A PHENOMENOLOGICAL INQUIRY INTO UNDERSTANDING UGANDAN FARMERS' DECISION PROCESS FOR FERTILIZER ADOPTION OR REJECTION:

THE ENDLESS LADDER

by

CHANDLER REID MULVANEY

(Under the Direction of Kathleen D. Kelsey)

ABSTRACT

Sub-Saharan African (SSA) countries are projected to be the second breadbasket of the world, behind the United States (Chahed, 2018). With a rising global population increased food and fiber production is imminent (FAO, 2015). Literature suggest that agricultural input (i.e. fertilizers) adoption will lead to an increase in agricultural production in Sub-Saharan African (SSA) countries (Barrett & Sheahan, 2017). As agricultural scientists and producers continue to search for methods to feed the growing global population, Uganda has been overlooked as a country with only 3.2% of its farming population having adopted mineral fertilizers (Barrett & Sheahan, 2017). With a limited understanding as to why farmers in Uganda have yet to adopt input innovations, there is a need to examine 1) What Ugandan farmers' experiences are regarding the adoption or rejection of mineral fertilizers and 2) How mineral fertilizers can be integrated into the Ugandan culture of social norms to increase adoption. phenomenological inquiry was employed to better understand the experiences and relationships among fertilizer use and farmers' perceived barriers. Thirty famers were interviewed in Uganda following phenomenological research design. The data were analyzed by (give some details here).

According to participants and the observations of the research team, the essence of using mineral fertilizers according to the Ugandan farmers was that of *the endless ladder*. Farmers are unable to use fertilizers due to a series of poverty traps caused by several factors including, 1) high costs to purchase the input, 2) inability to access fertilizers from the market, and, 3) a lack of knowledge and training regarding fertilizer application rates and timing. The essence of high-hanging fruit was used to inform recommendations for the establishment of an original model that outlines recommended interventions for in-country extension and outreach organizations such as Non-Governmental Organizations (NGO's), non-profits and the International Fertilizer Development Center (IFDC) to facilitate the adoption of mineral fertilizers among Ugandan farmers.

INDEX WORDS: Uganda; fertilizer use; qualitative inquiry; theory of planned behavior; poverty trap theory; international development.

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CHANDLER REID MULVANEY

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CHANDLER REID MULVANEY

Major Professor:	Kathleen D. Kelsey
Committee:	J. Scott Angle
	Nicholas E. Fuhrman

Electronic Version Approved:

Suzanne Barbour
Dean of the Graduate School
The University of Georgia
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DEDICATION

This thesis is dedicated to my loving parents who have supported me in every endeavor. Dad, from my time as a toddler walking the halls of Upchurch Hall at Auburn University to now, finishing my master's degree, I am thankful for your constant unparalleled support and desire to see me succeed, no matter what I choose to pursue in life. Mom, you are the greatest life-coach and continue to teach me more about life than I thought existed. Thank you for providing the strong foundation I have to serve others, be empathetic to the struggling and maintain a level of honesty that people look for but often can't find. To my brother and sister, Cameron and Katlin, thank you for you paving a path for your youngest brother and setting a quality example of what hard work looks like on the farm and in school. To Emma, thank you for your endless support and constant feedback while sharing in our love for research, agriculture education and helping farmers in African countries reach their full potential.

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CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

With a global population expected to exceed 9 billion by the year 2050, humanity needs more food and fiber with a resulting increase in agricultural productivity (FAO, 2015). As the global population continues to expand, there has been insufficient research conducted on identifying the best methods that will meet the challenges facing agriculture as a whole, especially in Africa (Connolly, Sodre, & Phillips-Connolly, 2016). Current literature suggests that African businesses and small-holder farms lack knowledge of and access to technologies and resources that can enable necessary increases in production (Connolly et al., 2016). With limited resources, imperfect markets, a lack of agronomic knowledge, and market constraints to farmers in Africa, there is a pressing need for farmers to adopt agricultural inputs in developing countries to contribute to the global food and fiber supply. (Connolly et al., 2016).

Uganda is a Sub-Saharan African country that is rapidly growing with a population comprised of mostly youth who lack the training and exposure to agriculture to contribute to economic development in this sector (FAO, 2015). According to the FAO, 31.4% of Ugandans are between the age of 10-24 years and 56% of the population is under the age of 18 (FAO, 2015). Furthermore, 72% of Ugandans work within agriculture and are reliant on the industry for sustaining their livelihood, most practicing subsistence agriculture and living well below FAO poverty levels (FAO, 2018). To prepare for the future of agriculture in Africa and meet the demand for feeding a growing global population, Ugandans need to invest in agricultural

innovations that will boost crop production and yield to reduce reliance on hunger assistance and move out of desperate poverty (FAO, 2015).

Intensification of input application is taking place throughout Sub-Saharan-Africa (SSA); however, Uganda is not part of the success story (Barrett & Sheahan, 2016). Barrett and Sheahan (2016) reported that, only 3.2% of all Uganda farmers use mineral fertilizers, which have the potential to improve crop output, build soil fertility and over time, remove layers of poverty that exist within developing countries (Chianu & Mairura, 2012). Given Uganda's beleaguered status, there is a need to investigate why and how farmers decide to adopt or reject fertilizer use within their farming practices, while examining farmers' behaviors upon learning about fertilizers (Barrett & Sheahan, 2016).

The Ugandan government and the FAO have placed an emphasis on increasing production of agricultural commodities (maize, beans, millet, rice, sorghum, ground nuts, Irish potatoes, sweet potatoes, etc.). Accompanying the call for action comes a need for the implementation of consistent fertilizer use to match the demand necessary to feed a young, hungry, and growing nation (FAO, 2015). Uganda has approximately 174,972 hectares of cultivated farmland, mostly owned and operated by smallholder farmers. However, only 0.14% of the farmland is irrigated (Barrett & Sheahan, 2017). With both the non-existence of mineral fertilizer use and limited irrigated land, Uganda is ripe for potential adoption of new technologies, including increased safe fertilizer application methods (Barrett & Sheahan, 2017).

Research has found that economic profitability is a result of increased yield resulting from fertilizer inputs and the increase of market smart subsidies throughout SSA countries (Liverpool-Tasie, Omonona, Sanou, & Ogunleye, 2017). However, there are limited studies that

have been conducted with the primary goal of discovering why and how farmers make decisions to adopt or reject mineral fertilizers, especially using phenomenological research design. (Thuo, Bravo-Ureta, Hathie, & Obeng-Asiedu, 2011). Therefore, the research reported here will describe the why and how farmers in Uganda make decisions to use mineral fertilizers.

The research reported here was structured in two separate studies. In the first study (Chapter 2), I employed a phenomenological inquiry-based research design to explore Ugandan farmers' learning behaviors associated with fertilizer use, as well as the learning process farmers' go through to adopt fertilizers, while examining the existing economic poverty traps within subsistence farming communities. The findings provided data to create a conceptual roadmap to inform outside extension and outreach agencies (NGO's, INGO's, aid-based organizations, the Ugandan Ministry of Agriculture, Animal Industry and Fisheries and the International Fertilizer Development Center) of best practices that can be employed to potentially increase mineral fertilizer use in Uganda. The data informed the development of an original model to support outside agencies in becoming more effective and efficient in representing the emic needs of Ugandan farmers' facing a set of barriers, challenges and perceived risks to adopt mineral fertilizers.

In the second study (Chapter 3), I conducted a phenomenological inquiry-based research design to explore the challenges and barriers farmers encountered when attempting to adopt fertilizers, and their motivation to use fertilizers in economically restricted regions. I explored what farmers' experiences were with fertilizers and how they experienced it in terms of conditions, situation and context. As a concluding synthesis according to phenomenological research design, I emerged the essence (a metaphor to explain the primary findings) of

participants' experiences when faced with challenges, barriers and forms of motivation to adopt mineral fertilizers. The data led to a modification of the model presented in Chapter 2 to better advise outside agencies of best practices to use when educating farmers of fertilizers. This model was underpinned by the theory of planned behavior (Ajzen, 1991).

Reflexivity Statement

I was born in Alabama and grew up on a family owned and operated cattle farm. My background in agriculture molded me into a pragmatic individual. I hold a strong epistemological stance supporting the belief that I can "find solutions to real world problems," while taking an interdisciplinary approach to collecting and examining data to reaffirm the benefit; solutions can have on the outside world (Creswell, 2018, p. 34). As a Caucasian male from the North who has worked in the international agriculture community, I continue to recognize my researcher bias that is a result of living in two sub-Saharan African countries for one year. My critical insight into agriculture has allowed me to build a sense of applied reality that can be reflected in my research. As a pragmatic researcher, I believe there are issues that can be resolved through qualitative inquiry and mixed methodology. My desire to solve problems is founded in a life-long interest in agriculture and my aim to examine the relationships that exist between humans and agriculture.

References

Ajzen, I. (2011). The theory of planned behaviour: reactions and reflections.

Barrett, C., & Sheahan, M., (2017). Ten striking facts about agricultural input use in Sub-Saharan Africa. *Food Policy,* 67, 12-25.

Connolly, A. J., Sodre, L. R., & Phillips-Connolly, K. (2016). GLIMPSE 2.0: A framework to feed the world. *International Food and Agribusiness Management Review,19*(4), 1-22. doi:10.22434/ifamr2015.0202

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Thousand Oaks, CA: SAGE.

Food and Agriculture Organization of the United Nations. (February, 2015). *Responding to the Challenges of Poverty, Food Insecurity and Climate Change.* Kampala, Uganda. Author.

Liverpool-Tasie, L. S., Omonona, B. T., Sanou, A., & Ogunleye, W. O. (2017). Maize Farming and Fertilizers: Not a Profitable Mix in Nigeria. *Agriculture in Africa: Telling Myths from Facts,*105-114. doi:10.1596/978-1-4648-1134-0_ch12

Thuo, M., Bravo-Ureta, B. E., Hathie, I., & Obeng-Asiedu, P. (2011). Adoption of chemical fertilizer by smallholder farmers in the peanut basin of Senegal. *African Journal of Agricultural and Resource Economics*, *6*(1), 1-17.

CHAPTER 2

A PHENOMENOLOGICAL INQUIRY TO UNDERSTAND UGANDAN FARMERS' EXPERIENCES USING FERTILIZERS: THE ENDLESS LADDER

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Abstract

Purpose:

The purpose of the research was to discover factors influencing subsistence farmers' adoption or rejection of mineral fertilizers throughout the Central Region of Uganda and the potential role that education could play in overcoming adoption barriers.

Methodology:

The study employed a phenomenology research design. Interview data was obtained through conducting semi-structured interviews with 30 farmers throughout the Budaka, Mbale, Tororo, and Butaleja districts in the Central Region of Uganda. The theory of planned behavior (TPB) helped to identify and explore factors influencing farmers' decision to adopt or reject fertilizers use.

Findings:

The factors that influenced fertilizer adoption included being a member of a formally recognized and registered farmer group with the Ugandan Ministry of Agriculture, Animal Industry and Fisheries. Farmers who identified as a group farmer were more likely to understand the benefits of fertilizers, while also being well-trained on fertilizer use, despite a lack of formal education. Farmers who were not a member of a farmer group were less likely to adopt fertilizers consistently due to a lack of confidence in their ability to apply it, reduced accessibility to fertilizers, and poor understanding of fertilizers in general. Those who had not adopted fertilizers felt cheated by the government, devalued by local market buyers, and victimized by the social factors that further necessitate they continue to farm with limited opportunities to embrace new innovations.

Practical Implications:

These findings inform the future design of curriculum and targeting participants for International Government Organizations (INGO), National Government Organizations (NGO), the International Fertilizer Development Center (IFDC) and the Ugandan Ministry of Agriculture, Animal Industry and Fisheries training sessions aimed at increasing fertilizer use in Uganda. In addition, U.S.-based Extension organizations could benefit from this knowledge to help further build upon this research and assist approaches to working with farmers in rural areas throughout the U.S.

Theoretical Implications:

Previous research conducted in international field settings has done little to better understand why and how farmers make decisions to adopt or reject mineral fertilizers. From a phenomenology perspective, the research reported here explains participants' social factors that interact with influential approaches to intentionally alter behaviors that may increase fertilizer use in Uganda. This research demonstrates how the TPB can be qualitatively applied to more clearly understand the decision-making process to adopt or reject fertilizers among subsistence farmers in Uganda.

Originality/value:

The research reported here provides an evidence-based approach to exploring the relationships that exists between farmers' attitudes and knowledge about mineral fertilizers and its use. Our approach led to new insights that deepen our understanding of farmers' decision-making process that may be used to inform agricultural development efforts. We explored the essence, a metaphor to explain the primary findings of producers' decision-making process to

adopt or reject fertilizers within their farming groups or individual farming practices. Challenges and barriers participants experienced when learning about fertilizers included 1) a lack of opportunity for training due to limited funding, 2) poor education, and 3) a lack of access to fertilizers. Thirty farmers participated in the interviews. They disclosed their motives for using mineral fertilizers (adoption) and deciding factors that established their decisions for not using fertilizers (rejection). their motives included a desire for increased yields, access to increased profits and a identify which included feeling a sense of worth within their community as a developed farmer who used new technology. As a result of these findings, we proposed a conceptual model for those engaged in educational outreach and Extension, including International Non-Government Organizations, Non-Government Organizations, government agencies and the International Fertilizer Development Center (IFDC) to implement in their work with Ugandan farmers.

Keywords: Uganda; mineral fertilizer adoption and rejection; qualitative inquiry; theory of planned behavior; subsistence farming.

Introduction/Review of Literature

The Need for Increased Food and Fiber Production Globally

As the global population races toward nine billion by the year 2050 it is necessary for global agricultural productivity to significantly increase (FAO, 2015). There has been insufficient research conducted on identifying best educational and Extension practices that will assist farmers in meeting the challenges facing agricultural production as a whole, especially in Sub-Saharan Africa (SSA) (Connolly, Sodre, & Phillips-Connolly, 2016). African businesses and small-holder farmers lack access to new technologies and resources that would significantly

increase food and fiber production (Connolly et al., 2016); however, African farmers face many challenges including limited financial and input resources, imperfect markets, lack of agronomic knowledge, and market constraints. Overall, there is a need to increase agricultural inputs, including mineral fertilizers, in developing countries to improve soil fertility and subsequent yields to feed and clothe the growing population (Connolly, et al., 2016).

Uganda is a rapidly growing SSA country with a population comprised of mostly youth who lack formal education and practical training in agricultural sciences (FAO, 2015). A third of Ugandans (31.4%) are between the ages of 10-24 years and 56% of the population is under the age of 18 (FAO, 2015). Furthermore, 72% of Uganda's population works within agriculture, mostly subsistence farming, and are reliant on local food production for survival (FAO, 2018). Generally, subsistence farmers lack both formal and practical knowledge to improve the quality and quantity of their produce. To prepare for the future and meet the demands of an ever increasing local and global population, Ugandan farmers must have access to best practices in agricultural production and technical innovations that will improve plant and animal production and reduce their reliance on foreign hunger assistance and other aid programs (FAO, 2015).

Need for Fertilizer Adoption

Our findings are rooted in explaining farmers' decision to adopt or reject mineral fertilizers as the need for increasing agricultural productivity globally is essential to feed nine billion people (Barrett & Sheahan, 2017). In addition, improvements in agricultural production improve national gross domestic product (GDP), which stands at $26.39 billion in 2017. Agricultural growth is predicated on expanding input use, such as mineral fertilizers (Barrett & Sheahan, 2017). Over the past 100 years, developed agricultural economies including the United

States, Europe, Asia, and regions in Latin America have converted from subsistence farming to highly mechanized practices that embraced improved technologies (Barrett & Sheahan, 2017). Through the widespread use of yield enhancing agricultural inputs, Asia and Latin American regions have reaped the rewards of improved seed technology, fertilizers, agro-chemicals and irrigation that have resulted in increased productivity in a short time (Barrett & Sheahan, 2017). In the 1970's-80's, the Green Revolution uniquely impacted countries around the world, especially those within Asia and Latin America. However, SSA countries did not participate in the Green Revolution due to a lack of universally accepted policies with national and state governments (Quiñones, Borlaug, & Dowswell, 1997), leading to a lack of development across their economies (Barrett et al., 2017).

Without an increase in inputs, including mineral fertilizers, the ability to produce enough food for the projected population will be compromised (Barrett & Sheahan, 2017). Much of the essential growth is expected to come from emerging markets in Brazil, Russia, India, China, and South Africa, more commonly referred to as BRICS nations (Connolly et al., 2016). Beyond BRICS nations, the next breadbasket for global agriculture production is projected to be in SSA (Connolly, et al., 2016). In order to meet the demand for food and fiber, African farmers must increase their rate of adoption of new technologies, including mineral fertilizers, and overcome the stigma of resistance to innovation held by developing regions of the world (Connolly, et al., 2016). However, little is currently known about the barriers to adopting mineral fertilizers among African farmers, which prompted this study.

Understanding Social Factors that Lead to Improved Production

Little is known about the social factors that lead to rejection of mineral fertilizers and other inputs that would boost agricultural production in SSA, specifically Uganda. Many nations are under producing according to data on developed nations with similar resources. For example, India, China, Niger, Ethiopia, and Ukraine all produce yields of 25-30% of what an average developed country produces annually (Connolly, et al., 2016).

Consistent fertilizer use across the African continent is low compared to other regions of the world (World Bank, 2018). According to Kelly, Naseem, Reardon and Yanggen (1998), African farmers use less than 1% of total global fertilizer application and less than 2% of fertilizers used in developing countries, resulting in 29.1% of the world's land mass using little to no fertilizers to enhance crop protection. . Despite having one of the highest soil nutrient depletion rates in the world, Ugandan farmers' use less than 1kg of fertilizers per year (Henao & Baanante, 2006) while fertilizer use has proven to be beneficial outside of Africa by increasing over 50% of India's grain production and increasing the world's cereal production by over one-third of its previous production capacity during the Green Revolution (1966-1985) (Kelly, Naseem, Reardon, & Yanggen, 1998).

In order to meet the global demand for agricultural products, there must be a green revolution in SSA (Chahed, 2018). If such a green revolution is to occur, African farmers must adopt best practices, including mineral fertilizers, to improve soil fertility and enhance agricultural production (African Development Bank Group, 2018; Quiñones, Borlaug, & Dowswell, 1997).

Barriers to Fertilizer Use in Sub-Saharan Africa

Limited fertilizer availability, a lack of supporting data on fertilizer use in African countries, and inadequate agronomic fertilizer application knowledge has created conditions for destabilizing fertilizer use in SSA (Liverpool-Tasie, Omonona, Sanou, & Ogunleye, 2017). For decades, SSA countries have attempted to implement programs that stimulate fertilizer demand (Liverpool-Tasie et al., 2017), including, but not limited to, Extension services to manage soil fertility, subsidy programs and enhancing farmers' access to credit based programs to purchase fertilizers (Liverpool-Tasie, Omonona, Sanou, and Ogunleye, 2017). However, a majority of the subsidy and credit based programs have been unsuccessful in raising SSA fertilizer application rates due to poor national infrastructure, substandard transportation systems, poor soil quality and a lack of availability of fertilizers at the markets (Liverpool-Tasie, Omonona, Sanou, and Ogunleye, 2017).

Despite the failure of multiple fertilizer subsidy and adoption programs throughout SSA , fertilizer use was widely considered the most important input for achieving increased agricultural productivity and food security (Olwande & Sikei, 2009). The growth of agricultural productivity in SSA is far behind the fertilizer use in Asia and Latin America. Olwande and Sikei (2009) reported that Kenya was the only country that achieved a 30% increase in fertilizer use starting in the early 1990's. With few countries in Africa using fertilizers to the capacity that is needed to significantly boost production, global economists have concluded that adoption of agricultural technology among farmers in developing countries was necessary to break the chain of poverty, subsistence farming, and to feed a larger population (Olwande & Sikei, 2009). In spite of numerous fertilizer incentive programs in SSA, few studies have reported increases in

the demand for fertilizers (Christianensen & Demery, 2017), warranting the need for additional study on the barriers to adoption among farmers.

Fertilizer Use in Uganda

In 2010 Uganda reported 74,972 hectares of cultivated farmland by smallholder farmers. However, only 31,357 hectares (42%) of farmland was equipped with irrigation technology (Uganda Bureau of Statistics, 2010). With limited use of mineral fertilizers and limited irrigated land, Uganda has the potential to excel if producers adopt new technologies, (Barrett & Sheahan, 2017). According to the Uganda Country Programming Framework (FAO, 2015), Uganda has an average GDP growth of 5.2% per year and sustains a population of 34.9 million. However, only one-third of the land in Uganda is suitable for agricultural production. Despite the limitation of available land, the agricultural capacity is far from being realized (FAO, 2015). The Ugandan government and the FAO have placed an emphasis on increasing the production of agricultural commodities (maize, beans, millet, rice, sorghum, ground nuts, Irish potatoes, and sweet potatoes) and with this call for action comes a need for the implementation of consistent fertilizer use to match the demand necessary to feed the growing nation (FAO, 2015). Uganda has the lowest rate of adoption fertilizers with only 3.2% of agriculturally dependent households applying fertilizers (Barrett & Sheahan, 2017). Therefore, in order to better understand farmers' barriers to adoption and decisions for rejection of mineral fertilizers, this research aims to understand and describe the factors that contribute to fertilizer rejection.

Theoretical Framework

Theory of Planned Behavior (TPB)

The theory of planned behavior (TPB) was developed by Ajzen (1991) based on the assumption that individuals make decisions rationally while considering the implications connected to their actions in advance of making a decision that leads in a behavioral direction (Ajzen, 1991). According to TPB, a person's intentions are affected by their attitudes toward the behavior, the subjective norms that exist within society and the individual's perceived behavioral control (Ajzen, 1991). According to the TPB people are more likely to exhibit certain behaviors when they believe that they can execute them successfully (Ajzen, 1991).

This study used the TPB as a lens to frame farmers' decisions and actions toward mineral fertilizer adoption or rejection. According to the TPB a person's attitude (ATT) toward a particular behavior, subjective norms (SN) and their perceived behavioral control (PBC) are critical precursors to the intention that leads to behavioral change (Ajzen, 1991). TPB provides a firm argument that one's intention is a good predictor of future behavior (Ajzen, 1991). ATT is connected to one's favorable or unfavorable evaluation of intended behaviors. Subjective norms are often referred to as the individual's perceived social pressure to perform critical behaviors. TPB is comprised of beliefs and social expectations that are motivated to comply with how the individual believes they are able to execute the behavior (Ajzen, 1991). Therefore, all of the components are critical to understanding Ugandan farmers' behaviors in relationship to their decision to adopt or reject fertilizer use.

Through the application of Ajzen's theoretical model, INT is typically exhibited more positively through attitudes, social environments and the confidence of individuals' when

performing a new behavior (Ajzen, 2011). Furthermore, the more expressed INT is made, the more probable one is to perform a behavior. In our study, INT concerns the intention to adopt or reject fertilizer use. Therefore, the strengths of TPB is the applicability to a variety of behaviors in different contexts (Ajzen, 2011; Meijer al., 2015). The TPB theory has been confirmed for usefulness and validity through several meta-analytic studies (Armitage & Conner, 2001; Godin & Kok, 1996). For our study, the TPB provided a lens to frame how social norms were established by farmers within the family and within social groups. According to the TPB, Ugandan farmers' acceptance or rejection of fertilizers served as a function of perceived usefulness or harm to their respective farming practices.

Purpose and Objectives

The purpose of the study was to describe factors influencing farmers' adoption or rejection of mineral fertilizers throughout the Central Region of Uganda.

Methods

Population

Thirty criterion-selected participants agreed to participate in the study by completing a one-hour face-to-face interview at their farm or at the sub-county building within their respective villages. The criteria used to select participants included input from the International Fertilizer Development Center staff (IFDC), the Ugandan Ministry of Agriculture, Animal Industry and Fisheries to randomly select 30 subsistence farmers in the Central Region of Uganda. Farmers were selected by the two groups based on who had not received formal training from IFDC on how to use fertilizers. IFDC staff identified 22 chairpersons of registered farmer groups in the Central Region of Uganda and eight farmers who had no association with a registered farmer

group. Key informants were used to identify the participants as members of the community of interest. . Utilizing key informants also helped us to establish rapport and trust among participants before the interviews took place. The University of Georgia Institutional Review Board provided approval through the following study number: Protocol ID#STUDY00006415.

Research Design

A phenomenological research design (Van Manen, 2014) was used to capture the *essence* (a metaphor to explain the primary findings) of the phenomena and better understand the "meaning of a phenomena for those involved" (Merriam & Tisdell, 2016, p. 5-6). A phenomena is "an event or a lived-through experience as it shows itself or as it gives itself when it makes an appearance in our awareness" (Van Manen, 2014, p. 65). Accordingly, phenomenology is employed to explore issues and problems from a holistic stance that captures the lived experiences of participants (Creswell & Poth, 2016). Examination into real-world issues is needed because researchers sometimes fail to identify the correct variables used to measure those silenced voices within research populations using survey methods (Creswell & Poth, 2016). Moreover, phenomenology was used to allow us to understand *what* and *how* participants experienced the central phenomenon and bring that experience to light by analyzing themes that were based in the shared experiences of the participants (Van Manen, 2014). The central phenomenon addressed in this study was Ugandan farmers' perceptions of mineral fertilizers and the existing barriers that limit increased adoption. Utilizing this research design, we emerged the structure of participants' experiences using verbatim descriptions of *what* they perceive to be barriers to fertilizer use and *how* they have experienced fertilizers in various situations,

conditions, and contexts, leading to the essence of that experience (Creswell & Poth, 2016). The essence is a metaphor used to elucidate the primary findings.

Data Collection

Instrumentation

We team developed a semi-structured interview protocol to facilitate a naturalistic conversation with the farmer, assisted by an interpreter when necessary. The interview protocol used the phenomenological research design, while applying key insight from the literature to inform the appropriate selection of questions. We developed a set of open-ended questions that focused on the participants' perspectives of fertilizers, experiences using or not using fertilizers, barriers to using increased fertilizers and the motivation to use fertilizer.

Use of Interpreter

The use of an interpreter was required to conduct research in the Central Region of Uganda. The IFDC in-country staff provided a professional interpreter who assisted the interviews by following along with a copy of the interview protocol to ensure that all questions were asked and answered appropriately by each participant. Eight farmers required no additional assistance from the interpreter. However, the remaining 22 participants required varying degrees of assistance when communicating their perspectives to the researcher.

Interviews

Upon securing informed consent from the participants, we conducted semi-structured, face-to-face, in-depth interviews with 30 participants during the month of October 2018. Interviews were located on the participants farms or at the local sub-county building within their

respective districts. The interviews were recorded using an electronic recorder. Interviews were then transcribed by the researcher and sent to the translator for member checking purposes.

Analysis

The following steps were taken to ensure procedural steps closely resembled the phenomenological research design (Creswell & Poth, 2016; Moustakas 1994; Van Manen, 2014) for ensuring trustworthiness and dependability.

1. Determine the research question and define the significant phenomenon. This was accomplished through a literature review and consultation with those who had worked in the region.
2. Data collection from participants used face-to-face interviews. Participants were asked a series of 25 questions with a focus on better understanding what and how farmers have experienced using fertilizers and barriers to adoption .
3. Verbatim transcripts were then sent to the interpreter for verification (member checking). No statements were changed, indicating the validity of initial data collection. Transcripts were not sent directly to the participants due to the inaccessibility to email.
4. The thirty verbatim interviews were loaded in Atlis.Ti (Saldana, 2015) and line-by-line coded for significant statements. that provided an understanding of how farmers experienced fertilizers.
5. Significant statements were then clustered into five themes to emerge the essence of what and how farmers experienced the phenomena (Creswell & Poth, 2018).

Quality Control

Quality control was enhanced by engaging participants in the research by (doing what?) can you discuss what you do to include members? Conversations with IFDC staff, etc. To ensure anonymity, we assigned pseudonyms to all participants and reported the findings as a composite profile to reflect individual assumptions and further enhance anonymity (Creswell & Poth, 2016). To address credibility and validity, participants were engaged in the research process and their quotations were included in the findings to establish truth-value (Tracy, 2010).

Researcher Reflexivity

I was born in Alabama and grew up on a family owned and operated cattle farm. My background in agriculture has molded me into a pragmatic individual. One who has a strong epistemological stance supporting the belief that I can "find solutions to real world problems," while taking an interdisciplinary approach to collecting and examining data to reaffirm the benefit; solutions can have on the outside world (Creswell, 2018, p. 34). As a Caucasian male in the international agriculture community, I continue to recognize my researcher bias that is a result of living in two sub-Saharan African countries for one year. My critical insight into agriculture has allowed me to build a sense of applied reality that can be reflected in my research. As a pragmatic researcher, I believe there are issues that can be resolved through qualitative inquiry and mixed methodology. My desire to solve problems is founded in a life-long interest in agriculture and my aim to examine the relationships that exist between humans and agriculture.

Findings/Results

Our findings focus on farmers' perceptions of fertilizers and their decision-making process that led to behavioral change, resulting in adoption or rejection of mineral fertilizers on their respective farms. Farmers were split into two groups; those who identified as a member of a farmer group within their local subcounty (n=22) and those who identified as independent farmers' without the support of a farmers group (n=8). A farmer group in Uganda is characterized by members who pay dues and then participate and reap the benefits of new information, sharing plots of group farmland, and access to an internal savings and loan group. Tables 1 and 2 list participants' pseudonym, district, age, educational level, literacy level, and type of fertilizer used.

Participant Demographics

Table 1

Group Farmers

Pseudonym	District	Age	Education[abc]	Literacy[d]	Fertilizer Use[e]
Zaharah	Tororo	53	S4	Both	Organic
Asha	Tororo	52	P7	Both	Organic
Esther	Tororo	51	S4	Some	Mineral
Ami	Butaleja	55	None	None	Organic
Rabea	Tororo	31	S3	Both	Mineral
Sarama	Butaleja	47	Bachelor	Both	Both
Abby	Mbale	N/A	S3	Some	Both
Sabah	Butaleja	30	P7	None	Both
Sadah	Mbale	N/A	P5	None	None
Halah	Butaleja	46	P3	None	Mineral
Abdulla	Mbale	34	S2	Both	Organic
Aaden	Mbale	58	P6	None	Both
Noah	Tororo	59	Bachelor	Both	Mineral
Abraham	Butaleja	35	P3	Some	Organic
Omari	Butaleja	36	S4	Both	Both

Ode	Budaka	32	Bachelor	Both	Both
Ali	Tororo	50	S4	Both	Both
Amare	Budaka	40	P3	None	Mineral
Kwame	Butaleja	48	S2	Some	Both
Zane	Budaka	75	S2	Some	Both
Zakai	Butaleja	58	P7	Some	Mineral
Moses	Mbale	56	P2	None	Both

Table 2

Non-Group Farmers

Pseudonym	District	Age	Education [abc]	Literacy[d]	Fertilizer Use[e]
Kali	Budaka	27	S4	Some	Organic
Mada	Budaka	30	P7	Some	Organic
Mae	Budaka	35	P5	None	Organic
Laila	Budaka	45	P7	N/A	Both
Farya	Budaka	35	S2	Some	Organic
Caliana	Budaka	49	S3	Some	Organic
Saleem	Budaka	46	S3	Some	Both
Dawda	Budaka	64	S1	Some	Both

Note. [a]Primary school. [b]Secondary school. [c]University education. [d] Both denotes farmers' ability to write and speak fluent English, with no assistance from the interpreter; some denotes farmers' ability to speak English conversationally with limited assistance from the interpreter; none refers to farmers' inability to speak English with full assistance from the interpreter. [e] Denotes the number of immediate family members that farmers' were responsible for housing and feeding, including adopted children. [e] Both denotes farmers' use of both mineral and organic fertilizers; none refers to farmers non-adoption of any fertilizer input, both organic and mineral.

The 30 Ugandan farmers' interviewed for this study were located in the Central Region of Uganda (see Tables 1 and 2). All farmers' reported their opinions and experiences with fertilizers as a need to enhance their knowledge and capabilities to adopt new innovations. The following themes provide a composite description of what and how participants experienced fertilizers.

Overall, farmers have a long-standing notion that fertilizers are innately good, for both increasing their profits and improving the soil. When asked what they thought about fertilizers,

the term ‘high yields’ was mentioned by 19 out of the 30 farmers interviewed. In general, farmers’ perceptions of fertilizer use, both organic and mineral, was positive in terms of increasing yields and profit.

Better Together

Claim: Farmers in the Central Region of Uganda were better equipped to adopt fertilizers and other agricultural innovations when involved in registered farmer groups that enabled new learning opportunities, sharing of resources among members, and potential for receiving training from outside organizations.

Supporting Evidence: The 22 farmers that identified as a chairperson of a registered group farm (Table 1) all shared a desire to engage in additional learning opportunities to grow their knowledge of fertilizer adoption. Farmers yearned to learn more about improving their agricultural practices as was seen through the impact farmer groups had on building up subsistence farmers’ into leaders within their communities and acting as a gateway to new information. Abdullah, the chairperson of his farmer group located in the Mbale District, said that he learned about fertilizers through his group. Abdullah said, “the sharing of ideas and also, opportunities to meet other group farmers provides my group members the chance to be model farmers to go out and demonstrate to others in the community (154-158).” All 22 participants who identified as farmer group members or chairpersons of the farmer group reported the value of farmer groups and the increased opportunities that came from being an active member. When asked how being in a group was helpful, Zakai responded through the interpreter by saying, “He says he’s recognized. He can speak in public. He has been given an audience. He is respected

publicly in the village as a chairperson. Even, he says he has developed financially. It has helped him to keep time and he is now the foreseer of the group (71-72)."

Behavioral Change Begins with Farmer Groups

Claim: The cultural identity of Ugandan farming necessitates the family or large groups of people be a part of making decisions, prior to any changes being adopted in farming methods.

Supporting Evidence: Previous findings suggested that farmers in Uganda benefited from farmer groups by having greater access to information that resulted in more improved productivity and adoption of new technologies, such as fertilizers (Adong, Mwaura & Okoboi, 2012). When asked how they made decisions, 14 of the 22 group farmers responded by saying that they all 'sit and discuss,' prior to making any decisions. When asked how he makes decisions, Abdullah, the chairperson of his farmer group, responded by saying, "It is a joint decision. I am the head of the family but when it comes to the farm, we make decisions as a family or group (373-374)." Farmers relied heavily on the group members to provide quality information and updates regarding the use of new innovations, such as fertilizers. The type of learning and advancement as a group farmer was expressed by Ode, "We realize as farmers during this dry season, when you do apply those fertilizers, there is a way it helps us even when it is dry, the crop can receive that small water. Mostly these days when our crops are in a flowering period those fertilizers do help us in the absence of rainfall (197-200)."

Because of the 22 farmers' (see Table 1) exposure to farming groups and subsequent farmer-to-farmer networking and external training, the participants grew their knowledge of fertilizers and were able to implement new information gained from the groups. Before becoming a farm group member, Zane, chairperson of his group, did not believe in modern

farming practices. When asked about his thoughts on fertilizers, Zane said, “I did not even know its purpose, so it was not necessary for me to use it (113-114).” Now, as a user of fertilizers and the chairperson of his farmer group, Zane attributes his professional growth to his farming group. We found that the transformation process as a farmer is best facilitated in a group setting and is supported by Abraham who said, “In a group, if a farmer says that they have one acre of land and he wants to cultivate it, they come together and look together to evaluate and get involved to work together, help one another and shift to other areas; all working together to help the farmer (45-49).”

Farmers Need Access

Claim: Participants had limited opportunities to expand their education and knowledge of fertilizers outside of the existing community.

Supporting Evidence: Adong, Mwaura, and Okoboi (2012) mentioned that farmer-to-farmer interactions were the main source of education for farmers to learn about agricultural advancements. Formal education networks through the National Agricultural Advisory Development Service (NAADS) and local extension agents were less effective in disseminating information than that of farmer groups (Adong, Mwaura, & Okoboi, 2012). We found that all of the farmers (N=30) reported a need for increased access to information, training, funds to purchase inputs, local knowledge on how to apply fertilizers, and the appropriate location to purchase agricultural inputs. When asked what her biggest limitation was to applying fertilizers was, Sarame said, “Affordability and accessibility. My group of people (farmers) are unique but most people cannot access it. It (fertilizer) is not accessible (192-193).” With all farmers experiencing a lack of affordability and accessibility to using fertilizers, others expressed their

concern over the lack of information and training that was made available to farmers, despite being in a farming group. When asked about her limitation to using fertilizers, Caliana said,

> I am still ignorant about it. If I were to get training and learn about its benefits (of fertilizers), then maybe I can use it. Also if I were to get training and the cost was low, then I would be able to use it on my farm (51-53).

Furthermore, the lack of access to education and fertilizers was observed when farmers summarized their thoughts on why they had not used fertilizers consistently. When asked why she had not used fertilizers, Halah said,

> The problem is the cost, the expense. Also, I lack knowledge and have never been trained on how to use fertilizers and as you can see they (other farmers) just use it locally in the rice farm. Also I don't have any idea on how it affects the soil and I want to learn how to use it and then testify (to other farmers) (95-98).

All 30 of the farmers who participated in the interviews were lacking opportunities to learn about fertilizers through training. In addition, the only knowledge that was circulated within the farming groups came from farmer's experiences, thus, external knowledge was not infiltrating into rural farming communities throughout Uganda. Those belonging to farming groups (Table 1) lacked the knowledge to use their funds appropriately to access fertilizers for their group and individual farms, while the non-group farmers (Table 2) lacked the information, training and funds to make any type of advancement on their farms through the adoption of fertilizer.

Change in Farmers' Knowledge Leads to Likelihood of Behavior Change

Claim: Farmers with strong levels of intention were more likely to experience a change in behavior having gained new knowledge regarding fertilizers. Farmers' new knowledge was dependent on the farmer being trained by an NGO or within a farmer group. Those not belonging to a farming group were less likely to experience changes in behavior.

Supporting Evidence: The TPB was observed through Ugandan farmers' making intentional decisions to use and apply fertilizers on their farm (Ajzen, 2011). We found that farmers' who experienced access to increased social and environmental factors, were more likely to use fertilizers. The type of change that is shaped by intentional behavior is due to the increased level of knowledge and exposure to the benefits that fertilizers can have upon their yields (Ajzen, 2011). All 30 farmers had strong beliefs that fertilizers had the ability to increase yields and provide their households with added financial stability. However, only 19 of the 30 farmers were consistently using mineral fertilizers. The same 19 farmers also belonged to a farmer group (Table 1). When asked why he did not use mineral fertilizers consistently, Abraham said, "I am using the type of organic fertilizer I am now because it is what I can afford. But, if I had a chance to use others, I would. The challenge is the price (5-6)."

All but one of the farmers were using a form of mineral or organic fertilizer. However, 10 farmers strictly used organic fertilizer due to a lack of training and subject knowledge of mineral fertilizers. Zaharrah, a female farmer from the Tororo district, only used organic fertilizer because she lacked training in how to apply mineral fertilizers. She said, "We have not been sensitized. If there could have been somebody to tell us that the mineral fertilizer are here we would use them, but we are ignorant about them (128-129)." The 10 farmers' who did not use

mineral fertilizers lacked knowledge and training, leading to no behavioral changes regarding adoption.

Participants not belonging to farmer groups were willing to receive training regarding the use of mineral fertilizers; however, they lacked access to such. Intention to adopt can be easily remedied by providing accessible training opportunities to farmers as well as price supports for purchasing mineral fertilizers.

Conclusion & Discussion

The idea of an essence is central to Husserlian philosophy and interprets what has been laid out from an empirical point of view in phenomenological research (Dahlberg, 2006). Furthermore, an essence can be understood as the structure of essential meanings that illuminate the fundamental characteristics of the phenomena captured (Dahlberg, 2006). Therefore, the metaphor that best describes how and what farmers experienced in terms of adopting or rejecting fertilizers in Uganda is t*he endless ladder*. Like an endless ladder, farmers hoped for a quick climb to the top but the climb proved to be an endless process of adding one rung after the other, representing barriers to profitable farming. As a result of endless climbing up the ladder, farmers expressed a desire to learn, expand their knowledge, and use more mineral fertilizers in the future, however, they lacked the appropriate information to engage in intentional behavioral change to finish climbing up t*he endless ladder*.

Our findings demonstrated that farmers lacked the appropriate educational opportunities from outside agencies, such as trainings, workshops and certifications, to learn about mineral fertilizer use. In a closed environment of only learning from each other, farmers were not able to advance their knowledge about fertilizer use beyond local knowledge. Farmer groups provided

quality relationships between farmers and increased access to outside agencies that shared new information with established farmers, while providing a boost up t*he endless ladder,* leading to increased intentional behavior that could result in increased mineral fertilizer adoption.

In summary, the 22 farmers who were a part of a farmer group provided evidence that offering all farmers support in a group setting can help to propel the progress of technological adoption, agricultural and science literacy within subsistence farming communities, and promote engagement in rural, Ugandan communities. This finding aligns with Adong, Mwaura, and Okoboi (2012) who reported that targeting farmer groups is an effective vehicle for promoting access to information and value addition in markets.

Participants were willing to increase mineral fertilizer use on their personal and group farms; however, they believed that the lack of training and exposure to fertilizer application methods justified the current levels of fertilizer adoption. This finding is consistent with Barrett and Sheahan (2017) who found that there was an existing knowledge gap in Uganda with farmers who understood how, when, and where to appropriately apply fertilizers . Additionally, our findings suggest a pressing need to support farmers throughout Uganda by conducting educational needs assessments at a local level to design trainings and implement fertilizer subsidies. Needs assessments can serve to gain a better understand of the motivation farmers have to use fertilizers, while building trust and rapport within farmer groups.

Our findings reinforce the literature that involving participants in qualitative interviews is important for understanding *why* and *how* fertilizers have not been used in Uganda, while promoting predicted behavioral changes (Moustakas, 1994; Ajzen, 2011).

In conclusion, farmers who participated our study have a desire to experience behavioral change but were lacking external resources in order to build their intention to change. Upon participating in the necessary social environment to learn about fertilizers such as farmers groups, farmers can overcome their expressed challenges and participate more fully in farming practices that will result in greater yields and financial stability.

Recommendations

Based on these findings, we propose a model to address farmers' limited knowledge regarding fertilizer application, lack of access to fertilizers in rural communities, and social factors that reduce positive behavioral change. The model in Figure 2 will guide outside agencies and academics in future research to promote fertilizer adoption through intentional-based behavioral change (Figure 2).

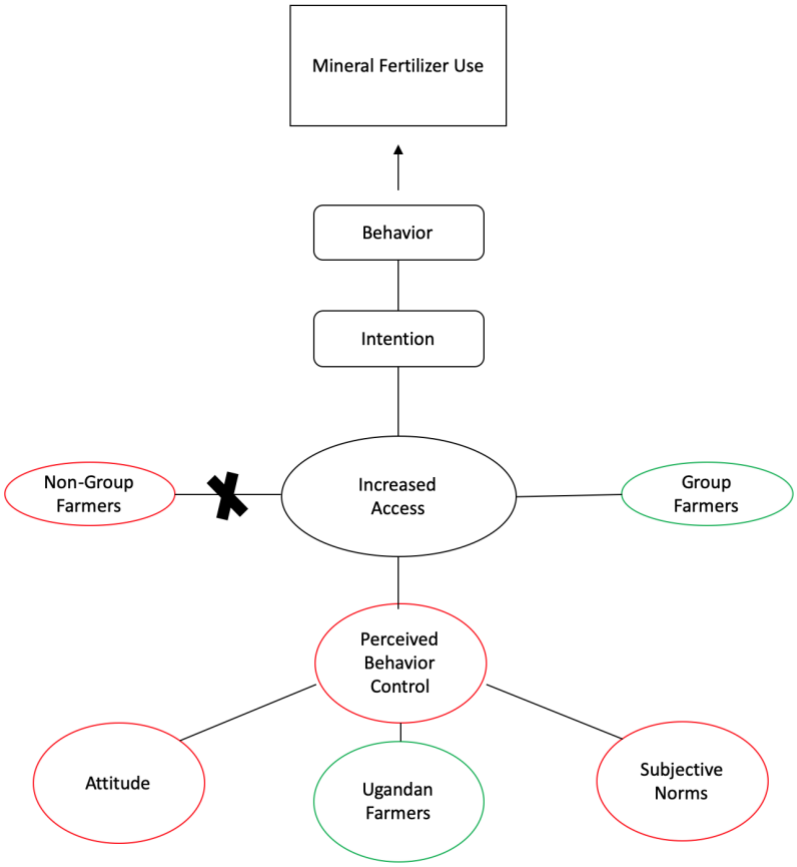

Figure 1. A model for increasing accessibility and a more fluid climb up the Endless Ladder to maximize mineral fertilizer use.

Understanding this model requires the following points:

1. *Isolate **points of access** that enable farmers to act upon intentional behaviors*.

   Participants reported that they were unable to locate fertilizers, know the appropriate locations to purchase fertilizers and were inadequately funded to purchase fertilizers for group and individual use. Farmers expressed their attitudes and subjective norms through perspectives shared on how fertilizers could benefit their group or individual farm. However, farmers were unable to act upon those levels of perceived behavioral control,

simply because they lack the appropriate access. Therefore, if farmers were provided access to new knowledge and information on where and how to buy fertilizers, this would lead to a potential increase in the number of farmers who changed their behavior and use mineral fertilizer.

2. *Promote the development of farming **groups** and increased opportunities for farmers to adopt mineral fertilizers through adapting to local needs*. We found that farmers within a group setting had been provided the right environment to learn, adopt new technologies, and gained access to appropriate funds to use fertilizers. Improving opportunities for subsistence farmers in rural Ugandan communities to become members of a group farm would positively influence attitudes, perceived behavioral control and group norms that lead to intentional behavior change. Group farms should be supported and promoted by university research, IFDC,NGO, and external agencies in Uganda.
3. *Implement participatory approaches within sub-districts to facilitate communication between **non-group** farmers and those members of farmer **groups**.* Our findings show that individual farmers without membership to a farmers group expressed overwhelming challenges and difficulties due to lack of information in order to farm effectively. Improving the dialogue between established farmers groups with those non-group farmers would enable attitudes, subjective norms and perceived behavioral control to be adjusted in a manner that leads to more informed decisions made on the farm. The community of Extension researchers are encouraged to further investigate the disconnect between group farmers and non-group farmers while attempting to observe behavioral change. Additionally, behavior change should be documented and shared to further

influence group norms through celebrating small wins and advancements in Ugandan farming communities (Azjen , 2011).

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References

Adong, A., Mwaura, F., & Okoboi, G. (2012). *What factors determine membership to farmer groups in Uganda? Evidence from the Uganda Census of Agriculture 2008/9* (No. 677-2016-46623).

Ajzen, I. (2011). The theory of planned behaviour: reactions and reflections.

Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British journal of social psychology*, *40*(4), 471-499.

Barrett, C., & Sheahan, M., (2017). Ten striking facts about agricultural input use in Sub-Saharan Africa. *Food Policy*, 67, 12-25.

Chahed, C. (2018, August 08). African Development Bank President Adesina calls for technology transfer to farmers. Retrieved August 8, 2018, from https://www.afdb.org/en/news-and-events/african-development-bank-president-adesina-calls-for-technology-transfer-to-farmers-18399/

Chianu, J. N., Chianu, J. N., & Mairura, F. (2012). Mineral fertilizers in the farming systems of sub-Saharan Africa. A review. *Agronomy for sustainable development*, *32*(2), 545-566.

Connolly, A. J., Sodre, L. R., & Phillips-Connolly, K. (2016). GLIMPSE 2.0: A framework to feed the world. *International Food and Agribusiness Management Review,19*(4), 1-22. doi:10.22434/ifamr2015.0202

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Thousand Oaks, CA: SAGE.

Creswell, J. W., & Poth, C.N. (2018). *Qualitative Inquiry & Research Design: Choosing among five approaches* (4th ed). Thousand Oaks, CA: Sage Publications, Inc.

Dahlberg, K. (2006). The essence of essences–the search for meaning structures in phenomenological analysis of lifeworld phenomena. *International journal of qualitative studies on health and well-being*, *1*(1), 11-19.

Demery, L., & Christiaensen, L. (2017). *Agriculture in Africa: Telling Myths from Facts*. The World Bank Group.

Food and Agriculture Organization of the United Nations. (February, 2015). *Responding to the Challenges of Poverty, Food Insecurity and Climate Change.* Kampala, Uganda. Author.

Godin, G., & Kok, G. (1996). The theory of planned behavior: a review of its applications to health-related behaviors. *American Journal of Health Promotion*, 11(2), 87–98. SAGE Publications Sage CA: Los Angeles, CA. doi:10.4278/0890-1171-11.2.87

Henao, J., & Baanante, C. (2006). Agricultural production and soil nutrient mining in Africa: Implications for resource conservation and policy development.

Kelly, V., Naseem, A., Reardon, T., Yanggen, David., (1998, November). Incentives for Fertilizer Use in Sub-Saharan Africa: A Review of Empirical Evidence on Fertilizer Response and Profitability. Michigan State University. Department of Economics. Working Paper, No. 70. Retrieved from http://ageconsearch.umn.edu/record/54677/files/idwp70.pdf

Läpple, D., & Kelley, H. (2013). Understanding the uptake of organic farming: Accounting for heterogeneities among Irish farmers. *Ecological Economics*, 88, 11–19. doi:10.1016/j.ecolecon.2012.12.025

Liverpool-Tasie, L. S., Omonona, B. T., Sanou, A., & Ogunleye, W. O. (2017). Maize Farming and Fertilizers: Not a Profitable Mix in Nigeria. *Agriculture in Africa: Telling Myths from Facts,*105-114. doi:10.1596/978-1-4648-1134-0_ch12

Meijer, S. S., Catacutan, D., Gw, S., & Nieuwenhuis, M. (2015). Tree planting by smallholder farmers in Malawi: Using the theory of planned behaviour to examine the relationship between attitudes and behaviour. *Journal of Environmental Psychology*, 43, 1–12. doi:10.1016/j.jenvp.2015.05.008

Merriam, S., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation.* (4t h, Ed.) San Francisco, CA: Jossey-Bass.

Moustakas, C. (1994). *Phenomenological research methods.* Thousand Oaks, CA: Sage Publications, Inc.

Olwande, J., Sikei, G., & Mathenge, M. (2009). Agricultural Technology Adoption: A Panel Analysis of Smallholder Farmers' Fertilizer use in Kenya. *Research Gate,*1-28. Retrieved August 15, 2018.

Quiñones, M. A., N. E. Borlaug, C. R. Dowswell 1997. A Fertilizer-Based Green Revolution for Africa. In: R. J. Buresh, P. A. Sanchez, F. Calhoun, editors, Replenishing Soil Fertility in Africa, SSSA Spec. Publ. 51. SSSA and ASA, Madison, WI. p. 81-95. doi:10.2136/sssaspecpub51.c4

Tracy, S. J. (2010). Qualitative quality: Eight "Big-Tent" criteria for excellent qualitative research. *Qualitative Inquiry, 16*(10), 837-851.doi: 10.1177/1077800410383121

The World Bank. (2013, April 17). Remarkable declines in global poverty, but major challenges remain [press release from The World Bank]. Author. Retrieved from http://www.worldbank.org/en/news/press-release/2013/04/17/remarkable-declines-in-global-poverty-but-major-challenges-remain

Uganda Bureau of Statistics. (2010). *Summary Report on Uganda Census of Agriculture 2008/2009.* Volume 1. Kampala, Uganda. Retrieved from https://www.ubos.org/wpcontent/uploads/publications/03_2018UCASummary.pdf

Van Manen, M. (2014). *Phenomenology of practice: Meaning-giving methods in phenomenological research and writing*. Walnut Creek, CA: Left Coast Press.

CHAPTER 3

HIGH-HANGING FRUIT: A PHENOMENOLOGICAL INQUIRY TO UNDERSTAND UGANDAN FARMERS' PERCEIVED BARRIERS TO FERTILIZER USE

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Abstract

Sub-Saharan African (SSA) countries are projected to be the second breadbasket of the world in the 22nd century (Chahed, 2018). With a rising global population, increasing food production is imminent for all nations, especially in Africa (FAO, 2015). Research has clearly documented that input adoption among farmers leads to an increase in agricultural productivity in SSA countries; however, adoption rates among this population remain low, especially in Uganda where only 3.2% of farmers report having adopted mineral fertilizers for food production (Barrett & Sheahan, 2017). With a limited understanding as to why farmers in Uganda have yet to adopt fertilizers, there is a need to examine 1) what Ugandan farmers' experiences are in regard to adopting mineral fertilizers and 2) how mineral fertilizers can be integrated into Ugandan social norms. We used phenomenological inquiry to better understand Ugandan farmers' experiences with fertilizer use, including perceived barriers to adoption. According to participants and researcher observations, the essence, a metaphor used to elucidate the findings of the Ugandan farmers' experiences with using fertilizers was *high hanging fruit*. Farmers are unable to adopt mineral fertilizers due to a series of poverty traps that were caused by 1) high costs to purchase the input, 2) inability to access fertilizers from local markets, and 3) a lack of knowledge and training regarding fertilizer use. The findings informed recommendations for the establishment of a model that outlines interventions for in-country organizations, non-governmental organizations, (NGOs), non-profits, and the International Fertilizer Development Center (IFDC).

Keywords: Uganda; mineral fertilizer use; qualitative inquiry; poverty trap theory; international development, Extension education.

Introduction

Uganda is a rapidly growing country with a population primarily comprised of youth who lack training and exposure to agricultural sciences, leading to an industry that is unable to contribute to the nation's economic, social and cultural wealth (FAO, 2015). Approximately 31.4% of Ugandans are between the ages of 10-24 years and 56% of the population is under the age of 18 (FAO, 2015). Furthermore, 72% of Uganda's population works within agriculture and are reliant on the industry for sustaining their livelihoods (FAO, 2018). Uganda has an average gross domestic profit of 5% per year and sustains a population of approximately 34.9 million (Uganda Bureau of Statistics, 2010). As one of the poorest countries in the world for over the past 50 years, Uganda is ripe with unrealized potential and opportunity within their agricultural sector (The World Bank, 2013). Since 2013, more than one-third of Uganda's citizens live below the international extreme poverty line, set at $1.90 USD (United States Dollars) per day (World Bank, 2016). Uganda is caught in a poverty trap. "Poor countries are poor because they are hot, infertile, malaria infested, often landlocked; this makes it hard for them to be productive without an initial investment to help them deal with these endemic problems. But, they cannot pay for the investments because they are poor – they are what economists call in a 'poverty trap'" (Banerjee & Duflo, 2011, p. 3).

Uganda retains a deficit in non-monetary poverty measures, such as, "sanitation, access to electricity, education, and child malnutrition" (The World Bank Group, 2013, para. 2). However, progress has been made as poverty rates have decreased during the last two decades and the overall state of the country has improved in regard to financial stability. With an increase in stability, The World Bank reported that from 2006 to 2013, poverty rates fell from 53.2% to

34.6%. The decline in poverty rates has been attributed to greater political peace, urbanization, and improvements in agricultural production, with 79% of the poverty reduction being credited to households within the agricultural sector (The World Bank, 2013). Despite the reduction of poverty, the agricultural capacity within Uganda remains unrealized (FAO, 2015).

As the backbone of the Ugandan economy, agriculture contributes over 70% to the country's export earnings (The World Bank, 2013). The Ugandan government and the FAO have emphasized increasing the production of agricultural commodities such as maize, beans, millet, rice, sorghum, ground nuts, Irish potatoes, and sweet potatoes to further lift farmers out of poverty. While the demand for crops increases, Uganda accounts for the lowest rate of adopting fertilizers throughout Sub-Saharan African countries, with a rate of 3.2% of farmers using mineral fertilizers (Barrett & Sheahan, 2017). With a call for action comes a need for effectively implementing mineral fertilizer use to increase production per acre (Barrett & Sheahan, 2017; FAO, 2015). In order to better understand farmers' perceived barriers to fertilizer use, we investigated farmers' decision making process for adopting or rejecting mineral fertilizers in Uganda. Understanding the decision-making process is important to assist NGOs, INGOs and local government officials in creating participatory oriented approaches to increase fertilizer adoption and reduce poverty in subsistence farming communities.

Conceptual Framework

To frame our study, we used Adato, Carter and May's (2006) poverty trap theory (PTT). PTT emerges when (a) an increase in earnings are scaled, fixed costs of inputs and risk creates a situation in which minimal returns on investment increase, as wealth accrues over an elongated period of time due to minimal returns; (b) lower income households are faced with limited access

to financial service, such as loans or insurance; and (c) exclusions occur within social and economic environments (Adato, Carter, & May, 2006).

Under these conditions, low income households face stalled situations characterized by low assets and unsuccessful efforts to amass wealth (Adato et al., 2006). The poor are often closed off from external opportunities, such as jobs, key contacts, quality transportation, and appropriate accommodations to pursue another form of income (Adato et al., 2006). The PTT suggests that the initially poor are trapped in persistently low levels of well-being, while initially better-off individuals are able to parlay wealth into higher levels of well-being (Adato et al., 2006). , Existing poverty traps constrain poor individuals by limiting their access capital and insurances that are key factors in reducing risk and increasing wealth (Adato et al., 2006). Furthermore, poverty traps are characterized by unstable markets with the inability to deliver appropriate financial services to the poor . In most cases, the poor will remain so due to social, cultural and economic environments that continue to disadvantage those already trapped in poverty (Adato et al., 2006).

Subsistence farmers are typically caught in poverty traps with few pathways out (Adato et al., 2006). Subsistence farmers lack connections outside of their poverty stricken social networks, which serves to further compound the cycle of poverty. Therefore, social capital does not enable a pathway out of poverty because connections (family, friends, social networks) also lack financial resources that would fortify change (Adato, et al., 2006).

The more recent poverty trap model introduced by Lade, Haider, Engström and Schlüter (2017) provided an important lens to further examine the political, social, economic, biophysical and historical settings that limited subsistence farmers in this study from breaking out of poverty.

Lade's et al. (2017) model suggests forms of input, such as lack of access to capital and insurances in developing societies control the concept of social exclusion and inequality. Per the poverty trap theory, social exclusion and inequality leads to a form of deprivation, as people are ashamed to appear in public or participate in community oriented activities (Bhalla & Lapeyre, 1997). As inequality increases, an individual's social identity becomes increasingly correlated with economic status; furthering the downward spiral for those already trapped in poverty (Adato, et al., 2006).

The markers of poverty are innately connected to one's social identity and economic status (Adato et al., 2016). Given the variables that comprise the PTT, Ugandan farmers are likely experiencing barriers to fertilizer use due to (a) high cost of fertilizer; and (b) lack of information and technical training on its use. Therefore, our findings examine the conceptual relationships that exist between Ugandan farmers' perceptions of barriers to fertilizer use through the lens of the PTT. Using a qualitative lens to observe, analyze and interpret data from interviews with 30 farmers' in the Central Region of Uganda, the hypothetical relationships between poverty and self-perception shared by farmers will be presented in an original model to inform future outreach and educational efforts.

Purpose

This study sought to describe factors influencing subsistence farmers' decision to adopt or reject mineral fertilizer use in the Central Region of Uganda. Three objectives supported achieving the study's purpose:

1. Describe subsistence farmers' perceptions of mineral fertilizers.

2. Describe subsistence farmers' barriers to fertilizer use and examine factors that contribute to poverty.
3. Develop an original model to inform future outreach and educational efforts based on the poverty trap theory.

Methods

Population

The population for the study consisted of 30 subsistence farmers in the Central Region of Uganda. The farmers were criterion selected by in country staff from the International Fertilizer Development Center (IFDC) and the Ugandan Ministry of Agriculture, Animal Industry and Fisheries. The selection criterion consisted of subsistence farmers who had not received formal training from IFDC on how to use fertilizers. IFDC staff identified 22 chairpersons of registered farmer groups in the Central Region of Uganda and eight farmers who had no association with a registered farmer group.

After obtaining University Institutional Review Board approval, we invited all 30 farmers to participate in the research by contacting them using cell phones and key informants in their respective communities. Key informant contacts helped to establish trust and rapport among potential participants.

Research Design

Phenomenological research design was used to capture the essence of the phenomena and to better understand the "meaning of a phenomena for those involved" (Merriam & Tisdell, 2016, p. 5-6). According to Van Manen, a phenomenon is "an event or a lived-through experience as it shows itself or as it gives itself when it makes an appearance in our awareness"

(Van Manen, 2014, p. 65). Phenomenology is employed to explore issues and problems from a holistic stance (Creswell & Poth, 2016). Exploration into real-world issues is needed, as often times, researchers fail to identify the correct variables underlying the phenomenon of interest from an emic perspective (Creswell & Poth, 2016, p. 45). Furthermore, phenomenology was used to allow us to better understand *what* and *how* participants experienced a central phenomenon and bring that experience to light by analyzing themes that are based in participants' shared experiences (Van Manen, 2014).

The fundamental phenomenon addressed in this study was subsistence farmers' perceptions of mineral fertilizers and the existing barriers that limit increased adoption. From this research design, we emerged the structure of participants experiences using verbatim descriptions of *what* they perceive to be barriers to fertilizer use and *how* they have experienced fertilizers in various settings, situations, and contexts (Creswell & Poth, 2016).

Data Collection

Instrumentation

We developed a semi-structured interview protocol to allow participants to actively engage in the interview process, while describing their experiences. . The interview protocol was designed following phenomenological research design best practices, primarily using open-ended questions that focused on the participants' perspectives of fertilizers, and their experiences with adopting or rejecting fertilizer use, given their current economic situation. *Interviews*

Upon securing informed consent from the participants, the principal researcher traveled to Uganda and conducted semi-structured, face-to-face, in-depth interviews with 30 participants

during the month of October 2018. Interviews were located on the participants' farms or at the local sub-county building within their respective districts.

The interviews were recorded using an electronic recorder. Interviews were then transcribed by the researcher and sent to the interpreter to validate responses during the interview process. The use of the interpreter allowed for 23 of the interviews to be completed with assistance, while seven farmers required no translation by the interpreter and were conducted in English. The interpreter was a native to Central Uganda, spoke seven languages and was trained with a bachelor's degree from Makerere University in Kampala, Uganda. The interpreter had been working as a consultant with IFDC and external organizations collecting household data with farmers in the region. The researcher mitigated any issues in the field associated with the threat of using an interpreter by observing responses by the interpreter and the participant (Williamson, Choi, Charchuk, Rempel, Pitre, Breitkreuz, & Kushner, 2011).

Analysis

The following steps were taken to ensure fidelity to the phenomenological research design as described by Creswell and Poth (2016), Moustakas (1994), and Van Manen (2014).

1. Determine the significant phenomenon of interest. This was accomplished following a literature review.
2. Collect data from participants using face-to-face interviews in country. Participants were asked a series of 25 questions with a focus on better understanding *why* and *how* farmers' experienced using fertilizers. The interviews were transcribed from the recordings.
3. Verbatim transcripts were sent to the research interpreter for verification (member checking). No statements were changed, indicating validity of initial data collection.

4. The 30 verbatim interview transcripts were analyzed line-by-line to highlight significant statements (open coding) using Atlas.ti, (Saldana, 2015) that provided an understanding of how farmers experienced fertilizer adoption or rejection.
5. The significant statements were clustered into four themes that enabled us to draw conclusions regarding the essence of the perceived phenomena (Creswell & Poth, 2018).

Quality Control

To address credibility and validity, members of the IFDC in country staff were engaged in the research process by assisting the research team in developing a rigorous interview protocol focused on uncovering the true perceptions of fertilizers held by Ugandan farmers. IFDC contributed to member checking by addressing interviewer technique in a culture different than that of the researcher. An interpreter was used and aided in 22 of the 30 interviews. The interpreter confirmed findings upon review of the transcripts.

We added participants' quotations in the findings to establish truth-value. Furthermore, to ensure anonymity, we apportioned pseudonyms to all participants and synthesized the findings into a combined profile in an effort to focus on the individual assumptions (Creswell & Poth, 2016). Finally, we established a thick, rich description of the findings that included direct quotations from participants' verbatim responses, addressing the concern for sincerity and credibility by attaining transferability of new information (Tracy, 2010).

Findings

Our findings focus on what farmers experienced while using mineral fertilizers and their perceived barriers to consistent use of them. Farmers expressed many barriers to adopting

agricultural practices that may lead to increasing wealth and shared a common interest in pursuing new farming methods that would enable more consistent use of mineral fertilizers.

All of the farmers reported farming out of necessity versus choice (N=30), as they had limited options for pursuing economic stability outside of working for a farmer or becoming a farmer by acquiring loans or small plots of land. The 30 farmers were split into two groups based on their level of education, previous exposure to fertilizers, and membership in farmer groups at the time of the interview. We classified the participants as those who were trapped in poverty (n=8) (Table 1) and those who reported more income, upward mobility, and a more stable household or "upward moving" as described by Adato, Carter and May (2006), (n=22) (Table 2). Upward moving households were considered poor from an external perspective but had reduced levels of poverty stress due to slight increases in household income.

Participant Demographics

Table 3

Farmers Trapped in Poverty

Pseudonym	District	Age	Education [abc]	Literacy[d]	Farmer Group	Fertilizer Use[e]
Kali	Budaka	27	S4	Some	No	Organic
Mada	Budaka	30	P7	Some	No	Organic
Mae	Budaka	35	P5	None	No	Organic
Laila	Budaka	45	P7	N/A	No	Both
Farya	Budaka	35	S2	Some	No	Organic
Caliana	Budaka	49	S3	Some	No	Organic
Saleem	Budaka	46	S3	Some	No	Both
Dawda	Budaka	64	S1	Some	No	Both

Table 4

Upward Moving Farmers

Pseudonym	District	Age	Education[abc]	Literacy[d]	Farmer Group	Fertilizer Use[e]
Zaharah	Tororo	53	S4	Both	Yes	Organic
Asha	Tororo	52	P7	Both	Yes	Organic
Esther	Tororo	51	S4	Some	Yes	Mineral
Ami	Butaleja	55	None	None	Yes	Organic
Rabea	Tororo	31	S3	Both	Yes	Mineral
Sarama	Butaleja	47	Bachelor	Both	Yes	Both
Abby	Mbale	N/A	S3	Some	Yes	Both
Sabah	Butaleja	30	P7	None	Yes	Both
Sadah	Mbale	N/A	P5	None	Yes	None
Halah	Butaleja	46	P3	None	Yes	Mineral
Abdulla	Mbale	34	S2	Both	Yes	Organic
Aaden	Mbale	58	P6	None	Yes	Both
Noah	Tororo	59	Bachelor	Both	Yes	Mineral
Abraham	Butaleja	35	P3	Some	Yes	Organic
Omari	Butaleja	36	S4	Both	Yes	Both
Ode	Budaka	32	Bachelor	Both	Yes	Both
Ali	Tororo	50	S4	Both	Yes	Both
Amare	Budaka	40	P3	None	Yes	Mineral
Kwame	Butaleja	48	S2	Some	Yes	Both
Zane	Budaka	75	S2	Some	Yes	Both
Zakai	Butaleja	58	P7	Some	Yes	Mineral
Moses	Mbale	56	P2	None	Yes	Both

Note. [a]Primary school. [b]Secondary school. [c]University education. [d] "Both" denotes farmers' ability to write and speak fluent English, with no assistance from the interpreter; "some" denotes farmers' ability to speak English conversationally with limited assistance from the interpreter; "none" refers to farmers' inability to speak English with full assistance from the interpreter. [e] Denotes the number of immediate family members farmers' are responsible for housing and feeding, including adopted children. [f] "CH" refers to the title of chairperson in a farming group; "S/T" refers to the title of secretary and treasurer. [g] "Both" denotes farmers' use of both mineral and organic fertilizers; "none" refers to farmers' non-adoption of any fertilizer input, both organic and mineral.

Systemic Poverty Resulted in Reduced Motivation to Use Fertilizers

Claim: Farmers in the Central Region of Uganda were unable to afford fertilizers due to lack of resources and an inability to provide for basic household needs.

Supporting Evidence: Participants expressed various difficulties they faced when attempting to use mineral fertilizers. The primary barrier was their inability to afford basic necessities such as food, water, and school fees for their children's education. Forms of poverty were observed by the principal researcher and reported by farmers. Farmers were unable to consistently use fertilizers, hire labor, and adapt to shifting weather conditions. These challenges served to sustain systemic poverty and reduced farmers' motivation to adopt new technologies beyond what they learned from their parents who were also subsistence farmers. Zaharrah, a female farmer from the Tororo District, said the following about her form of poverty,

> We lack [items needed for farming] sometimes, if we are cultivating tomatoes you need a system for spraying and watering, watering cans, those tools are [needed] for agriculture. We lack all of those things that help in agriculture. So we have to struggle in a small hole. You cannot move anywhere. Yes, if you have such things, you can help your farm, you can grow crops in a large scale because this little hole here will take you nowhere, you cannot move (371-385).

Participants felt as though they were stuck in the mud, unable to move and make any consistent changes to adopt agricultural innovations due to the lack of resources and extreme poverty that severely impact rural farming districts in Uganda.

All participants (N=30) reported feeling uncertain about how to overcome the challenges they faced to eradicate poverty in their household that would enable increased fertilizer use.

Many of the farmers (n=14) believed that fertilizer affordability was the main barrier to use. Ode, a male farmer from the Budaka District, said the following about prices impacting his fertilizer use,

> Some of the challenges [are grounded in] the prices, there are no really stable prices. We are seriously engaging in farming but the bias [of the government officials and market buyers] always determine the prices. So they [government officials and market buyers] are not even considering us (224-226).

Ode speaks to the constant fluctuation and instability in local markets throughout his community and all of Uganda. Inconsistent prices and market conditions impacts farmers' ability to account for their costs and adapt to the year-to-year needs when buying seeds, hiring labor to assist in land preparation, and factoring in additional household expenses, which take priority over purchasing mineral fertilizers. Despite a desire to adopt mineral fertilizers, some farmers (n=10) believed they were faced with corrupt government and market buyers that abused their power during peak sell-off times by draining the small savings farmers had obtained over several years.

Fertilizers Equate to Increased Yields

Claim: Participants believed that the use of fertilizers is automatically associated with increased yields.

Supporting Evidence: Despite the existing poverty that impacted all 30 participants, farmers preferred the idea of mineral fertilizer use over any additional input they had adopted in the past. When asked why they were motivated to use mineral fertilizer, Zaharrah said,

> The yield, the yield! Because people who are using fertilizers you find they are getting a bumper harvest. Some good, good harvest. Even the soil remains fertile there. The moment you apply, the soil changes and the fertility is boosted (276-278).

Zaharrah and 10 other farmers in the study believed that fertilizers increased yields when applied to a crop. Ode, a consistent user of both organic and mineral fertilizers, mentioned that when he consistently used fertilizers on his crops, he was "assured of good yields (193-194)."

Over half of the farmers (n=19) believed that fertilizers were directly associated with increased yields, despite that fact that 17 of the 19 farmers had not received any formal fertilizer training. Despite the lack of formal knowledge and training regarding fertilizer use, farmers remained confident in fertilizers' ability to positively impact their crop yields, increase profitability, and provide a boost in stature within their respective communities.

Cheated Farmers

Claim: Farmers in the Central Region of Uganda feel cheated from opportunity, fair prices and devalued by an inability to share their thoughts and be heard.

Supporting Evidence: All 30 participants expressed financial concerns but only 10 reported a sense of feeling cheated by the government, buyers from larger markets, and the consumers. Noah spoke about his personal experience being cheated by the buyers from local markets by saying,

> In fact there was one time there was a group that came and they gave us seed for soybeans and they told us they would get us a market [to sell]. So we planted and then the people disappeared. Then, we got stuck with all of this soybean in our house and had to

> sell for cheap. People got discouraged to grow soybean. Some people will use tricks to convince farmers to grow something and then cheat us into [poor] prices later (304-308).

Noah spoke to the greater poverty trap that existed within his own household. Farmers attempt to break free from a form of poverty by trusting in commodity traders but are left feeling devalued by the system that is supposed to be in place to support them. Eleven farmers cited accessibility and transportation issues that cause greater issues to their potential successes in the field. Esther, being a farmer who lacked access to transportation from the fields to the market, said the following about being cheated,

> After harvesting, those people [buyers] just disappear and they send people to come and cheat you from your products. Then, you must search for a person to buy. It was promised that the person would buy for a certain price. But when they come back, they do not remember the agreed upon price and try to cheat you (308-310).

Mada, a female farmer from the Budaka district, also experienced being cheated by buyers, saying,

> We depend on the buyers. We [farmers] don't have bargaining power because what they [buyers] give you is what you take. At the end of the day, they [buyers] are selling it at a much higher price but we depend on them [buyers] because what they say is what we take. Take it or leave it. We depend on the local methods and buyers for our crops (495-500).

Without access to markets and limited transportation availability, farmers were forced to trade with unscrupulous buyers, sustaining the subsistence economy generation after generation. Farmers continuing trust in the existing market system has resulted in a stagnant farming

economy throughout Uganda; a degraded community that lacks a voice to demand a fair price in local markets. Without rights in the marketplace throughout Uganda, farmers were further propelled into poverty, leaving no funds purchase mineral fertilizers.

No Other Way: People Are Trapped in Farming

Claim: Farmers in the Central Region of Uganda were trapped in poverty with no pathway to financial improvements.

Supporting Evidence: For all but two of the participants (n=28), farming was their only employment option. When asked why he continued to farm, Omari said, "farming is what you rely on. You get food and in the case of plenty, I sell some to earn a living (96-97)." Omari and 27 other farmers found themselves in a subsistence farming trap, with limited opportunity to escape.

For 15 of the participants, their stories begin out of the depths of poverty. Sabah, a female farmer from the Mbale District, said, "there was a moment when poverty was too much and I felt like I could hardly even afford a meal. So I was forced to go and work in the rice fields (23-25)." Fifteen of the 30 participants believed they were trapped in subsistence farming and poverty because there was no other work in Uganda and they possessed limited skills and training for work outside of agriculture. However, all of the participants expressed hope for the future, despite their reported barriers to generating wealth from farming. When asked why he continued to farm, Noah said,

> So, I know farming but the problem is we are just doing it locally. We are just doing because God has given us an ability. So, it is my prayer that God helps us, trains us and gives us new skills (21-23).

All 30 farmers were committed to growing their skills and abilities in agriculture to escape poverty. They hoped for new opportunities combined with a desire to learn new farming techniques.

Emerging the Essence

Our findings report *why* and *how* farmers perceive mineral fertilizer use Uganda; while explaining existing poverty traps that serve to keep farmers from advancing economically (Moustakas, 1994; Adako et al., 2006). Farmers who participated in this research have a desire to improve their economic status but lack external support structures to do so. Participants believe they lack the needed social environments to learn about fertilizers by expressing their desire to create more opportunity, yields and financial support for fellow farmers who are stuck in a form of a culturally bound, resource trap.

Based on our findings, we conclude that the essence of understanding a farmer's decision to adopt or reject fertilizers is like *high-hanging fruit*. Ugandan farmers perceived mineral fertilizers to be the fruit at the top of the tree, out of reach without the right set of tools to properly access and use for their betterment. Farmers continue to reach for the high-hanging fruit but are trapped in poverty, keeping them from the higher branches on the tree. Our model (Figure 2) shows how farmers in Uganda are prevented from picking high-hanging fruit as they are pulled deeper into poverty, with no pathway out.

Conclusions and Recommendations

A number of studies have expressed the need to better understand the reasons why farmers reject inputs, such as mineral fertilizers, in Uganda (Barrett & Sheahan, 2017; FAO, 2015; Adong, Mwaura, & Okoboi, 2012). Our findings recommend ways to overcome the

challenge of poverty, while examining two poverty traps that limited farmers ability to adopt mineral fertilizers consistently. Through the use of the Lade et al. (2017) model of how poverty traps are formed and sustained, we examined participants' responses to create an adapted model based on the needs of the farmers who experienced poverty firsthand.

Our findings uncovered two poverty traps, (a) resource trap; and (b) cultural trap. Both traps result from the social, economic and cultural beliefs that farmers in the Central Region of Uganda embraced (Lade, Haider, Engström, & Schlüter, 2017). Hypothetical relationships exist between the resource and cultural traps based on Lade et al. (2017) findings that suggested poverty traps were cyclical repeating and difficult to eradicate from social environments. Figure 2 provides an overview of the social, economic and cultural beliefs held by farmers that participated in the research, demonstrating that all three factors were present. Each category of farmers' beliefs (social, economic and cultural) contained connections to factors in other categories that induced poverty in households. Therefore, a farmer who has a cultural belief that his/her origin in farming determines his/her future, contains a hypothetical connection to his/her social belief that they are limited in their opportunity to grow outside of farming, in order to make a living.

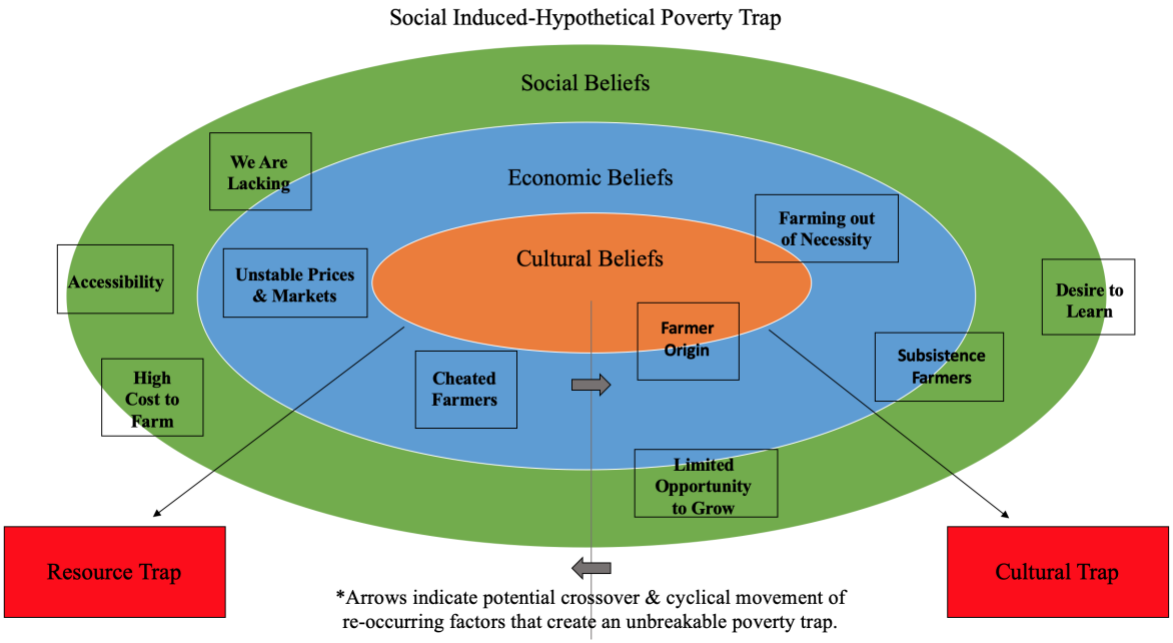

Figure 2. Social Induced-Hypothetical Poverty Trap Model

The resource trap was defined by farmers' expressed opinions that the high cost to farm, coupled with an increasing lack of access to resources such as hiring labor and purchasing quality seed, leads to a social belief held by the participants. The resource trap can be observed through the lack of assistance and accessibility to fertilizers and farmers' expressed desire to have more stable, secure and farmer-first markets. With a lack of power in the markets, farmers are left struggling to address the resource trap while continuing to suffer from economic vulnerability and financial despair, resulting in a sense of being devalued and cheated within local markets. This is due to a lack of education, limited access to funds, and unstable markets that left farmers with little motivation to adopt new practices, further repeating the cycle of poverty.

The cultural trap is rooted in farmers' belief that there was no other option for them but to continue subsistence farming to feed their household. With all 30 participants growing up in a household that was based in subsistence farming, each individual found themselves reflecting on their own life story. This reflection led to farmers noticing that throughout their life, they had been pressured to farm due to cultural, economic and social constraints that limited their opportunity to leave subsistence farming behind, despite a desire to learn about ways to improve themselves. Farmers believed they were trapped in farming with no pathway to other forms of earning an income to sustain their household. Both the resource and cultural traps served to restrict farmers' use of fertilizers consistently.

Recommendations

Farmers in the Central Region of Uganda would benefit from targeted educational programs focusing on best practices for mineral fertilizer use. Such programs can be implemented through existing extension programs such as the Ugandan National Agricultural Advisory Development Services (NAADS) and external NGOs such as IFDC. Educational opportunities serve to integrate new technology into the community, leading to economic growth, and reducing both types of poverty traps identified in Figure 2.

30% of the farmers perceived themselves to be cheated, devalued and abandoned as subsistence farmers . They believed the government had deserted the farming community, while buyers manipulated prices to cheat the farmers.

In this case, the inaccessibility to transportation, quality markets and no other options of employment for low-skilled workers, leave the farmers in an unfortunate situation. Providing educational programs to initiate farmers' rights, accessibility to inputs, farm tools to do their job

better and a voice to fight for fair prices would be the foundation for developing steps to achieve the high-hanging fruit of increased fertilizer use in Uganda.

References

Adato, M., Carter, M. R., & May, J. (2006). Exploring poverty traps and social exclusion in South Africa using qualitative and quantitative data. *The Journal of Development Studies*, *42*(2), 226-247.

Adong, A., Mwaura, F., & Okoboi, G. (2012). *What factors determine membership to farmer groups in Uganda? Evidence from the Uganda Census of Agriculture 2008/9* (No. 677-2016-46623).

Banerjee, A. V., & Duflo, E. (2011). *Poor economics: A radical rethinking of the way to fight global poverty.* New York, NY: Public Affairs.

Barrett, C., & Sheahan, M., (2017). Ten striking facts about agricultural input use in Sub-Saharan Africa. *Food Policy*, 67, 12-25.

Bhalla, A., & Lapeyre, F. (1997). Social exclusion: towards an analytical and operational framework. *Development and change*, *28*(3), 413-433.

Bunyatta, D. K., Mureithi, J. G., Onyango, C. A., & Ngesa, F. U. (2005, May). Farmer field school as an effective methodology for disseminating agricultural technologies: Up-Scaling of soil management technologies among small-scale farmers in Trans-Nzoia district, Kenya. In *Proceedings of the 21st Annual conference, San Antonio, TX* (pp. 515-525).

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Thousand Oaks, CA: SAGE.

Food and Agriculture Organization of the United Nations. (February, 2015). *Responding to the Challenges of Poverty, Food Insecurity and Climate Change.* Kampala, Uganda. Author.

Figueroa, A., Altamirano, T. and Sulmont, D. 1996. "Social exclusion and inequality in Peru". Geneva: International Labour Organisation. International Institute for Labour Studies Research Series, No. 104

Lade, S. J., Haider, L. J., Engström, G., & Schlüter, M. (2017). Resilience offers escape from trapped thinking on poverty alleviation. *Science Advances*, *3*(5), e1603043.

Merriam, S., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation.* (4t h, Ed.) San Francisco, CA: Jossey-Bass.

Moustakas, C. (1994). *Phenomenological research methods.* Thousand Oaks, CA: Sage Publications, Inc.

Radhakrishna, R. B., & Jackson, D. G. (2007). Approaches for linking markets and farmers to foster indian's rural development. In *Proceedings of the 24th Annual Meeting, EARTH Costa Rica* (pp. 1-17).

Saldaña, J. (2015). *The coding manual for qualitative researchers*. Sage.

Sigman, V. A., Chibwana, C., & Matenje, I. (1994). Reaching Malawian smallholder farmers with agricultural extension programs: A case for increased use of women-farmer groups. *Journal of International Agricultural and Extension Education, 1*(2), 35-41.

The World Bank. (2013, April 17). Remarkable declines in global poverty, but major challenges remain [press release from The World Bank]. Author. Retrieved from http://www.worldbank.org/en/news/press-release/2013/04/17/remarkable-declines-in-global-poverty-but-major-challenges-remain

Tracy, S. J. (2010). Qualitative quality: Eight “Big-Tent” criteria for excellent qualitative research. *Qualitative Inquiry, 16*(10), 837-851.doi: 10.1177/1077800410383121

Uganda Bureau of Statistics. (2010). *Summary Report on Uganda Census of Agriculture 2008/2009*. Volume 1. Kampala, Uganda. Retrieved from https://www.ubos.org/wpcontent/uploads/publications/03_2018UCASummary.pdf

Van Manen, M. (2007). Phenomenology of practice. *Phenomenology & practice, 1*(1).

Williamson, D. L., Choi, J., Charchuk, M., Rempel, G. R., Pitre, N., Breitkreuz, R., & Kushner, K. E. (2011). Interpreter-facilitated cross-language interviews: a research note. *Qualitative research, 11*(4), 381-394.

CHAPTER 4

CONCLUSIONS

Our findings suggest that farmers' in the Central Region of Uganda would benefit from increased training, access to information and technical advice on fertilizer use, in order to report any future increase in fertilizer adoption and reduction in household poverty. Additionally, the information reported here demonstrates that farmers' lacked the appropriate educational opportunities from outside agencies, such as trainings, workshops and certifications to then learn about mineral fertilizers. In a closed environment of only learning from each other, farmers were not able to advance their knowledge about fertilizer use. Farmer groups provide quality relationships between farmers' and increased access to outside agencies that can share new information with established farmers, while providing a boost up *The Endless Ladder* toward increased intentional behavior that could result in improved mineral fertilizer adoption.

In summary, the 22 farmers' who were a part of a farmer group provided evidence that offering all farmers' the guidance from a supportive environment in a group setting can help to propel the progress of technological adoption, agricultural and science literacy with subsistence farmers' and promote quality engagement in rural, Ugandan communities. This finding aligns with the research of Adong, Mwaura, & Okoboi, G. (2012), who published that targeting farmer groups is an effective vehicle for promoting access to information and value addition in markets.

Participants were willing to increase fertilizer use on their personal and group farms; however, they believe that the lack of training and exposure to fertilizer application methods

justified the current levels of fertilizer adoption. This finding is consistent with Barrett and Sheahan (2017) who found that there is an existing knowledge gap in Uganda with farmers' who understand how, when and where to appropriately apply fertilizers (Barrett & Sheahan, 2017). Additionally, our findings suggest a pressing need to support farmers' throughout Uganda by increasing needs assessment at a local level to then increase trainings, fertilizer subsidies or access to information by first attempting to understand the motivation farmers' have to use fertilizers.

The findings from this research reinforce the literature that involving participants in qualitative interviews are important to increasing the exposure of *why* and *how* fertilizers have not been used in Uganda; while promoting predicted behavioral changes (Moustakas, 1994; Ajzen, 2011). In conclusion, farmers' that participated in this research have a desire to experience behavioral change but are lacking external resources in order to obtain the intention that can lead to behavioral reform. Upon receiving the necessary social environment to learn about fertilizers, farmers' can overcome their expressed challenges and create more opportunity, yields and financial support for farmers' left stuck with their current attitudes, subjective norms and perceived behavioral controls founded in skepticism.

Therefore, we believe that the findings recommend that farmers' in the Central Region of Uganda would benefit from targeted programs that increase accessibility to knowledge, resources and trainings that would assist farmers' in using increased mineral fertilizer. Utilizing the existing extension programs such as the Ugandan National Agricultural Advisory Development Services (NAADS) and external Non-Governmental Organizations (NGO's) would be decisive

in employing new technology to further stimulate economic growth to eradicate both the poverty and cultural trap identified in figure 2.

Farmers' perceived themselves to be cheated, devalued and abandoned as they find their way to make a living in the agricultural sectors of Uganda. They believe the government and marketplace has turned their back on the farming community, while prices are manipulate alongside the farmers' for the profits of those outside the existing poverty traps suggested above. In this case, the inaccessibility to transportation, quality markets and no other options of employment for low-skilled workers, leave the farmers in an unfortunate situation. Providing educational programs to initiate farmers' rights, accessibility to inputs, farm tools to do their job better and a voice to fight for fair prices would be the foundation for developing steps to achieve the high-hanging fruit of increased fertilizer use in Uganda. Additionally, the perspectives shared by participants provided an introspective look at how to fight poverty in subsistence farming communities by increasing farmer rights in the marketplace, promoting value for the importance farmers' hold in Ugandan culture and providing access to learning opportunities to adopt fertilizers that can potentially increase yield.

The findings of the qualitative research conducted is not generalizable. However, the data collected does offer new information regarding key behaviors that lead to change or the adoption of fertilizers by farmers in Uganda. It is important to note that this research only addressed a small group of farmers in the Central Region of Uganda; therefore, further research is warranted to determine if the information collected and reported through the findings listed above are applicable to other farmers outside the Central Region of Uganda. Also, future research should test the model suggested through the use of the Poverty Trap Theory to examine generalizability

in poverty climates across Ugandan farming communities to better understand the core issues outside of fertilizer adoption or rejection.