FARMERS' EXPERIENCES WITH IRRIGATION: A PHENOMENOLOGICAL PHOTOVOICE STUDY

by

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(Under the Direction of Abigail Borron)

ABSTRACT

Water scarcity is a global issue and with rising populations and increased food demands, is directly related to agriculture. Agriculture consumes nearly 70% of fresh water worldwide, and irrigation scheduling technology is a viable tool to alleviate water issues in the agricultural sector. By using a phenomenological approach to photovoice, this study intended to critically examine the experiences farmers have when making decisions based on irrigation and adopting irrigation scheduling technology. The phenomenological examination of farmers' individual lived experiences led to a more holistic understanding of the intersectionality of issues faced by farmers. The farmers' experiences can help communicate to Extension and university partners what drives decision-making around irrigation, technology adoption, and challenges associated with the livelihoods of farmers.

INDEX WORDS: photovoice, phenomenological approach, irrigation, agriculture, technology adoption, farmers' lived experiences

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DEDICATION

I would like to dedicate my thesis to individuals whose stories are unrecognized, unheard, or silenced.

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I would like to thank God for helping me through this educational journey and the blessings He has provided me with my partner, family, friends, and opportunity to learn. Thank you to my husband, Tony, who supported me throughout my endeavor and who continues to give me endless love and encouragement. I am appreciative to the participants in this study, who took the time out of their busy schedules to contribute to this study and for sharing their worlds with me. I want to thank my committee members, Dr. Jessica Holt and Dr. Adam Rabinowitz, for offering their knowledge and time, and also challenged me during this process. Lastly, I would like to thank Dr. Abigail Borron, who provided the opportunity to work on this project and who challenged me to see more in my research and in myself.

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CHAPTER 1

INTRODUCTION

Structure of the Thesis

This thesis contains five chapters that include an introductory chapter, a review of literature, methods, results, and a summary conclusion chapter, all of which are based on the application of a phenomenological method to photovoice to understand better how farmers perceive and approach irrigation technologies and scheduling on their farms. This qualitative study was a partnership between the University of Georgia and the University of Georgia Extension and took place between July 2018 and September 2018. With the purposive criterion sampling of 10 Georgia farmers, the researcher collected data through photovoice projects, one-on-one semi-structured interviews, field notes, and reflexive journaling. This study used phenomenology as a guiding framework for photovoice, while employing postmodernism and constructivist grounded theory.

Introduction

Freshwater is a commodity that in many areas of the world has become scarce or on the verge of becoming non-existent. Many of the world's regions are experiencing water shortages due to climate change, the inconsistency of rainwater, increasing demand for food supply, and centers of increasing populations stressing water supplies (Mahafza, Stroutenborough, & Vedlitz, 2016). The World Wildlife Fund Organization (2018) has predicted by 2025, two-thirds of the world's population will experience water shortages. Agriculture comprises 70% of the world's fresh water use and with increasing populations, remains tied to producing food and economic

security for communities (Moore, Coleman, Wigmosta, Skaggs, & Venteris, 2015; World Bank, 2017). Predictions suggest that the continued increasing demand for agricultural products will positively correlate with an increase in water usage (Scheierling & Treguer, 2016).

In the United States, nearly 81% of its consumptive water use is in agriculture (Moore et al., 2015). In 2012, there were approximately 54 million acres of irrigated farmland and pastureland in the United States (United States Department of Agriculture, [USDA], 2018). The average value of production for irrigated U.S. farms totaled $118.5 billion in 2007, more than three times the average value for a dry land farm or a farm that does not use scheduled irrigation (Schaible & Aillery, 2012).

With the demand of water coupled with the scarcity of water, within and between countries "water wars" ensue amongst for the needs and expectations of organizations, industries, consumers, and political entities (Bencala, & Dabelko, 2008). In the U.S. alone, the ongoing "water wars" are diverse and contentious throughout the country. For example, in the West, the seven states along the Colorado River including Arizona, California, Colorado, New Mexico, Nevada, Utah and Wyoming experienced conflict regarding water rights and the populations living along the river (Richards & Orr, 2003); whereas, in the Southeastern states, water rights battle continue today between Alabama, Georgia, and Florida with the Apalachicola-Chattahoochee-Flint Rivers. This water war intensified after significant drought impacted water availability in the Southeast from 1998-2002 (Manganiello, 2017).

In the broad scope of agriculture globally, there is a significant need to work toward finding solutions for water sustainability as fresh water becomes scarcer worldwide. There are multiple recommended solutions to reduce agricultural water consumption including the integration of efficient irrigation technologies and scheduling (Levidow et al., 2014;

Manganiello, 2017) and cultivating and growing crops that require less water (Moore et al., 2015). Other solutions include reducing land used for farming during times of water shortage (Ward, 2014), and altering current water consumption policies (Dinar, 2015; Manganiello, 2017; Scheierling & Treguer, 2016).

Tied to each contentious issue and recommendation solutions around water use in agriculture are the livelihoods of farmers, the vitality of their farms, and the sustainability of agriculture and agricultural lands. Even further, this social landscape of agricultural production is dynamic as the population of farmers continues to decline. In the U.S. alone, the number of farmers including farm operators, farm labor, and family members working on farms has remained on a steady decline (Table 1.1) (USDA Economic Research Service, 2018).

Table 1.1

Decline of US Farms and Farmers by Decade 1954-2012

Year by Decade	Number of Farms	Land in Acres	Farming as Primary Occupation
1954	4,782,416	1,158,191,511	N/A*
1964	3,157,857	1,110,187,000	N/A*
1974	2,314,013	1,017,030,357	1,427,368
1982	2,240,976	986,796,579	1,234,787
1987	2,087,759	964,470,625	1,138,179
1992	1,925,300	945,531,506	1,053,150
1997	2,215,876	954,752,502	1,044,388
2002	2,128,982	938,279,056	1,224,246
2007	2,204,792	922,095,840	993,881
2012	2,109,303	914,527,657	1,007,904

*No data available

(USDA Economics, Statistics and Market Information System, 2017; 2018)

In 1950, 7.6 million people worked as self-employed and family farm workers compared to 2.06 million in 2000, a 73% reduction (USDA Economic Research Service, 2018). The numbers of farms in 2017 were nearly 2.05 million, a decrease of 12,000 farms from 2016. Total land in farms totaled 910 million acres, a reduction of 1 million acres from 2016. Nationally, the number of farms has decreased while the average size farm has increased for example; the average farm size in 2017 was 444 acres, up two acres from the previous year (USDA, Farms, and Land in Farms 2017 Summary, 2018). In the U. S., there is a decline of farmed acres; a decline of the occupation of farmers, while the remaining farmers' cultivated acres and responsibility of land is getting larger. With this change brings heightening pressures regarding controversial issues meeting the demand for food, climate change, resource availability, viability and sustainability of farm business, vulnerability to the market shifts, and obligations to changes in policy and regulatory standards (Olson, 2013).

Statement of Problem

As the worldwide dependency on agricultural production remains persistent, yet the number of farmers continues to decline, there is an ever-increasing value to situate the discussion of sustainability first through the view and perceptions of the farmers themselves. Farmers have valuable knowledge since they take on the responsibility of producing food, while serving as practitioners and teachers living from the land and contributing to the food system (Bulla & Steelman, 2016). Previous research has examined farmers' perceptions and attitudes toward land conservation practices (Kalcic et al., 2014) and predicting if farmers will adopt efficient irrigation technologies and scheduling (Hunecke, Engler, Jara-Rojas, & Poortvliet, 2017). However, numerous factors influence a farmer's decision to adopt specific practices related to conservation (Floress et al., 2017; Kalcic et al., 2014) and exploring the individual characteristics

of the farmer can help deepen the knowledge of their decisions to adopt technology (Hunecke et al., 2017). Research highlights factors, such as financial and environmental benefits, which influence a farmer's adoption of a practice but conversely recognizes there is no guaranteed adoption by a farmer (Glenk, Eory, Colombo, & Barnes, 2014).

With persistent water concerns, there is a frequent and much-needed examination of agricultural-based water consumption. However, also critical but empirically lacking is research that situates the farmer at the center of the conversation. The current study used irrigation technology as an entry point of conversation around Georgia farmers' experiences of irrigation to access the world of participating farmers.

Purpose and Research Objectives

This study addressed the problem of water use and water efficiency in the agricultural sector through the investigation of farmers' experiences of irrigation. By using a phenomenological approach, the intent was to critically examine the experiences farmers have when making decisions based on irrigation. Phenomenology is the study of phenomena (van Manen, 2014) and in the context of this study, the phenomena of irrigation. Phenomenology, when used as an approach within communication, can significantly assist in understanding the experiences of others (Craig, 1999). A phenomenological approach was defined in this study as the use of elements from the philosophy and writings of phenomenological scholars to design, perform, and report findings. In this study, the researcher used a phenomenological approach intended to better understand the experiences of farmers through photovoice that offered daily windows, or photographs, of the farmers' space, time, and existence.

This research aimed to understand the direct and indirect obstacles farmers face regarding irrigation. The purpose of using phenomenology in this study was to understand how farmers'

lived experiences assisted in the communication of these challenges. This study used a phenomenological approach within the qualitative research method of photovoice to better understand the experiences farmers had regarding their daily decisions, including those of irrigation scheduling technology. This study aimed to address the following research objectives:

RO1: To examine farmers' lived experiences within the framework of phenomenology to provide insight into the individual decision-making processes of farmers regarding water use and water efficiency.

RO2: To identify issues that have an impact on farmer's irrigation practices.

RO3: To examine the influence a phenomenological approach has on the researcher in collecting and analyzing data, and reporting results as it relates to farmers' lived experiences.

Context of Study

This study took place in the state of Georgia where peanuts and cotton are considered some of its major agricultural commodities. Georgia farmers relied on dry land farming or rain-fed farming until the early 1950s for their major crops (Manganiello, 2015). Irrigation gradually spread statewide and its adoption increased after droughts occurred in the 1980s (Manganiello, 2015). Irrigation increases the growth rate of crops, while minimizing risk and crop productivity (Manganiello, 2017). Currently, Georgia has 9.3 million acres of agricultural land as 1.5 million of these acres are irrigated (Manganiello, 2015). As the adoption of irrigation increased in the last few decades, a gradual decline in farming as an occupation and farmed acres in Georgia ensued (Table 1.2).

Table 1.2

Decline of Farms and Farmers in Georgia 1954-2017

Year	Number of Farms	Number of Acres	Farming as Primary Occupation
1954	198,191	37,429,120	N/A*
1964	83,336	37,295,360	N/A*
1974	54,911	13,878,294	30,243
1982	49,630	12,291,885	23,075
1987	43,552	10,744,718	19,449
1992	40,759	10,025,581	18,817
1997	40,334	10,671,246	19,860
2002	49,311	10,744,239	25,076
2007	47,846	10,150,539	20,106
2012	42,257	9,620,836	19,858
2017	40,900	9,300,000	19,858**

*No data available
**Principle farm operators as a primary occupation were not reviewed in 2017. The number reported in the 2017 Census from the 2012 Census.
(USDA Economics, Statistics and Market Information System, 2017; 2018)

In addition, Georgia is currently involved in a Supreme Court case, *Florida v. Georgia,* over water allocation rights of the Apalachicola-Chattahoochee-Flint River basins. The Apalachicola-Chattahoochee-Flint River basin extends 19,600 square miles, and its waters are used for irrigation, drinking water, power plant cooling, navigation, hydropower, recreation, and ecosystems (Georgakaos, Zhang, & Yao, 2010). The Flint River basin, which is the southwest quadrant of the state, uses more water to irrigate crops than any other region in Georgia (Manganiello, 2017). The state of Florida blames the over-consumption and use of water for the decline of its shellfish industry due to the lack of upstream freshwater, which ultimately damaged their ecosystems (Charles & Flowers, 2014). By 2050, the demand for water in agriculture will experience growth in every region in Georgia (Manganiello, 2017). Manganiello (2017) also predicted the increase in water demands in the agricultural sector will add new stresses on groundwater supplies.

The current study was part of the *AgWET Irrigation Project,* a larger collaborative, interdisciplinary project that examined the integration scheduling and use of irrigation, soil moisture sensor technology, as well as how Georgia farmers perceive irrigation. A purposive criterion sampling of 10 farmers in five counties across Georgia participated in this study that began with the voluntary installation of soil moisture sensors in fields of peanuts requiring scheduled irrigation. While the participating farmers produced a variety of commodities, all dedicated a significant portion of their production to peanuts and cotton. After the installation of the soil moisture sensors provided by the research study, participants contributed in three phases of the study for one portion of the larger AgWET project:

- *Phase 1:* The participation in a photovoice project that was comprised of taking daily photographs based on the researcher's prompts related to irrigation and irrigation scheduling technology.
- *Phase 2*: One-on-one interviews held on-site at the participants' farm. Interviews discussed their photographs and other questions related to the experience and description of their farm's irrigation processes.
- *Phase 3:* Focus groups scheduled after the harvest of peanut and cotton crops in 2019, held at the farmers' local extension office.

Phase 1 included the participation of a photovoice project where participants captured daily photographs over two weeks, related to the challenges and opportunities related to irrigation scheduling, technology, and water. This portion of the project occurred during the peak watering time for peanuts. Phase 2 included one-on-one semi-structured interviews that took place on-site at their farms or homes. The researcher applied constant comparative analysis in constructivist grounded theory to adjust questions based on data obtained in the interviews.

Phase 3 consisted of two different focus groups for farmers located in the eastern and western counties of Georgia. The researcher used the themes that emerged from coded transcribed data from the participants' one-on-one interviews to form questions and conversation starters for the focus groups. The data that informed the methodology of photovoice in this study is only from Phase 1 and Phase 2. Implications for Phase 3 will be discussed in Chapter 5.

Significance of Study

The significance of this study was to understand the individual farming experiences and decision-making behind irrigation practices and water usage. If a better understanding of what experiences farmers face when making decisions related to water and the technology they employ is clarified, University Extension can integrate better and more appropriate on-farm practices, systems as well as technology to assist farmers.

Understanding farmers' experiences can also assist in forming policies based on water usage, which can add to the significance of this study. The addition of policy changes is necessary with the help of technology to address issues with water usage (Manganiello, 2017). Although technology and tools can enhance irrigation efficiencies and water conservation, it will not resolve the water conflicts or produce additional fresh water supplies (Manganiello, 2017).

The significance of this study was the timing in which the state of Georgia, Alabama and Florida are tied to long-standing legal battles over the waters of the Apalachicola-Chattahoochee-Flint River Basin. Since 2013, in the *Florida v. Georgia* Supreme Court case, Georgia has spent 40 million dollars fighting the case, while Florida has spent 57 million dollars (Leavenworth, 2018). In June 2018, the Supreme Court issued the case back to the Special Master citing that more information and legal briefing was needed before they could issue a decision in the case (Southern Environment Organization, 2018). As no current resolutions have been court

appointed, it is critical that communities find alternative solutions to issues that worsen daily. It has been predicted that climate change will result in more extreme droughts that additionally result in, "lower lake levels, water supply shortages, reduced firm energy generation, and lower instream flows" (Georgakaos, Zhang, & Yao, 2010, p. 2). As years progress, growing seasons and harvests occur with no court-appointed solution, the conversation is critical for Georgia's concern for its water sustainability, agricultural industry, and the wellbeing of its residents and neighboring states.

It is also significant that Georgia has a substantial amount of industry in agriculture and the crops produced are a resource to many in the population. In 2017, Georgia's agricultural commodities values were nearly $14 billion ($13.79 billion) (*2016 Farm Gate Value Report*, 2017). Food and fiber production and associated industries within Georgia produced a significant value ($73.3 billion) as well as provided more than 383,600 jobs in the economy (*2016 Farm Gate Value Report,* 2017). Georgia contributed nearly 50% of the nation's peanut yield and is the second leading producer of cotton in the United States (USDA, 2016). For Georgia to continue its agricultural industry sustainably, it is necessary that it find solutions for water efficiency, while considering farming constraints.

Definitions

The terms below were presented throughout the study:

- Center Irrigation Pivot (referred to as a pivot): Irrigation equipment that moves in a circular pattern around a central pivot point. Pivots are capable of applying water, chemicals, fertilizers, and herbicides. They can be electrically power or through diesel ("How a center pivot irrigation works", 2016)
- Dry land farming: farming without the use of scheduled irrigation

- End-guns: a type of large sprinkler on a center pivot installed at the very end to irrigate fields areas beyond the end of the center pivot structure (Gerdes, 2013)
- Epoché or bracketing: removing of the natural attitude or the taken-for-granted aspects of the world (Strugess, 2018)
- Georgia-06G: a runner-type peanut that is high yielding ("Georgia-06G peanuts", 2019)
- Georgia-09B: a runner-type peanut that is high yielding with the high-oleic trait. It has high-oleic and low linoleic fatty acid ration for improved oil quality and longer shelf life of peanut and peanut products ("Georgia-09B peanuts," 2019).
- Lifeworld: "The world of the natural attitude of everyday life which Husserl described as the original, pre-reflective, pre-theoretical attitude" (van Manen, 1990, p. 7).
- Lived experience: the way people individually experience the world
- Phenomenology: "Aims at gaining a deeper understanding of the nature or meaning of our everyday experiences (van Manen, 1990, p. 9). It is the study of phenomena including appearance or what gives or shows itself in the everyday experience. It aims to focus on the singular aspects of a phenomenon or event (van Manen, 2014).
- Variable rate irrigation: a type of regulated irrigation technology that can be tailored to put precise amounts of water over irrigated land, resulting in more efficient water use (Groeteke, Dotterer, & Shanahan, n.d.)

Limitations

This study has several limitations including:

1) Study Design Limitation: Some participants did not include or submit photographs in their photovoice study. These participants were not shown any photographs from other participants in the one-on-one interviews, but did elaborate on an image constructed in

their minds. The use of reflection and description of imagery used as a tool justified the inclusion of their interviews and their constructed photovoice submissions. Phenomenology is the inclusion of consciousness that is real or imagined (van Manen, 1990).

2) Data Limitations: Two participants did have their county extension agent near or in the proximity of the one-on-one interview setting. Limitations may have existed on how freely these participants could discuss issues that could have occurred due to the third party presence. The data collected was essential to support other data and still was significant in that it included farmers' experience in a particular region and topographic area in the state. In future studies, it is suggested the participant is in a location and with others (or the absence of others) where they feel comfortable sharing their individual personal information.

3) Results Limitations: Due to the access point of participants for this study, it cannot be considered representative of all farmers, let alone all peanut farmers across the entire state of Georgia; therefore, results cannot lead to generalizations for farmers beyond the participants. The limitations of this study include a lack of diversity with the sampling of participants by using only male farmers in Georgia. According to the USDA (National Agricultural Statistics Service, 2018), principal operators by sex include males as 35,853 to 6,404 females in 2012 within the state of Georgia. Additional limitations include the type of commodities planted by the participants were only peanut and cotton. Results could differ with studying participants that produced other commodities that experience irrigation in Georgia such as corn, blueberries, soybeans, vegetables, or other grains.

Organization of Thesis

This thesis is organized in the following way: Chapter 2 is a literature review that investigated global and local water scarcity issues, people's perceptions of water shortage, farmers' perceptions including water assistance programs, technology adoption, and sustainable practice. The review of literature also included the concepts of the theoretical framework including phenomenology, photovoice, and postmodernism. Chapter 3 reviewed the methods involved in performing the study, while Chapter 4 discussed the results. Chapter 5 presented the conclusions and recommendations based on the results and findings of this study.

CHAPTER 2

LITERATURE REVIEW

Overview of Chapter

This chapter is organized into four sections to address the scope of literature. The first begins with a review of literature that covers the current local and global water supply issues. The second section provides an overview of people's perceptions of water supply shortages, specifically as it relates to empirical evidence regarding the value of public perception research, as well as how the relationship between a communities' behavior and its water availability. This section provides an overview of farmer perceptions, including their perspectives on water assistance programs, moving to sustainable water practices, and technology adoption. In addition, it provides an overview of conventional methodologies and associated theories used to examine the behavior of the public and consumers in decision-making. The third section provides a survey of the literature that demonstrates elements from the theoretical framework including phenomenology, postmodernism, and photovoice. This chapter concludes with a discussion on how photovoice coincides with the phenomenological tradition and is appropriate to use to study the perceptions of farmers as it relates to irrigation practices.

Introduction

In 2017, the global population was nearly 7.6 billion people and was expected to reach nearly 9.8 billion by 2050 (United Nations, 2017). Agriculture consumes 70% of the world's fresh water use and, with growing populations, remains tied to producing food and economic security for communities (World Bank Group, 2017). Water scarcity is a global concern, yet

water-related problems and adaptions to address these problems tend to be localized in context (Scheierling & Treguer, 2016).

Local Water Supply Issues

Rivers can geographically unite and politically divide communities of people. The states of Alabama, Georgia, and Florida are geographically connected by the Chattahoochee, Flint, and Apalachicola River Basins, but are divided on the rights each state should have for water allocation. This issue stems from the fact that the Chattahoochee River and Flint River meet to form the Apalachicola River, which flows into the Gulf of Mexico at the Apalachicola Bay (United States Geological Survey, 2017). In the past 30 years, increasing populations and unpredictable weather conditions due to climate change affected the flow of water down these river systems (Charles & Flowers, 2014; Manganiello, 2017). Water allocation allowances and rights from the river basins have been the root of controversy between Alabama, Georgia, and Florida, which has resulted in the aptly named "Tri-State Water Wars" (Charles & Flowers, 2014).

The most recent lawsuit was filed on September 29, 2013, where Florida sued the state of Georgia for over-using water from Lake Lanier (Charles & Flowers, 2014). The residents of Florida and Alabama blame the population of Atlanta, Georgia for consuming most of the water that should be allocated for downstream river basins (Charles & Flowers, 2014). The reservoir at Lake Lanier provides the population of Atlanta 75% of its water for consumption (Charles & Flowers, 2014). The residents of Florida claim its environmental and economic livelihoods, which includes shellfish and tourism, is from the river basin and they have been severely damaged from Georgia's over-consumption of water and lack of downstream river flow (Charles & Flowers, 2014). According to the Southern Environment Organization (2018), on January 16,

2018, the Supreme Court began hearing oral arguments from the state of Florida against the state of Georgia. The United States Supreme Court has primary jurisdiction over interstate disputes, including water, and a special master is appointed to assist in resolutions (Hardberger, 2015). The special master collects findings and submits a report back to the Supreme Court, which can approve or revise any part of the report (Hardberger, 2015). In June 2018, the Supreme Court issued the *Florida v. Georgia* case back to the special master because the judges needed more facts related to the case. As a result, the case remains in litigation at the time of this study (Southern Environment Organization, 2018).

As the water allocation rights of the rivers remain unresolved in the Supreme Court system, the need and use of water continues. Georgia has six river basins within its borders, including the Flint River that joins the Chattahoochee River to form the Apalachicola River in Florida (Chalmers, 2002). The Flint River Basin region in western Georgia uses more water to irrigate crops than any other region in the state (Manganiello, 2017). It is forecasted by 2050, the demand for water in agriculture will experience growth in every region in Georgia (Manganiello, 2017). Manganiello (2017) predicted the increase in water demands in the agricultural sector would add new stresses on groundwater supplies. The need for water in agriculture is not limited to the state of Georgia, the Southeast, or the United States but worldwide with predicted global agricultural water consumption to increase 19% by 2050 (World Water Assessment Programme [WWAP], 2012). Globally, studies have shown irrigated farmland has produced nearly three times as much crop yield compared to rain-fed farming; consequently, irrigation will continue to expand and have a significant role increasing food production (WWAP, 2012).

Global Water Supply Issues

Many of the world's regions experience water shortages due to climate change, the inconsistency of rainwater, increasing demand for food supply, and centers of growing populations stressing water supplies (Mahafza et al., 2017). Within the United States, though 1% of water scarcity is attributed in "unstressed" river basin areas, when studied with spatiothermal assessment, the results demonstrated the "unstressed" river basins were experiencing a significant amount of stress (Moore et al., 2015). Another area of the world that has experienced water scarcity issues is Cape Town, South Africa. Cape Town was predicted to reach Day Zero in the spring of 2018 when its four million people would have their water supply cut off by the government (Torchia, 2018). On the predicted date, April 18, 2018, the residents would go to government mandated water dispensaries to receive their daily 25-liter fresh water allowance (Torchia, 2018). Some Cape Town residents did not believe that Day Zero would occur even though Cape Town's government officials forecasted it and warned people (Monteiro, 2018). The start date of Day Zero was deferred to July 2018 and then moved to an unspecified date in 2019 (Chutel, 2018). As the predicted dates of Day Zero occurred with no incidence, Cape Town residents have reverted to previous practices and increased their water consumption (Chutel, 2018).

Perceptions of Water Shortage

A review of the literature regarding individuals' perceptions during times of water shortage revealed many unique phenomena, one being residents increased water consumption amidst a shortage. A study conducted by Dessai and Sims (2010) compared the public's perceptions of water supply in two regions in England, one region specifically at a time that was experiencing drought. In that particular region, residents changed their short-term behavior by

decreasing their water consumption based on the seriousness of the drought. After the drought ended, the long-term behavior of residents reverted to increasing their water consumption (Dessai & Sims, 2010).

Mahafza et al. (2017) concluded when living next to bodies of water, some people do not see a change in water levels even though it has decreased during a drought period. Mahafza et al. (2017) interviewed residents in Texas living close to bodies of water, rivers, as well as streams and concluded these residents were less likely to see there was an insufficient amount of water in the bodies of water. During the time of the study, Mahafza et al. purposely conducted the interviews during a drought and when water supplies were at some of the lowest levels. Because the participants saw the water daily, they perceived they would have enough water now and in the future. The authors alluded to this as change blindness, the non-ability to identify change when it is occurring (Mahafza et al., 2017).

Agricultural Water Supply Issues

It is expected there will be an increase in water usage due to the increased demand for agricultural products (Scheierling & Treguer, 2016). In 2015, the agricultural sector in the United States consumed 80.7% of consumptive water supply (Moore et al., 2015). Suggestions to solutions that address the world's use of agricultural water consumption include efficient irrigation technologies with scheduling (Levidow et al., 2014; Manganiello, 2017) and farmers changing to crops that require less water (Moore et al., 2015). Ward (2014) recommended reducing the land used for farming during times of water shortage, while other authors suggested altering current water consumption policies to minimize agriculture's water use (Dinar, 2015; Manganiello, 2017; Scheierling & Treguer, 2016). Some farmers, stakeholders and policymakers believed it is the government's responsibility to assist in water scarcity issues (Mehryar, Sliuzas,

Sharifi, Reckien, & van Maarseveen, 2017), while some farmers felt pressure from their consumers to use better agricultural conservation practices (Doll et al., 2017).

Perceptions of Farmers

It is necessary to include literature that highlights the perceptions of farmers, as it relates to water assistance programs, sustainable irrigation practices, and technology adoption. The value in examining the perceptions of farmers is to better understand the impact their choices and actions (Fruscalso, Antillón, & Hötzel, 2017). The study of farmers' perceptions may help with designing policies, education, research agendas related to climate change (Doll et al., 2017), and planning stewardship programs based on farmers' willingness to practice water conservation (Floress et al., 2017). The inclusion of farmers and other stakeholders' perceptions is critical in policymaking regarding water (Mehryar et al., 2017), while water-saving irrigation programming must take into account the farmers' perceptions and daily issues (Burnham et al., 2015).

Water assistance programs. Farmers and other stakeholders perceive water assistance programs with various receptions while complication is furthered when establishing what was valued in the programming: water, production, or farmers' livelihoods. Some farmers believed it is the responsibility of the government to regulate water practices (Mehryar et al., 2017) or the government's role to give financial assistance with the effects of climate change (Doll et al., 2017). Though some farmers support water assistance programs, research showed that government assistance in water programs did not increase water conservation practices (Gandure, Walker, & Botha, 2013; Ward, 2014). A government's assistance in free water programs did not encourage farmers to seek more sustainable long-term plans in dealing with climate change (Gandure et al., 2013). Gandure et al. (2013) contend governmental assistance creates a dependency and discourages farmers to adopt any new practices or water saving

methods. Governmental assistance such as public subsidies resulted in farmers still cultivating the majority of their land during times of water scarcity (Ward, 2014). Because irrigation was available through governmental assistance, farmers grew crops on most of their land, even though they yielded crop loss (Ward, 2014). With full public subsidies to adopt drip irrigation and the utilization of reserve aquifer pumping, farmers found even in times of drought, they were able to still produce on most their land and have minimal income losses (Ward, 2014). Some researchers believe if public subsidies are used to help finance drip irrigation, the farmer's consumption of water should not increase (Scheierling and Treguer, 2016). Farmers should not switch to higher market value crops just because they received financial assistance to allow more efficient irrigation, which depletes the same amount of water (Scheierling & Treguer, 2016). Problems in agricultural water conservation include the various understandings of how water saving is actually defined. Water efficiency for farmers can be the idea of maximizing economic productivity rather than water conservation (Knox, Kay, & Weatherhead, 2012). Levidow et al., (2014) had a similar finding in that farmers and water agencies had varying understandings of irrigation efficiency; to the farmers, it meant to increase in revenue, while water agencies sought to decrease water usage and conserve water.

Sustainable irrigation practices. Farmers have various perspectives on how to make their farms more sustainable as well as practice conservation by using efficient irrigation practices. According to the USDA Economic Research Service, sustainable irrigation practices include the creation of policies that achieve water availability while protecting the environment today and into the future (as cited in Schaible & Aillery, 2012). Some researchers consider conservation agriculture as using modern technologies to improve crop production while protecting and enhancing resources such as land (Dumanski, Peiretti, Benetis, McGarry, & Pieri,

2006). Conservation agriculture is a community-driven development process where local communities and farmer associations identify and use the best options, tools, and strategies in their location (Dumanski et al., 2006). In some instances, farmers felt a need to move toward more sustainable and conservation practices because they have a sense of stewardship to better the farmland they occupy (Floress et al., 2017; Kalcic, Prokopy, Frankenberger, & Chaubey, 2014). Certain farmers adopted sustainable or conservation practices because the government gave incentives that encouraged these approaches (Kalcic et al., 2014). Other farmers felt the adoption of conservation practices, such as switching to a less water-thirsty crop, was not appealing because it required restructuring their farm management to a possibly less profitable crop (Bonzanigo, Bojovic, Giupponi, & Maziotis, 2015).

Technology adoption. The implementation of conservation and sustainable practices can require the adoption of new technologies by farmers and the farming community. Levidow et al. (2014) compared various farmers' perceptions of water efficient technologies and concluded that farmers believed they were saving water because they adopted current irrigation technologies, even if the technology was not routinely maintained or checked for optimizing conservation. The authors posit there were no incentives to adopt new technology because farmers considered their current technology successful (Levidow et al., 2014). The perceptions of farmers with technology adoption were attributed to their level of trust to those who are using/promoting the technology/practice (Hunecke, Engler, Jara-Rojas, & Poortvliet, 2017) and how useful technology will likely be (MacDonald, Heanue, Pierce, & Horan, 2016). Furthermore, farmers perceived the conversion to new technologies was more likely to occur when the technology was offered at lower cost (Ward, 2014) and if the farmers were informed of current information and technology practices (Bonzanigo et al., 2015; MacDonald, 2016). Farmers' perceptions of

technology adoption need to be evaluated for what works best for each farmer (Burnham, Ma, & Zhu, 2015).

Theories Used in Adoption Studies

Past agricultural technology adoption research has used theories to study farmers' choices (Genius, Koundouri, Nauges, & Tzouvelekas, 2014), examine behavior and attitudes toward introduced agricultural innovations and practices (Pino et al., 2017), and adoption studies (Redza, Nordin, & Saad, 2017). Agricultural innovations are the combination of technological, social, economic, and institutional change and in a broader context are situated in policy, societal, farming, and economic systems (Klerkx, van Mierlo, & Leeuwis, 2012). The dominant narratives in these types of studies are that the agricultural researchers create the knowledge, technology, systems, and practices to solve the problems of the agricultural community (Douthwaite & Hoffecker, 2017).

Diffusion of Innovations

The diffusion of innovation theory is used to explain the process of how behavior, practice, or innovation is communicated to a community (Rogers, 2003). An idea can include a practice, idea, or object perceived as new to a group of people and can be welcomed or rejected (Rogers, 2003). The agricultural extension model is one of the oldest diffusion models in the United States, and the agricultural extension model is a research subsystem that works with county extension agents who then work with local farmers and state extension specialists (Rogers, 2003). The rate of diffusion takes the form of a normal distributed bell curve commonly referenced as an S-shaped curve. Within the S-shaped curve, Rogers (2003) defined categories of the types of adopters: innovators, early adopters, early majority, late majority, and laggards. The value in the diffusion of innovations theory and this type of approach to agricultural innovation

research is it examines adoption as a social process, where various players work toward a common goal or innovation (Klerkx et al., 2012). This type of research may enhance innovation but often does not take into account that the actors may have different and conflicting goals (Klerkx et al., 2012).

Research demonstrates multiple critiques of the diffusion of innovation theory including that adoption of innovations does not take linear approach (Jahanmir & Lages, 2015), technology does not diffuse in a homogenous and fixed social atmosphere and not necessarily a singular, discrete package (Lyytinen, & Damsgaard, 2001). Diffusion of innovations theory should include a bottom-up approach where it accounts for farmers possessing the innovation not extension in technology transfer (Padel, 2001; Röling, 2004). Additional weaknesses include not all people benefit from the adoption of an innovation (Röling, 2004). When studying conservation behaviors, diffusion of innovations model's of individuals trying and observing an innovation make long-term investments challenging to follow because the results will take a more extended amount of time (Priest, Greenhalgh, Neill, & Young, 2015).

Elaboration Likelihood Model

Elaboration Likelihood Model is a dual process model that looks to understand why people make the decisions they do and identify the factors that persuade them to engage in a specific decision-making behavior (Cacioppo & Petty, 1984). Elaboration likelihood model contends that people's attitudes are significant factors in his/her decision-making behaviors in information processing and messaging (Cacioppo, & Petty, 1984). The higher the elaboration, the more likely they will positively respond to the message, attempt to find more information, critically assess the information, look at criticisms of the message, which results in an overall attitude toward the issue in the message. When someone is not motivated to think about an issue,

avoids thinking about the issue in the message, disassociates the issue from their own life, and distracts themselves with another task if exposed to the issue, it results in low elaboration likelihood (Cacioppo & Petty, 1984). Advertising researchers commonly use the elaboration likelihood model to examine how persuasion is related to people's change in attitudes (Kitchen, Kerry, Schultz, McColl, & Pals, 2014). The value in using elaboration likelihood model as a theoretical framework allowed agricultural communicators to understand how people process messaging on water conservation (Rumble, Lamm, Martin, & Warner, 2017) and examine responses to messaging regarding water conservation practices (Price, Fielding, Gardner, Leviston, & Green, 2015). The model needs updating with today's technology and messaging capabilities since its inception during the mass-media marketing schemes of the 1980s (Kitchen et al., 2014). Practitioners of the elaboration likelihood model should be cautious because there is the lack of studies that replicate the model (Kitchen et al., 2014). Academic researchers who study the model note their work has little relevance with people who attempt to practice it (Kitchen et al., 2014).

Social Cognitive Theory

Social cognitive theory is a theory commonly used in educational and psychological settings to understand how people learn (Straub, 2009). The social cognitive theory posits that people learn from their social environment and human behavior is a result of three factors: people's variables (goals, self-efficacy, and outcome expectations), their behavior, and their environment. The theory holds importance to self-efficacy or one's beliefs of capabilities perform behavior within an environment (Schunk, 2012). There is value in using social cognitive theory to understand technology adoption because of its social learning aspect and how individuals use their own experience, and the experience of others could influence whether

someone adopts a technology (Straub, 2009). Examining farmers' self-efficacy concerning future policy and farming infrastructure demonstrated the need for increased farmer capacity to help ensure appropriate policies are in place (Eakin et al., 2016). In water conservation research, self-efficacy was the most important element of how a farmer actual behaved in areas of water conservation (Yazdanpanah, Feyzabad, Forouzani, Mohammadzaedh, & Burton, 2015). Although socio-cognitive factors such as self-efficacy assist in examining farmer decision-making, a more holistic approach is essential to understand an individual's decision-making complexities (Singh, Doward, & Osbahr, 2016).

Theory of Planned Behavior

The Theory of Planned Behavior (TPB) postulates that an individual's intentions to perform a behavior can be predicted from the attitudes toward that specific behavior, subjective norms, and perceived behavioral control (Azjen, 1991). According to the TPB, behavior can be predicted by attitude, beliefs and perceived control beliefs (Azjen, 1991). The TPB can help with examining the determinants farmers might have toward their intentions to adopt water-saving behavior (Pino et al., 2017) and motives to adopt soil conservation efforts (Werner et al., 2017). There are strengths in using the TPB including it can help understand the motivations that affect farmer decision-making to adopt the technology, but other variables need to be considered to account for the model's weaknesses (Herath, 2010).

There are studies that critique the TPB because evidence reveals that the general framework of TPB cannot be applied to all groups of farmers (Yazdanpanah, Hayati, Hochrainer-Stigler, & Zamani, 2014), environmentally concerned intentions do not always reflect environmentally concerned behavior (Beattie, McGuire, & Power, 2017), and general attitudes towards the environment have an indirect relationship to a specific pro-environmental

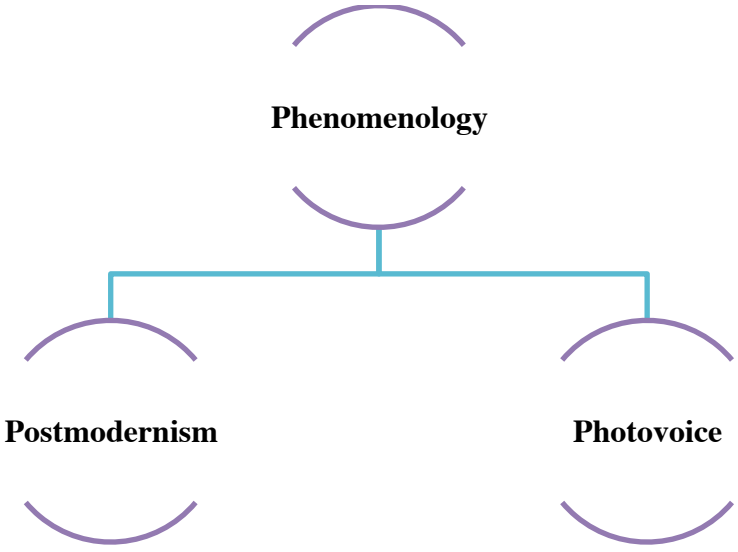
behavior (Bamberg, 2003). One of the main weaknesses in using TPB is that is measures intention, not an individual's actual behavior (Herath, 2010).

Theoretical Framework

The studies mentioned above used theories and models to study the behaviors and attitudes of the public and consumers, and examined ways to predict future behaviors when adopting new technology and practices. While these approaches provide varying and valuable degrees of insight into associated behaviors and attitudes, they do not explore the importance of the individual's experience and perception. Therefore, to take into account the individual's perspective in this study, it was essential to consider another level of constructivism that lent itself to examining how an individual's experience could assist in communicating collective, not generalizable, experiences of farmers. The theoretical framework that informed this study was phenomenology, postmodernism, and photovoice as shown in Figure 2.1.

Figure 2.1

Theoretical Framework



Phenomenology was the overarching methodology while photovoice was the overarching qualitative method to collect data. This portion of the literature review begins with the descriptions of phenomenology and its background. It highlights concepts within the methodology with how to examine lived experiences and lifeworlds of participants while acknowledging the role of the researcher through reflexivity and bracketing; and will demonstrate how phenomenology supports communication research and the use of visual imagery. The literature review continues with a description of postmodernism and lastly, a description of the photovoice method and its use in studies in agriculture and rural communities is reviewed.

Phenomenology

Phenomenology is often referred to in the literature as a phenomenology of practice (van Manen, 2014; van Manen, 2017a), a philosophical discipline (van Manen, 2014), a method and a philosophy (Giorgi, 2017), and a qualitative research method (Paley, 2018). In its purest sense, it is the study of phenomena that includes the appearance or what reveals itself in the everyday experience (van Manen, 2017a). It aims to focus on the singular aspects of a phenomenon or event and attempts to find a deeper understanding and meaning to an individual's everyday experience (van Manen, 2014). In its origin, phenomenology as a philosophical concept stemmed from the writings of Edmund Husserl, a mathematician turned philosopher, during the early twentieth century (Sturgess, 2018). Phenomenology opposed naturalism, a widespread belief at that time, which was the idea that science could be applied to understand everything about nature (Ungvarsky, 2017). Husserl believed phenomenology was the study of an individual's consciousness based on the experiences and the reflection of experiences (Sturgess, 2018). Husserl is credited with coining the term lifeworld, which is commonly used in

phenomenological studies (Kings & Ilbery, 2015). Husserl believed the lifeworld is how individuals live through an experience in the world and make sense of their experiences, or phenomena, in their worlds (Vagle, 2018). Husserl believed the description of the phenomenon was a thing or object experienced through our consciousness outside of the natural world and within these separate lifeworlds (Vagle, 2018). Husserl's student, Martin Heidegger, had a different approach from his teacher; Heidegger believed an individual could not separate their experiences from their surroundings or the natural world (Vagle, 2018). Heidegger posited individuals could not separate the phenomenon from the natural world because phenomena are experienced through their environment and their surroundings (Vagle, 2018). Heidegger took a more interpretative approach to phenomenology and examined how individuals interpret their world in their surroundings. Heidegger philosophized that the phenomena is not a separate entity or thing but is brought into the world as an experience living it (Vagle, 2018).

From these two founding phenomenologists, two traditions continue to be practiced: Heidegger's interpretative and Husserl's descriptive phenomenology (Lopez & Willis, 2004). Although phenomenology has many traditions and various interpretations, all phenomenology is considered in a family (Sebbah, 2012). As phenomenology has evolved, the work of Heidegger is distinguished in making an ontological turn in phenomenology by contextualizing the living in the world (Vagle, 2018). According to van Manen (2014), all methods of phenomenology traditions follow the idea from Heidegger's "it shows itself," where something that is hidden then reveals itself (p. 28). In essence, Heidegger believed individuals' experiences happen in the world and cannot be separated from the world they live in (van Manen, 2014).

Phenomenology Rationale

Phenomenology was a reaction to the positivist approach to science and social sciences in how it approached studying people and their environments (Vagle, 2018). Phenomenology does not seek to test theories in how people experience the world (Vagle, 2018). Phenomenology does not seek to form theories because it is atheoretical (LeVesseur, 2003). It aims to focus on the singular aspects of a phenomenon or event (van Manen, 2014) and the multiplicity of these singularities can help better understand the phenomenon (Drescher, 2014). Each lived experience gives access to the phenomenon in its singularity and makes the phenomena more understandable (van Manen, 2017a; van Manen, 2017b).

How to Practice Phenomenology

With various definitions and methodologies used in this vast tradition, there are multiple uses and applications of phenomenology in social science research. Phenomenological practices can have similar techniques to social science methods like the use of observation, descriptive writings, and interviews (van Manen, 2017a). Phenomenology does not have to take the form of traditional qualitative research methods but can be practiced in a reflective manner and may need knowledge of art, cinematography, experience gained through travel, and other creative art forms and expression (van Manen, 2014). Phenomenology can be practiced in various ways including but not limited to lifeworld approaches, interpretative or hermeneutic, and descriptive phenomenology (Vagle, 2018). Students of phenomenology need to refer to the original literature not the writings of second-hand sources claiming to be phenomenology (van Manen, 2017). To be familiar with phenomenology, researchers must to read the work of leading phenomenologists such as Edmund Husserl, Martin Heidegger, Maurice Merleau-Ponty, and Jean-Luc Nancy (van Manen, 2017b).

Studying lifeworlds. Research demonstrated phenomenology or the study of an individual's experience is directly related to their lived experience or an individual's experience lived in a particular space. Lived body, lived space, lived time, and lived sense of other comprise an individual's lifeworlds (van Manen, 1990). Lived space can indicate the landscape that a person identifies as the primary context by which the majority of his/her life resides and functions (van Manen, 1990). Kings and Ilbery (2015) studied conventional and organic English farmers to understand their lifeworlds through lived space and examine farmers' decisions to farm organically or conventionally. The researchers conducted in-depth interviews on each participant's farm to obtain descriptions of the environments in which farmers worked and lived. The authors argue that using behavioral approaches to a study would focus on the attitude and values of decision-making while using a lifeworld approach helped the farmers' experiences remain forefront to the researcher-imposed goals. A behavioral approach would attempt to explain how the observers or researcher constructed meaning versus a phenomenological approach, which attempted to describe the participants' experience. A lifeworld approach was used to examine the perceptions of the farmers in relation to their environment. In this approach, the authors describe how the researcher abandoned all previous assumptions and knowledge to understand the farmers' social construction of their natural and social environment. King and Ilbery (2015) examined the aspects of farmers' environments to understand the totality of their everyday environmental experience. The use of phenomenology allowed the researcher to explore parts of a farmer's lived experience and lived place to understand their whole lifeworlds (Kings & Ilbery, 2015).

Likewise, the research examined demonstrates how an individual's lived place influenced their decisions in land conservation. Drescher (2014) studied how and why non-farming

landowners made decisions based on preserving the land in which they lived using interpretative phenomenological analysis (IPA). IPA culminates three principles including phenomenology, hermeneutics, and idiography. Phenomenology studies the experiences lived with others while hermeneutics is the interpretative process of the experience. Idiography supports the individual perspective, while not making claims for the general population. The author notes IPA should not contribute to hypothesis testing like other types of studies. Drescher (2014) applied IPA to in-depth, semi-structured interviews, which helped reveal the personal relationship each landowner had with the environment. The author described how IPA used in other studies other summarizes participants' experiences without reaching the full potential to delve further in the interpretative level of IPA. The author concludes landowners felt a sense of beauty and pride on their land while many described their experiences in their childhood and youth, which greatly impacted their strong connection with their natural environment. The use of phenomenology revealed the participants' strong relationship with nature and their propensity toward land conservation. It was recommended that participants' deeply rooted ethics could be used to engage other landowners with outreach conservation efforts (Drescher, 2014).

Studying lived experiences. Existing arguments in the field of phenomenology challenge how studying lived experiences are performed. Max van Manen, an interpretative-oriented phenomenologist (Vagle, 2018), argues that there is no model or prescribed steps that will lead to a phenomenological insight or understanding (van Manen, 2017a). Many qualitative studies anticipated using phenomenology and its aspects but fall short because they sought to find specific research answers and did not practice true phenomenological questioning (van Manen, 2017a). Some studies labeled as phenomenology were misnomers; some researchers confused participants with making sense or their lifeworld as phenomenology and should be

considered more like a psychological study (van Manen, 2017a). For example, John Paley (2018) argued lived experiences should not be discussed in interview format but follow more empirical practices such as observation, discourse analysis, and practical experiments. Explanations of participants' experience a phenomenon can then be made into models to be then practiced in future qualitative studies (Paley, 2018). Amedeo Giorgi, a current Husserlian-oriented phenomenologist (Vagle, 2018), criticized Paley for trying to explain a phenomenon because it is contradictory to the descriptive and interpretative methods of phenomenology (Giorgi, 2017). Van Manen (2017c) notes Paley misunderstands the philosophy of phenomenology and the basic concepts lived experience, reduction, and phenomenological meaning because of his attempt to explain how or why people attribute meaning to their experiences.

Language in Phenomenology

Since interviews are used to practice phenomenology (van Manen, 2017a), communication is integral in phenomenology as, "Humans speak and things too speak to and with us" (van Manen, 2014, p. 130). Thoughts cannot be expressed without language (van Manen 2014), and phenomenologist Hans-Georg Gadamer believed phenomenology is understood through language (Sturgess, 2018). Phenomenology is the study of how things appear and language describes how our experiences are interpreted (Sturgess, 2018). The description of our human experiences and individual lifeworlds are only possible through language (van Manen, 1990). A phenomenological approach used in communication research acknowledges and respects our individual differences, to learn from and seek common ground with each other, remain truthful, while encourages cohesion in our relationships with other people (Craig, 1999). Phenomenology applied to communication research is theorized as using dialogue to express

one's individual experiences with others to understand one's common and different human experiences (Craig, 1999).

Visual imagery as language. When people express themselves through imagery, it is a language that can reveal information about who they, where they live, and their backgrounds. Phenomenologist Jean-Luc Nancy (2005) described the idea of the image, as not only a visual tool yet as something that intimately reaches all sensory factors. Imagery is a language and, "Language speaks for all and of all: for all, in their place, in their name, including those who may not have a name" (Nancy, 2005, p. 3). Every image is a portrait, not necessarily representing a face with traits of a person but does extract an intimacy and force (Nancy, 2005). Nancy postulates a landscape or the imagery of land does not open itself to the viewer but instead allows the viewer to approach in the image, and puts the viewer within the space created. A landscape has transformative abilities because it can present the taking place of sense (Nancy, 2005).

Visual imagery, as an alternate form of communication, can assist with the dialogue with others. Using visual imagery can be helpful because phenomenology uses dialogue as the ideal form of communication, yet there are some difficulties in maintaining dialogue (Craig, 1999). In a study by CohenMiller (2018), the author used the visual arts in a transcendental phenomenological tradition to understand the experience of doctoral students and motherhood. Visual arts can include drawing, painting, sculpture, ceramics, architecture, printmaking, photography and film (Esaak, 2017). CohenMiller (2018) contends that visual arts can help with communication of emotions and allow the students to express themselves in an alternative method if they were not comfortable with the interview process. The author noted with a non-native English speaker in her study, the practice of visual arts allowed the participant to use

imagery as metaphors. The use of visual methods as communication encouraged the participants to voice their experience while discussing a sensitive topic for research. CohenMiller (2018) examined the use of visual arts encouraged participants to reflect and see their experiences in ways that may not have been known initially to them. CohenMiller (2018) asserted the phenomenological tradition relies on the analysis of text and the use of art can be used alongside text to open up insights into the participants' experiences. Visual arts provided a valuable benefit to encourage communication and understand the voices of those who are participating in a phenomenological study (CohenMiller, 2018).

The Role of the Researcher in Phenomenology

In phenomenological studies, it is essential that the role of the researcher is acknowledged and taken into account because the researcher is writing the written expressions of the phenomenon that occurred (Vagle, 2018). Though the term reflexivity is rarely mentioned in the work of phenomenology philosophers, reflexivity, bracketing, and reduction are commonly practiced to question the researcher's positionality in the study and separate bias and preexisting assumptions (Vagle, 2018).

Practicing reflexivity. The term reflexivity is not vocabulary discussed in the work of phenomenology philosophers, but its concept remains essential to the ontological practice (Walsh, 2003). Reflexivity refers to the process in which researchers take into account the complexities in which our realities are framed which may be initially unknown to the researcher (Vagle & Hofsess, 2016). The researcher constantly questions and reflects on the research process while attempts to understand how subjectivity affects data collection and analysis (Finlay, 1998). Researchers practicing phenomenology examine their natural attitudes toward obtaining information, which may be lacking in reflective criticism (Sturgess, 2018). Through

self-analysis, self-awareness, and acknowledging the researcher's positionality, it allows the researcher to analyze data and examine how influences affect the ways in which experiences are interpreted (Clancy, 2013). Practicing reflexivity in qualitative research can add more rigor, credibility, and quality while the research promotes limiting bias (Clancy, 2013). Reflexivity promotes validity by the researcher disclosing how their assumptions and bias acknowledge how they possibly affect the research process (Creswell & Miller, 2000). Reflexivity as a form of validity aligns within the critical paradigm where the researchers reflect on their context concerning how they perform and analyze research (Creswell & Miller, 2000).

Epoché, **bracketing, and reduction.** Essential elements of phenomenological writings include the idea of the epoché (van Manen, 2017a), which can be interchangeably referred to as bracketing or reduction (LeVasseur, 2003). Bracketing is used in both descriptive and interpretative phenomenology (Vagle, 2018). Bracketing refers to suspending researcher's expectations, preconceived views, and assumptions out of understanding an experience to take out one's prejudice (LeVasseur, 2003). By removing one's predetermined views, it allows an individual to step back and reflect on the experience in a more philosophical way, rather than one's natural attitude toward the experience (Sturgess, 2018). Husserl believed that one could suspend all expectations and views, to remain completely objective in understanding an experience (LeVasseur, 2003). Heidegger's views on phenomenology include bracketing, but his views differ from Husserl; Heidegger believed people cannot fully separate from their contexts and existing in the world (Sturgess, 2018). Heidegger thought people could not fully take their previous experiences and surroundings completely out by bracketing because of our natural existence and living in the world (Sturgess, 2018).

Phenomenology lacks a single definition, as does the process of bracketing within phenomenological literature and research techniques. No set of rules exists to how much literature the researcher should study before beginning phenomenological studies or if a literature review should be conducted after data collection (Chan, Fung, & Chien, 2013). Bracketing should be based on the ideas of Husserl and Heidegger, as well as interpretative and descriptive phenomenology (LeVasseur, 2003). Bracketing can be achieved to demonstrate validity in phenomenological studies by promoting the researcher's reflexivity during data collection and analysis (Chan et al., 2013). Bracketing occurs when an individual becomes curious or inquiring more knowledge on a subject matter and when he or she admits to not fully knowing or understanding (LeVasseur, 2003). Research demonstrates one's bracketing should continually occur like a hermeneutic circle, to continually question and understand new meanings (LeVasseur, 2003). Other research suggests bracketing or taking out the researcher's prior knowledge should be well planned in the research process and before data collection and data analysis (Chan et al., 2013).

Postmodernism

Postmodernism is described as a theory, and occasionally its use draws confusion due to its common description of contemporary culture (Cilliers, 2002). Postmodernism as a social philosophy has foundations based upon language and question the current system of knowledge production while promoting new social movements (Premfors, 1992). Postmodernism emerged from the philosophies of phenomenologists, including Heidegger, though it is more conceptually not methodologically driven (Agger, 1991). A postmodernist view holds similar foundations with phenomenology in that knowledge does not come from one source, but a multitude of individuals' knowledge (Agger, 1991). Different groups of individuals are described as

institutions, disciplines, and communities, which tell different stories about what they know and do (Cilliers, 2002). Postmodernism within the social sciences has methods that create more questions, a limitlessness amount of answers more so than a particular method to solutions (Rosenau, 1992). Postmodernism rejects the grand narrative or a story that represents all people because it dominates individuals' lives (Sim, 2011). Postmodernism supports that knowledge can be obtained through ordinary people and can also empower people who are commonly muted to join discussions while de-privileging the conventional positivist voice (Agger, 1991). Jean-François Lyotard was a prominent philosopher of postmodernism (Agger, 1991) and he rejected stated absolutes, domineering authority, and the injustice performed in the grand narrative (Sims, 2011). Lyotard supported the idea that the smaller narratives are fluid, ever changing, and do not seek to hold power and oppress (Sim, 2011). Lyotard's work expressed knowledge does not come from a central location but to people, who experience their world, bring their knowledge, and contribute to knowledge production (Sim, 2011).

Photovoice

Some researchers consider photovoice as a community-based participatory research method (Nykiforuk, Vallianatos, & Nieuwendyk, 2001; Teti, Pichon, Kabel, Farnen, & Binson, 2013), and other researchers address it as a participatory research (Wang & Burris, 1997) or as participatory action research (Sutton-Brown, 2014; Wang, 1999; Wang, Yi, Tao, & Carovano, 1998). Community-based participatory research describes conducting research in partnership with a community (Blumenthal, Smith, Braithwaite, & DiClemente, 2013). Aspects of the collaborative method include the community identifying an issue, designing the research, conducting, analyzing, and disseminating the results (Blumenthal et al., 2013). Participatory

action research is described as a collaborative process to generate knowledge to use the created knowledge and share it (Lake & Wendland, 2018).

Photovoice is where participants document aspects of their lives through photography and participate in the research process (Wang et al., 1998). Participants share their photographs and discuss their meaning, contexts, and identify common themes in their stories (Wang et al., 1998) through focus groups or interviews (Novak, 2010). Photographs provide visual imagery to communicate participants' experiences, expertise, and knowledge, which can be used for community change (Wang et al., 1998). The goals of photovoice are for participants to document and reflect on their community's strengths and concerns, to promote dialogue in large and small group discussion, and to have these issues and concerns reach policymakers (Wang, 1999). Photovoice is traditionally a method used in marginalized communities and allows the voices of the silenced to be heard (Plunkett, Leipert, & Ray, 2012). The result of photovoice is that participants have the potential to help bring change in their communities (Wang & Burris, 1997). According to Wang and Burris (1997), photovoice has its roots from three theoretical traditions: critical consciousness, feminist theory, and documentary photography. Photovoice has been used in studies related to public health initiatives (Teti et al., 2013; Wang & Redwood-Jones, 2001; Wang, 1999) and youth empowerment (Wilson, Dasho, Martin, Wallerstein, Wang, & Minkler, 2007). The use of photovoice was used to address feminist issues (McIntyre, 2003), environmental and health issues (Bisung, Elliot, Abudho, Karanja, & Schuster-Wallace, 2015; Bradford, Idowu, Zagozewski, Bharadwaj, 2017; Chanse et al., 2017), as well as environmental and social issues (Bennett & Dearden, 2013).

Photovoice has multiple strengths including, it took the researchers' goals and agenda out of the research process and allowed the participant to perform their own needs assessment (Wang

& Burris, 1997). Photovoice allows flexibility and can be tailored to multiple communities and achieve various goals (Wang & Burris, 1997). The use of photovoice also allowed people to describe their needs through imagery, which encouraged people who cannot read and write to participate (Wang & Burris, 1997). Photovoice can be used in vulnerable populations who may benefit from expressing themselves in alternate ways (Teti, Koegler, Conserve, Handler & Bedford, 2018)—possibly providing the researcher with a more authentic way of gaining perspective of society's most vulnerable people, whose voices might not be heard because they are not the dominant or the loudest (Wang & Burris, 1997). Another benefit is it can capture various social and behavioral moments the researcher otherwise would not have access to collect (Wang & Burris, 1997). According to Wang and Burris (1997), photovoice could be a source of pride in a community, could help define a program's goals during needs assessment, and could allow other participants to share stories relating to their images. The photographs from photovoice are tangible items of value to participants and can reflect not only a person or community's needs but also their assets (Wang & Burris, 1997).

Challenges with photovoice as methodology claim a broad scope of challenges: (1) it lacks perfectly prescribed steps to carry it out (Wagner, Ellingson, & Kunkel, 2016); (2) it utilizes images as a data point in research, which has left various academic communities claiming it as unscholarly (Novak, 2010); (3) it can require a significant investment of human and financial resources, as well as time (Nykiforuk et al., 2011); (4) it can bring false hope to its participants (Johnston, 2016); (5) it can fail to give credit to the aesthetic eye of the photographer (Shankar, 2016); (6) it can re-establish dominant power struggles that its foundations attempt to destruct by classifying participants as marginalized and vulnerable populations (Sutton-Brown, 2014); (7) it can also present ethical dilemmas when participants take photographs of other

people whom the approved Institutional Review Board (IRB) did not fully encapsulate (Novak, 2010); and (8) it can provide a large amount of complex in-depth data, which can compromise the analysis process and the validity of the results (Wang & Burris, 1997). However, like other complex social science methods, there are critical elements, such as the theoretical framework and role of the researcher that can help ensure said challenge could be rigorously addressed.

Photovoice in Agriculture and Rural Communities

Photovoice in agriculture has been known to encourage dialogue amongst farmers (Bulla & Steelman, 2016), display evidence of resilience of the farming community (Bulla & Steelman, 2016), empower women in agricultural roles (Gervais & Rivard, 2013), and allow the beginnings of conversation to occur between policymakers and farmers (Gervais & Rivard, 2013). An examination of the literature shows a deficiency in photovoice studies that investigate farmers' perceptions of irrigation. Photovoice studies in agriculture examined climate change with farmers (Bulla & Steelman, 2016) and conservation issues in rural populations (Beh, Bruyere, & Lolosoli, 2013).

Photovoice to promote dialogue. Photovoice can promote dialogue in agricultural and rural communities. Bulla and Steelman (2016) examined seven small family farmers in Chatham County, North Carolina, who participated in a photovoice study that primarily focused on observable climate change on their farms. The results of from using photovoice in this study promoted the farmers' advocacy for sustainable food in their community, revealed creative ways to deal with agriculture, and encouraged dialogue amongst the farmers such as creating a local seed bank (Bulla & Steelman, 2016).

A study by Beh, Bruyere, and Lolosoli (2013) used photovoice in a rural Kenyan community as a means to communicate the concerns and address issues based on the

conservation of natural resources. A result of the photovoice method was participants learned from each other by sharing their expert knowledge and felt empowered to initiate change through the presentation of ideas like community outreach projects and to how to go about change in their community (Beh et al., 2013). The use of photovoice in the Beh et al. (2013) study did not result in policy change but the authors noted it did initiate a conversation within the community.

Photovoice can help the voices of marginalized populations in rural areas to be heard by using imagery in a public forum. Using visual methodology with imagery in photovoice allowed illiterate participants to equally share information and express themselves (Gervais & Rivard, 2013). Photovoice supported the ability to study people in a community in a short period of time, revealing data that was missed in conventional data collections tools like surveys (Gervais & Rivard, 2013). The authors concluded photovoice does not always guarantee a change in policy or societal structure, but it could be used as a voice to marginalized people who can be a source of change in a community (Gervais & Rivard, 2013).

Conclusion

As the state of Georgia is closely examined on water usage in the *Florida v. Georgia* Supreme Court case, it is timely that researchers investigate how to best use water supplies while maintaining the livelihood of its residents working in its agricultural sector. A survey of the literature demonstrates farmers have various perceptions of irrigation including government assistance in water programs, efficient irrigation practices, and the adoption of technology. Common approaches and theories are used to study why people behave and hold attitudes around water issues and potential solutions. The importance of using phenomenology in this study is to examine the individual experience, not the collective or predictive behavior of farmer and their technology adoption. Based in a constructivist approach, phenomenology runs against a priori

assumptions, which allows entrance into a community or targeted group in a way that is based on empirical observation rather than theoretical deduction. This preserves the reality without placing it in the confines of particular expectations (theory or hypotheses). Postmodernism supports phenomenology by emphasizing that one grand narrative cannot represent the narratives of many and supports that knowledge production comes from people's experiences.

Photovoice studies exist that investigate agricultural and rural communities, but there were no studies found on how photovoice can assist with farmer communications with technology use or adoption. Photovoice studies highlight the importance of using imagery as an alternate form of expression and assist in communication, where the individual voices in a community might be overlooked or not heard by the policymakers. The phenomenological approach is appropriate to use in photovoice research because it takes an experience viewed through the lens (literally the lens of a camera) and sees how it took place to the person who captured the photograph. Photovoice can be used to help deepen the understanding of lived experiences through participant dialogue of an experienced phenomenon (Plunkett et al., 2012). The use of photovoice allows the participants to show their world by capturing their lifeworld and describing it to the researcher, while giving additional data when incorporated to the narrative interview (Plunkett et al., 2012). In photovoice, the participants decide what is important to photograph and discuss it with the researcher that assists in equalizing the research process (Novak, 2010). The shared discussion of experience can deepen the social understanding and importance of the phenomenon or experience that took place (Plunkett et al., 2012).

Taking photographs of experiences coincides with the phenomenological concept of bracketing and focuses on the importance removing the taken-for-granted aspects of the world, to examine one's everyday experience as something important and relevant to others (Sturgess,

2018). When the researcher removes their interpretation of an image, it supports the Husserlian concept of phenomenological bracketing, where one places one's assumptions and knowledge outside the phenomenon (van Manen, 1990).

A gap in literature establishes the need to prioritize farmers' perspectives to examine what challenges farmers face when making critical decisions related to irrigation and water use. Consistent with the literature reviewed, there is value in the individual's experience and importance in smaller narratives for knowledge production. Understanding the challenges farmers' experience through a phenomenological approach to photovoice could help communicate the reasoning some farmers decide to adopt specific technologies and practices. Additionally, communicating farmers' perceptions of irrigation could be valuable information to outreach programs to provide solutions to critical issues such as water efficiency not only within Georgia but worldwide.

CHAPTER 3

METHODS

This qualitative study examined the issues of irrigation using a phenomenological approach to photovoice to better understand the lived experiences of farmers and their selected irrigation decisions throughout a growing season. The intent of utilizing the qualitative method of photovoice within the framework of phenomenology throughout the research design provided an in-depth way to examine the experiences of participants through daily windows or photographs of their space, time, and existence. The study aimed to capture the participants' experiences of critical decision-making as well as preserve the participants' point of view while separating the researcher's biases. This study intended to address the following research objectives:

RO1: To examine farmers' lived experiences within the framework of phenomenology to provide insight into their individual decision-making processes regarding water use and water efficiency.

RO2: To identify issues that have an impact on farmers' irrigation practices.

RO3: To examine the influence a phenomenological approach has on the researcher in collecting and analyzing data, and reporting results as it relates to farmers' lived experiences.

This chapter reviews the methods used in the study and includes various links to the appendices to access information to replicate the study. This chapter's organization is described in three parts: (1) An explanation for the research design, including the rationale for the selected

methodology and the role of the researcher; (2) a description of the participants, followed by the data collection instruments; and (3) an overview of the research procedure, data analysis, and evidence of the study's validity. The researcher is addressed as co-investigator in this chapter.

Research Design

Phenomenology aims to focus on the singular aspects of a phenomenon and attempts to find a deeper understanding and meaning to an individual's everyday experience (van Manen, 2014). In this study, phenomenology was the guiding framework, and a phenomenological approach was the lens in which all elements were designed, considered, and performed. The study did not focus on a specific phenomenological tradition as defined by Embree (1997), such as transcendental, natural constitutive, hermeneutic, generative historicist, existential, realistic or transcendental constitutive. The study aimed to use aspects of the philosophy and the writings of phenomenological scholars to support the ontological practice. The study explored the phenomenological concepts of lived experiences, lifeworlds, bracketing, and reflexivity. These concepts were highlighted to capture the experience of each participant in the study and the phenomena of irrigation.

Rationale for Selected Methodology

The study was designed with a phenomenological approach using postmodernism and the participatory action research method of photovoice. This framework encouraged a focus on farmers' lived experiences while simultaneously placing such experiences in the broader context of agricultural production. Postmodernism highlights the importance of the individual narrative while promoting the creation of knowledge by ordinary people in a community. Photovoice was integrated into the research methods to encourage farmers to capture instances or situations in their daily activities and in the absence of the researcher; in addition, shared images served as an

interviewing tool to promote dialogue with the farmer. This ensured the one-on-one interview guided critical issues identified by the farmer, rather than only questions presented to the participant by the researcher.

Role of the Researcher

Before the start of this study, the researcher had no prior knowledge of irrigation systems and equipment. Also, the researcher incorporated her subjectivity into the data analysis due to inductive reasoning in constructivist grounded theory. Constructivist grounded theory recognizes that the researcher cannot remain completely objective with data collection and its analysis (Charmaz, 2014). Therefore, the researcher utilized reflexivity throughout the study to assist in the phenomenological concept of bracketing or removing one's taken-for-granted aspects of the world (Sturgess, 2018). Reflexivity assisted in the examination of how her pre-existing assumptions and values help construct meaning to the participants' interpretations (Charmaz, 20014).

To ensure that reflexivity was thoughtfully, and carefully monitored, the researcher maintained a reflexivity journal throughout the study, which could be then carefully analyzed alongside other field data, including interviews. Reflexive journaling is the process of writing down thoughts in a journal or diary during data collection so they can be reflected on later (Clancy, 2013). For this study, such journaling allowed the researcher to document questions and concerns that emerged from data collection as well as assisted in the development of emergent themes from the researcher discussed in Chapter 4. Field notes were used to collect memos from the interview process as well as memos collected in the initial stages of the photo-capturing project. The value of field notes is they can assist in capturing the details and documenting

nuances of human behavior in the qualitative research process (Saldaña, 2011). A journal can be a source of reflective human experiences that hold phenomenological value (van Manen, 1990).

Research demonstrates how using reflexivity by the researcher can result in changing the data collection process by altering questions and how they are asked (Darawsheh, 2014). The researcher used reflexivity to decide the amount of self-disclosure discussed with participants before each interview. When the researcher reflected on her positionality in the research process, she felt she should offer information to the participants since she was asking for information from them. Before the interviews, the researcher informed each participant with some personal information such as her background and career aspirations, because in phenomenological interviewing is it essential to foster a relationship of personal sharing before delving into the topic of the research (van Manen, 2014)**.**

Participants

The selection of the participants was a multi-step process designed by the principal investigator of the larger interdisciplinary study, *AgWET Irrigation Project,* in which the social science portion of this study is a derivative. The principal investigator designated five county Agriculture and Natural Resource (ANR) Extension agent's participation in the study. The designation of the counties by the principal investigator included that the counties were dispersed through the state of Georgia, representing various weather patterns and topography. A purposive criterion sampling of 10 participants was chosen for this portion study. Five county ANR Extension agents selected two farmers in each of their respective counties who met the following criteria established from the larger interdisciplinary study.

- Participants must currently grow peanuts (variety Georgia-06G or Georiga-09B)
- Participants must live in Georgia

- Participants must be willing to install and use the provided moisture sensors through the duration of the study
- Participants must be voluntarily willing to participate in the study

The participants represented farmers within the southern half of the state. In addition, they represented farmers who have regular and ongoing interactions with the state's Cooperative Extension System. A small sample size of 10 participants was used because phenomenological approaches do not emphasize theoretical saturation (Drescher, 2014) and typical phenomenological studies range from one to ten persons (Starks & Trinidad, 2017).

Data Collection Instruments and Timeline

The data collection instruments used in this study included participants' smartphone cameras, a Google Voice phone number account, photovoice prompts, an interview guide, an audio recorder, the researcher's field notes, and reflexive journal entries. Participants used their smartphone cameras to capture and text photographs to the researcher's designated Google Voice phone number account. The Google Voice phone number account assisted in the collection of photographs and communication with participants directly. The semi-structured interview form guided the one-on-one interview process between the researcher and participants. The researcher's field notes were based on interactions and observations of participant's interviews and all forms of communication, including the absence of dialogue. In phenomenological interviews, researchers should practice patience and encourage silence so that participants have the time and space to recollect experiences and tell their stories (van Manen, 2014).

Mobile Phone Devices and Applications

Participants used the cameras on their smartphones to capture photographs and send corresponding text messages to the researcher. The use of mobile phones as data collection

instruments was appropriate for the sampling because the participants used their phones for communication with ANR Extension agents. The photographs served as discussion prompts throughout each interview, encouraging conversation and serving as reminders to participants regarding experiences they had four to eight weeks prior. The participants used their mobile phones to communicate with the researcher via text messaging.

A mobile device application, Google Voice, which instituted a third-party neutral phone number, was used for the researcher to communicate with each participant individually. Communication included sending the research prompts to each participant, allowing a method for the participants to ask questions, and for the researcher to communicate deadlines the photo-capturing portion of the project. Google Voice also assisted in collecting and storing the participants' photographs in one location in a password-protected account.

Photovoice Prompts

Photovoice prompts were designed to inform participants what their photographs should address. Prompts were emailed to each participant and sent via a text message from the researcher's Google Voice phone number account on the start date of the photo-capturing portion of the project. The prompts included:

1. What are issues (positive or negative) you face in regard to irrigation practices or technology?
2. What are issues (positive or negative) that other farmers face in regard to irrigation practices or technology?
3. What other existing issues and responsibilities (not related to water use or irrigation) directly or indirectly affect your irrigation decisions?

Semi-Structured Interview Guide

The semi-structured interview guide (see Appendix A) contained five overarching questions that served as a discussion guide. Within each section were sub-questions used to encourage participants to elaborate on their answers. The questions were designed to focus on the process of taking photographs and understanding the participant's experiences in the photograph in regards to their irrigation practices, irrigation technologies, and technology adoption. Empirical methods of gathering lived experiences include borrowing from other people's lived experiences through interviews so as researchers we can better understand the human experience of a phenomenon (van Manen, 2014). The questions attempted to understand what direct and indirect issues participants face when making decisions related to irrigation.

Additional questions were asked to investigate if the use of imagery and photographs of experiences would reveal new information participants did not see when initially taking photographs. The use of phenomenology allows people to find meaning in experiences they sometimes not aware of (Sturgess, 2018). Phenomenology continued to be explored in the questions regarding the construction of imagery and the description of imagery. Personal descriptions of experiences and exploring experiences through imagination from other aesthetic sources are empirical and reflective methods of phenomenological interviewing (van Manen, 2014). The guide concludes with instructions for each participant to choose three photographs that best represent their barriers and opportunities with current irrigation practices to be utilized in focus group sessions. The participant dictated the caption to the researcher. The researcher read the caption back to the participants to confirm their statements.

Field Notes

The researcher kept a log of communication between her and the principal investigator as well as participants during the two-week photovoice session. After the conclusion of the photo-capturing portion of the project, the researcher kept detailed notes on interviews after each interview concluded. Comprehensive notes were taken after each interview because during the interview process, participants became distracted when the researcher made notations. Brief observation notes were taken during the interview process with each participant. The researcher's field notes include observations based on conversations and experiences with participants. During interview sessions, field notes were taken after the conclusion of each of the 10 interviews to aid in not distracting the participant.

Reflexive Journal Entries

The researcher maintained a reflexive journal during the duration of the study. When traveling to various locations for interviews, the researcher used the audio recorder to record notes after each interview and then transcribed them in her journal. The use of the audio-recorder and the written journal allowed the researcher to capture her initial feelings and questions so then she could go back and reflect, practicing reflexivity.

Research Procedure

The study took place between July 2018 and September 2018. The study was designed to take place during some of the peak weeks of irrigation for peanuts and well as taking into account participants' schedules with harvesting as shown in Table 3.1.

Table 3.1

Schedule of Study

	April	May	June	July	Aug.	Sept.
Planting of peanuts						
Peak times for irrigating peanuts						
Photovoice (farmers taking + submitting photos						
In-depth interviews						
Field Notes						
Reflexive Journaling						

Before the beginning of the photovoice project, the principal investigator called participants to explain the study's overview and instructions. The principal investigator created a script (Appendix B) to serve as a general guide for phone conversations with the participants and give them an overview of the project. Additionally, the principal investigator emailed the project's instructions (Appendix C) to each participant and ANR Extension county agents one week before beginning the photo-capturing portion of the study. The instructions were intended to capture the moments or issues they found themselves facing as it related to irrigation scheduling or decision-making, and that the photos were expected to serve as a discussion prompt during the one-on-one interview.

Farmers were asked to submit photos for two weeks. In a span of 14 days, they were asked to try and capture 15 to 25 images. Throughout those two weeks, the researcher used

Google Voice to send prompts to participating farmers, as well as reminders to those who had not yet submitted photos. Table 3.2 is an overview of the timeline of messages sent to participants from the researcher over the two weeks, including reminders to submit photos, as well as the prompts intended to guide them in taking the photos. When the researcher received a photograph or a series of photographs, she would send a response text to confirm and thank each participant.

Table 3.2

Schedule of Text Messages Sent to Participants

Schedule	Participants that sent Photographs	Participants that did not send photographs
Day 1	Good morning [participant]. This is the starter text for the photo portion of the AgWET Irrigation Project. As described in the email, please take 1-2 pictures per day from now through July 27. Images should be sent to this number. Just as a reference, pictures should be based on the following: 1. What are issues (positive or negative) you face in regard to irrigation practices or technology? 2. What are issues (positive or negative) that other farmers face in regard to irrigation practices or technology? 3. What other existing issues and responsibilities (not related to water use or irrigation) directly or indirectly affect your irrigation decisions?	
Day 3	Thank you for your participation in the project. If you have any question, please don't hesitate to ask. Otherwise, we look forward to continuing to receive your images.	This text is a friendly reminder to submit your photos regarding your perceptions and experiences in irrigation practices and technology.
Day 8	Thank you so much for your photos. Your participation is greatly appreciated. This is the second and last week of taking photos. If you have any questions, please let me know.	If you have any questions about the photovoice project, please let me know. (Contact their ANR Extension agent to follow-up with details of the project.)
Day 10	Thanks again for the pictures. A couple of days until the project concludes.	(Based on the feedback from the county Extension devise a plan

		to extend the project to provide flexibility to participants or decide alternate arrangements.)
Day 14	Thank you so much for participating in this photovoice portion of the project. This week ends the photo taking part but if you would like to send any additional photographs over the next few weeks, I will still be collecting images.	

After the two-week photo-capturing project, the researcher printed each photo on photo paper in a 4-inch by 6-inch format. Each farmer's photos were then labeled with a code on the back that was based on a number to reflect the county, a letter to indicate the farmer from that county, along with additional numeral seriation to order the photographs chronologically. This ensured farmer confidentiality while ensuring that each farmer's photos remained together. Each farmer received only their photos during the semi-structured interview, which took place on location at each of their farms. Photos were not intermingled from one farmer to the next. Before the interviews, each participant signed a consent form (Appendix D). The interviews were audio-recorded using a digital audio recorder, included open-ended questions, and were conducted between four to eight weeks after the conclusion of the photo-capturing portion of the project.

The photographs were printed for participants to hold and see the entire scope of their work versus a digital format because printed photographs allow participants to hold tangible objects they created (Wang & Burris, 1997). During each interview, photos were either assembled in sequential order in front of the participants to view or handed as an ordered a deck (depending on location and space of interview). The photographs served as conversation starters and references to experiences with each participant. If a participant submitted texts alongside each photograph, each message was written on the back of the image for the participant to review if necessary. During their one-on-one interviews, participants went through their

photographs and explained situations and meanings to the researcher. Participants were asked to select the top three photos that he or she believed best represented his or her experiences (barriers and opportunities) with current irrigation practices and provided captions for each selected. The researcher wrote each photograph's caption on the interview guide with the corresponding photograph's numerical and letter identity.

Additional identifying information of the participants remained confidential and was changed when the results were written up and shared with others. The data were collected using a digital audio recorder that only the researcher had access to during the study. The Google Voice phone number account was password protected and was private only to the researcher. The photographs were printed from an online service that was password protected and only accessible to the researcher. The data was stored in Google Drive through a Gmail account and was password-protected using the university and the researcher's personal Internet account security measures. The researcher used the professional transcription service Rev.com to transcribe the interviews. These transcribed interviews were stored on the researcher's password protected Google Drive account. The printed, transcribed, and coded interviews were stored in a locked cabinet that was only accessible to the researcher.

Data Analysis

This study included qualitative data from the semi-structured interviews, field notes, and reflexive journal entries. The data collected from the semi-structured interviews were analyzed by the researcher's use of constant comparative analysis and applied constructivist grounded theory (Charmaz, 2014) to categorize codes emerging themes.

Constructivist Grounded Theory

Constructivist grounded theory has origins in Glaser and Strauss' (1967) grounded theory yet differs epistemologically in its constructivism foundation (Mills, Bonner, & Francis, 2006). Glaser and Strauss' grounded theory described the methodology as the objective researchers constantly comparing qualitative data, then progressing to comparisons between their interpretations into translated codes and categories containing more data (Mills et al., 2006). The constant comparison and dynamic nature of continually analyzing data allow the researcher to ground the theory of participants' experiences while maintaining the researcher's objectivity (Mills et al., 2006). Constructivist grounded theory differs from grounded theory in that it embraces the notion that the researcher cannot separate themselves from the data and highlights the researcher as instrumental as the author (Mills et al., 2006). According to Charmaz (2014), constructivist grounded theory is similar to grounded theory in that it is flexible and maintains a dynamic process of the research, but the author argues that research is not given but instead constructed. In constructivist grounded theory, the researcher acknowledges their subjectivity and reflexivity in interpreting data in which they ground theories (Charmaz, 2014). Constructivist grounded theory allows the researcher to analyze data throughout the data collection process and invariably involves the interaction with data and analysis (Charmaz, 2014).

Constructivist grounded theory was applied to analyze the transcribed interviews, field notes, and the researcher's reflexive journal. As a result, during interviews, questions were altered slightly after emergent themes began to appear in previous interview coding and focused coding by adhering to practices of constructivist grounded theory (Charmaz, 2006). Interviews were transcribed verbatim in Rev.com and manually coded by the researcher. The researcher

compared the transcribed interviews with the recorded conversations to check for errors. The transcribed interviews were printed and coded directly on the printed transcriptions. Transcripts, field notes, and journal entries were coded manually because phenomenology students should not look to find themes in computer software programs (van Manen, 2017a). The use of a process to find codes such as constructivist grounded theory would seem to misalign with van Manen's (2017a) recommendation that students of phenomenology should not use a specific method or steps to find themes. However, constructivist grounded theory allows the themes to emerge (Charmaz, 2014), a concept similar to how is phenomenological insights occur which is described as "encountered, discovered, given, found, and sometimes stumbled upon" (van Manen, 2017b, p. 820). Codes and focused codes that emerged from interviews, field notes, and journal entries anad were put into a clustering technique designed by the researcher. The use of clustering can allow the researcher to see the whole image of the codes before writing about it (Charmaz, 2014). Data were analyzed using clustering which enabled the researcher to identify essentials and create pathways for emergent themes (Charmaz, 2014). An example of the clustering is located in Appendix E.

Validity

Research demonstrates how proving validity in phenomenological studies is problematic due to the multiple traditions and various approaches (Yardley, 2000). Phenomenology lacks a set of prescribed methods, and the true phenomenological student stays away from a step-by-step process or computer software for coding and themes (van Manen, 2017a). Phenomenology in communication research studies highlights the creation of knowledge by understanding and seeing the world (Sturgess, 2018). This creation of knowledge means there cannot be a fixed set of instructions for establishing new knowledge because it would lead to the limitations (Yardley,

2000). These limitations include the ability to create knowledge and who has access to the rules to develop knowledge (Yardley, 2000).

Reflexivity

The nature of the researcher's involvement was to examine the experience of farmers without any personal motivations or goals. The researcher had no connection or relationship to the participants before the study, and her involvement with the study remained consistent throughout the project's design, collection, and analysis of data. The researcher considered how she might have influenced the actions of participants and interview process in her reflexive journaling. It is obligatory that researchers remain reflexive about what they bring into the research process and their perspectives (Charmaz, 2014). Through the process of reflexive journaling, the researcher noted her questions and purpose as it related to the significance of the study. Subsequent themes related from the researcher's reflexive journaling such as questioning the role of the researcher are discussed in Chapter 4.

Analyst Triangulation

Validity is sought through analyst triangulation or the use of multiple perspectives to review the data findings (Patton, 1999). The discussion of the data's coding and code clustering occurred between the principal investigator and co-investigator. Analyst triangulation assisted with validity with the coding of interviews between researcher and another graduate student who was not involved in the study. The researcher and graduate student coded and the transcribed the interviews together, line by line, to seek consistency and to keep the researcher's bias out of the coding process. After the first interview was coded collectively, the researcher and graduate student coded the first set of subsequent transcribed interviews separately. Following the separate coding, the researcher and graduate student discussed common codes. It was essential to

code data after the first set of three interviews to create initial codes. Constructivist grounded theory encourages researchers to move about their data taking codes from interview participants and developing them further to use in ideas with soon-to-be interviewed participants (Charmaz, 2006).

Limitations

Some limitations could affect the results of the study including the measure used to collect data. One of the participants fulfilled the requirements for the study but did not have a smartphone. Though this participant contributed to the semi-structured interviews, this participant did not have equal access to participate in the study. In future studies, a suggested addition to this list of criteria includes the level of comfort using a smartphone to send images to the researcher. In retrospect, this criterion is pertinent to make sure all participants have equal access in participating in the study.

The length of the study is acknowledged as a limitation. The time frame of the two-week photo-capturing portion of the study might not allow enough time for participants to address the project's prompts in photographs adequately. Extending the length of the photo-capturing part of the study might result in more photos to analyze by the participants and more data to analyze for the researcher. The length of time for participants to capture their photographs varies depending on the time availability of participants (Sutton-Brown, 2015). Because of the demands of the time of the growing season, a shorter length of time was designated for participants in this study.

Summary

This study used a phenomenological approach to the qualitative method of photovoice to examine farmers' lived experience concerning irrigation and water use. Participants' smartphone use and a Google Voice account were used to capture and store the photographs for the

photovoice method. Semi-structured interviews with individual participants occurred at their farms to discuss their photographs' meanings and descriptions. An online transcription company transcribed the interviews, which the researcher analyzed by using methods in constructivist grounded theory. Additional data in the researcher's field notes and reflexive journaling were analyzed through constructivist grounded theory. The following chapter will address the themes and results from the researcher's data analysis.

CHAPTER 4

RESULTS

Introduction

This study will address the problem of water use and water efficiency in the agricultural sector through the investigation of farmers' experiences of irrigation. This study sought to communicate the greater challenges farmers experience with irrigation efficiency and water usage. The utilization of a phenomenological approach to photovoice was for participants' individual experiences to be captured through the use of photographs and preserve their experiences throughout the research process. Photovoice and the interviews of the study were based on the following research objectives:

RO1: To examine farmers' lived experiences within the framework of phenomenology to provide insight into the individual decision-making processes of farmers regarding water use and water efficiency.

RO2: To identify issues that have an impact on farmer's irrigation practices.

RO3: To examine the influence a phenomenological approach has on the researcher in collecting and analyzing data, and reporting results as it relates to farmers' lived experiences.

Overview of Data Collection

The study was qualitative and used phenomenological approach to photovoice and data was collected through participants' photographs and one-on-one interviews. A purposive criterion sampling of 10 peanut farmers participated in the study from five counties throughout

the state of Georgia. To examine the lived experiences of farmers, the participants contributed to a photovoice study where they captured photographs for two weeks based on experiences with irrigation. Participants analyzed and described their photographs during their audio-recorded one-on-one interviews. The transcribed interviews were analyzed using constructivist grounded theory by the researcher. The researcher used focus coding, open coding, and clustering to organize and work through the data to form themes. The study is comprised of 10 interviews with each participant on-site at their respective farms. Recorded interview times ranged from 23 to 74 minutes in length. The average interview time was 50 minutes. The range of photographs submitted by participants was 0 to 25. All interviews were transcribed verbatim, which comprise of 346 pages of interview data.

Participants

The study lasted over a three-month period from July 2018 to September 2018. Participants had to grow peanuts, live in the state of Georgia, use irrigation, and install as well as use a moisture sensor provided by the research project during the study's duration. Seven participants contributed in the photo-capturing portion of the project and all 10 participants participated in one-on-one interviews. Participants' identities remain confidential through the use of pseudonyms throughout the study. Participants included 10 male farmers, one female who assisted in capturing images with her spouse, and two females who were involved in the one-on-one interviews with their male spouses. The participants lived and farmed in five counties in Georgia where they produce cotton, peanuts (Georgia-O6Gs and Georiga-O9Bs) and other commodities including pecans, watermelons, cantaloupes, tobacco, and raised livestock. Four of the farmers were geographically situated in the Flint River Basin where much of the water rights controversy was focused in the state of Georgia. The ages of the participants range from 32 to 65

years old. Years of full-time farming experience range from 5 to 40 years while most participants worked on farms from young ages in their lives. Refer to Table 4.1 for additional details of each participant.

Table 4.1

Details of Participants

Pseudonym	Age	Years Farming (Full Time)	Acres Farmed	Acres Irrigated	Located in the Flint River Basin
Brian	34	15	1850	1500	No
Chris	59	38	200	175	Yes
David	37	19	2500	-	No
Jay	32	5	1700	760	No
Kyle	65	42	1300	150	No
Michael	39	10	1200	950	Yes
Nick	39	13	2400	200	No
Robert	62	23	500	170	No
Stephen	43	23	2500	2460	Yes
Taylor	48	25	-	-	Yes

(-) Information not disclosed by participant

Forms of farming education include learning from male members of their families, including fathers, uncles, and a father-in-law. Participants used various types of irrigation sources on their farms, including groundwater wells and wetland surface water accessed by the use of center irrigation pivots and drip lines. Participants incorporated various amounts of acreage that used irrigation ranging from a few hundred acres to a couple thousand acres. The participants voluntarily participated in the study by way of invitation from their county Extension agent.

Chapter Overview

The purpose of Chapter 4 is to review the resulting themes that emerged from multiple forms of data. This chapter is organized by the themes because of the phenomenological framework used; additional themes emerged from the data collected in interviews from the researcher's reflexive journaling. Through the use constructivist grounded theory as previously

mentioned in Chapter 3, four themes emerged from the open coding and focused coding in transcribed interviews and the researcher's field notes. The emerged themes include: (1) *facing barriers to farming*, (2) *mitigating farm stress*, (3) *preserving farming heritage* and (4) *expressing experiences through imagery*. Three themes emerged from the researcher's reflexive journaling while collecting data and include (1) *questioning the research project*, (2) *critiquing the liaison role of the researcher*, and (3) *acknowledging the role of gender during data collection*.

Facing Barriers to Farming

During the interviews and conversations concerning their photographs, participants expressed the dependent relationship they have with water and recognized they could not farm without water. Participants admitted issues like precipitation (too much or too little) were out of their hands and felt addressing natural elements like inconsistent rainfall, erosion, natural pests, topography and geography of land, as well as environmental limitations were all issues they were aware they had to deal with when working land and relying on nature. While such environmentally-based issues remain as barriers over time, the farmers also identified persistent structural issues they associated with difficulty, uncertainty, and frustration: limited cell service, public utility reliance, and agricultural policy, all which drove their decision-making on irrigation. Other barriers that impacted farmers' decision-making included commodity prices, the use of chemicals, and their dependent relationship with irrigation. The following provides an overview of participants' responses that further illustrates such barriers.

Limited Cell Service

Most participants described barriers to irrigation and technology due to the limited access to cell phone service. In some of the more rural areas, limited cell service was a general source of

frustration. But it also negatively impacted decisions and the farmer's desire to implement irrigation technology, which often requires cell service to transfer data from the filed sensor to the farmer's smartphone, intended to enable real-time tracking and decision-making. David felt cut off by the cell phone companies and explained while motioning to the cell tower near his property:

> Our service is awful here…I mean you can see the tower on this side of the trees over here. There's another one about a mile or two down the road, and they won't, they won't put not antennas on them. So we're just stuck with nothing…Where I've got Internet service, I can check them like that, but as far as I'm riding down the road, it ain't gonna let me know nothing until I get service.

David admitted because the lack of a cell signal on his property, he relied little on technology for irrigation scheduling explaining that he checks his irrigation equipment by driving to his fields and checking on them physically. Jay shared similar sentiments with David and explained how in the past he could not adopt irrigation technology because he did not have strong enough cell signal. He explained pointing to a nearby pivot, "And that pivot actually, until two years ago, we couldn't do that, because the cell signal wasn't good enough." Stephen also expressed how his cell phone signal was also weak and negatively affected his ability to turn on his irrigation equipment. Stephen expressed his desire to have more instantaneous connection from his cell phone to his irrigation technology. Stephen explained:

> I don't think it's the actual pivot or the program I think it's some Internet cell service type issue. Simply in the fact of, it's not instant. I could start a pivot right now and it could take, it could take twenty minutes before it actually come back and shows you that it's running…And I know maybe in your mind you think: 'Well 20 minutes. That ain't bad.' But if you got forty of 'em. That's a long time. And you're sittin' here on your phone wondering 'Alright well that one's runnin'. Yeah, well that one finally connected.

Public Utility Reliance

Participants expressed the dependent relationship they had with the electric companies that supplied electricity to their irrigation pivots and to pump water from their wells or other

water sources. Participants did not associate a price on water, but associated a price with running electricity and equipment to get and distribute the water on their farms. David explained his dependency on electricity to farming:

> I'm trying to think of what we, the week costs, but we've done it one week. I think maybe six or seven thousand dollar electricity just to run them. I mean, it's expensive, but you know, it pays for a crop.

Some participants did not have to run their pivots, as they would have in drier years or past seasons because during the time of the study, most areas experienced a sufficient amount of rainfall. Taylor explained the positive aspect of sufficient rainfall was paying for his irrigation equipment, "I've always heard that's the year you can pay for a pivot, is the year you don't have to run it." When the researcher asked if not using a pivot would save his farm money in the current year, Robert explained how he was tied to a contract that promised he would use a specific amount of electricity and during the year. Robert did not need to use his irrigation equipment due to the amount of rain in the growing season but would have to pay a price:

> Well, I'll tell you what, I didn't save anything because at the end of the year, the power company's gonna charge me a $1000 'cause I didn't use enough power. I had to guarantee 'em. I had to pay last year. Thousand dollars because I didn't use enough power…How 'bout that-slap me in the face once.

Some participants described the challenges of working with the electric companies to operate their pivots because during the peak watering times and electricity usage, many companies would restrict the farmer's access. Limiting the access to electricity, participants felt they were forced to decide when to irrigate their crops. Robert explained how the electric companies determined how much electricity he received and how it related to his irrigation, "They'll determine the load. That kind of relates to when you can get the water to the crops." Robert explained it was challenging to try to irrigate his crops and balance the amount of time he had access to power his pivots. Taylor had similar sentiments and frequently experienced the

electricity was cut off to his farm. He questioned how he was supposed to continue to work to help his crops survive especially when the electric company would issue times of day that prohibited the use of electricity for irrigation:

> Another issue that did have with irrigation is, the ones that we have that are run by, um, electricity, the um, power company send us some black out times…Peak demands, they'll send us and tell us that today may be a peak demand day and that, you know, they're gonna cut the power off from 3:00 to 7:00. And so, they'll…they had a box put on our pumps.

When discussing the restrictions with electricity, Taylor seemed irritated and questioned how he was supposed to do his job with the restrictions, "If we're trying, if we're trying as farmers to produce food for the country, and the power company says they're gonna cut you off right when you need to be watering, that's a problem." Taylor expressed frustrations with the dependency on the electric company especially when they issued black out times or the time they had no access to electricity. Taylor continued to question why electric companies did not take on other businesses to attempt to conserve electricity:

> The power company could take on a store, Wal-Mart, Piggly Wiggly, whatever, and they could put something in that building to where it would cut off every other set of lights during a certain time. I believe they could save more electricity doing that than they would shutting a well down that I need to be pumping water on the crop when it needed it.

Beyond just blackout times, Taylor mentioned additional restrictions such as the location of electricity lines and where he could access electricity on his farm. Therefore, to combat the enormous expense of installing an additional electrical line he continued to use diesel run pivots. Diesel was more expensive than electricity but a necessity for Taylor. According to Taylor:

> We run diesel and there's a reason, because we're so far away from the power, the line…and this, and this was in 1999 that we put that, that diesel unit in. And at that time, it was gonna cost, uh, it was gonna cost over $50,000 to put electricity back there. Um, and that was just the cost to us for the line, not the cost of the power.

Other participants expressed similar views but only a few still relied on diesel operated pivots due to the lack of access to electricity. Kyle described his relationship to electric companies by not having access to power companies to run irrigation in certain fields. Kyle explained, "There are fields that don't have power anywhere near them. So that can be an issue, a holdback about irrigating." David expressed similar reasoning to justify dry land farming on some of his property because he did not have access to a three-phase electrical line in certain parts of his farmland. He explained how diesel operated pivots required more maintenance because he had to manually turn them on and check on it because of their inconsistency of operation and old age, "Where diesel, you gotta get the motor going, get the oil going, 30 minutes later, motor probably gonna shut off, 'cause it's forty years old."

Issues with Agricultural Policy and Water Restrictions

The changing nature of agricultural policy emerged as participants expressed uncertain information and altering rules and regulations. Michael explained how the changes in water restrictions affected his decision-making process on where to install irrigation. Michael's farmland was located near the Flint River Basin where a lot of attention has been focused in the Tri-State Water Wars:

> I put a pivot in that's you would think it's in the red zone, what they call it, for moratoriums, but it wasn't but somebody that was about ten miles further away from the river, they were in the red zone. So you know, it kinda changes all the time so it's you, uh, water play in our decision making process every day.

Brian lived in a different area of Georgia where water supply did not seem to be an issue compared to the interviews with other participants. Brian admitted the most challenging aspect he faces with irrigation was water restrictions. Brian said the expense of irrigation is challenging but accepted that it was the cost of farming. He explained how water restrictions were the most difficult aspect he faced:

> Just EPA [Environmental Protection Agency] restrictions…So you know, they put more restrictions on that, and that's just going to make it…That's just going to make it harder, but I would say the biggest thing with irrigating is just the water restrictions, you know. Not the expense wise, but that's hard, hardest part, you know. It's hard enough, just the money, it cost to irrigate. But you know, that's a known thing…you're going to deal with there.

Brian's conversation evolved to discussing commodities prices and how he felt restricted by the set prices of crops. He then explained his concern that there was no programming to help with financial assistance with irrigation. Brian's farmland was predominantly irrigated compared some other participants in the study. He explained how he felt with all the water restrictions he faced:

> Everything costs so much, and uh, crops aren't really making a big help toward paying off that kind of stuff, so just expense of getting the water…There's no incentive, there's no program to help you get…It's almost like they don't want you to irrigate. It's…they don't want you I mean, I guess it's a secret. They'd probably you rather not say you know. Just figure out a way to make it without that, or farm somewhere else.

Metering irrigation wells is common in Georgia to monitor the use of water for conservation efforts. Taylor described a barrier to farming was working with agricultural policy groups when they came on his property to install the water meters:

> I ran into a guy, a group last year. I saw them [Georgia Environmental Protection Division] come in and, to put the meters. And I went back there and told them there's no need to put a meter right here. Well, this is where it told me to put it. I said, 'I'm telling you, that meter cost $1000, $1200, I'm not sure how much they cost now. I've already got a meter and it's out there at the pivot. There's no need to put this meter here." And I leave and he puts a meter there.

Taylor was frustrated because he explained he still has wells there were not metered and would have been happy to help the EPD to locate the wells that needed metering, "the EPD groups or whoever…they can make things a lot easier if they asked the farmer to help them." But the EPD did not listen to him.

Commodity Prices

The topic of commodity prices emerged as a result of several participants referring to their photos. Initially during the interview, Brian described one photograph with the caption, 'drowning'. Brian described most of his crops were drowning due to a large amount of rainfall that occurred during the time of the photo-capturing project. Brian described how his struggle to take pictures was similar to the struggle he experienced in the growing season. Brian continued with conversation discussing the amount of rainfall in the season and foresaw some future issues in relation to his land be hilly and heavy precipitation. He discussed how in the upcoming months, he would probably spend his time addressing erosion issues due the total rainfall. Brian continued to discuss expected issues with nature but had difficulty reconciling commodity issues. Brian explained:

> I got deer, hogs, rain, all those kinds of problems, but they kind of…that's part of it. The other seems, I guess unnecessary. I would be satisfied with all the environmental problems, I can deal with all that if the prices were just mediocre, and, you know, I just don't…know, that's the main problem I have. I mean, you can't help these things, and that's just part of farming. That's, that's not…that's political, and a lot of other factors go into that, so, you know, that's more, that struggle with is just the price problem to deal with.

Brian discussed how farming is one of the only industries where farmers cannot set prices on their products. As Brian mentioned earlier, he could adapt to environmental issues but did not have a solution to the issues of commodity pricing:

> We're one of the only industries where, you know, cons-you know, consumer business, however you want to put it, tells us what, what they'll pay us for their product. Everybody else gets to…Levi's, when they get their cotton, you know, got a pair of jeans, they tell you what they're going to cost. But you know, but they tell us what they'll pay for it. So, you know, it's just bad, it's a bad way it works, but I don't really have a fix for it either, you know.

The inconsistency of commodity pricing was expressed in conversations with several participants. Participants discussed how they did not understand the changing commodity prices. Stephen felt the fluctuating commodity prices forced him to make a rushed decision on planting a particular crop:

> But how I don't, I don't understand all that part of it either. But it could go up a dollar down, a dollar…it's crazy how thing fluctuates how. So you really have to…and I don't like that because sometimes it'll make me pull the trigger on a contract on some crops that I really didn't want to. But felt like I had to.

Stephen acknowledged that although he felt pressured by the fluctuating commodity prices but took responsibility in making the decision to plant a specific crop. Stephen explained:

> It is out of your control. But it's not. You got to be, you got to, you got to make a decision…You done pulled the trigger. And that's what, that's what, the market's fluctuating like they do seem to push me to do something quicker than I normal would.

Some participants described how they altered their farm decisions and use of equipment and storage due to commodity prices. Stephen explained how he had the facilities to store corn he could not store it for long or to wait till commodity prices increased because he needed to the cash flow. Stephen explained, "And with the commodity prices as they are, I got storage. I can store corn. But I can't store corn a year at a time. I got to have that cash flow." Michael, like Stephen, has the equipment and storage facilities to grow corn but described how it's low pricing made it almost impossible to plant. According to Michael:

> Uh we grow corn, you heard me mention earlier we, we do custom combine, we have a combine but corn prices being where they are. Um, we just can't I mean we've got a giant grain bin and all the facilities we need but the prices there you just, it's not, you can't grow it.

Michael explained how commodity prices influenced what type of crops to grow, "This year peanut prices came out lower. Uh and so we went all in on, on the Howlett peanut stuff." Michael explained how the commodity prices have fallen over the years and in earlier years

when he moved home to help his father in farming, everything they planted seemed to make money. Michael continued in the conversation and described how his overall occupation as a farmer was stressful and discussed trying to financially survive. Michael explained how he felt overwhelmed by the amount of decisions:

> And peanut, and commodity prices are lower. So it's farmers get a bad rap I mean, it's you know…You know right, right now we're just trying to survive and it's kinda like everybody cut us a break you know, chemical prices should have went down but it's kinda like oh we're here we're not gonna go down, we might not go up as much and uh, same thing with, uh tractor parts and you know, its, you have to make a decision, do you buy new with a warranty or you buy used and have to worry about a repair bill, it's…it, there's so many decisions to be made.

Tied to the Price of and Use of Chemicals

Participants discussed the use of chemicals for pesticide prevention and fertilizers during the growing season that while they were a major expense, they were also necessary. Michael was interested in using an irrigation technology like a moisture sensor to help save him money with irrigation especially since the cost of chemicals increased. According to Michael:

> Anywhere you can save a dollar is so useful because you know I don't mind saying it, I mean our chemicals this year…Our chemical bill, we still have a month left in this growing season of spray and everything, but our chemical is already passed, exceeded last year's bill.

The heavy amounts of rainfall in the current growing season resulted in many participants using more chemicals and fungicide to combat issues with moisture compared to previous growing seasons. Chris described his photograph of two containers of chemicals in the back of his truck and how they were necessary to have a good peanut crop: "Some of the chemicals we use...that controls grass. If you don't kill the grass when you go to dig them [peanuts], they don't dig good. They [peanuts] go to dragging and goes through the grass."

Taylor was eager to express his opinion on how much chemicals cost when discussing other costs of concerning irrigation, "Well, obviously the cost of fuel, which goes right along

with electricity. Um, and you're talking about irrigation issues, not…you don't want to get me started on the cost of chemicals, do you?" After the researcher asked Taylor if chemicals relates to how he makes irrigation decisions on his farm he explained:

> Oh, it definitely does. You can spend more on a crop than you can get out of it. And quick…If, …and this might go against UGA [University of Georgia Extension], but if you did everything UGA told you do, you'd go broke. You would.

Taylor referred to spending money on chemicals and irrigation like the University of Georgia Extension recommended for a successful crop would result a negative financial situation.

Tied to Irrigation

Most of the participants explained how their livelihoods were directly tied to irrigation and being able to farm. Michael's farm was predominantly irrigated and explained why he must use irrigation, "It, because farmers, if you don't have water it goes to dry land. We cannot make a living growing dry land crops at what chemical input costs are. What equipment costs are." Brian's farmland was mostly irrigated and explained how water was part of the survival of his farm:

> I mean, we, we pretty much in an area that we can't survive without, you know, without irrigation. You might, I mean, you might skim along but you, you got to be, the more irrigation the better, and there's no guarantees the…but we pretty much got to have water…I think you got to be pretty…at least in this area now, I mean I'm sure it's like that anywhere else, but around you here, you got to be, you got to be irrigated to survive.

Taylor's farmland was near the Flint River Basin and explained one of his biggest challenges in irrigation was how volume of water he could access in a short time if it became dry. He explained he could access water, but it would be very expensive to afford. According to Taylor:

> A portion of our county is in the Flint River Basin…but when you get into the Flint River Basin, they don't want you coming out of the Floridian. They want you to go to the Claiborne Aquifer and if you're coming out of the Claiborne Aquifer, you, you're talking about either a pile of money to get the 500 gallon a minute, or either you're just gonna have a 200 to 300 gallon a minute. And it's still gonna cost you a lot of money.

Mitigating Farm Stress

The participants described farm stress by as the amount of decisions they made within a given day, including if they should irrigate, use, and adopt irrigation technology. They faced man-made barriers, as mentioned in the previous theme, that were out of their control, but the unpredictability of weather was also an issue that created stress. Farmers described their water use and irrigation practices was how they sought to promote and maintain the health of their crops, as well as their wellness and stress levels. They discussed a level of uncertainty in technology and the Tri-State Water Wars that caused additional stress outside of irrigation. The participants used their photographs to display some of the stressors in farming.

Stress

Participants discussed stress in two ways: one to describe how a crop needs water or stresses as Kyle explained, "[Crop stressing] pretty much the same if a person tramps in across the desert and they're thirsting to death." Participants also described stress as feeling overwhelmed with the number of decisions and their timing within a given day. The majority of participants mentioned managing stress with various practices, and for Kyle, he described stress management was not only crucial for the crops and their irrigation, but essential for the farmer to do for himself:

> And not everybody is cut out to farm. I mean, my son found that out-It's tough, if you want certainty in your life, do not farm. Because there are so many uncertainties that you have not control over whatsoever. You've got to go into it-stress management is not only important for cotton and peanuts, it's important for the farmer himself, you know?

Stress affected the participants' decision-making processes regarding water use and efficiency, and impacted their overall irrigation practices. Participants addressed their stress by adopting irrigation technologies, irrigating, and finding a balance in their work life. Kyle felt

overwhelmed by amount of technology and the reliance on their use for his farm, which caused additional stress:

> So I don't know, I worry about technology has pretty well taken over our lives, but it's happening on the farm too…you do get feeling overwhelmed sometimes…we're almost to the point of saturation with technology. There's more being thrown at us than we can possibly absorb, almost. We can get lost sometimes, I think, in and what we are doing though, is the same thing men did thousands of year ago. We're putting a seed in the dirt and we're trying to produce a gain out of that. And that has never changed and it won't ever change.

Michael discussed how farmers needed to help themselves by monitoring their irrigation pivots more carefully especially if a pivot is broken causing a washout or if an end-gun is spraying on the road. He explained it is not intentional neglect by the farmer that these events happened, but the amount of problems a farmer has to solve within a day can affect their irrigation equipment monitoring:

> I mean it is, it's not because you're just lazy but it's like your to-do list, I mean it's …you know, we everyday…You know before you get to line item one you've already gotten phone calls, combines downs or cow have gotten out. Or you, just something else and, and it's something that you have to address so…

Participants described the overall amount of decisions they had to make daily added to their stress levels. For Stephen, the number of decisions included the market prices and other paperwork that added to his stress. Stephen explained how monitoring the commodity prices, and markets was a constant action just as keeping up with the latest irrigation equipment. Stephen had family who worked in irrigation sales and helped him navigate the newest irrigation equipment, yet still described never-ending nature with keeping up with technology:

> Far as just the, having to deal with the paperwork and the keeping up with decisions and I mean not decisions but the markets and all that stuff. I mean, I've always had to do it. I mean, not saying that. But I don't' know. And it's going to keep on. It's just going, just like these pivots. You going, you going, they going to come out with their stuff, and you're going to get it.

Brian described how even though farming was becoming more efficient, it was not getting any easier, "More information of, you know, we want to water as much as we need to, but no more than that, so I don't know, it seems like it's getting more efficient, but its not really getting easier." Participants explained they continually made decisions about their farms and crops, making judgment calls when deciding to irrigate. Many of the participants discussed looking at the weather forecast and judging if it will affect their farmland. Jay explained how making judgment calls on irrigation could result in wasting water. According to Jay, he might decide to irrigate his crops because the rainfall missed his farmland repeatedly, and as a result, he chose to irrigate. When it did rain, he wasted water as a consequence:

> You have a big weather cell coming and you say, 'Oh I'm not gonna irrigate.' And then you miss the rain. Or you have one coming say, 'Well I've missed it the last two or three time', so you irrigate, and then you're wasting water.

Kyle explained how judgment calls still had to be made even with the implementation of the moisture sensors. The moisture sensors indicated how much moisture is in his soil, but he still had to decide on whether to irrigate or not:

> So many times, two of the sensors are calling for water, and the other one was saying it's okay. So we just-we had to make a judgment call. Generally speaking, when two out of three were saying we need water, I went ahead and watered…We have to make a judgment call, according to what the crop is.

Jay discussed how he had to balance irrigation decisions so that some of his crops survive. According to Jay, "Sometimes you have to water something before you really want to just so something else doesn't dry out." Though most participants appreciated the moisture sensors to help them indicating the moisture levels of the soils, they emphasized how they would have to make a final decision on whether to irrigate or not. For Jay, who admittedly liked using technology like the moisture sensors, still referred to his father to help make irrigation decisions because of his father's farming experience. For Stephen, just because the moisture sensors were

in his fields, he was still had to make an important decision on if and when to irrigate, "But even if you saw that one, if you did have a field that had sensors everywhere. You'd still have to make a judgment call of water." When asked how Stephen made decisions on irrigation he stated:

> My gut feeling. I really don't have an irrigation program or a watering program, I should say. I know all my fields ever since I've been farming and I know all my fields and I just know…I know what fields will get dryer you, know if everything if we had to, course you get rain here and not down there and rain over there and not over here but um, I know that's may sound crazy but I kind do it by the seat of my pants…I know this sounds crazy, but um, I just do it from past experience…I know what the crop needs and I know what the fields need what.

Participants described the amount of time they worked could add to their stress levels and as served a significant factor while making irrigation decisions on their farm. Taylor explained how timing went into his irrigation decisions and could affect the overall success of his yield:

> Timing is a big issue. Timing, getting planted at the right time, sprayed at the right time, uh, even when it comes down to harvest…the timing thing is…you could make a really good crop and you can be profitable, but it's all about getting it done in a timely manner…like I said, just be more efficient on every decision you make with sprays or watering.

Taylor during his interview described how timing affected when he would spray pesticides and also was stressful for him.

> The stink bug spray, when you spray it on, it needs at least three hours of dry time, and the growth regulator needs a minimum of four to eight hours of dry time. And you look at the weather forecast before you leave the house in the morning and they say no rain until 5:00 in the evening, so you decide that you're going to pour that costly chemical in your tank and you're gonna go out there and spray it, because it's not gonna rain until 5:00. And you pull out the field at a quarter to 12:00 and it starts raining. That is extremely stressful.

Chris explained how timing is involved with even the small decisions like the timing of when to spray his peanut plants with chemicals. Chris described that he could not spray his peanuts if the wind was blowing which he referenced when he discussed his photograph of a fence line. The property line to Chris represented how he had to keep in mind the wind and his neighbors crops

when spraying a fungicide, “You gotta catch the wind just right to where you won’t damage yours and your neighbors [crops].” He later in the interview mentioned how timing added to the factors of stress:

> Everyday it’s something. Like this morning, I had to spray peanuts, and time I got the sprayer filled up, started leaving, and look and wind’s just like, wow like. And you really don’t want the wind blowing it…you gotta make a decision.

When discussing what other obstacles come into Jay’s irrigation decisions he described how pests like wild hogs get in the way of his planned tasks. For Jay, wild hogs ate several acres of his plants that he then had to replant. Jay explained that the amount of tasks he needed to address would include no sleep, which he could not do without:

> Also trying to plant the rest of your crop, or spray, or do this. I mean you can’t work 12 hours a day then hunt all night. Or I can’t anyways. Some people might can, but I need my sleep.

Participants discussed the need for balance in decision-making when it came it irrigation and technology use and adoption. Michael addressed the potential he saw in the adoption and use of the moisture sensors in farming if they did not become too expensive. Michael balanced the price of a technology versus its practicality. Michael described his daily routine of questioning his decisions when he needed to irrigate, “You’re working all the time, and you’re trying to make decisions, do I need to water my crops? Do I need to water, do I need to water?” Michael was visibly in a hurry to begin his day during his interview and repeatedly expressed the number of decisions he had to make associated with chemicals and irrigation.

Participants described how making decisions of if, when, and amount to irrigate was dependent on a field’s soil type. Many participants described how the soil content in their field varied, and it made it challenging to decide how to irrigate since they did not have variable rate irrigation. For example, if a pivot was set to irrigate a field the same amount, some soils can hold

more moisture than others; therefore, the farmers have to balance how to decide the amount of water to use. Kyle discussed this challenge on his land:

> Where we do have it, I mean, it's uh these variable soils that we have, I guess that's the biggest challenge, just trying to make sure you put enough where it needs it without doing yourself harm…where the lower ground is.

Kyle continued to explain how the varying soil types affected how he would try to balance irrigation decisions, "The middle of the field can be screaming for water, and you're still a little bit too much water on the edges of the field." Participants explained how they balanced their irrigation decisions with the predicted versus actual rainfall. Robert discussed how he evaluated the amount of precipitation to supplement the irrigation he needed to use. According to Robert:

> It depends on rainfall a lot of times. If we need rain, if we need water we water, uh, if not very aggressive, hopefully, we water according to our forecast. Say we got sixty percent coming up tomorrow and man we need rain, we'll be watering the day before to try to catch the sixty percent.

Taylor discussed how he tried to stay of his crops suffering by monitoring the rainfall. He explained he had to stay ahead of the crops showing the need for water so he would go ahead and begin to irrigate:

> If we hadn't seen rainfall in several days and you're starting to see the crop suffer, um, you know, you don't wanna let it get to that point. You wanna be a little bit ahead. So we would, you know, go ahead and start our watering.

Chris explained his adherence to Extension's recommended method for irrigating and his experience were the basis of his irrigation decisions: "We first of all if you handle it, you know experience uh, through the years, kinda know when you know, when to water. And going by the UGA water table, you go by that."

Balancing the Use of Irrigation Technology

Participants described the advantages of irrigation technology and irrigation equipment adoption but also explained how it caused disruptions to their workday. Robert explained,

"Breakdowns is, is the only biggest barrier for us. You know?" While Michael pointed to his photograph and explained how an irrigation pivot required constant supervision like a newborn child:

> I took a picture of the pivot because as good as a blessing they are, they can also be the biggest headache that you're gonna have because you know, uh, this particular pivot is a nine-tower pivot…They're [pivots] a headache, I mean you know, it's just, it's just like a newborn child when you, when you cut it on to walk around, you can't just necessarily say alright well I'll come back and check it.

Jay had similar sentiments, but pointed to his photograph of corn and how is displayed the advantages to irrigation. His photograph showed corn crop the center pivot reached during irrigation next to corn where the pivot did not access. The difference was extreme and Jay described:

> Those corn stalks are that tall, and that big around [showing a large size with his hands]. I mean they're like not even waist high there the water doesn't hit. And here, even though it wasn't the best corn, it was six and a half feet high and healthy ears.

Participants described the use of irrigation technology and compared it to their knowledge and experience concerning how they made irrigation decisions. Participants described using their expertise and eyesight to help make decisions of when to irrigate. David explained, "I've got one tobacco field that's got a pivot on it, and tobacco is mostly a sight thing. I can, I can tell what it's doing." Kyle described how using his knowledge acquired through experience matched with what the moisture sensors were telling him in regards to irrigating:

> Where we have the sensors, of course, we just go by the sensors, when it says it's dry and it's needing water, then we're turning it on. Works out pretty much the same. You know, once you've done it a while, you kind of get a feel for things.

David used sensors in some of his fields before the study and expressed how he found them sometimes not helpful. He explained how the moisture sensors could recommend bad decision when irrigating representing a discrepancy in the technology:

> But she [moisture sensor] was telling how you need, you know, your probes are getting low, might want to water. I said, "Well, if I water, try to get that one back up, I'm gonna drown, you know 80 acres to try to water five acres.

Participants described how they used irrigation technology and their experience as well as eyesight to help make irrigation decisions. Chris took a minute to reflect during his interview and explained how using the moisture sensors questioned his knowledge and experience of when to irrigate:

> Let, let me go back to that last question again. And also at time, I wonder maybe on water, when I don't have the sensors you know, or maybe I'm not watering right. Maybe I'm watering too soon. And if I'm watering too soon, that means I'm putting too much, and that means gotta pay more. And I'm always wondering if I'm watering, if you water too late, that's going to affect your yield. So either way, both ways you're affecting your bottom line.

Promoting Health

Participants described they were continually faced with issues concerning the life and death of their crops when discussing issues related to irrigation. The participants worked daily on tasks and monitored that ensured their crop's survival. They demonstrated diagnostic capabilities and visually analyzed the appearance of their crops, the soil, and the weather to better predict and remain ahead of any unforeseen issues. Participants continually balanced decision-making for their farms, balance irrigation methods, and amounts of water to apply to their crops. The participants discussed how they promoted the health of their crops by explaining how they used water. Nick compared trying to irrigate various soils type with irrigation amounts in medical terms and treating multiple patients with the same medicine:

> I could take a picture of that it would show you, that you're trying to treat, if I could put it in medical terms, you'd be trying to treat three or four different patients with different diseases with the same medicine.

In the field notes, the researcher noted Nick compared irrigating his crops as a prescription to a sickness twice within his interview. Nick associated his decision-making around irrigation in terms of a medical procedure. Stephen used a different comparison by discussing how he cared for the health of his crops by irrigating. Stephen used the relationship of a parent caring for a baby. Stephen explained:

> It's going to be very hard for my crops to need water and I got water there and they tell me I can't use it. I mean, that's going to be, that's going to be serious. Cause, you know? That's like your baby that's hungry. And it needs feeding. And you got food and they say, 'No. You can't feed it' I say, 'Oh. Oh yes I am.'

Stephen passionately described how he would go to lengths to care for his crops or in his terms, his baby. With Stephen, there was a protective sense to his crops, and after he referred to them as like a baby, he expressed what measures they take to ensure his crop's health. Stephen discussed how with irrigation issues if he visually saw a concern, he would immediately address it no matter what financial resources it takes. According to Stephen:

> Definitely, if I can visually see in my crops that there's a tower or some sprinklers that aren't doing what they're supposed to be doing I mean we address that immediately no matter what…But like I say, when, when they're visual…we gone fix it. It don't, we gone find a way no matter what it costs.

Mitigating stress. Participants expressed how the use of irrigation assisted in aid of stress relief and how to avoid putting a strain on their crop. For some participants, this meant finding stress relief in the adoption of irrigation technology or the use of irrigation equipment. Participants explained that although technology could be helpful, they attempted to balance it with their inherent knowledge. Michael felt differently because he explained how the moisture sensors helped reduce his stress levels:

> Being out there on the field on the tractor, that's our stress relief. All the other stuff is just fortunately it's, it's just as much of farming as actually taking care of the crop. So being able to have that just another place where you can get some that, think, I don't wanna say

> I'm gonna stop thinking about my work but just to have another tool [moisture sensors] in my pocket that I can pull out and say okay it's good.

Taylor discussed the use of a smartphone application assisted in checking on his irrigation pivots to see if they were still working. Taylor explained:

> That telephone app, you know, it gives you that peace of mind to look at it and say, 'hey it's still working.' Which all that's costly. It's just like auto-steer on a tractor. You have to pay a subscription. It all is costly, but it does help. You know?

Taylor continued to discuss how he used the application on his smartphone to find out how far his pivot progressed in irrigating, "Plus you can pull it up [irrigation application] and see where it's [pivot's] at, whether it's half around or it's …it helps you sleep better at night." Jay explained how rain was a natural form of stress relief, "You get a good rain, middle of the week or something for, you know, and you can relax for a couple of days that's much better, and it just lifts the spirits a little too." The researcher's field notes included several participants taking vacation time during or around the time of the project. These notes are evident of a way for participants to promote their health, balance work and life, and find stress relief. Two participants discussed how they could monitor their pivots and sensors remotely when they were away on their various trips using smartphone applications. Kyle explained how irrigation could take some of the emotional stress away:

> So it kind of-sensors can take the emotion out of, uh, irrigating where you're just irrigating to feel better about things when you don't necessarily need to be watering today. You might need to be watering tomorrow or the next day…the timing of it, uh, removing the emotion out of it, I think is a useful thing.

Kyle showed how he examined his moisture levels with the researcher on his phone. He described how the use of technology made him feel better about his irrigation practices, "I think it made me more confident that when I was watering, I needed to be water. Sometimes if you don't, you know, the sensors can take the emotion out of it that sometimes." Kyle discussed how

his son planned to take over the family's farm and work alongside him until he retired. He explained that the uncertainty and the amount of stress were not good for his son and to help with stress, installed irrigation: "He [his son] has since decided that farming and the stress associated with it…it was killing him, basically."

Taylor was a well-respected farmer in the community according to his peer Chris who also participated in the study. Taylor's farmland extended all over the county, and he explained how irrigation technology helped address issues he could not see physically as well as help with relieving some stress. Taylor explained how his smartphone application that monitor's his pivots provided peace of mind, "If that motor shuts off for some reason or another, it sends me a text and that tells me immediately the motor's off. I can come down here, 'hey something's wrong.' So that's another peace of mind." Taylor's spouse continued to explain how updating and adopting technology helped with monitoring the older pivots on their property:

> We put the technology on the pivots we have at what we call the Grass Farm. And that was for peace of mind, was the main reason we put them over there, because the pivots were older, but we could put that technology on them and have that peace of mind that they was…it was still running or that it was gonna cut off, you know, it had cut off when it was supposed to.

Michael discussed how the moisture sensor technology was a possible innovation to farmers just like GPS. He compared the irrigation technology to be like another employee, aiding in the care of his farm:

> I could see this just like the GPS, it's just another tool, another employee on your farm that's taking a little bit of the stress off of you. Uh, 'cause you know, planting wise now, I still have stresses on me, but it's not that stress that I had ten years ago.

Participants described the use of irrigation technology allowed them to promote their health by reducing stress. They referred to the use of the moisture sensors as helping them make decisions when to irrigate. Michael described the use of the sensors assisted him on not guessing if a field

needed irrigation and he appreciated how it could remind of how his field was doing via a message on his smartphone. He also described how other factors, like being a father can interrupt his workday and the technology assisted in monitoring his crops:

> I have two young children…You know, you're human, and sometimes you're like I need to go check I forgot, so, this is where that tool is great in the sense of because you know, we all have phones, we all have smartphones and, and it was, I mean it, it was a good reminder when I'd get that text saying hey the sensor is going dry. So, it, it helps in taking some of the guesswork out.

Michael explained how he used his father's knowledge and experience to make irrigation decisions and compared it to the moisture sensors when trying to decide when to irrigate his crops:

> …Because what I found was uh, there was a couple of time where this year, where I was like dad what, you know, what do you think? He was like well if it, you know, if we don't get a rain by so and so but, we stayed true and we let this sensor tell us when and it was maybe three days later.

Michael associated the use of moisture sensor technology by finding an opportunity to save money and not spending water on irrigation. He described how it could be stressful to balance how much moisture the ground had in indicating if he needed to use additional irrigation:

> And it was time to water so...it's good I mean you know, that, every time this [use of moisture sensors], this saves us a trip from water I mean that's money in your pocket. And it stresses you out a little bit in case a rain does come in, so it's yeah, I definitely see where this is a great tool.

Michael continued to describe how the use of the sensor gave him a sense of comfort in his decision-making with irrigation. Michael explained, "It's [sensors], it's my safety blanket, I mean I do. And I could see where this could possibly be a safety blank…so that's kinda how I feel on, on some of this technology."

Kyle viewed irrigation as a type of investment for the future and to ease future stress. He discussed how investing in irrigation equipment was to help plan for the future in what crops he could cultivate:

> But it's [irrigation] still insurance, basically, so that you don't' have a total loss. Plus we were looking at also, I don't know what's gonna happen five years, 10 years down the road…If my son was gonna farms with me, he may have to look at truck crops, high-value crops, and you gotta have irrigation for that. So that was another reason why I put it in, just to give us an option down the road for onions or carrots or some other kind of produce.

Kyle described putting pivots or irrigation equipment on some land where his daughter lived. For Kyle, having the pivots as an investment on the property would give his daughter options in the future on how she could use her land. Kyle explained, "They built a house on the track, and then I put about 25, 30-acre pivot up there."

Chris had similar sentiments and described irrigation as a type of insurance when rain missed her fields, "But that was, looks like rains coming and…if the rain don't come, we've got a pivot there, you know." Jay recognized how the moisture sensors did help ease some of his irrigation concerns but also pointed out that irrigation technology is not fully reliable. Jay explained, "It does make life easier. I'm not saying they're not worthless, by any means, 'cause they do make life a lot easier. But they have their faults."

Uncertainty

Participants described various aspects of their irrigation decision-making related to uncertainty, which inherently caused stress. Some participants were uncertain of adopting new technology while other participants were uncertain of irrigation information related to their crops. All participants expressed an uncertainty in the future related to water policy especially in regards to the Tri-State Water Wars. Chris had farmed in his community for years and explained,

> I'm afraid in the, it just going keep getting worse and worse, you know? Well water is a concern. It surely is. We, we're afraid that one day it's going be say, you know you can't turn that pivot on cause you done used so many gallons you know? So e-every farmer you know, that's…And and I you know, its's a concern for 'em. It sure is.

Taylor felt similarly to Chris in he was unsure of the future concerning the Tri-State Water Wars. He emphasized how he did not know anything about new Special Master pertaining to *Florida v. Georgia* who would eventually rule in the case. With this uncertainty, Taylor questioned how the special would look at the case and ultimately affect the farmers' futures:

> We don't know what we're facing, because right now they…we had a special master from Rhode Island or somewhere up northern states, and now we have one…the special master that they've named is from New Mexico, so we really don't know anything about him or how he's um, gonna to look at this.

Michael expressed fear with the endless legal battle of the Tri-State Water Wars. The never-ending nature of the case kept him in a state of uncertainty with the future:

> Well what scares me about the water wars is you know, I wish I had time to read…I see what's on the news, and if I get into articles sitting on my phone if I'm, you know I might take a second to read it but you know, technically Georgia has already won the legal battle. But because of the way our judicial system is, they've basically just changed one thing and they're starting it all over again. So, it, they'll never be an end to it. It'll just be a constant back and forth, back and forth. It just disappoints me and it might be different but just what I see is you know, Florida backs Florida, Alabama backs Alabama. Georgia a lot of times tends to back Northern Georgia. Because that's where, and I don't wanna say that's where the money comes from because if you took agriculture away from the state, you know, Georgia couldn't survive I don't think.

Chris had similar sentiments to Michael and described his concern for water and how he saw no end to the legal battle. He felt while the court case would never end, other people were making money from the court case. Chris discussed how the actors in the legal case did not understand how much water it took to farm, while he felt farmers' situations were getting worse:

> Well, water is a concern…Cause you know, Georgia, Florida, and Alabama's fighting over that. I don't know if you are aware of that, but they've been fighting over that for years. And the Judge will make a ruling and then they'll appeal it. And it's, I guess all the lawyers and judges are getting rich I guess. I'm afraid in the end, it just keep getting

> worse and worse you know? The folks that don't farm that I mean, they don't understand how much water it takes, and how much water that it takes at a certain time.

When Robert was asked about the water situation in Georgia, he described seeing pivots in every field across the state and questioned how irrigation practices could continue in the future. Robert did not reside in the Flint River basin but expressed an overall concern for the state of Georgia and its water supply, "And it-every field you go by's got a pivot in it. I can't see how this can go on. I just can't see it, but anyway."

Stephen, Michael, Taylor and Chris all lived in southwest quadrant of Georgia near the Flint River Basin. Each participant who farmed in this area expressed concern of the future of water and the ruling of the *Florida v. Georgia*. Stephen explained trying to farm and irrigate is coupled with keeping the peace:

> But right now, far as you know? And I say you can call it a concern I guess. To be able to just, to be able to make money and, and be able to keep the peace and keep them [pivots] up where you can use them, you know?

Stephen was uncertain of the future in regards water use and explained he was not into politics but was aware of the severity of the situation:

> I think if it with the, they call it the Flint River Basin around here…It's going to be some challenges if they start trying to regulate our water. It's going to be some big challenges…I don't' know how that works far as…I'm more of a manual hands on guy. I'm not political type. And I know that it, it could be very serious. Far as me, that, that's that would be…my main concern right now what happens with all of that.

Michael also described not being political like Stephen, and explained how he felt that the state of Georgia was divided and southern Georgia was supported. Michael felt that the divide within the state of Georgia was stronger than the divide between the water rights with the states:

> If you don't have water, you can't farm. Uh and now, I'm not into politics or anything like that, but, you know, it's, it's common knowledge that in the state of Georgia it's almost like two states. You got the south where agricultural and then you got Atlanta north. And you know, it's a challenge within our own state, I mean you look at, we have moratorium's on putting in wells. But yet in Alabama and Florida, they're being

> supported they be like put ‘em in, put ‘em in. Here in Georgia they’re all about making money in housing authority units and just growing Atlanta. I mean, ‘cause uh, that’s, that’s big money, so we’re, you know, we’re having a fight in our own states.

Michael described the uncertainty of future water usage in the context of the *Florida v. Georgia* case, and explained how farmers’ livelihoods would be damaged if water was taxed as a result of the case’s ruling:

> Again, if Georgia lost, you know, if they started putting taxes or, or you know just started, they couldn’t crank it down as far as on water. Um, and if they did that you would see the state of Georgia and, and really because Georgia’s the leader in peanuts, I mean and I, I actually wanna say Georgia might be the leader in pecans how. You’d see it hurting across this whole country um, because a lot of things would have to change.

Preserving Farming Heritage

Farmers looked toward the future with irrigation adoption, looking at the potential of irrigation technology, and how technology could help sustain their farms. They saw the potential in technology but also expressed concern of seeing the savings in adopting technology on their farms. Participants described how they were good stewards of water and good water practices were a necessity to continue to farm. They described experiences where they demonstrated the capability to adapt to changing environments and technology as well as offered solutions to how they would adopt the moisture sensor technology outside the study. Participants also described challenges indirectly related to irrigation they faced to prove their credibility in their community with the public’s perception of their occupation while struggling to promote their legacy as farmers. The participants questioned how a new farmer would start farming with all the challenges they face and the financial undertaking it involves. For some participants, they questioned whether they would be able to pass on their farms to their children in the future.

Looking Toward the Future

Participants described planning for the future when it came irrigation and the continuation of their farms. Michael described planning ahead in terms irrigation and the future of his farm. Michael with his father on the farm and described how they planned ahead with planting pecan trees and the irrigation wells they would need to install. He discussed how if they dug the wells now they would be grandfathered into having the wells compared to in the future where water policy was uncertain:

> We're full irrigated farm…now thank goodness we can put four inch wells, there's no moratorium's on four inch wells, that's what we had to use in our pecan groves. The problem with that though I think it's only a matter of time before they put a stop on that, so we're even you know looking, okay five years from now, we're thinking about cleaning this spot up and putting a pecan grove in. Well we are, we're thinking about go ahead and digging a whole and having it, 'cause the holes dug for a well, I guess you're, right now you would be grandfathered in, so you know that even comes into play.

Kyle explained how farmers in his community invested in irrigation pivots because they had at one time experienced when irrigation was critical, seeing irrigation as a type of investment:

> They've been through bad enough years where they didn't make anything, and-and they had money that they-they had, you know, for a long time you couldn't-if you had some money, uh, you couldn't get any interest on it, if you were saving it, you know. So they chose to invest in irrigation-and just knew that it was gonna take them 15 years or 20 years to get their money back, but they felt like you know, their advantages of irrigation brings makes it worthwhile…There's a lot of money, uh, it's a lot of money to put them in. And so you know, if you-it is a long-term investment though.

Participants described their experiences with farming as planning in advance and tried to stay ahead of the curve the use of irrigation with their crops, the use of chemicals, and the application of fertilizers. The participants discussed the value in irrigation technology, as well as technology and equipment adoption as looking ahead to the future. Participants discussed the appearance of their crops in their photographs, and noted how well they looked. It was repeatedly described by participants that if a crop looked stressed and needed water, it was too

late. Kyle discussed how he purposely looked ahead when it came to his crops' health and irrigation, which then led to the discussion of the future of farming. Kyle recognized some farmers struggle due to the lack of a business plan and thinking toward the future. Kyle was one of the more experienced farmers and acknowledged the potential technology adoption to assist with farmers staying ahead of the curve:

> Much of farming is, um, being ahead of the curve. If you wait until you've got a problem, you're probably too late to fix the problem. Same thing with irrigation. If you wait until the cotton or peanuts are screaming-screaming for water, you've already lost yield. The sensors help us be ahead of the curve instead of behind the curve…and that general rule applies to everything, I think. The farmers that struggle, I think, uh, not only probably they don't have a good business plan, uh, of keeping up with their assets that they're putting into the crop, but they're behind the curve a lot of the times, um, not-not thinking ahead. And in general, you need to be putting what the crop needs two weeks ahead of when it needs it, or three weeks ahead of when it needs it. Uh, you don't need to-to wait…So it, that kind of technology might help us with that, I think. That'd be one of the biggest things that technology can do for us, is keep us ahead of the curve.

Nick discussed trying to stay ahead with making decisions related to his crop's health and irrigation. Nick emphasized how important it was throughout his interview that he physically set foot in his fields and looked at the soil. He relied on visually looking at his crops in order to stay ahead with irrigation decision-making. Nick stated:

> I try to stay ahead of my crop wilting and so what I do is, I may go right around and survey fields that are around where I'm going to irrigate obviously my irrigated fields would, in drier times would receive more, more moisture than, drier fields but I may go look.

Jay worked with his father on their farm and admitted the many of the irrigation decisions they make on their farm is looking to stay ahead of issues and looking to the future. Jay explained how if his crops looked liked they needed water, it would be too late and he needed to stay ahead of the curve. According to Jay:

> I mean, like I said, a lot of it's staying ahead of it. I mean, [toward the direction of his father] wouldn't you say most of it's staying ahead of it? If you can tell you need to water something by looking at, it's too late.

Stephen discussed similar sentiments when planning head in decision-making and elaborated with how looking to irrigate his crops a small amount to prepare if there is equipment breakdown. He explained adding a small amount of water would be better than no water in case a problem arises in his equipment where he had no access to irrigation. Stephen explained:

> I don't know maybe that's some of that old school thinking from uh…I'd rather go ahead and get a little bit of water on my crop…Cause these pivots, you get…We don't have a whole lotta trouble with 'em but a pivot is a very important tool. And I guess what I'm sayin' is, I'd rather see that pivot go ahead and get across that half a pivot tonight and then if something happens at least I got a little bit of water on that whole crop instead of two days later and it's made it half way and something happens and then you got water, a lot of water on half of it and none on the rest of it.

The cost of saving money. Participants demonstrated how they adopted various types of irrigation technology on their farms but expressed all the technology had an upfront costs that was difficult to see the savings. Participants described making decisions on adopting technology involved money and they were willing to spend it if they were could see the savings. Taylor felt if there were better commodity prices on his crops he would be able to spend some of his profits on reinvesting in irrigation technology for his farm. According to Taylor, "And if we was…if we were getting a profitable price for all our commodities, it'd make things a lot better, a lot better, to keep up with all this technology." Taylor admitted he had experienced loss last year so had to get rid of some of the irrigation technologies because their increasing prices and subscription fees. Some participants questioned where the savings were evident when they adopted water use practices or new irrigation technologies. Jay questioned, "So where's the payoff, you know, if it's not as efficient and you're spending all this money to put in a variable frequency [variable rate irrigation], while you have reliable three phase [three phase electrical line], it doing you any good?" Kyle felt similarly that he had to see the savings before he would adopt irrigation technology:

> But you know, when you talk about the cost of these things, if I've got to spend $1 to get 99-cent return, I've just lost a penny, you know? Even though I've got the latest and greatest technology, it really didn't do me any good.

Participants related their experience with the adoption of irrigation technology similar to how they adopted other forms of technology on their farms. All participants recognized technology made their farms more efficient but some had hesitations based from past experiences. Stephen acknowledged the positive aspect of technology adoption was allowing farmers to do work efficiently but questioned where the money saving is involved with adopting technology:

> The technology and the equivalent, I think we do a better job than what we're doing. And do it more efficient. A lot more efficiently. But in the same sense, I think that money and that we're saving from doing it more efficiently, and with less people, the equivalent people are getting it. I don't think, it's not coming back home to us is just what I'm trying to say.

Kyle described how from his personal experience new and what is considered the best equipment or technology does not also equate to working out positively. Kyle was hesitant on adopting new technology on his farm because of a recent experience:

> I recently bough a tractor from a major supplier that, uh, had all the bells and whistles and technology on it, put it on a tractor sprayer to spray peanuts, and never could get-get the technology to work right, and they couldn't get the technology to work right. And we ended up going back to some older technology that we had that is really just as good, but, I've become a little bit cautious, even cynical, about when you hear some of the new technology and it's the latest and greatest and this is the most wonderful thing in the world and easy to operate and then when you go price it, it's pricey, and when you go to operate it, it doesn't work as advertised.

Kyle discussed how he was cynical of adopting the newest technology and in his experience with a new tractor, reverted back to his old technology.

Preserving Water Supply

Most of the participants felt it was important to conserve water to help sustain the natural resource in the future. Participants expressed they thought overall they were good stewards of

water in their farming practices. Jay explained how having good water-saving practices was related to the knowledge of a farmer:

> I mean, anytime you've gotta be proactive in managing that and I do think overall we do a good job…I think most people around here know how precious irrigation is. So they do a very good job. I mean, but you also in this area have a lot of long time farmers. Very few farmers around here are new to it, or to irrigation.

Kyle recognized the importance for farmers to be good stewards of water and explained how technology could assist in their water efficiency and water-saving practices:

> We have an abundant water supply, but it's not limitless supply so we need to be, prudent about how we use it, and you know, one good thing about some of the technology now, it kind of helps us do that so that we're not over watering. But by the same token, we don't want to under water, it's just a resource that we're glad we've got but we need to be good stewards of it.

Participants admitted though they tried to conserve water at all possible, they realized they probably wasted some water in their irrigation practices. Brian discussed how he most likely misused water when he was guessing when to irrigate versus using a technology like the moisture sensor. Brian explained, "Instead of [a pivot] just going halfway around you know. So, probably wasted, maybe something, when I just was guessing. You know, you just kind of guessing what you need." The researcher noted how Brian did not describe wasting water but wasting money on irrigation. Brian explained, "You know, I know I waste, I probably waste money irrigating. Some crops I don't waste as much as others, but I, and, I kind of feel like that was an area where I could save money." Other participants described wasting water was equivalent to wasting money. Kyle explained how misusing resources and supplies was contradictory to the nature of farmers as they are natural conservationists:

> I think there's a lot of misconceptions of –that farmers are just over using water, over using chemicals, and really nothing could be further from the truth, because every time I overuse something, that's money thrown away, and-besides the environmental impact. We don't want to harm the land in any way.

Stephen felt similarly that every thing he puts on a field costs money and farmers did not want to waste money:

> But like I say for the most part I think we do a pretty good job far as. Because I mean, like I said…It all costs money. Anything you do in the field costs money. Runnin' the pivots or whatever and you don't wanna, we don't wanna waste water. Ain't nobody, ain't nobody wantin' to run a pivot just to be runnin' and waste water and throw water away…costs money too and ain't nobody just doin' that for the heck of it.

Brian explained how farmers did not want to be wasteful and they would look to multiple solutions to maximize efficiency:

> You put something out there that'll help us be more efficient, farmers will jump on it. I mean, there's nothing…There's nothing we want to do that wants to be wasteful. It's just natural to be more efficient, and they don't, they don't see it like that, you know.

Taylor explained how water meters put on their irrigation wells to measure water usage proved that farmers were being efficient with their water for irrigation. Taylor explained, "I think we've proven that we…on the wells that are metered, we're not using the water they claim we're using. And we're using it efficient." Stephen described how he thought he did a good job in saving water. Stephen was aware some of his irrigation practices needed improvement but turning a pivot's end-gun off when it is directed not at a field but toward the road was an obvious solution. Stephen explained also how preventing end-guns from spraying in the roads is an apparent answer to water saving, yet the technology to monitor their end-guns requires money:

> I think for the most part, we do a, we do a pretty good job in general. I think there's a lot of things that could be done to maybe help save some water. End guns, throwin' in the roads, stuff like that. But all that take-everything you do to make it better takes money.

When Jay discussed other farmers in his community and their water usage, he admitted how he saw other farmers waste water when they irrigate land with no crop due to the way a pivot travels:

> I'm sure y'all see that all across the state. Especially, as you get bigger, bigger pivots you're gonna have some ground that's just wasted. If you can time it right, or set your

> program right, you can fast walk over that. But, if it's an irregular thing you're just wasting water going over some of it.

He explained how most farmers had wasted land but variable rate irrigation might assist with the misused water, but variable rate irrigation was very costly. Robert described how other irrigation practices of farmers did not help with water conservation:

> Don't excess…water you know, some people put excessive water and it just runs out of the field. That's unnecessary. You know, that's, that's not good cultural practice as far as I'm concerned. Conservation practices…I know there's a lotta irrigation out there and we usin' a lotta ground water. Sometimes, I-you see wastage uh, on the roadsides that uh, can be stopped. That's not necessary. But ah, and this new, this new stuff that we lookin' at today even, I can see where if you can uh, put the solenoids on pivot and where it needs water, water. And where it don't need water you can-I know they got ways to in their systems to cut-em off an everything.

Taylor lived in the Flint River Basin and described how he felt like he had to prove they were good stewards of water in light of the Tri-State Water Wars:

> The biggest thing that we're facing right now with water is um, Florida thinks that we're stealing their water. They think we're misusing our water, and um, you know, I think we're being as conservative as we possibly can.

During the interviews, the researcher never directly inquired or discussed the topic of "water conservation" practices, but participants brought up the topic. The subject of a pivot's end-gun arose in several of the participant's interviews regard their conserving water supply and their credibility. Michael discussed how a pivot's end gun can be set to turn off when it reaches the road area but also sometimes farmers were unaware it was going on. Stephen discussed how he thought farmers did a good job on conserving water but also admitted the end-guns irrigating on roads could help save on water:

> I think for the most part, we do a, we do a pretty good job in general. I think there's a lot of things that could be done to maybe help save some water. End guns, throwin' in the roads, stuff like that.

Credibility

Participants discussed the public's of perception of the farming community force them into situations and drive their decision-making. Participants discussed particularly their neighbors of their farmland blaming them for the drying up a neighbor's home well. One participant admitted to just paying for the neighbor's well to be re-dug even though he knew it was not his fault. He discussed how it kept the peace in the community. Brian explained:

> Let's say we got a well bordering somebody, like this house right here with somebody else's. We run that irrigation. Well, in each dry year, it pulls the water table down to where somebody may have a well out, you know, running their home, and it pulls the water table down to where they have to drop their well. Their well runs dry, basically, and they have to get somebody come out to service it and drop the well down. Cost them some money, you know, and it, it, you know, in ways, it's, it's not our fault, because the whole water table, it's not just us using the water. The cities are using water. They're using water. Everybody's using water. We're supposedly pulling from a different aquifer than a home well, because we're so much deeper, but you can't convince anybody of that. So, we're, uh, so yeah, we've had people. We've paid for people's wells to get, you know, just to keep the peace, you know. So, you know, it's only happened to us twice, but we don't have a lot of homes, I guess, real close to, to, uh, our field, but you know, just keep the peace, and…You can't convince anybody that you didn't run their well dry, so-

Jay's experiences were similar to Brian's in the public's misconceptions where agriculture gets its water. Jay explained how the public assumed farmers were lazy when irrigation was on when it had recently rained:

> Or I mean, everybody, which the average Joe they see rain they're like, "Why's that pivot still running?" Well, you know, if you're only getting two tenths of an inch of rain, you're gonna leave the pivot running. But sometimes you do wonder, it's like, "Okay. Well, we just had an inch and a half of rain. Why are you watering? Just 'cause you were too lazy to come around and cut the pivot off." But, that's an easy, I mean, a lot of times that's not the case. Something else came up and they just hadn't been able to go over there and do it. Or they don't know they got an inch and a half of rain because, you know, it's not raining over there. I mean that honestly the public doesn't realize one, how much it costs to irrigate. Two, how the irrigation actually work.

Jay continued to discuss how although there was a balance between being informed. The public needed to be informed as well as the farmer so that they can respond properly to the public's misconceptions, "And then, which is getting into a whole deeper, but knowledge as a farmer." Kyle discussed the public's misconceptions in a different perspective than Brain and Jay. Kyle talked about the future of farming and the public's lack of concern for the continuation of farming as a career choice. Kyle stated, "Not a lot of guys are able or willing to get into farm and the and the general public need to be concerned about that." Kyle explained how he felt like people outside of agriculture or people living in more urban areas, did not understand the demands of water and agriculture. Kyle expressed a divide between agricultural populations versus non-agricultural populations:

> Just the competing, the competition, in a way. I don't really-might be probably not the appropriate word, but between urban demands for water and ag demands for water, you know, people think when they see these pivots all over the place, well, that's using up all the water.

Kyle continued to explain how he felt that people outside of farming tend to mock farmers, demonstrating a felt division between populations. Kyle believed that populations outside of farming do not understand all that is involved with farming and admits irrigation mitigates risk:

> People kind of, particularly urban people, kind of mock farmers. "Oh, you got it easy. You're in an air conditioned cab." Well, I would, you know, say, "Well, um, do you run the air conditioning in your car or truck? Uh, you know even more so if you're out there eating dust and needing protection from, you know, different element or whatever…So it's just an issue to me that, that I'm trying to communicate to the general public, particularly to the urban public, that this is what farming is, because I just think a lot of people don't have a clue, not that they're ignorant but that they just haven't been exposed to what it takes, the risks involved. Irrigation is one way to mitigate the risk some.

Chris had the same perceptions toward the public as Kyle in people do not understand how much water it takes to irrigate a farm, "The folks that don't, that don't farm that I mean, they, they don't understand how much water it takes, and how much water that it takes at a certain time."

Kyle continued to express how people do not understand that farmers care about the environment,

> One thing that concerns me is just the lack of understanding in the general public about what it take to produce food and fiber for the country and that, uh, I think there's a lot of misconceptions of –that farmers are just over using water, over using chemicals, and really nothing could be further from the truth, because every time I overuse something, that's money thrown away, and-besides the environmental impact. We don't want to harm the land in any way.

Brian felt similarly to Kyle in how he perceived how people think. He explained farmers are not wasteful and justified the need for the use of irrigation technology like the moisture sensors:

> There's, there's nothing we want to do that wants to be wasteful. It's just natural to be more efficient, and they don't, they don't see it like that, you know. It is expensive, and, and it's hard on us, you know. They put restrictions on us, water usage, and then, but yet if we, uh, like, we're over using water to produce our crop, and we're just…It's not the case. It's just not the case. We're using what we need to use, which may be a lot, but I don't know how they expect the crops to get produced with it…Everybody wants to think of farmers as out there just trying to waste water and, you know, just sucking the groundwater dry and that's…we don't want to water anymore than we have to, but you know, we want to know…and that's why we need something like this [sensors].

Some participants discussed how their reputations as farmers are damaged when there is misuse of irrigation practices. Michael explained how a center pivot end gun might spray in the road at night and cause an accident with a person outside the farming community. Michael explained how he could foresee a person driving fast and hitting parts of the road where end-guns are spraying water causing an accident. An accident could damage how all water policy is implemented due to one person's neglect of the irrigation practices:

> We're having a water war going on with Alabama and Florida, and so…Obviously people that are not involved in agriculture, they drive by a field and they see a pivot running and it just rained the day before, they're thinking oh they're just abusing their water or, or even end guns. You see end guns throwing water out into the highways and stuff like that…All it would take is one of those cars freaking out, hitting their windshield late at night and having an accident. And even though it was just an accident, and there's no laws about water going into the road, there you go. They got, they got something to go to the table with right now… Like late at night or something a car is traveling through because they do, when they see, when they come through [the town]…A lot of people it's

> just a spot on the map and they're just flying through. Pivots, watering in the road, and they're not paying attention it freaks 'em out, it freaks me out sometimes and I know what it is when it hits your windshield. All it would take is one of those cars freaking out, hitting their windshield late at night and having an accident. And even though it was just an accident uh and there's no laws about water going into the road, there you go. They got, they got something to go to the table with right now…You know, um, we have things set up on our pivots where when it's going into the road we try to have it cut off, or we'll cut off going around those rows because you know, all it takes is somebody from up north, a politician, and they see water being thrown on the road and that' just, they're gonna stop and take pictures and this is gonna be something that they're gonna use and well all get lumped into that.

Legacy. Participants described the importance of family with maintaining aspects of their farms. Some participants worked with their fathers, sons, and other male family members in the farming operation. Jay, Michael, Brian, David, and Stephen were all working with their fathers or had worked with them on their farms. Other participants had children that they expressed giving their farms to while Kyle had attempted to pass on his farm to his son. Brian described how it was easier getting into farming when you have your family to support you. Brian explained, "I'm able to build up stuff over time, but I got my father and uncle just, you know, backing me. It's just a lot easier that way." Participants were concerned with how new farmers even begin to afford starting off their businesses. Participants recognized the importance of family and support to maintain their farms. Brian stated how he relied on the support of both his father and uncles in his farming. Brian discussed the challenges of a young farmer affording irrigation, "If somebody was…If I was on my own, starting off, I don't know how you could ever take that step, you know, and, and, and get from, get from, uh, you know, dry land to irrigated…I don't think you can survive." Brian discussed how farms where evolving in his community. According to Brian:

> It seems like just smaller farms are, are fading out, whether it be they're not really going broke or anything, they're just getting old and nobody's taking over that. The bigger farmers just kind of take those, those smaller farms, and, I think you got to be pretty…at least in this area now, I mean I'm sure it's like that anywhere else, but around here, you

> got to be, you got to be irrigated to survive. Maybe not even make a bunch of money, but survive, and how good a farmer you are I guess is how much, how good you do after that…Yeah, smaller farms are kind of dying out. So, I don't really feel like anybody's…It's a lot of young farmers getting into it, like from, from scratch. I don't know if you could. I don't know if you can, really, and, you know, I don't know how…you really got to have a, a big backbone of some kind of money to throw at it to begin with, 'cause it's, it's expensive. So, just, just getting…I don't know. The big farms are getting bigger and the small farms are kind of going away.

Kyle discussed how difficult it is for a young farmer to begin in the business: "It is a tremendous capital investment for a young guy to try to get into farming…It's-it's really hard to get started, point blank you know, in the farm almost impossible, I would say." Michael questioned how some farmers in his community survive with the costs of farming. Michael pointed to a neighboring field, "Like the guy that rents from us. We give him a fair price on rent, but we know he's renting some land at just, I don't see how it adds up on paper."

Expressing Experiences through Imagery

During the one-on-one interviews, submitted photographs were laid in front of the participants on tables, a truck bed, and given to a participant like a deck of playing cards. The interview question format varied for each participant in how they discussed their images. The use of the photographs promoted the participants to reflect on their images while express how their photographs captured their experiences. The participants used their photographs but also imagined images of experiences to describe to the researcher. With the photovoice study, participants discussed the lack of photographs and the absence of subject matter from their images.

Reflection

The photographs were a method for participants to practice reflection and to recall their experiences during their interviews, six to eight weeks after their photographs were taken. Some participants described attempting to capture certain narratives within their photographs. Taylor

described how their experience this year was different from drier growing season because of the sufficient amount of precipitation.

> *Researcher*: What were key issues, these could be good or bad, that you felt were important to capture when you took them [photographs]?
> *Taylor*: The main key issue, is, look how the good the crops looks, I think…I was trying to get a different-trying to get different looks of the field, um, because if it had been a dry year, you would have been able to see, like, on the terraces, the tops might have been dry or…we didn't see that, because we had sufficient water.

Other participants found that the photographs served as reminders of what was going one, for instance Stephen said, "It's [the photograph] just a reminder of what was going on." Jay described his photographs that showed weather radar with expected precipitation. Jay explained how his photograph reminded him that his farmland did not receive any of the expected precipitation. Jay explained how his photograph reminded him of the experience of how his farmland did not receive any of the forecasted rainfall. According to Jay, "Well, obviously that one 'cause I remember the one [photograph] with the radar cloud coming right to us and we did miss that rain. I distinctly [remember]…'cause next I started to send back and say, 'Yeah we missed that rain." Jay laughed it off as he recalled how that type of experience happened all the time, and in some areas of his farmland, it would rain, while in other areas, predicted rainfall would miss his fields. His photograph represented ho he would irrigate based on weather predictions, but also sometimes he had to irrigate and as a result, would waste water because the forecasts were incorrect. Jay continued to explain he might decide to irrigate his crops because the rainfall missed his farmland repeatedly, so he would to irrigate and then waste water because of the rainfall.

At first for Chris, the photovoice project seemed like it was asking for a picture of the same area everyday. He discussed how the process allowed him to think more reflect on the prompts given in the instruction and what the subject matter of his photographs:

> When I first saw about the pictures everyday I said, 'Well that's gonna get old just taking a picture of the peanut patch every day.' And then I kept reading, and it was saying things that affect you. So I said, you know, 'There's, there's more to it.' So that's when the light kinda clicked, clicked on. So that's when I started sending different.

Chris highlighted how the process allowed him to think more on what he was capturing in his photographs.

> *Researcher*: How's the process of taking the photos? Is there anything that stood out to you were you were taking photos?
> *Chris*: It made me think more you know what I mean?

Setting out the photographs for the participants to view allowed them to review and reflect on when and why they chose experiences to photograph. Stephen found looking at his photographs allowed him to reflect on his hard work and appreciate all that happened during a two-week span. He explained how he loved farming but was so busy he rarely had time to sit back and appreciate his fields and the resources needed to produce crops. According to Stephen:

> I mean I love farming and I, I just, all this stuff happened so fast. When you're, when you got so much to do. And it's, it's really, I know you probably think, well, you see them fields everyday. Yeah. I do. But sometimes I want to just, just sit back and, and really look at the field. I mean, you know what I'm saying? Because its, I mean, really and truly. End of the day, its amazing. I mean, it's really amazing. All the, that takes place…It's lots. Lots and lots of money. And it's lots and lots of energy and time. And somehow it all works out. It's amazing to me.

Participants described how the imagery in their photographs was an attempt to express certain messages. Jay pointed to his photo of a clock in his truck to show the time to express how there was not enough time to do all the tasks required in farming: "Obviously like that one… I just finished spraying at eight o'clock at night. I'd been spraying since 7:30 that morning, you know, you don't always have time." David explained that his photograph represented how well his peanut plants were doing. Although the photograph appeared like a picture of the peanut fields, David explained to the researcher what it represented:

> They [peanuts in photographs] all look good. I mean, I like this one 'cause it's level. When they can't tell where the rows are to dig them, usually is a good sign. This one you could probably see it, it's probably either just rained or wind blowing. They look like their wilting, but it, it's not. It's either wind blowing them or it was early in the morning when I took it…I think they're all good.

Participants were asked to submit a caption with three of their photographs. Michael described his photograph as representative of a healthy field. His described his caption for the photograph as, "I'd say that's a healthy picture." Michael continued to describe how his photographs looked healthy and also admitted what he liked to see in his fields. He explained he liked to see his peanut plants join together over the dirt rows and described this as "locking up." Michael explained:

> These all are good healthy looking pictures but even though they were young, I just don't like seeing the dirt lines 'cause you know as a farmer you like it when they lock up, you tend to like think oh they locked up earlier last year. Or hey they locked up quicker this year…

Michael selected another photograph and explained why he took a photograph of a pivot. He explained how pivots affected his daily routine represented how much time they could consume due to breakdowns and repairs:

Figure 4.1

Michael's photograph (described on following page)

> I took a picture of the pivot because as good as a blessing they are, they can also be the biggest headache that you're gonna have because…this particular pivot is a nine tower pivot. So on that nine tower pivot every tower has a set of tires, so you gotta worry about 18 tires and when they have a blowout or something, you know, if you've got a corn crop, you can't wait until nightfall when it's cool, no you're going out there whenever you find it and changing it…So up top you got aggravations of wasps nest, frogs, just like your well at your house as far as shorting it out…They're a headache…it's just like a newborn child when you, when you cut it [pivot] on to walk around, you can't necessarily say alright well I'll comb back and check it…The good new is…we feel like if we can't put a set of eyes on that pivot, all during the course of the day, I mean we just, we work too long as it is, so we still wanna make time for family but still be able to do a good job…

The arrangement of photographs in front of Stephen allowed him to choose three photos to express both the positive and negative aspects in irrigation. His three selected images allowed him to express his experiences by the images speaking, or as he stated, "saying it all." When reviewing his photographs in their entirety, he acknowledged that he did not plan it, but three of his photographs were symbolic of the positive and negative aspects in irrigation.

Figure 4.2

Stephen's images "say it all" about irrigation

Stephen also mentioned a worse case scenario when discussing his photograph of a broken pivot in a field:

> You got to me in these three pictures right here, I mean, they say it all. You got, you got a pivot that you can use. And you need it, and you're using it. And then you're thankful that you don't need to run it. And then worst case scenario, well actually this ain't worst-

> case scenario. Worst-case scenario you would need to run it and can't…I did not plan that way, but to me, those three pictures right there say it all.

He explained how this year's rainfall, the breakdown of his irrigation equipment did not cost them any valuable time or crop damage. But when relating it to year's prior, he described how that situation would be "detrimental." Stephen continued to explain how he preferred to irrigate his land in case something happened to his equipment and he could not irrigate:

> I'd rather see that pivot go ahead and get across that half a pivot tonight and then if something happens at least I got a little bit of water on that whole crop instead of two days later and it's made it half way and something happens [to the pivot] and then you got water, a lot of water on half of it and none on the rest of it.

Constructing Imagery through Imagination

Each participant was asked by the researcher to construct an image in his or her minds of a photo that they were unable to take or wish they could have taken that would have addressed the research prompts. Chris described seeing five deer in his field and wished he were able to capture that image to show an obstacle in farming such as natural pests digging up the peanut plants. His intended image encouraged additional conversation of farming challenges, including other pests like wild hogs. Chris used his image of deer digging up the peanut plants as an existing issue:

> I thought of one couple days later after I got through that. When I rode by, I seen it out there. There was uh, five deer out there in the field. And they, they paw, they'll paw the row. They'll eat em. Uh, lot of folks have trouble, wild hogs…But I mean, you know the deer love peanuts, you now we, we have em. And like I said, I thought about it, I shoulda took a picture of that and sent that to you.

Other participants described an experience that occurred they wished they had taken a photograph, but in the moment forgot or were unable. Jay explained how in the moment, he forgot about the project but was experiencing obstacles with irrigation and making repairs on equipment. He explained, "The picture I wish I'd gotten was some of the moderate repairs and

just how you have to stop everything you're doing 'cause it take two or three people to do it." Some participants constructed images that did not occur during this particular growing season but were symbolic imagery, representative of an experience, or an imagined scenario. Kyle imagined an image that he did not want to see. In his image he described an oasis of green crops surrounded by around other crops that were suffering due to the lack of irrigation. Kyle's constructed image represented how irrigation would serve as a savior of crops in a drought situation:

> I have a low percentage of acres that are irrigated, um, you know, the real, the real, image that you see is if you were going through a fairly severe drought…and but you were able to keep those pivot fields trucking along...and producing pretty much normal, just the contrast between the two. Of course, everybody down here says, well, you-you really don't wanna have to use the irrigation, because if you are using irrigation then probably your dry land crops are not doing as well. And most of us have more dry land than we do irrigated. So that would be the image, you know, of a-kind of an oasis of green crops with, you know, suffering crops around it. You don't wanna see that image, but it's still good to see that you are gonna produce something under the irrigation.

Nick described his image is his experience of questioning how to act in a situation when irrigation forces him make a judgment call especially when he has a field that utilized a pivot and has various soil types resulting in soil holding moisture differently. Nick referred to his image as a worse case scenario and described how he was in a position of a doctor, trying to treat patients with the same medicine even though they have different diseases:

> If I could have taken a picture for you that would show you a water standing in the field with possibly crop drop at the top of a hill, and how that would be a challenge for me. What do I do? I'm kinda wet around the edges but I'm dry up on the top of the hill. That would be a worst case scenario there…but if I could take a picture of that it would show you, that you're, you're trying to treat, if I could put it in medical terms, you'd be trying to treat three or four different patients with different diseases with the same medicine.

Robert did not submit any photographs for photovoice but described how his image was representative of the challenges in irrigation. He described how weather and commodity prices had no solution unlike how seed and chemical technology had advanced. Robert explained:

> Well it might not be what you want, but, I [the image] would be mostly, I would say, it would be current weather and commodity prices…World market prices. That's ah, those are two-two biggest challenges we face is getting' our work done, equipment's not, we got technology in tractors, we got technology in seed that's unreal it's, you know…those, those challenges have been met.

Taylor described images he wised he had captured his photographs to display an obstacle with irrigation. He described his image as showing the washes on the ground created by too much water with precipitation in combination with his pivot's tire tracks. Taylor explained:

> I think I jumped back to the back the, the question before, about what should I have took pictures of…was washes. We didn't take any pictures of any washes…and um, I wish I would took some pictures of some, because we have some here on this farm. Um, but that's, that's a problem that I see sometimes, is the pivot tracks causing washes.

Absence of Photographs

The lack of photographs submitted by some participants in the study for varied including one participant did not own a smartphone phone and two were unclear they needed to send any when they signed up for the study. The absence of photographs was also evident in other participants because when participants explained how the current growing season differed from other years. Taylor acknowledged an absence in his photographs when he examined them across the table. Taylor explained the absence of pivots in his photos because he did not have to use them due to the sufficient amount of precipitation in the current growing season, "We didn't ever take a picture of the pivot running-because the pivot was on the end, because we, we weren't having to run it this year." During Jay's interview, he remembered a photograph he should have submitted a photo of him repairing a pivot but was too busy to think about the project in the moment:

> That's one of the hardest things with irrigation its 100 degrees and you gotta walk out in a cornfield and change a gearbox that weighs 200 pounds. That's the kind of stuff I never thought to take a picture while we were doing it.

David expressed absence differently in his photographs. David explained there was not a need to take a photograph daily because there was not much to show in difference of peanut growth:

> Like I said, peanuts, when they get this size, they're, there's not really a lot of difference you can tell. Now if you could see the peanuts growing, it might be a different story, but there's not a whole lot you can tell as far as the difference… I mean, if they were wilting, you know, that would be something you could, you know, take. But if they were wilting, we'd done, you know, been watering.

Michael described the absence of a photograph of white mold represented a positive outcome in his photovoice project. White mold on a peanut plant is a result of too much moisture in the soil and is combatted with fungicide application. He explained he did not want any farmer to experience white mold, "You know, I'm glad I don't have a picture of a bad white mold problem to show you but I wish, well I don't wish it on anybody but you know…"

All participants discussed how the weather this particular growing season was different than previous experiences with irrigation. Heavy amounts of precipitation occurred in the beginning of the planting season between April and May and continued into June. Due to high amounts of precipitation, participants described the absence of using irrigation as representative of differing from past growing seasons. Stephen described how the pivots were not used during the two week photo-capturing project therefore it he took a photograph it would just show a pivot sitting in a field not being used. Stephen stated, "I coulda went out there and took a picture twice a week of the pivot just sittin' there I mean not doing anything." Brian discussed how during the photovoice project; he was not doing a lot due to the weather. Brian explained he did not feel compelled to take any pictures during this time. He admitted the absence of photographs was because he did not find any experiences as an opportunity to show something significant in his irrigation practices. Brian explained how the struggle to take pictures was similar to how this year's crop was also difficult:

> So, I'm sure I missed some opportunities that you would've like, but, ah, you know, nothing that clicked in my brain as this is a great opportunity to show something…It's been a struggle year, but yeah, as far as the pictures go, I don't know, I might've missed some opportunities but they just, they just don't stand out in my head…I guess it's just boring to me, you know, just like, I don't want to take a picture of this, but, you know, somebody else looking in might think this is, you know, a good opportunity, a good picture or something.

Themes from the Researcher

Through the use of reflexive journaling and field notes, three themes emerged including (1) *questioning the research project* (2) *critiquing the liaison role of the researcher*, and (3) *acknowledging the role of gender during data collection*. The following section is written in the first person, and the researcher is referred to as "I."

Questioning the Research Project

My first set of interviews was in the southwest quadrant of Georgia where the Tri-State Water Wars affected farmers. My interviews were intense and participants, Chris, Taylor, and Michael, all wanted to find solutions to address the water problems and restrictions they were experiencing. I felt an intensity when interviewing Taylor and his spouse as shown as their farm's location was near the Flint River Basin:

> Entering the home of a family member of Taylor, this interview felt intense, sitting in the intimate space of his home with his family in another room. Taylor's interview had a sense of urgency and also desperation to figure out how to resolve some of the irrigation issues near the Flint River basin. This feels like we are sitting in the heart of the situation. The silence that took place in this in this interview was intense. Taylor took a few moments in silence to look at his photographs to really concentrate on his answers. He seems committed to helping the problem of water on his farmland. (8/24/2018)

Several days later, I traveled to interview Nick and David who resided in the southeastern quadrant of Georgia. The interviews with Nick and David had a very different tone from the ones in southwest Georgia. Nick and David's challenges and issues with irrigation seemed far removed from the Flint River Basin problems, primarily because they lived far away from the

issues. I noted Nick and David were less forthcoming in their interviews, and when we discussed water availability, it did not seem to be an issue. As their interviews progressed, I learned they were predominantly dry land farmers, so irrigation was not as much a concern. I became frustrated because my previous interviews were so powerful and Taylor, Chris and Michael described feelings of fear for the future. Nick and David's interviews seemed superficial and my initial feelings were recorded in my journal entry:

> Why are these participants in the study? Water availability and water efficiency do not seem to be an issue with these two farmers [Nick and David]. It seems there is a huge difference of needs between areas of the state; perhaps this study should have concentrated on farmers in the Flint River Basin only and to help the people who want help. What is the point of this research? Is it to improve farmer's livelihoods, to improve irrigation practices, improve water supply, push technology on farmers, or to increase the yields of peanuts? (8/27/2018)

I struggled to adhere to phenomenology and remove my biases. I grappled to keep in mind these two stories did not represent the entire stories of farmers in this particular county, but why did I feel like I could assume so? I noted an enormous contrast between the two sets of interviews and the dichotomy within the state. During his interview, Michael discussed how he felt like Georgia was divided into two parts: north and south. I began to feel the division between the east and west within my interviews. As I examined my journal entry later, I questioned if I projected my personal need to help people on Nick and David. I also questioned how researching the topic of water scarcity for my literature review helped encourage my assumptions that all participants would experience water scarcity issues:

> As a reflect on my initial feelings from my interviews with Nick and David, I question how reading articles for my literature review on some water scarcity crisis, like Cape Town South Africa, encouraged my assumptions that all participants would have issues with water scarcity and water availability. (9/3/2018)

If Nick and David felt water was not an issue on their farms, I should not have compared the two sets of farmers. With my questioning of the project, I wondered if my frustration entered the

interviews with Nick and David. Did it affect how forthcoming they were because their interviews seemed to lack the problems of my earlier interviews with Taylor, Michael, and Chris? From the use of reflexivity, I noted I needed some assistance in coding these two interviews so that my feelings remained separated from analyzing the data.

Critiquing the Liaison Role of the Researcher

Before entering into the study, I acknowledged my role as a researcher was to collect and analyze data and I recognized that bracketing and reflexivity would help maintain the validity of this study. I had 10 farmers who I never met before who were going to help me in this process. I anticipated I would record interviews and attempt to work out emerging themes. I assumed bracketing and reflexivity were applied to the participants' interviews, but I realized examining how I gathered the data was what I needed to question.

I appreciated all the participants for opening up their lives and personal spaces to share with me details of their lives not necessarily all related to this study. Therefore, through reflexivity, I noted I felt a personal connection with these farmers and felt responsible to best report their experiences:

> I felt like I was in my family member's home! Is it strange that I felt like I should have hugged Robert's wife before I left? They were such welcoming and nice people! This experience has left me more personally invested with these farmers than I thought I would be. (9/21/2018)

As I reflected on my entry, I noted I should be careful to separate my personal and sincere feelings toward the participants to have an unbiased report of results. I noticed in the data collection process through interviews involved taking participants' information and experiences, and I assumed it was the nature of collecting research:

> I assumed conducting interviews was a straightforward process where I would ask the question and naturally, the participants would answer and a conversation would take place. Meeting new people is not awkward for me because in my former jobs, but I never

> considered the comfort level of the participant. I assumed because we were on their farms or in their homes they would feel comfortable, but as soon as the recorder is brought out, a wave of hesitation seems to take place. I need to do a better job of making the participants feel more comfortable. I will share some of my personal information on the record. (8/24/2018)

Although participants signed a consent form that allowed me to use their interview information as data, I assumed my role was to take information without necessarily having to give information outside of the purpose of the study. I realized in my journaling how the level of self-disclosure varied with the amount of information and could affect the readiness of giving information by a participant. After Chris' interview, we had nearly 60 minutes of unrecorded conversation on Chris' farm. Another graduate student, Chris, and I had conversations about our families, where we grew up, and what we wanted to do in the future.

> Chris sat back, looked over his fields while we enjoyed the breeze, out of the car we had been in for hours. We sat in near silence. This is not uncomfortable silence like I would have assumed while sitting with a stranger because after our interview and his invitation into his lifeworld, we seem more connected (8/24/2018).

I found participants Taylor, Nick, Chris, Stephen, Kyle, and Robert were interested in my personal interests such as what career paths and education that I pursued. I asked participants to share their experiences with irrigation and discovered when I altered the interview format, to share my personal information at the beginning, participants appeared to be more relaxed in the interview setting. During the one-on-one interviews, the only personal questions I asked were related to demography such as age, years of farming, how he/she learned to farm, and information about their land and crops grown. After the first interview, I adapted subsequent interviews where I disclosed some personal information to the participants in the study.

The first three interviews I conducted were on the same day in various counties. After the first interview, I noted in my journaling how the first participant was obliging to participate in the interview, but he was eager to start his daily work duties. On another interview day, one

participant had a lengthy, unrecorded conversation with me outside his house, before the interview took place in his home:

> This interview was challenging. I got the impression I was not trusted. This interview did not feel welcoming. When I asked basic questions about irrigation, he seemed frustrated that he had to explain how aspects of irrigation worked. I feel like my lack of knowledge on irrigation does not give me credibility in this situation. Who am I to ask these questions to participants? (8/27/2018)

I struggled in analyzing the data from this interview when I coded. The advantage of keeping my journal was my notes on how I felt during and after this interview, which provided some space to recognize where my potential bias might lie. I also noted in this particular interview, it was physically representative of the interview process: before the participant revealed any personal information, I had to exchange my personal information before entering his home, as a form of admission. This particular interview was the shortest in length, 20 minutes because much of the conversation occurred before the participant allowed me to audio record him. I questioned how I was expected to get or take information about people without sharing personal information about myself. I questioned whether the lack of my knowledge of agriculture and farming prohibited this participant for sharing his irrigation experiences.

Acknowledging the Role of Gender during Data Collection

At the beginning of this research process and study, I acknowledged my position as a student and researcher. I attempted to bracket out my initial assumptions and acknowledge my position in the research project as a student of a land-grant university, collecting data. I recognized how my environment and past experiences would inherently influence how I interpret the experiences of my participants, even if I tried to remain objective. I tried to remove my assumptions and bias to the best of my ability, but what I could not remove is my gender. My gender is indicated by my first name, though it used is sometimes used for a man's name. It is in

the pronouns associated with emails and documents sent to people involved in this study. My gender is noticed in my physical appearance before I speak when meeting a person for the first time. I question how my gender affected the data collection process and how everyone, not only participants, treated me during this study based on my gender:

> I wonder how my gender affected these interviews? I am only a few years younger than a few of the participants and wonder how open they feel to sharing their issues on their farms? Does gender help with gaining information compared to someone of the opposite gender? Would a participant be more inclined to share personal information with a particular gender? (8/27/2018)

My natural attitude is not to frame my experiences from a woman's perspective, but I struggled with how I can separate my gender from my framing because it is part of my identity. When out in the field collecting data in rural areas, I identified myself as a researcher but would have jarring moments where I identified myself as a woman-- alone in a rural area with no connection to anyone in the area. My gender hit me when I attempted to use GPS on my phone but had no cell signal. Before this point, I never considered my safety and the position I was putting myself in to collect data. Was this even safe? As a woman, I know I have to be aware of my safety but would a male researcher feel the same way? As a female researcher, I drove on-site to the farms of male farmers whom I never had before and had minimal communication via a text message. I noted in my journal:

> Outside of a research setting, this [collecting data] does not seem to be a wise decision. I am alone, I do not know the men I am meeting and I have no cell phone signal. I am meeting men for the first time and will possibly be alone in these settings. Is this a good idea? (8/27/2018)

Farming is a male-dominated field in Georgia, and I questioned how my gender affected the way I felt and reacted with participants during interviews that I was not aware of before. I was self-aware of my lack of knowledge on irrigation, but I never assumed that my gender would be a factor in research because it was merely a demographic detail of who I am. This assumption is

what I wrestled with during the study because I realized being a woman and framing how I see the world, and how the world sees me, cannot be separated, even though I thought it could.

As my interviews progressed, my cell phone signal was stronger in the areas I visited, which also seemed less remote than my earlier interviews. Out of the ten interviews, I was alone for five, in three of the interviews a male undergraduate student accompanied me, and two were with a female professor and a male extension agent. Although in my journaling, I noted my safety, it is essential I recognize most participants welcomed me in their private spaces and shared their personal stories, at most importantly, made me feel safe and comfortable. They extended their knowledge and also wanted to link me with other women in agriculture in their communities, and encouraged me to continue my educational pursuits.

CONCLUSION

Introduction

The purpose of this qualitative study was to employ a phenomenological approach to photovoice and examine the experiences farmers have around water use and irrigation. As water availability intensifies amidst the current "Tri-State Water Wars" coupled with the decrease of Georgia farmers, examining the experiences of farmers is critical to ensure their individual perceptions are accurately captured and integrated into the larger discussions around water use and conservation. Phenomenological experiences look at everyday events to find meaning (van Manen, 2014), and this study used the specific phenomena of irrigation to explore the individual experiences of farmers through photovoice and one-on-one interviews. The entry point of conversation with the participants was crop irrigation and its association with irrigation technology and technology adoption. In phenomenology, the description of lived experiences can be expressed in narratives or vignettes (van Manen, 2017b), and in this study, the vignettes were photographs accompanied by the participants' descriptions in their semi-structured interviews. As Heidegger postulates, phenomena are brought into being through our living in the world and the phenomena cannot be separated from our world (Vagle, 2018). The phenomena of irrigation were affected by the farmers' experiences in their environments. As a result, the farmers revealed other experiences concerning irrigation pertaining to their livelihoods. This chapter connects the collected data back to the following research objectives, which guided the development and completion of this study:

RO1: To examine farmers' lived experiences within the framework of phenomenology to provide insight into the individual decision-making processes of farmers regarding water use and water efficiency.

RO2: To identify issues that have an impact on farmer's irrigation practices.

RO3: To examine the influence a phenomenological approach has on the researcher as it relates to collecting and analyzing data, and reporting results on farmers' lived experiences.

This chapter is organized into six sections. The first three sections address the three research objectives respectively. Each research objective is supported by select emergent themes from the data. Therefore, the first three sections are as follows: (1) RO1 is supported by the theme, *reflecting experiences through imagery*; (2) RO2 is supported by the themes, *facing barriers to farming*, *mitigating farm stress*, and *preserving farming heritage*; and (3) RO3 is supported by the themes that emerged from examining the role of the researcher through a phenomenological approach to the study, which include *questioning the research project*, *critiquing the liaison role as the researcher*, and *acknowledging the role of gender during the data collection process*. The fourth section details implications for the theoretical framework and practice, followed by a section that addresses recommendations for future studies. The sixth and the final section is a summary conclusion.

Phenomenological insights cannot be predicted and are similar to gifts, which an individual cannot plan or anticipate (van Manen, 2017b). Therefore, this inductive study had results that are supported by prominent concepts of phenomenology; these include reflection, symbolism, absence, and imagination that were not originally addressed within the review of literature in Chapter 2. These phenomenological concepts helped demonstrate the direct

challenges faced by the farmers concerning irrigation and irrigation decisions while helped reveal indirect challenges the farmer faces to their livelihoods

Expressing Experiences through Imagery (RO1)

In the foundational work of Edmund Husserl, he described how images have the ability to express alternate meanings. These images are like symbols; by which they carry meaning:

> In this case, the images, just like symbols, bear a phenomenological characteristic of their own. They are charged with a *responsibility*. They not only carry with themselves the presentation of the signified object, they also refer to it as <to> that which is supposed to be meant. They divert interest from themselves and seek to turn it away, as it were (Husserl, 1904/5, 2005, p. 58).

The use of imagery throughout the study takes an active role with the photographer/participant, the subject in the photograph, and the physical photograph. The pictures were used, in conjunction with the participants' narratives, to convey the meaning of their lived experience during their interviews. Some participants found their photographs were symbolic of the irrigation experience, as Brian described how his struggle to take pictures was similar to the struggle he experienced in the growing season, represented in his photograph titled, "drowning" (Figure 5). The use of imagery in photovoice initiated a conversation based on irrigation experiences of the individual farmers, as well as encouraged the disclosure of additional stories and assisting in the development of other emergent themes, and other indirect challenges the participants faced in farming.

Figure 5.1

Brian's only image captioned, "Drowning."

Phenomenologist Jean-Luc Nancy described how the imagery of land does not open itself to us but instead allows us comes to in and puts the viewer within the space created (Nancy, 2005). The active space created recognized by phenomenological approach encouraged participants to access their lifeworld captured within the imagery, while they described their lived experiences. The use of photovoice in this study allowed participants to capture their lived experiences and share them with me without taking away from their daily task-filled routines.

Through the discussion of their lived experiences, participants indicated they were visual people; they used eyesight and vision to assess their crops and soil daily, watch the weather, and look at the sky for rain clouds. The participants also used their metaphorical vision to see potential in technology, possible solutions to issues with technology, the farming community, while foreseeing hypothetical obstacles and their futures. Using imagery with farmers to explore their lifeworlds was appropriate in this study because it helped them recall experiences from four to eight weeks before taking photographs as well as past or childhood experiences. The images

helped with recall like Husserl's writing of images serving as "engines of memory" (Husserl, 1904/05, 2005, p. 58). The ability to look at and observe land for the farmers is incorporated in their daily lives and is heavily involved with decision-making around water use and water efficiency with like: "What do I do?" and, "Should I water?" These results suggest the use of visual imagery in research methods can be helpful for the participant to recall the past, prior situations, and recent or distant memories.

The participants reflected on their imagery produced in their photovoice project to express their lifeworlds during interviews. Husserl used the term lifeworld to describe the world in which the human experience and phenomena take place (Vagle, 2018). Participants used their photographs to reflect on the events and experiences they had lived through when capturing the photographs. For some participants, the opportunity to look back and enjoy their fields and crops was a new way of looking because when they captured their photographs, they were too busy to enjoy them during the growing season. Phenomenology is concerned with an individual's experience and how these experiences are meaningful, which people are sometimes not aware of (Sturgess, 2018).

During the interview process, the semi-structured interview guide included a question related to missed opportunities for a photo, where they were asked to describe the image they wished was captured. The participants' responses included missed photographs and also imagined scenarios and experiences. Each participant's photograph or construction from their imagination was access to their singular experience based on the phenomena of irrigation, which allowed me to access to understand their individual experiences. Imagination as a type of perception and experience is a concept supported by the writings of phenomenologist Maurice Merleau-Ponty. Merleau-Ponty believed the imagination added to the depths of our perception

and give individuals access to being of self, others, and the world (Mazis, 2016). These single individual imagined photographs or images, were access to the farmers' experiences. The inclusion of constructed and imagined photographs allowed the experiences of participants who did not participate in the photovoice project or who missed photo opportunities, to share their lived experiences with me. Participants reflected on their photographs and explained how their photographs were similar to how they looked at their crops when trying to decide what they need. The participants looked toward the future in the decision-making in the crops with irrigation, the next growing season, and years to come. The examination of farmers' lived experiences within the framework of phenomenology included expressing lived experiences in lifeworlds, reflection, symbolism, and imagination, suggest there are multiple ways to explore participants' experience regarding their decision-making processes with water use and number of decisions they make on their farms. The results suggest participants' decision-making was highly personal to the context and needs of the farmer and their farms.

Issues that Impact the Farmer (RO2)

The range of issues that impact the farmers' irrigation decisions varied from each participant, but collectively could be assessed within the themes *mitigating farm stress*, *preserving farming heritage*, and *facing barriers to farming*. Through the interview discussions based on their images and photographs, participants demonstrated diagnostic capabilities described by experiences with their fields and crops. These capabilities were conveyed into their personal lives with the maintenance of their mental health in dealing with stress and practicing various methods of stress relief. Participants frequently discussed mitigating farm stress through irrigation and the adoption of irrigation technology. Their decisions around water use and water

efficiency were related to how they adopted irrigation on their farmland through irrigation equipment and technology.

Participants described the adoption of irrigation on their farms as a way to preserve their farming heritage by using it as a form of investment for their family's future and a type of insurance for their farm in case there was a lack of rainfall. Preserving their farming heritage meant promoting their credibility in the community and facing the public's perceptions of farming. Participants consistently described how people outside of farming did not understand how much water it took to farm. They felt misunderstood because by the nature of relying on the natural resources for survival, they were good stewards of the land. Participants described the importance of being a good steward of water but found it challenging, because it required money to afford irrigation technology and the lack of technology promoted waste. The topic of uncertainty was a common issue in all participants' interviews including uncertainty of new technology and the Tri-State Water Wars that impacted their irrigation practices. Chris, who lived in the southwest quadrant of Georgia was afraid of what the future held with irrigating his crops and that his irrigation would be shut off, "We're afraid that one day it's going [to] be said, 'you know you can't turn that pivot on cause you done used so many gallons'…" Participants discussed the uncertainty of the future not only in water policy and availability but also the uncertainty to pass down their farms.

During their interviews, participants discussed their photographs and how they faced barriers in their farming practices that affected their decision-making regarding water use and water efficiency. These barriers included limited cell phone service, changing agricultural policy, public utility reliance, and the price of chemicals. The lack of cellphone service emerged as a significant problem for the majority of participants including not having any access on their

farmland and having delayed signals. Not having cellphone service restricted the decision of farmers to not adopt or rely on a technology that requires this connectivity. Participants discussed how electric companies would limit their access to electricity through the process of blackout times when their electricity would be turned off as well as "peak" times when they were encouraged to use irrigation during varying times of the day or night. Agricultural policy related to organizations such as the Environmental Protection Agency (EPA), Georgia's Environmental Protection Department (EPD), and political climate of the Tri-State Water Wars affected how participants made decisions on where to put irrigation on their farms. The participants also expressed barriers to the increasing cost to chemicals that was a necessity of their crops' health. Many noted if there were better commodity pricing for their crops, they would invest more in irrigation technology. Commodity pricing emerged naturally in conversation and was an indirect challenge that affected their livelihoods and making financial decisions, while being tied to irrigation was equated with survival.

Irrigation practices caused stress with the amount of resources it consumed including time and money, but paradoxically, irrigation was used to help ease stress. Farmers were willing to adopt new technology to help their practices and the land but had difficulty reconciling the challenges associated with manmade structural complexities. Farmers discussed the uncertainty of their livelihoods in the short and long-term capacities discussing plans in for next year's growing season and the ability to pass on their land to family or any farmer's ability to start in the industry. The discussion of photographs during interviews, encouraged facets of the irrigation experience to emerge, to better understand the scope of direct and indirect issues the farmers were facing with water use. These results are similar to the study by Kings and Ilbery (2015) that examined the aspects of farmers' environments to understand the totality of their everyday

environmental experience. Using irrigation for the entry point of conversation allowed the farmers' complex challenges to emerge and reveal the broader societal and structural issues related to their practices.

Phenomenology and the Researcher (RO3)

I was influenced by a phenomenological approach when collecting, analyzing, and reporting results for this study. Phenomenology influenced how I collected data by using reflexivity, altering the photovoice methodology, and acknowledging how my gender could positively or negatively affect the participant's interviews. When analyzing the data, a phenomenological approach helped me find emerging themes from a researcher's perspective and allowed me to engage in reflexivity. Reflexivity was vital in analyzing data, so my personal feelings, initial reactions, and assumptions were critically accounted for to hone in on the participant's experiences with the phenomena of irrigation. As I was reporting results, the phenomenological concepts of absence and imagination encouraged me to look at the data more holistically when reporting results. When looking at all the findings in the study, I realized the issues on the farmers' irrigation practices and decisions associated with irrigation extended beyond the survival of the crops but the farmer's survival.

The results from this study suggest the photovoice method needs to acknowledge and account for absence when collecting images from participants or the lack of photographs submitted by the participants. The results of this study suggest photovoice as a method needs to be a more intentional research process. In future photovoice studies, researchers should consider participants imagined images in substitution for photographs during the interview and focus group stages. The results suggest the researcher should inquire about the absence of pictures to encourage conversation with participants and possibly reveal more experiences related to a

phenomenological question. Intentionality and thoughtfulness should be applied with studies involving farmers over a growing season need to account what works best for their schedules and demands on their farms.

Collecting Data

For this study, I collected data from photovoice projects, one-on-one interviews, and reflexive journaling. I made some adjustments to the photovoice method when collecting data to align with aspects of phenomenology. These included altering the training sessions and omitting the SHOWeD technique initially designed in the interview guide. During one of the interviews an extension agent was present. In my observations of this interview, I believe the presence of the extension agent adversely affected the interview, specifically because the participant would turn to the agent in an effort to affirm his answers or seek additional information to answer the questions asked during the interview. The involvement of an extension agent could affect the findings or the level of freedom a participant felt they could express. Although the level of comfort between a producer and an extension agent might help with the interview process, it is imperative that a neutral discursive space is available for the experience of the participant to emerge.

A phenomenological lens required alterations in the photovoice process that differs from commonly referenced photovoice literature. Although training needs to be tailored to fit a community's needs and goals (Novak, 2010; Wang & Burris, 1997), many photovoice studies point to the importance of training sessions (Novak, 2010) and within these sessions, brainstorming ideas for photographs (Teti et al., 2018). In Novak's (2010) study, participants were trained on how to use a camera, what to include in subject matter, how to participate in the photovoice process, and the researcher suggested potential subject matter. It was critical in this

study, based on phenomenological concepts, the value in the individual's experience was upheld. Therefore, I did not give examples of subject matter so that participants' remained unconcerned with satisfying my research needs. Not giving example of subject matter to participants is supported in the foundational research of photovoice. Wang and Burris (1997) noted, training needs to help the participants expand a community's assets, not be restricted with strict guidelines. Through the application of a phenomenological approach in this study, it was vital the photographs were participants' interpretation of the prompts they received and the individual experiences surrounding irrigation and water use. The participant's individual lived experiences captured in a photograph and sometimes the absences of photographs were important data to include, not a participant questioning the quality of their photograph. It was essential to exclude examples of photographs because it would take away the power of the participant's ability to take a photograph and detract from the importance to capture experiences. Focusing on the aesthetics or seeking to perform the researcher's given examples in photovoice projects limits the potential and abilities of the photograph and the photographer/participant. It restricts the potential of the photograph by only serving to be a description and reinforces the lack of creativity or ability that is stereotypically associated with marginalized groups of people (Shankar, 2016).

Some photovoice practitioners and studies follow the SHOWeD technique (Bulla & Steelman, 2016; Wang, 1999; Woodgate, Zurba, & Tennent, 2017) or variations of the technique (Novak, 2010; Teti, 2018) when interviewing participants to describe their pictures and analyze their photographs. Teti et al. (2018) identified nine photovoice studies that employed the SHOWeD technique or variation during interviews with participants about their photographs. The utilization of the acronym in discussions with participants' photographs can encourage them

to critically reflect on the photographs (Wang, 1998; Wang, 1999; Wang, Yi, Tao, & Carovano, 1998). The technique involves asking the questions: What do you See here? What's really Happening here? How does this relate to Our lives? Why does this problem or strength Exist? What can we Do about this (Wang, 1998; Wang, 1999). After the first interview, I realized this technique seemed too forceful to get answers out of the participants and chose to omit it. This interviewing technique was removed because participants developed a different approach to handle, look, and reflect on their pictures similar to a study by Sutton-Brown (2014). Its omission coincides with the phenomenological writings of van Manen (2014) who described how the phenomenological question should impart in the researcher a sense of wonder and openness to the researched phenomenon, while this wonder should help explore conversation. As participants discussed their photographs, it progressively led to other stories, issues, and what two participants referred to as personal their, "soapboxes." Letting participants discuss what was most relevant in their experiences was a benefit of using a semi-structured interview guide. The participants were limited in time, and it was essential to let participants look at their work and decide what was important, the meaning behind the image, or what they were attempting to capture or not capture in their work.

Through practices of reflexivity in my field journal, and through constructivist grounded theory, the theme, *acknowledging the role of gender* during data collection emerged. My gender was considered a factor when collecting the descriptions of the lived experiences of farmers. I struggled with removing my biases concerning my gender because being a woman was part of my identity and how I framed the world and was all I had ever known. It is uncertain whether my gender affected how open participants were with disclosing information or perhaps my gender encouraged the sharing of information. Reflexivity helped me recognize the various challenges

farmers were faced with outside irrigation because I was aware of my assumptions and all farmers' issues might not be related to water scarcity and irrigation.

Analyzing Data

Using a phenomenological approach to the study influenced how I analyzed the data with the use of reflexivity in the research process. I practiced reflexivity in my journal to assist an analyzing the data and remove as much of the assumptions I was aware of before the research commenced. It was essential to acknowledge how my assumptions, initial feelings from interactions with participants, and the research process could affect how I interpreted results. Three themes emerged from a self-analysis of my reflections in the study including (1) *questioning the research project*, (2) *critiquing the liaison role as the researcher*, and (3) *acknowledging the role of gender during the data collection process*. I was challenged to practice reflexively by examining my assumptions, initial feelings, and questions during the research process. When I analyzed the data, I recognized the *themes of the researcher* to perform my coding better and remove my biases. I triangulated my coding with another graduate student as well as discussed the challenges of the interviews with my professor and principal investigator. I tried to adhere to the literature since the researcher should not bring their bias into the study and preconceptions need to be neutralized so that they do not affect the object of study (Lopez & Willis, 2004).

Reporting Results

A phenomenological approach influenced how I reported results by highlighting the phenomenological concept of absence and imagination. Absence is repeatedly evident in the study through reporting results by listening to the absence of sounds in interviews and accounting for the lack of photographs submitted by participants. This study does not attempt to

explain why images or sounds were absent but acknowledges there was an absence because phenomenological questions do not seek to attribute meaning to the lifeworld (van Manen, 2017c). Phenomenologist Merleau-Ponty refers to silence as not nothingness but the absence of sounds (Frers, 2013). The lack of sound within the study has value in understanding how to understand the lived experiences of the participants. Silence within interviews allowed for some participants to reflect and refer back to answering questions previously asked in the one-on-one interviews. The absence of sounds is a form of communication with the world of sounds (Frers, 2013), and this silence encouraged me to critically listen in the space where the interviews occurred.

Absence in photovoice. One of the disadvantages of using photovoice was a participant's personal opinion to decide what was included and what was excluded from the photovoice process (Wang & Burris, 1997). Wang and Burris (1997) compare the exclusion of data is similar to what questions should be included or excluded in a questionnaire. In the review of the literature, the absence of photographs in photovoice data collection was addressed by Novak (2010), but only referenced their omission due to the lack of consent by the subject or images that could implicate or embarrass other people within the photos. Plunkett et al. (2013) stated how restrictions on consent were the cause of the absence of photographs, such as photographs taken of a child without the permission of an adult.

Future photovoice studies need to refer to the original studies performed by Wang and Burris (1997) to highlight the importance of absence within a photovoice study. Wang (1999) discussed the absence in a woman's life signifying it was essential to look at what was left out in a woman's life rooting back to photovoice's feminist theory foundations. In the Wang and Burris (1997) photovoice study of rural Chinese women's health, the authors wanted to explore what

health issues were being overlooked or ignored in a patriarchal society. Wang and Burris (1997) stated the importance of looking for the absence in the Chinese women's life, yet photovoice studies seem to lack to account for this in collecting data. Because there are multiple ways to maintain fidelity to the original photovoice method (Sutton-Brown, 2014), researchers need to have intentionality in the photovoice method as a research process and consider what is missing or absent from the studies.

Implications

Theoretical Framework

The theoretical framework of phenomenology, photovoice, and postmodernism used in this study has implications for theoretical frameworks used in future studies. After answering the research objectives and identifying the singular narratives of the farmers, the question lies in what agricultural communicators and professionals in Extension should do with these results. The Theory of Planned Behavior is added to the framework as a plausible next step to continue exploring communication research and practice.

Using the framework of phenomenology, postmodernism, and photovoice helps to set the foundations for future quantitative studies with the addition of the Theory of Planned Behavior. The Theory of Planned Behavior postulates that an individual's intentions to perform a behavior can be predicted from the attitudes toward that specific behavior, subjective norms, and perceived behavioral control (Azjen, 1991). The components of the Theory of Planned Behavior can provide insight into participants' intentions to adopt irrigation scheduling technology. Based on the theory's components and this study's results, the revised framework with the Theory of Planned Behavior can be applied to better understand how farmers adopt technology.

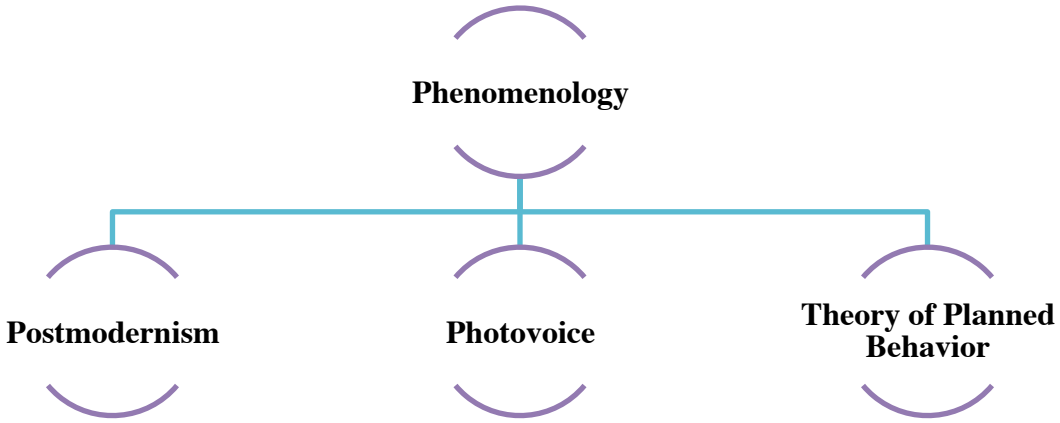


Figure 5.2

Revised Theoretical Framework

Theory of planned behavior. The Theory of Planned Behavior has three independent determining factors of intention to perform a behavior. The first factor includes the attitude toward the behavior or the degree to which an individual has favorable or unfavorable consideration of the behavior in question. The second factor includes subjective norms or social pressure to perform or not perform behavior. The third factor is the degree of perceived behavioral control or the ease or difficulty to perform a behavior, which is similar to one's self-efficacy (Azjen, 1991). According to Ajzen (1991), "The more resources and opportunities individuals believe they possess, and the fewer obstacles or impediments they anticipate, the greater should be their perceived control over the behavior" (p. 196).

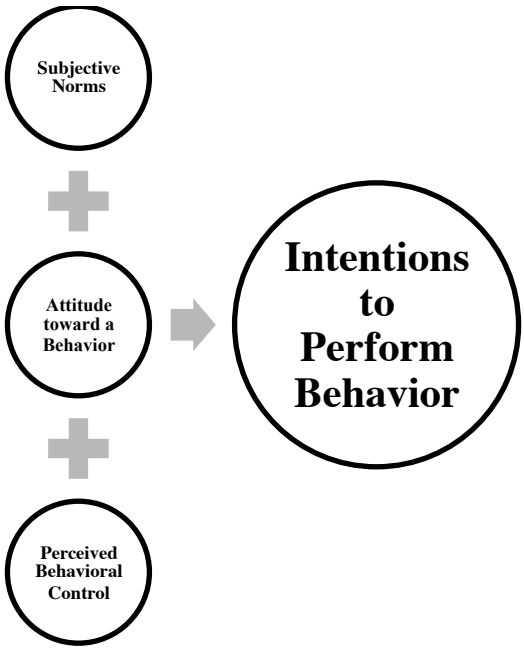


Figure 5.3

Theory of Planned Behavior (Ajzen, 1991)

The components of the Theory of Planned Behavior are evident in the current study's findings, including attitudes toward a specific behavior, subjective norms, and perceived behavioral control. The attitudes toward the behavior of technology adoption were demonstrated in participants' descriptions of their decision-making about investing in technology. For example, participants decided not to adopt technology because of lowered commodity prices and the increasing price of the technology. Other attitudes included the hesitation in adopting new technology due to past experiences and the dissatisfaction with their investments as Kyle explained:

> I've become a little bit cautious, even cynical, about when you hear some of the new technology and it's the latest and greatest and this is the most wonderful thing in the world and easy to operate and then when you go price it, it's pricey, and when you go to operate it, it doesn't work as advertised.

Although some participants described negative attitudes toward technology adoption, other attitudes toward technology adoption were positive. Participants described a positive attitude toward adopting irrigation technology because it assisted in maintaining their positive mental health. Participants discussed how irrigation scheduling technology helped to mitigate their daily farm stress and technology adoption provided a "peace of mind" and "taking the emotions out of irrigating."

The second component of the Theory of Planned Behavior is subjective norms. Subjective norms were demonstrated when participants described how their relational networks assisted their decision-making around irrigation. Subjective norms include social pressure and in this study, were from family and others in the farming community. Some participants discussed seeking advice about irrigating from more experienced family members, while others described looking at their neighbors' farms to see if they were irrigating their fields. Participants also discussed an overall uncertainty with technology and the amount available was challenging to navigate. Social pressure has the potential to ease the uncertainty of technology, especially if a family member or neighbor had previously adopted technology.

The third component of the Theory of Planned Behavior, perceived behavioral control, is evident in this study's findings. Perceived behavioral control of technology adoption was demonstrated when participants discussed little control surrounding indirect issues that impacted their irrigation decisions, including manmade structural complexities. Participants discussed low levels of perceived behavioral control by describing limited access to a cell phone signal and when dealing with the electric company, which regulated when and how much electricity they could use. Because of the lack of perceived behavioral control, some participants described not relying on irrigation scheduling technology that needed a cell phone signal to operate. Low

levels of behavioral control were described by participants because they wanted to be better stewards of water, but discussed how adopting water efficient technologies required more money. The need for more money circled back into the conversation when discussing commodity prices and the lack of the farmers' ability to control them.

Practice

Previous studies seek to understand the public and consumers' perceptions, farmers with technology adoption, and water saving behavior through various behavioral theories and approaches discussed in Chapter 2. As an atheoretical approach (LeVasseur, 2003), phenomenology focuses on the individual experience with phenomena allowing what is most relevant to the participant to come to the forefront of the research process. Phenomenology allowed the issues and themes to emerge naturally instead of forced within a theory. Phenomenology recognizes the researcher examines the individual experience of each participant and allows the potential to see if others have similar experiences, to better understand the collective human experience. Phenomenology does find individual experiences but does not claim to speak in general for people (Drescher, 2014).

The results from this study suggest no one set of comprehensive technologies such as soil moisture sensors, can be encouraged as a solution to water efficiencies with equal adoption and usage. As technology becomes more advanced and developed, it is pertinent that university Extension helps navigate what options could be best suited for their residents, not by preconceived assumptions of the farmers' needs. Moreover, as irrigation scheduling technologies address water use, the results of this study suggest other indirect challenges affect decision-making around water and farming use not related to technology. While it would be ideal for extension agents to practice a type of bracketing or removal of personal assumptions, delving

into the needs of each of their farmers is unrealistic across a state with 159 counties and highly diversified commodities with varying sizes of production farms and operations. The results of this study propose academic institutions of research and University Extension should consider how the individual experiences of residents in each county will vary and yet might share similarities based on a phenomenological approach. Before encouraging and suggesting a practice, technology, or product, recommendations include a phenomenological approach is taken to understand the needs of its community members and beginning a conversation in communities.

Intentionality needs to be addressed in how we obtain research and that as researchers we do not continually produce studies, with putting our agendas first before the needs of the community. As researchers, we must to take into account the needs of the farmers', otherwise studies that seek to understand technology adoption or practices will not adequately address the more substantial imminent challenges faced by the farmer. Phenomenology is a widely discussed philosophy, yet the ultimate goal of the phenomenology of practice is to act with thoughtfulness in our everyday professions and lives (van Manen, 2017b). A phenomenological approach could be a useful form of communication between institutions and the people they serve.

Recommendations for Future Research

The results of this study propose some recommendations for future research. The current study only examined the first two phases of photovoice to assess in detail how the application of phenomenological concepts influenced each step of the research process. The final phase of photovoice, the sharing of photos with a group or focus group session, promote dialogue in large and small group discussion, and to have these issues and concerns reach policymakers (Wang, 1999), is not detailed in this study but is recognized as a critical step of photovoice. In future

studies, the examination of how a phenomenological approach is applied to the focus groups session(s) might contribute to additional findings.

Based on the findings in this study, future research could examine farmers' perceptions of the lack of unity within the state of Georgia. As Michael discussed, "It's common knowledge that in the state of Georgia, it's almost like two states." The division was described between communities in agriculture and urban communities or northern populations near Atlanta, the state's capital. Prospective studies can examine how the University of Georgia, with campuses throughout the state, can better unify the relationships between these areas through university outreach and Extension. Further research can include studying the public's perceptions of farmers throughout the state of Georgia. The results suggested participating farmers felt misunderstood by the populations outside agriculture; therefore, studying what people perceive their ideas of farming could assist in communicating all sides and stories.

Future research is recommended in the practice of photovoice as a research method and how it can be altered in communities lacking access to technology or the submission of photographs. The results of this study suggest if resources are limited or participants are unable to submit photographed images, a critical phenomenological element to include is the construction of an image through imagination which can take the form of past experiences, future worries or fears, or wishes. The act of constructing visual imagery as a photograph should be encouraged in that not all moments could be captured due to time, inconvenience, or past events that can not be translated into the present, yet remain relevant to the participants' lived experiences. The use of a phenomenological approach to photovoice can be applied to areas of research or data collection in both Western and non-Western communities where researchers need to be sensitive and intentional when working with a community and their cultures. Future

studies with limited access to cell phone connection or camera technology can still use the description of visual imagery to help participants' experiences be captured as data.

Further recommendations from the results of the study include studying the relationship farmers have with organizations, such as the Environmental Protection Company. Future research could examine how governmental organizations communicate with farmers in a community and further study risk communication in the political science sphere. Many factors are identified that relate trust with political science and risk communication including honesty, willingness to disclose information, dedication, and confidence in the government's preparedness (Gamhewage, 2014). In the realm of governmental regulation, recommended studies should examine rural infrastructure since participants demonstrated behaviors that they are willing to adopt and use technology, yet do not have access to cell phone services to connect to these app-based technologies.

The results of the current study suggest the participants used irrigation scheduling technology to mitigate stress around making decisions on timing and the amount to irrigate. Applying these results into the Theory of Planned Behavior, researchers can better inform risk communication. The Theory of Planned Behavior is synthesized into a component of risk information seeking and processing model to assist in preventive health behaviors (Griffin, Dunwoody, & Neuwirth, 1999). Risk communication is a two-way, multi-directional process involving a community as stakeholders (Gamhewage, 2014). The application of the Theory of Planned Behavior in the revised framework from this study suggests future studies should examine forms of risk communication that will help farmers with stress, if and when they lose access with the irrigation scheduling technology or water supply.

Conclusion

The participants in this study described times where they worked long hours, continually faced with decisions around their farm and practices. They described the feeling of being on-call 24 hours a day to tend their livestock or crops, while also balancing the demands of their business, equipment, and families. The participants made recommendations to modify the soil moisture sensor technology from the research study to fit the needs of their farms. These farmers demonstrated adaptive tendencies and problem-solving capabilities throughout their interviews. Because the participants regularly dealt with concerns on their farms, including those of irrigation, their impending concerns might be overlooked, dealt with privately, or not noticeable to their community or Extension. The use of a phenomenological approach allowed their individual experiences to be maintained throughout the research process to capture their personal experiences adequately and helped better understand the phenomenon of irrigation. In phenomenology, researchers are not studying the individuals but how a particular phenomenon is experienced in their lifeworlds (Vagle, 2018).

Social science research incorporated into larger interdisciplinary projects can give value in the projects, including revealing other aspects outside the initial focal point of a study, such as technology adoption. In this study, issues surrounding mental health, the longevity and ability to pass down family farms, and how commodity prices influenced decisions emerged, not just whether a farmer would adopt irrigation scheduling technology. Postmodernism recognizes the importance of these individual farmer narratives; negating one story can express the story of many adequately. Postmodernism supports that knowledge is generated at the local level, not from scientists or institutions. The farmers have the experience, knowledge, and insights of their crops and land that could be used to solve critical agricultural issues including water

inefficiencies when a space for conversation is created. The results of this study suggest the use of photovoice helped capture farmers' experiences and aid in expressing their various experiences of irrigation. Farmers' experiences of irrigation varied, but the single independent experiences gathered help inform how a collective group experienced irrigation. These singular experiences help researchers make the phenomena more understandable (van Manen, 2014).

This study sought to refer to the writings of significant phenomenologists to add to its validity of practice and literature. The application of phenomenology as an approach was used to understand the experiences of farmers and assisted in deconstructing photovoice as a methodology. Each participant's experience was vocalized through the expression of lifeworlds, reflection, imagination, and the acknowledgment of an absence. The use of visual data collection like photovoice was an appropriate format to use with farmers who were visual people and relied heavily on their eyesight in their everyday experiences.

This study seeks to help fill a gap in the literature that exists with the photovoice method focused on water use and irrigation decisions and adds to the literature on photovoice. The study's results suggest how a phenomenological approach can help preserve the experiences of the farmers. Their experiences can help communicate to Extension and university partners the extent of the issues and underpinnings of decision-making around irrigation, technology adoption, and challenges associated with the livelihoods of being a Georgia farmer. A phenomenological approach worked for this study but might not work well with other salient issues, locations, and populations. A phenomenological approach allowed multiple singularities of the experiences of farmers to be maintained, but did not lead to the representation of all irrigation experiences. The experience of the participants in this study did not make a general claim about the Georgia farmer nor the national and international livelihood of farmers.

The use of smaller stories gives a starting point for researchers to continue to try to understand irrigation scheduling and what drives decision-making on when and how much to irrigate. Technology and tools can enhance irrigation efficiencies and water conservation, but it will not resolve the water conflicts or produce additional fresh water supplies (Manganiello, 2017). The addition of policy changes is necessary with the help of technology to address these issues with water usage (Manganiello, 2017). Before a policy is put into place, the voices of the farmers and their knowledge need to be considered.

This study allows researchers who are not exclusive to the social sciences to understand the perceptions of farmers. In addition, it contributes and informs to the development of messages for producers and consumers related to irrigation practices, equipment, and technology adoption. The study began around the topic of irrigation scheduling technology adoption, but the results demonstrated a deeper and more complex set of phenomena related to the farmers' lives and their livelihoods. The farmer's experiences hold value, and their perceptions are vital to holding conversations, which have the potential to create new knowledge and address significant global issues like agricultural water scarcity and the sustainability of farmers. The conversation has started in the context of this study, and it is the responsibility of researchers, university outreach, and Extension to listen and heed the experiences of individuals working, living, and maintaining agricultural communities.

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APPENDIX A

Semi-Structured Interview Guide

One-on-One Interviews

Logistics & Facilitation

Time: 1 Hour

Participants: Farmers who participated in photovoice project

Interviewer: UGA faculty & UGA grad student

- Provides overview to participant of the purpose of this interview and how it ties into photographs and the overall project.
- Provides participant with photovoice consent form (2 copies)
- Keeps times to make sure that interview stays within 1 hour time frame
- Takes notes as needed (if possible) throughout duration of interview

Materials Needed:

- IRB consent forms (2 copies, both signed, one for participant to keep)
- Audio recorder
- Participant's submitted photos printed in 4x6 size

Interview Protocol

Go over additional photovoice consent form and remind participants where they are at in the process of the project.

a. *Do you have any questions?*

b. Ask some demographic questions: *Where are you from? How long have you been farming? How old are you? What crops do you grow? [If they answer peanuts as one crop, ask what kind]*

1. *Before we begin reviewing your photos, I would like for you to take a few moments and share with me your thoughts on water usage in agricultural production, specifically in Georgia.*
    a. *What are some key issues you think about or are aware of?*

2. *If you don't mind, I'd like for you to take a few moments to tell me what this Photovoice process (not sensors) has been like for you.*
    a. *Are there any key things that stood out to you while you thought about or captured photos?*

3. Set out photos for participants to use. Any photos that have captions included in their message are noted by a red Post-It.
    - ***What are key things that stood out when you took these photos?***
    - ***What are key issues (good and bad) that you felt were important to capture?***
    - *For each of the photographs you selected, I will be asking you the same questions.*

    - *Review the time and space caption that the participant associated with each photograph.*
        a. *What do you See here?*
        b. *What's really Happening here?*
        c. *How does this relate to Our lives?*
        d. *Why does this problem or strength exist?*
        e. *How do you feel you can or cannot address this?*
        f. *Talk about when and where you were when you decided to take this photograph?*

4. Encourage the participant to discuss the photos more in detail if necessary.

5. Additional questions to cover if the participant did not address while discussing photos:
    a. *Describe your current irrigation practices on your farm. How do you typically handle irrigation on your farm?*
    b. *What would you describe as the most significant* ***barriers or obstacles*** *you face daily as it relates to irrigation practices?* ***These can be direct and indirect obstacles.***
    c. *What factors determine whether or not you choose to adopt new and emerging irrigation technologies?*

d. *What are you looking for in a technology?*
e. *What do you believe are some of the greatest challenges* ***(for you and others)*** *around water use and field irrigation?*

6. Wrap up discussion questions:
    a. *Is there anything you see in the pictures now that you did not see before?*
    b. *Is there a photograph you wish you were able to take but for whatever reason could not? If so, describe what it would look like.* If it is something that can be captured on-site, try to photograph it.
    c. *Of all the photos submitted, can you select the top three photos that you believe best represents you experiences (barriers and opportunities) with current irrigation practices?*
        i. *Please provide a brief caption for each:*

Photo deck picture IDs go below [Write photo reference number below with provided caption]

Photo Ref #:
Caption:

Photo Ref #:
Caption:

Photo Ref #:
Caption:

7. Thank participant for taking the time to contribute to project and share glimpses of their world with us.

8. Discuss the next step in project. This could be arranging the next time and date of focus group discussion.

APPENDIX B

In-person or Phone Script

In-person or phone script

As a [Cotton/Peanut] producer in _____ County, you are being invited to participate in a two-part project titled *Photovoice and Farmer Perceptions of Irrigation Practices.* The purpose of this project is to better understand farmers' and county agents' behaviors and attitudes related to existing irrigation practices and adoption of advanced scheduling tools.

If you agree to participate, you will be asked to participate in a photovoice project that consists of:

- PHOTOS: Capturing photos on your own time based on basic guidelines over the course of two weeks. Total number of photos will be 25, and should be submitted via text to a designated phone number.
- INTERVIEWS: Taking part in a one-hour interview with a researcher to discuss your captured photos and additional perceptions and thoughts regarding irrigation and water use practices. This will take place at your farm and based on your availability.
- FOCUS GROUP: Taking part in a 2-hour focus group discussion with other farmers and Extension agents to discuss results of photovoice portion of the project, as well as dig a little deeper into the attitudes that exist regarding irrigation practices and adoption of advanced scheduling tools. This focus group discussion will take place at a designated county Extension office near you.

For your time, you will be provided a $20 gift card for the interview, and a meal at the focus group discussion. And please remember that your involvement in this project is voluntary.

If you have any questions, please contact the Abigail Borron at 706-542-8913 or aborron@uga.edu.

Your participation is greatly appreciated.

APPENDIX C

Photovoice Instructions

Overview & Instructions

QUICK REFERENCE OF ALL INFORMATION

- **Project phone number** (for texting pictures or questions only): 762-499-4293
- **Timeline:**
  - **STEP 1:** July 16 - 27 -- Photo capturing (20-30 photos texted to 762-499-4293)
  - **STEP 2:** July 30 - Aug. 10 -- One-on-one interview at your farm
  - **STEP 3:** Aug. 27 - Sept. 7 -- Focus group discussion @ your county Extension office
  - ***NOTE:*** *Dates in Steps 2 & 3 are subject to change depending on harvest schedule*

- **Contact:** Abigail Borron - aborron@uga.edu / 765-412-4412

PROJECT OVERVIEW

This study takes into account the combination of recent droughts in the southeastern U.S. that has increased the demand for irrigation, increased competition for fresh water supplies, and water litigation between Florida and Georgia that has resulted in criticism of agricultural water use in Georgia. Therefore, this project is a collaborative effort by the

University of Georgia – with funding support from Mars, Inc. – to provide Georgia peanut/cotton farmers with the tools and information necessary to make better irrigation scheduling decisions with the goal of increasing the water-use efficiency of peanut and cotton production.

Therefore, we greatly appreciate your partnership in this project with UGA Extension. With your help, we want to understand how certain irrigation issues, practices, and technologies are perceived and/or dealt with throughout the growing season. You are the expert in these matters and we need to learn from you.

This project will take part in three steps: (1) photo capturing, (2) one-on-one interview, and (3) focus group discussion.

STEP 1: PHOTOVOICE

In the first step of this project, we ask that you take photos of water- and irrigation-related issues you face daily or regularly on your farm and in your field(s). The purpose of this is to show us how you see your farm and land through your own experiences. Your pictures might be crooked, imperfect, blurry—and, that is fine! Don't focus on taking the perfect staged picture--just capture the moment or issue (this project is not meant to get in the way of all the other responsibilities you have on a daily basis).

The following are questions for you to keep in mind as you take photos:

4. What are issues (positive or negative) **you face** in regard to irrigation practices or technology?
5. What are issues (positive or negative) that **other farmers face** in regard to irrigation practices or technology?
6. What other existing issues and responsibilities (**not related** to water use or irrigation) directly or indirectly affect your irrigation decisions?

How many photos? & What to do with them:

- **Over a two-week period (from July 16 - 27), please try and take 1-2 photos per day.** If you skip a day or two, or take 5+ photos in one day, that is fine. We are just looking for around 20-30 photos total.
- **Text your photos to 762-499-4293.** We encourage you to text them as you take them. This will save you time in the end, as well as help us ensure you're not having any difficulties.

> ***Note:*** *You will receive an initial text from the phone number above the morning of July 16, repeating the instructions and saving you the step of having to start the text conversation.*

STEP 2: ONE-ON-ONE INTERVIEW

After two weeks of taking and sending us your pictures, we will schedule a follow-up interview with you regarding the photos you took. This interview will be sometime between July 30 and Aug. 10 and will take place on your farm on a day and time that work best for you. During this time, we will have a few guiding questions. However, the majority of the conversation will be based on the photos you took. Our visit to your farm will most likely last 60-90 minutes.

STEP 3: FOCUS GROUP DISCUSSION

Sometime between Aug. 27 and Sept. 7, we will arrange a group discussion that will review and discuss key findings from Steps 1 and 2. The group will be comprised of 5-6 other farmer participants, and the Extension agent of each represented county. While we will try to arrange this to take place in person, we also recognize everyone's busy schedules. Therefore, we may opt for this to take place via a video conference call, where you can participate from your own county Extension office.

If you have any questions, please don't hesitate to contact the project director, Abigail Borron at aborron@uga.edu or 765-412-4412.

Again, thank you for your partnership in this project.

APPENDIX D

Qualitative Informational Consent Form

UNIVERSITY OF GEORGIA

CONSENT FORM

Photovoice & Farmer Perceptions on Irrigation Practices

Researcher's Statement

I am/We are asking you to take part in a research study. Before you decide to participate in this study, it is important that you understand why the research is being done and what it will involve. This form is designed to give you the information about the study so you can decide whether to be in the study or not. Please take the time to read the following information carefully. Please ask the researcher if there is anything that is not clear or if you need more information. When all your questions have been answered, you can decide if you want to be in the study or not. This process is called "informed consent." A copy of this form will be given to you.

Principal Investigator: *Abigail Borron, Department of Agricultural Leadership, Education, and Communication*

aborron@uga.edu / 706-542-8913

Purpose of the Study

This study takes into account the combination of recent droughts in the southeastern U.S. that has increased the demand for irrigation, increased competition for fresh water supplies, and water litigation between Florida and Georgia that has resulted in criticism of agricultural water use in Georgia. Therefore, this project is a collaborative effort by the University of Georgia – with funding support from Mars, Inc. – to provide Georgia peanut/cotton farmers with the tools and information necessary to make better irrigation scheduling decisions with the goal of increasing the water-use efficiency of peanut and cotton production.

Study Procedures

If you agree to participate, you will be asked to …

- Participate in a photovoice project, which will include:
    - Capturing up to 25 photos in and around your daily life as it relates to irrigation practices and irrigation issues (over a two-week period)
- Participate in a one-on-one in-depth interview (approximately 60 minutes) with a project researcher to discuss and review your photos, along with a personal selection of the top 3. Questions in the interview may include but are not limited to:
    - Describe your current irrigation practices on your farm.
    - What would you describe as the most significant barriers or obstacles you face daily as it relates to irrigation practices?
    - What factors determine whether or not you choose to adopt new and emerging irrigation technologies?
    - What do you believe are some of the greatest challenges around water use and field irrigation?
- Allow the researchers to audio record the interview & group meetings for transcribing later.
- Allow the researchers to take notes during the interview and group meetings

Risks and discomforts

- I/We do not anticipate any risks from participating in this research.

Benefits

The benefits to you participating in this study is that you have the opportunity to share your experiences, opinions and concerns related to irrigation or water use practices personally, locally, or regionally. Information collected from your interviews and photos, along with your ideas and guidance offered to the researchers, will inform the research team, as well as UGA Extension, how to improve client services and technology use/development.

Incentives for participation

As a participant in this project, you will receive a $20 gift card for your time. To receive this incentive, you will be asked to write your name and signature on a payment log, indicating that you received the gift card from the researcher. This information will only be shared with the business department for accounting purposes, and will not be connected to your collected data from the interview.

Audio/Video Recording

To ensure accuracy of all data collected, the interview and group discussions will be audio recorded and transcribed verbatim for analysis purposes. All transcriptions will be stored on a password protected device, and once all transcriptions have been coded and common themes have been identified, the audio files will be deleted. The final document will contain themes supported by quotes of participants in the study.

Privacy/Confidentiality

Interviews will be recorded on audio files. Participants will be identified by a code (i.e., 1-S-A) or a pseudonym (a fictional name). The identifiers will be kept during the coding process of the study. Once common themes have been identified from transcriptions, the identifiers will no longer be necessary. The identifiers will serve to keep order of the transcriptions while coding is taking place. Identifiers will also be useful when supporting the themes in the final written document for this study. All transcriptions will be stored on a password protected device, and once all transcriptions have been coded and common themes have been identified, the audio files will be deleted. Researchers will not release identifiable results of the study to anyone other than individuals working on the project without your written consent unless required by law.

USE OF PHOTOS: The final set of photos (to be taken and selected by you and others on your planning team) may be used in publications/presentations (by UGA) or promotional material (by ACFB). Therefore, as you take photos, please address privacy issues with individuals who may be represented in your photos.

Taking part is voluntary

Your involvement in the study is voluntary, and you may choose not to participate or to stop at any time without penalty or loss of benefits to which you are otherwise entitled. Your participation decision will have no bearing on any service you receive from UGA Extension. If you decide to withdraw from the study, the information that can be identified as yours will be kept as part of the study and may continue to be analyzed, unless you make a written request to remove, return, or destroy the information.

If you have questions

The main researcher conducting this study is Dr. Abigail Borron, an assistant professor at the University of Georgia. Please ask any questions you have now. If you have questions later, you may contact Dr. Borron at aborron@uga.edu or at 706-542-8913. If you have any questions or concerns regarding your rights as a research participant in this study, you may contact the Institutional Review Board (IRB) Chairperson at 706.542.3199 or irb@uga.edu.

Research Subject's Consent to Participate in Research:

To voluntarily agree to take part in this study, you must sign on the line below. Your signature below indicates that you have read or had read to you this entire consent form, and have had all of your questions answered.

_____	_____	_____
Name of Researcher	Signature	Date
_____	_____	_____
Name of Participant	Signature	Date

Please sign both copies, keep one and return one to the researcher.