmers are producing wheat?

12. In your experience working with farmers in this area, how much influence does field appearance have on farmers’ decisions about how to manage their wheat fields (e.g., seed selection, weeds, chemical application)?
APPENDIX C

Pennsylvania Farmer Background Questionnaire

1. How many years have you been farming for? _______

2. How many years has your farm been owned by your family for? (If farmer has multiple pieces of land, ask for how long the oldest piece of land has been owned for) __________

3. How many total acres does your farm currently include (whether owned or rented)?
   _______ acres (owned) _________ acres (rented)

4. About how many acres do you have for each crop that you grow?
   Please specify crops:
   ___________________________________________   Pasture: ______________________
   ___________________________________________   Woodland: ______________________
   ___________________________________________
   ___________________________________________
   ___________________________________________

5. Do you raise livestock? YES NO
   If yes, what do you raise?
   ___________________________________________

6. How old were you on your last birthday? ______

7. Are you familiar with Barley Yellow Dwarf Virus (BYDV)? YES NO

8. Have any of your fields ever been affected by BYDV? YES NO

9. Do you use integrated pest management (IPM)? YES NO
APPENDIX D

Italy Focus Group Guide

1. **A.** Since you started farming, what are some of the general changes you have seen in agriculture in this part of Italy?
   *Quali sono alcuni dei cambiamenti generali che avete visto in agricoltura in questa parte d'Italia, da quando avete iniziato la vostra attività?*

   • If participants appear to not fully understand the question prompt them with these examples: What changes have you seen in the type of crops grown, size of farms, ownership of farms, markets for agricultural products, and farmer demographics?
   *Per esempio, avete visto cambiamenti nelle colture che si coltivano? Nelle dimensioni delle aziende? In chi possiede le aziende? Nel mercato per prodotti agricoli? Nell’età dei coltivatori?*

   **B.** Which of these changes do you consider most important for wheat farming in this part of Italy?
   *Quali di questi cambiamenti voi considerate più significativi per i coltivatori di cereali in questa zona d’Italia?*

2. What are currently some of the biggest pest challenges affecting wheat fields in this area?
   *Quali sono al momento i problemi maggiori causati da malattie o insetti che più danneggiano campi di grano in questa regione?*

   • Follow-up with these questions:
     o How do the biggest pest challenges you are currently facing compare to pest challenges you have had in the past? Are they more serious or less serious?
   *Quanto sono simili, questi problemi dati da malattie o insetti, a quelli che c’erano in passato? Sono più o meno seri?*

3. **A.** What sources of information do you find most helpful for making decisions about managing pests on your farm?
   *Che tipo di informazioni trovate siano più utili per gestire malattie e insetti nella vostra azienda?*

   **B.** Has how you obtain information for making decisions on your farm changed since you first started farming? If so, how?
   *Avete visto cambiamenti in come ottenete informazioni per gestire la vostra azienda, da quando avete iniziato l’attività? Quali?*

4. **A.** How familiar are you with using smartphones? What about the internet?
   *Avete familiarità con l’uso di smartphones? Internet?*
B. How do you use smartphones or internet websites to help you make decisions about managing your farm, if at all?

Come usate smartphone o internet websites per aiutarvi a prendere delle decisioni su come gestire l’azienda, se li usate?

C. If you have used a smartphone to help you make a decision on your farm, what did you like about that experience? Were there aspects you didn’t like or problems you had using a smartphone to help you make a decision on your farm?

Se avete usato smartphone come aiuto per prendere decisioni sulla gestione della vostra azienda, che cosa vi è piaciuto di questa esperienza? Che cosa non vi è piaciuto o che problemi avete avuto usando smartphone come aiuto per prendere decisioni su come gestire le vostre aziende?

D. If you have not used a smartphone or internet website to help you farm, what are some reasons why?

Se non avete mai usato smartphone o internet come aiuto per gestire l’azienda, potete indicare delle ragioni per cui non li avete utilizzati?

Now we want to shift the topic a little:

5. What would you say are the most important skills to have as a farmer these days?

Quali sono le doti più importanti per un coltivatore al giorno d’oggi?

- Follow up with these questions:
  - How do farmers acquire or develop these skills?
    
    Come fa un coltivatore ad acquisire o sviluppare queste doti?
  
  - Are these skills different than what were most important when you started out farming?
    
    Sono queste doti diverse da quelle che erano più importanti quando avete iniziato l’attività?’

6. A. How would you describe what a “good farm” looks like?

Come descrivereste quale è l’aspetto di una bella azienda?

- (If participants appear to not fully understand the question, prompt them with these examples: fields, buildings, equipment, animals, people, wildlife?)

  In termini di: campi, edifici, macchinari, bestiame ed animali, persone, selvaggina?

B. How would you describe what a “good wheat field” looks like?

Come descrivereste l’aspetto di un bel campo di grano?

C. How important do you think it is for farmers in this part of Italy to have wheat fields that look like this?

Secondo voi quanto è importante per gli agricoltori in questa parte d’Italia avere campi di grano che rispecchiano questo aspetto?
APPENDIX E

Italy Farmer Background Questionnaire

1. How many years have you been farming for? _______
   Da quanti anni ha iniziato questa attività? ______________

2. How old are you? _____
   Da quanti anni ha? ______

3. How many years has your farm been owned by your family for? (If farmer has multiple pieces of land, ask for how long the oldest piece of land has been owned for) _______
   Da quanti anni ha questa azienda? ______________

4. How many total acres does your farm currently include (whether owned or rented)? _______ acres (owned) _______ acres (rented)
   Quanti ettari possiede? ____________ O affitta? ______________

5. About how many acres do you have for each crop that you grow? Quali culture coltiva, e su quanti ettari?
   Please specify crops:
   _______________________________ Pasture: ______________________________
   _______________________________ Woodland: ______________________________
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APPENDIX F

INFORMED CONSENT FORM

Informed Consent Form for Social Science Research
The Pennsylvania State University

Title of Project: Social and Cultural Factors Influencing Farm Management Practices of Farmers Growing Wheat in Southeast Pennsylvania

Principal Investigator: Kristin Babbie (Graduate Student)
301 Armsby, The Pennsylvania State University
University Park, PA 16802
1-248-376-4194; babbiekr@psu.edu

Advisor: Dr. Clare Hinrichs
112-F Armsby Building, The Pennsylvania State University
University Park, PA USA 16802
1-814-863-8628

1. Purpose of this study. There are two main purposes of this research study. The first is to better understand the attitudes that farmers in the county have toward web- and smartphone-based prediction technology systems to make decisions about pest control. The second is to explore social and cultural factors that influence their farm management decisions. You were selected because you grow wheat in X County.

2. What is involved. If you agree to take part in this research, you will participate in an interview for about one hour. During the first section of the interview you will be asked about your attitudes toward using technology to make decisions about pest control on your farm. Then you will be asked questions about local beliefs, knowledge, and values about farming in this area. You will also be asked to respond to a short questionnaire that asks for background information about your farm. The interview will be audio recorded. The recordings will be locked in a filing cabinet in the researcher’s office and stored digitally on a password protected computer. Only the Principal Investigator will have access to them. The recordings will be destroyed within two years from the time the interview takes place.

Your decision to be in this research is voluntary. It is not expected that you will have any discomfort from participating and you may choose to stop the interview at any time. You do not have to answer any questions you do not want to answer. The information you provide will be used to prepare written materials intended to assist agricultural scientists, educators, sociologists, and companies to better assist farmers. The information from this interview will also be used in the Principal Investigator’s Master’s thesis.

3. Confidentiality. Your participation in this research is confidential. A code number and not your name will be used to identify your participation in the interview. Only the Principal Investigator can match names with code numbers. No information about you specifically will be released. The information you provide will only be used for research and preparation of publications and educational materials. Entire transcripts will be confidential. The only exception is if we think that you or another person, including a child, is in danger.
4. **Contact information.** Please contact Kristin Babbie at (248) 376-4194 or babbiekr@psu.edu with questions, complaints, or concerns about this research study. You may also contact Dr. Clare Hinrichs at (814) 863-8628.

You must be 18 years of age or older. If you agree to take part in this research study, please sign your name and indicate the date below. You will be given a copy of this form to keep for your records.

____________________  ______________________________
Date                  Participant Signature

____________________  ______________________________
Date                  Signature of Person Obtaining Consent