THE CONTRIBUTION OF TRUST IN QUALITY GROUNDNUTS SEED SELECTION AND SOURCING AMONG SMALL-HOLDER FARMERS IN UGANDA

BY

Gitundu Rachel Njeri

(N50/8470/2017)

A THESIS SUBMITTED TO THE DEPARMENT OF ANTHROPOLOGY, GENDER AND AFRICAN STUDIES, FACULTY OF SOCIAL SCIENCES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF ARTS IN DEVELOPMENT ANTHROPOLOGY OF THE UNIVERSITY OF NAIROBI

2020

DECLARATION

I hereby declare that this thesis is my original work and that it has not been submitted for examination in any other institution.

Signature …  …… ….Date…9th Nov 2021…….

Gitundu Rachel Njeri

(N06/8470/2017)

This work has been submitted with our approval as University Supervisors:

Signature ……. Date---10/11/2021

Prof. Owuor Olungah

1st Supervisor

11.11.2021

Signature …… Date----------

Dr. Dalmas Omia

2nd Supervisor

Signature ……..Date----------11.11.2021----------

Dr. Esther Njuguna-Mungai

3rd Supervisor

Senior Social Scientist, International Crop Research Institute for the semi-arid tropics.

ACKNOWLEDGEMENTS

The path toward this thesis has been exigent. Its completion is thanks in large part to the special people who challenged, supported and stuck with me along the way. I would like to first express the deepest appreciation to my first supervisor Prof. Owuor Olungah who has the attitude and substance of a genius. His guidance and persistent support has made this work possible. In the same light, I would like to thank my second supervisor Dr. Dalmas Omia for his input throughout the process.

Secondly, I wish to express my sincere thanks to Dr. Esther Njuguna-Mungai of ICRISAT Nairobi for her instrumental role in this undertaking. In addition to supervising me, she's given me the opportunity to be affiliated with a great gender researcher and mentor. She accorded me the opportunity to sharpen my skills in the gender dynamics in seed systems which was part of research program. Through her, I got the opportunity to not only research the subject but also interact with people in diverse places besides attending international conferences. I would also like to extend my appreciation to the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT). This is for its logistical and financial support through the CGIAR Research Program on Grain, Legumes and Dryland Cereals (CRP- GLDC) – Gender Internship Program.

Special thanks go to the University of Nairobi for granting me a scholarship which made it possible for me to pursue my master's degree. It is a timely asset to continue investing in the empowerment of young Kenyans. To the Department of Anthropology, Gender and African Studies fraternity, thank you for your support.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

ATU Appropriate Technology Uganda

CBCC Center for Behavior Change and Communication

CGIAR Consultative Group for International Agricultural Research

CRP-GLDC CGIAR Research Program on- Grain Legumes and Dryland Cereals

FAO Food and Agriculture Organization

FGD Focus Group Discussion

GLDC Grain Legume and Dryland Cereals

HYVs High Yielding Varieties

IAGAS Institute of Anthropology, Gender and African Studies

ICRISAT International crop Research Institute for the Semi-arid Tropics

NARO National Agricultural Research Organization

NaSARRI National Semi-Arid Resources Research Institute

NGOs Non-governmental Organizations

QDS Quality Declared Seed

SPSS Statistical Package for the Social Sciences

UbOS Uganda Bureau of Statistics

WFP World Food Programme

ABSTRACT

This was a cross-sectional descriptive study on the contribution of trust in quality groundnuts seed-selection and sourcing among small holder farmers in Uganda. The study documents the role of trust in farmer's (male/female) preferences for good quality seed attributes; trusted groundnut sources and explored reasons for trust of these sources. The study was premised on Coleman's Social Capital Theory which posits that individuals are embedded in a network of social relations, values and networks that influence their decisions and actions. These values and networks were therefore, explored to frame the choices made by groundnut farmers on seed selection. The study population comprised all groundnut farmers living in Kumi, Serere, Nwoya and Dokolo Districts of Uganda. Cochran (1963:75) formula was used to determine the sample size of 385 farmers however, due to the study's purpose to only include farmers who had grown any of ICRISAT's mandate crops (sorghum, finger millet, pigeon peas and groundnuts) in the last two seasons preceding the study, the final number that was included in the study for groundnut farmers was 286. Additionally, 86 farmers were engaged in the study distributed in 8 FGDs carried out in the same areas.

Quantitative and qualitative data collection methods were employed in the study where household surveys and focus group discussions were conducted respectively. Descriptive statistical and thematic analyses for quantitative and qualitative data were conducted. Frequency tables and graphical illustrations have been used to present quantitative findings that were analyzed using SPSS while verbatim quotes have been used alongside the main themes to present qualitative data.

The findings indicate that trust, especially interpersonal trust among informal networks, is a central aspect of the seed selection and sourcing process among both male and female farmers from the North and East of Uganda. Cereal stockists were identified as the most trusted seed sources among both the male and female farmers in the two regions. This was due to their reliability in providing seeds with farmer desired attributes as well as the success farmers reported following their interactions with the stockists in the past. The physical attributes identified as part of quality seeds included; physical (color, taste and size); physiological (early maturity and ability to germinate); Genetic (high yielding, disease resistance and drought tolerance) and seed health.

The study concludes that both forms of trust identified (interpersonal and trust in systems) form a critical component of the seed selection and sourcing process among both male and female farmers from both the Northern and Eastern region of Uganda. However, interpersonal trust seems to be dominant as is elaborated in their social networks which produce the most trusted seed sources who also seem to some extent drive definitions of quality seed attributes. Therefore, the study recommends the inclusion of farmer's emic perspectives in any intervention that seeks to sustain the delivery of quality seed to farmers within the study areas.

CHAPTER ONE: BACKGROUND TO THE STUDY

1.1 Introduction

Groundnut (*Arachis hypogaea L.*) also known as peanut is an essential oilseed crop in the world (Okello et al., 2013; Verter, 2017). It's a leguminous plant native to Latin America (Didagbe et al., 2015). The crop is at present cultivated in the semi-arid tropical and sub-tropical regions of nearly 100 countries in six continents (Okello et al., 2013). This translates into crop cover of more than 26.4 million hectares with an average productivity of 1.4 tons per hectare. Developing countries hold 97% of these cultivated areas that produces 94% of the overall production (Didagbe et al., 2015).

Globally, Africa ranks second after America in peanuts production with 10 million hectares of cultivated area and produces 10 million tons a year (Didagbe et al., 2015). Despite ranking second in peanuts production, the African continent has the lowest yields per hectare (1 t/ha), compared to America (3 t/ha) and Asia (1.8 t/ha). The leading countries in the production of peanuts from Africa are Nigeria, Senegal and Sudan (Didagbe et al., 2015).

In Eastern Africa, farmers produce groundnuts mainly for economic and nutritional value (Kidula et al., 2010; Okello et al., 2013). Uganda is a major producer within East Africa, ranking 11th in production and 6th for area harvested in 2013 and 2014 (Jelliffe et al., 2018). The crop is widely grown as a legume and as an oil crop (Kassie et al., 2011). In Uganda, groundnut is one of the staple crops that is increasingly becoming a cash crop and whose production areas are also increasing (Okello et al., 2013). The crop is a major contributor to food security, income generation and the overall economic growth for agriculture-based industries in Uganda (Kassie et al., 2011). It is mainly grown in the Northern, Eastern and Southern parts of the country with the Eastern region ranking first (Jelliffe et al., 2018).

Considering the importance of this crop, solving the problem of low yields is extremely essential. Didagbe et al. (2015) identified the nature of agricultural policies, fluctuations in the market, and low quality of agricultural equipment as some of the constraints causing low yields in most African countries. Quality seeds of any preferred variety are one of agriculture's high-quality equipment that form a basis for improved agricultural productivity (Pelmer, 2005).

Over the years, the concept of quality has gained popularity amongst scholars who have approached it differently. Garvin (1984) as cited in Urrea et al., (2015), defined quality in abstract terms as the 'intrinsic' quality of a product which cannot be defined so instead people through experience learn to recognize it. Thus, studies need a way to understand and articulate how farmers recognize quality. This has been discussed later in this section under the perceived quality approach. Quality seed can play a critical role in increasing agricultural productivity as well as farmer incomes, which impacts food security. Derwisch et al. (2011) affirm this as they look at quality of seed, determining the upper limit of crop yields and the productivity of all other agricultural inputs into the farming system.

Future food security is threatened by recent climate changes that impact food production negatively. According to Lobell et al., (2008), the development of new crop varieties is a key factor to mitigating this threat. Farmers' adoption of these new varieties is however, a complex arena with several underlying ideologies. The spread of new technologies within and across farming communities is related to the structure of their social networks (Thuo et al., 2013: 340). This is because adoption is affected by social networks in which interactions of individuals affect their attitudes and behaviors toward any new technologies (Thuo et al., 2014). Following Kopainsky and Derwisch (2009), for example, in their analysis of the adoption and diffusion process of improved seed by farmers in West Africa, product adoption results from a dynamic interplay

between the evaluation of utility of improved seed varieties and trust in the quality of improved seed varieties. This conceptualization introduces the important aspect of Trust, which Derwisch et al. (2011) note to play an important role in the decision making of farmers to buy improved seeds. Building as well as maintaining trust in improved seeds thus becomes imperative to sustaining or increasing their adoption rates.

When negative outcomes are a possibility, Hosmer (1995) cited in (Urrea et al., 2015), examined trust to be one's willingness to be vulnerable to the actions of others while expecting favorable action. Trust, from recent research in information systems, is described as a primary predictor of technology usage and a fundamental construct for understanding user perceptions of technology (Li et al., 2008). Derwisch et al., (2011) state that trust involves beliefs about reliability, safety and honesty. Giddens (2013:34), looked at trust as an assurance of the reliability of a person or system regarding a given set of outcomes or events. Through this definition by Giddens (2013) therefore, trust is presented in two forms; first, interpersonal trust and second trust in systems (Agyekumhene et al., 2018). The concepts of reliability, belief in and willingness of people to be vulnerable to others that cut across all these different outlooks of trust from the different scholars could be a possibility if one examined the social networks among farming communities.

With these underpinnings, this study took trust to mean a farmer's expression of confidence in a seed type and seed source. Which meant it was about trusting both the system that delivers seed and individuals (actors) within the systems of seed delivery among groundnut farmers.

Consumer preference for certain product attributes differ from researchers' preference and from situation to situation (Derwisch et al., 2011; Urrea et al., 2015). This makes defining and quantifying the preferences of the subsistence farmer for certain attributes of utmost importance in the attempt to understand patterns of adoption (Derwisch et al., (2011). While defining quality,

farmers/informal experts focus on yield stability, resilience, resistance and low input (Urrea et al., 2015). Consumers are increasingly demanding high-quality products that they are willing to pay more for. This necessitates studies seeking understanding of quality to do so from the consumer's perspective. This is referred to as the perceived quality approach in which quality judgments are dependent on the perceptions, needs, and goals of the consumer (Urrea et al., 2015).

Perceived quality is regarded as an overall uni-dimensional evaluative judgment (Urrea, 2015). Rather than being a specific product attribute, it is a higher-level abstraction that is based on the perception of the product based on the quality attributes. An understanding into how consumers arrive at quality judgments necessitates an understanding of how quality attribute beliefs are formed by consumers. A distinction is thus formed between quality cues and quality attributes: These are defined as "informational stimuli that are, according to the consumer, related to the quality of the product and can be ascertained by the consumer through the senses prior to consumption" and the functional and psychosocial benefits or consequences provided by the product that represent what the product is perceived as doing or providing to the consumer which are unobservable prior to consumption respectively (Urrea, 2015). In other words, quality cues are the observable product characteristics that are used to infer the quality attributes (not a priori observable) that provide the benefits (Urrea, 2015).

The quality cues are therefore, what the consumer observes while the attributes are what they want. This means that at the point of purchase, consumers use quality cues to choose between a variety of products. These cues are valued due to their perceived relationship(s) with quality attributes, that is, the benefits it is believed to predict. Quality attribute beliefs can be established through either of the three ways; descriptive, informational, and/or inferential belief formation (Urrea, 2015). Descriptive beliefs are described as all those beliefs that result from direct observation,

through either of the senses, of the characteristics of the product. Outside sources, such as friends, can also be used as a basis for belief formation in which a consumer accepts information about the quality attributes as provided by them, this constitutes informational beliefs. Lastly, inferential belief is based on prior beliefs activated from memory concerning a perceived relationship between a cue and an attribute combined with new information acquired from the environment (Steenkamp, 1990). The study posits that farmers have formed descriptive and informational beliefs around groundnut seeds that form the basis of a seed type being trusted and eventually adopted.

1.2 Problem statement

Groundnuts production in Uganda plays a critical role in poverty reduction. Despite this, the per capita production and yield levels have been declining thus spurring great concerns in Uganda (Okoko et al., 2010; Li et al., 2013; Thuo et al., 2013). Studies such as Scarpetta & Tressel, (2004) have shown that Agricultural productivity can be boosted by introduction of farm innovations such as improved seeds. Although public crop research institute have breeding programs whose mandate is to produce these quality seeds of improved varieties, the subsequent private sector stages of the seed value chain are underdeveloped. Consequently, improved seed varieties developed by the national and international agricultural research centers very often fail to get adopted by the smallholder male and female farmer (Ntare et al., 2008; Derwisch et al., 2011; Rodier & Struik, 2018). As noted by Jelliffe et al., (2018), the National Semi Arid Resources Research Institute (NaSARRI) in Soroti, which is part of Uganda's National Agricultural Research Organization (NARO), is one example of such crop institutes that has released a number of high yielding varieties (HYVs) over the years through collaborative efforts between domestic and international geneticists and plant breeders which have not been adequately adopted by male and female farmers.

For a well-functioning seed supply chain that generates improved varieties through research,

produces them, and delivers them to male and female farmers to develop, there's need to understand certain push and pull forces. Trust could be one of these forces, as it has been shown to be closely associated with choices and actions of men and women, thereby forming a basis for decision making (Lewicki et al., 2006). Kopainsky and Derwisch (2009), for instance, argued that product adoption results from a dynamic interplay between the evaluation of utility of improved seed varieties and trust in the quality of improved seed varieties. It is against this background therefore, that this study sought to explore trust, an important determinant of a farmer's adoption decision, as a major pull force in the supply chain of quality seeds for improved groundnuts varieties in Northern and Eastern Uganda. Overall, the study sought to answer the following overall research question.

What is the contribution of trust in quality groundnut seed selection and sourcing among the smallholder farmers of Uganda?

Specifically, the following questions guided the study;

1.2.1 To what extent does trust influence male/ female farmer preferences of good quality seed attributes for groundnuts?

1.2.2 What are the most trusted seed sources by male and female Groundnut farmers?

1.3 Research Objectives

1.3.1 Overall Objective

The overall objective of the study was to explore the contribution of Trust in quality seed selection and sourcing for Groundnuts among smallholder farmers in Northern and Eastern Uganda.

1.3.2 Specific objectives

a. To determine the extent to which trust influences male/ female farmer preferences of good

quality seed attributes for groundnuts.

b. To establish trusted groundnut seed sources and delve into understanding why these sources are the most trusted.

1.4 Study Assumptions

a. Trust is a key determinant in the groundnuts quality seed selection process among both male and female farmers in Uganda.

b. There exists trusted groundnut seeds sources by male and female farmers based on a variety of reasons and sourcing behaviors.

1.5 Justification of the study

Exploring the contribution of trust in quality groundnuts seed selection and sourcing among smallholder farmers provides useful data for seed systems value chain actors. This is possible through shedding light on male and female farmers preferred groundnut attributes, why these attributes and how they assess quality. Shedding light on how farmers assess quality in their seed choice could guide seed delivery programs on how to package information about improved quality seeds of groundnuts being released from the groundnuts breeding program. By shedding light on the most sought out sources of groundnuts seeds and why, this study may also potentially benefit the seed systems value chain in aligning with the needs of their end users. In addition, this study has the potential to contribute to the body of limited literature regarding the influence of trust on agricultural innovations. The importance of the emic perspectives in choice making is a critical concern in agricultural policy approaches in the long run.

1.6 Scope and limitations of the study

The study focused on the role of trust in farmers judging the quality groundnuts seeds as well as how trust influences groundnut seed sourcing among male and female farmers. Geographically, this study was conducted in the Northern and Eastern regions of Uganda. It specifically involved groundnut farmers as the population sample. Only farmers who had grown groundnuts in any of the two seasons prior to the study were included in the sample. Both male and female groundnut farmers and their knowledgeability in seed sourcing and selection were included in the study as respondents in the survey and participants in the focus group discussions (FGDs).

The main limitation of the study was language barrier since the principal investigator did not understand the *iteso* and *Lango* languages which are used in the study regions. The assistance of a language expert was however sought in data collection and transcription to mitigate this limitation. It's however possible that some meanings were lost in the back and forth translations especially in instances where cultural expressions lack exact English equivalents. Being implemented under the auspices of the umbrella organization ICRISAT, the study was construed as an intervention with direct benefits for the farmers. The researcher explained the academic nature of the study and limited direct benefits to a provision of local food for the individuals who participated in the study, a cost that was covered by ICRISAT. The fieldwork dynamics has shown that the design ought to have been case controlled due to the natural interventions in the North resulting from the destabilization of the *Kony* war that resulted in the attraction of a lot of players whose presence had immense influence on seed sources for the communities here yet this study only spoke to an explanatory model of the seed selection and sourcing behavior and how trust influences these given the current set-up of these regions.

1.7 Definition of key terms

Trust - a farmer's expression of confidence in a seed type and a seed source, that is, both the system that delivers seed to them to obtain and plant and individual actors within these systems.

Quality seed - seed which meets a farmer's level of satisfaction in terms of desired characteristics such as purity, yield levels, germination capacity, freedom from noxious weeds, resistance to diseases and pests.

Quality attributes - the unobservable functional and psychosocial benefits of a product to consumers/what the consumers want before consumption.

Quality cues - observable product characteristics that are used to infer the quality attributes by consumers before consumption.

Social Networks – a broad range of relationships within the seed selection and delivery value chain.

This chapter explores the subject matter of the study. It forms a background of the work and lays the foundation of the later chapters by giving a detailed description of the global, Africa, East Africa, country and site specific context of the study. It also details the problem, research questions, scope and limitation as well as the justification to the study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter is a review of literature within the following sub areas; Quality trait preferences among smallholder farmers; crop quality descriptions; Gender, seed sourcing behavior and trust; information sourcing; risk aversion and seed sourcing, and extends to the theoretical framework of the study.

2.2 Quality trait preferences among smallholder farmers

Global population growth, limited water and land access, and the resulting over-exploitation of available resources has accelerated the demand for quantity and quality of food (Placide et al., 2015). Additionally, global climate changes aggravate the biotic and abiotic stresses on food crops creating a need for mitigation strategies. Over the years, different strategies have been employed such as development of plant breeding programs that worked on high-yielding and improved crop cultivars in favorable environments and under controlled experimental situations. These strategies, however, have not been considerate to farmers' preferences and attributes, locally available germplasm, and the real conditions of small-scale farmers in their efforts. The result has been consistently low adoption of newly developed improved crop cultivars (Placide et al., 2015).

Quality seed form a critical aspect of agricultural production. This is because, poor-quality seeds limit the yield potential of crops and reduce the productivity of a farmer's labour input (FAO, 2011). Due to globalization and export trends, quality has become a key concept of concern as expatriates and some local consumers continue to be quality conscious.

FAO (2011) identifies four seed quality attributes; Physical qualities of a seed in a specific seed lot, Physiological qualities referring to aspects of performance of the seed, genetic quality which relates to specific genetic characteristics of a seed variety and Seed health which refers to the

absence of diseases and pests within a seed lot. Physical seed attributes are characterized by minimum of damaged seed, minimal weed or inert matter, minimum of diseased seed, near uniform seed size and non-discolored seeds which can be detected by visually inspecting seed samples. Physiological seed attributes entail high germination and vigor of a seed in which the seed should emerge from the soil to produce a plant under normal conditions and have the capacity to emerge from the soil and survive under potentially stressful field conditions and to grow rapidly under favorable conditions respectively. Genetic seed attributes constitute high yielding ability, pest and disease tolerance as well as adaptation to local conditions. Seed health on the other hand refers to the presence or absence of disease-causing organisms, such as fungi, bacteria and viruses, and animal pests, including nematodes and insects.

Farmers use these attributes to assess the quality of the seeds they choose to plant. Preferences are symbolized by the perceptions, taste, and attitudes that consumers hold toward food types (Ayinde et al., 2013:618). The sorting and grading of groundnuts are based on quality and value is placed on the attributes of the seeds such as color and size (Jelliffe et al., 2018).

In a study to assess the impact of improved seeds on the agricultural productivity of family farms in Cameroon, for example, a farmer's expression of satisfaction with improved maize seeds was found to be based on attributes such as color, yield and quality (Shimeles et al., 2018). In Mashushu community of Capricorn district in South Africa, farmers select ZM 421 (maize variety) for its comparative high and stable yield, drought tolerance, and early maturity compared to other varieties. Its early maturity is especially attractive, because it eases the burden of guarding the crop from destruction by baboons (Setimela & Kosina, 2006).

Men and women do not adopt new technologies at the same rate or benefit equally from their introduction in developing countries (Obisesan, 2014). Women and men play different roles in

farming systems, have different levels of control over and access to resources and face different constraints (Thuo et al., 2014). For instance, a study examining gender differences in cassava production technology adoption and the impact on poverty status of farming households in southwest, Nigeria found that male farmers adoption levels were 26% higher than those of female farmers, attributing the gap to better access to information and other resources on improved production technology by male farmers (Obisesan, 2014). In addition, gender shapes preferences and aspirations within households (Ayinde et al., 2013). For example, an analysis of farmers' varietal preference of drought tolerant maize in Southern Guinea Savannah region of Nigeria, a study by Ayinde et al., (2013) found that male farmers have a preference for big cobs with full grains, big seed, and multiple cobs while female farmers preferred yellow color of seed, nutrient fortified seed and big cobs with full grains. Essentially, women choices are based on the food security of their household.

Male and female farmers therefore assess' seed attributes differently, prioritizing different aspects. For instance, production for markets is largely a male field and production for subsistence a female role. Some crops may also be labeled "women crops" which presents different vulnerabilities for men and women. Interventions, therefore, must evaluate challenges facing each group separately and identify how social groups are linked to result in optimal support for adoption of agricultural technologies (Thuo et al., 2014).

2.2.1 Crop Quality Description

Different end users of crop cultivars have varied preferences and needs (Placide et al., 2015). Farmers for instance choose the cultivars to grow based on their preferences such as high oil content and taste while retail groundnut traders prefer varieties with a ready market such as the red beauty variety (Mugisha et al., 2014).

Past studies (Placide et al., 2015; Asrat et al., 2009) have shown that the failure for plant breeding programs (formal experts) to consider farmers' (informal experts) preferences have consistently resulted in low adoption rates, for example, in a study to investigate farmer preferences for crop variety attributes in Ethiopia, Asrat et al., (2009) found that farmers prioritized sorghum varieties resistant to drought and frost occurrences (environmental adaptability) and those resistant to disease and pest problems as opposed to varieties that ensured increased productivity furthered by the existing formal systems. In addition, a study on smallholder access to quality and diverse seed in Uganda and the implications this has for food security, finds that though formal seed systems are on a rise, informal seed systems still predominate for all crops and all geographical areas in Uganda. This, the study attributed to the diversity in varieties the informal seed systems provide farmers and its delivery of varieties with traits preferred by these farmers (Otieno et al., 2016).

Since the actual quality of seed before use is unknown, both formal and informal experts, infer quality from the available quality cues, which they may use differently or differentially to fit what they consider important as guided by their perceptions, needs and goals. Disagreement between formal and informal experts on which quality attributes are important, may also result from the underlying conception of what quality means for a specific product category or a specific use context (Urrea et al., 2015).

Following the formal expert perception lens, seed quality is based on parameters, standards and processes as defined by what the experts can measure and what they believe to be important. These parameters relate to variables that predict yield potential (Urrea et al., 2015). For formal experts therefore, the relation between the quality cues and the quality attributes that deliver the desired benefits is formalized in parameters, and ultimately expressed in (certification) protocols and standards. They mainly focus on efficiency, yield level, economic and commercial aspects (Urrea

et al., 2015: 2).

Informal expert perceptions of quality on the other hand, are based on whether a product can provide consequences that are positively valued. Positive valuing of a consequence comes because of the contribution this consequence is seen to have on the goals that the informal expert has set. Some of the quality cues used by informal experts to infer desired qualities include seed state (turgid/sucked), size, sprout diameter, absence of damages by insects, rottenness or visible diseases (Haan, 2009).

While differences in quality description between researchers and farmers may explain the low adoption rates of high-yield variety (Placide et al., 2015; Asrat et al., 2009) in most contexts, Ceccarelli et al. (2009) observed that farmers have the same selection ability as breeders. This therefore, means that participatory plant breeding programs involving the farmers and breeders are necessary to respond to the needs of every stakeholder (Placide et al., 2015).

2.3 Gender, seed sourcing behavior and Trust

Increase in agricultural productivity is key to poverty alleviation in most African countries whose economies are based on agriculture including Uganda. The adoption of improved technology is greatly emphasized on all efforts to enhance agricultural productivity (Thuo et al., 2014). Seed can be delivered to and accessed by male and female farmers through a range of formal and informal networks of seed and planting materials. These networks are governed by the social, cultural, political, economic, and technological factors of a geographical territory (Pautasso et al., 2013).

Seed transactions occur within a set of specific social relations (Badstue et al., 2002). Male and female farmers save and exchange seeds with their neighbors, friends, and relatives daily. This is standard practice among social networks which Hoang et al., (2006: 514), define as ‘mechanisms that connect individuals to society, providing patterns of social interaction, social

cues, and social identities while Devkota et al., (2015) defines them as the interpersonal relationships among a set of persons connected through the flow of information or goods and materials, or through joint activities or other social bonds. This is to say that seeds and planting materials exchange is an element of the social networks that are part of peoples 'everyday practices' (Devkota et al., 2015). For example, a study seeking to support farmers' seed systems, particularly in times of severe stress in East and Central Africa reported the level of social capital to strongly affect farmers access to new varieties, information, and other resources (McGuire, 2000). Adam et al., (2018:343) in their study in Tanzania found that farmers sources of sweet potato vines are largely own saved seeds at 62.5% of their sample. However, male and female farmers have other sources, who make up their social networks, from which they get sweet potato vines as; neighbors in the community (25.9%), the vast majority of which are female neighbors (22.7%); vine multipliers located relatively far away from the farmers' fields (9.8%); farmers along the lakeshore (5.3%); relatives (1.9%); farmer groups (0.3%); and NGOs (0.3%).

During a study on social relations and seed transactions among small holder maize farmers in the Central Valleys of Oaxaca, Mexico (Badstu et al., 2002) identified five forms of seed transactions. These include purchased seed, where a cash transaction occurs at a price agreed upon by both parties for seed; borrowed seed, that is paid for in kind as agreed between the parties; seed as a gift, where farmers share seeds with an expectation that the receiver would come to the aid of the giver when the need arises; Exchanged seed in which one type of seed is exchanged for another; and seed obtained without the knowledge of the provider, where either seed is stolen or maize grains provided for consumption or for the making tortillas are used as seed.

Globally, the most common sources of crop seeds are local farmer systems which are generally

referred to as informal seed systems (Croft et al., 2018). Seed reaches remote farmers and women in particular, mostly through Informal channels (Coomes et al., 2015; Mcguire and Sperling, 2016) and along gender lines. Although these systems make seed largely available and accessible to male and female farmers in terms of seed security, quality is still a great limitation of this form of seed system. Informal seed systems are a dynamic and complex phenomenon that varies from community to community where sourcing of seeds is through an array of channels such as trade, barter, and gifts (Croft et al., 2018).

The absence of certified seed systems brings with it a lot of uncertainty in a farmer's decision to purchase seed. In 2018, a study by Jelliffe et al., (2018), found that concerns over the prevalence of counterfeit seeds among farmers in 2002 saw 90% of all crops in Uganda, including groundnuts consist of landrace varieties from home-saved seed, and by 2014, this share remained between 85% and 90%. This is despite the National Semi Arid Resources Research Institute (NaSARRI) in Soroti, which is part of Uganda's National Agricultural Research Organization (NARO), releasing several High Yielding Varieties (HYVs) over the years.

Trust therefore, becomes the deciding factor where farmers result to sourcing for seed from places or people, they believe in. These sources are normally those with a good reputation among the farmers. The sources are known to have good quality seeds and have met farmer expectations in the past. This means that reputation is an indicator of the reliability of a supplier to their customers. Reputation can thus be argued to be a measure of trust. How well the supplier is able to maintain their reputation in a market can be used by consumers as an important cue on how the product compares to others in the market (Batt, 2003). Accurate evaluation of seed quality by mere observation is not always possible which is why farmers try to reduce risk by visiting potential seed suppliers to purchase from those that have provided good quality seed in the past or seek out

those with a good reputation. Buyers prefer purchasing seeds from suppliers with whom they have relationships or those that they have dealt with in the past. While dealing with firms, buyers look for organizations leading in the market as they are perceived as being more trustworthy (Batt, 2003).

In a study on building trust in the Filipino seed potato industry by Batt (2003), a seed supplier's reputation was found to have the most significant impact in developing trust between the farmer and their preferred supplier. Suppliers seek to build trust with farmers by making relationship investments in several areas such as financial risk, reducing the risk of growing and evaluating new varieties as well as helping farmers grow potatoes.

2.3.1 Information sourcing

The flow and access to agricultural information and knowledge is key to agricultural production as well as market linkages for increased agricultural produce. Rural farmers require access to information on aspects such as where to get farm inputs, where and how to access and utilize new technologies including improved seed varieties and market prices for their produce (Kirimi, 2013).

To realize the desired goal of farmer adoption of new technologies in agricultural production, their availability must be complemented by enough outreach and education that often rely on pre-existing social networks (Jelliffe et al., 2018). The transmission of seeds and knowledge within the formal and informal networks happen together (Devkota et al., 2015). Farmer networks have actually been shown to foster technological innovation and the adoption of high yielding varieties (HYVs) (Thuo et al., 2013; Thuo et al., 2014; Lamb et al., 2016). The interactions within a social network enhance effective information sharing among farmers, researchers and extension service providers. This is because the social interactions enable individuals to acquire new information,

share their knowledge with others and evaluate their actions. In the networks, learning is influenced

by the closeness and frequency of interactions among individuals (tie strength) (Thuo et al., 2014). Though past studies have demonstrated the importance of information dissemination to agricultural productivity (Vasilaky, 2013; Thuo et al., 2013), this still remains a great hurdle to the process.

A study on social network structures among farmers in Uganda and Kenya by Thuo et al.(2013), demonstrates the failure of outsiders in utilizing social networks and social capital to connect dissemination of information with training and adoption of new practices and to reach out to the most marginalized groups in farming communities.

As pointed out in the introduction, farmers are increasingly demanding for crop diversity and with the vast number of varieties in the markets, farmers then need access to information to help them find and identify seeds. Badstue et al., (2002) points out that farmers access information from several sources; during conversation with friends and neighbors, through paying attention to what other farmers are growing and from friends and family from other parts of the country. These are all sources within the social networks of farmers which as Hoop (2012) posits, trust improves the effectiveness of the dissemination of information about new crops (in his case French beans) in social networks.

Farmers have been shown to learn and borrow more from their strong ties (individuals with whom they have emotional connections) such as those individuals they have interpersonal ties with, in comparison to people or outsiders with whom they have weaker ties (connections of a social system to the broader society) such as researchers and extension officers (Thuo et al., 2013).

Following a study on the assessment of women smallholder sorghum farmers access to agricultural information in Mwingi central district, Kirimi (2013) found out that agricultural extension officers are also considered a critical source of agricultural information closely followed by Informal

contacts such as neighbors, friends, relatives and family members. These interpersonal relationships thus form a very critical aspect of seed selection for farmers as it's through the information they gather from these sources that they choose which crop varieties to adopt or the farming methods to use. The study further asserts that the extension workers and informal contacts are the first sources of information to the farmer before any external help is sought. This is consistent with Hoop (2011:116) who states that villagers use more information about the prospects of new crops from community residents with whom they are connected by relatively strong ties. Further, Hoop (2011) states that farmers also learn from their own past experiences concerned with the use of new technologies.

2.3.2 Risk aversion and seed sourcing

Due to the high degree of risk in agriculture, considerations of risk become a hallmark of agricultural decision making (Moschini and Hennessy, 2001). When situational factors such as risk and incomplete buyer information are present during an exchange and with the growing problem of counterfeit seeds within the formal seed systems which often result in farmers reliance on informal channels for information sharing (Jelliffe et al., 2018), trust becomes a critical component of the exchange (Batt, 2003). In Uganda for instance, the problem of counterfeits has resulted in quality assurances such as certified seeds from commercial seed companies and quality declared seed (QDS) by farmer groups (Jelliffe et al., 2018).

The trust buyers have on their suppliers reduce the transaction costs of an exchange, reduce the perception of risk that is associated with opportunistic behavior as it also increases the buyer's confidence in the resolution of short-term inequalities over time (Batt, 2003). Trust is in fact defined as a type of expectation people have which alleviates the fear they may have that their exchange partner will act opportunistically (Nooteboom, 2007).In situations where risks are

difficult to manage by formal means such as government control, legal contract and hierarchy, trust is important in that it helps reduce risks and transaction costs of relationships (Nooteboom, 2007). This is especially important as farmers in spaces where they may not have ways to cover themselves against risk, may end up disengaging in any agricultural productions which would be detrimental to food security issues and household incomes for the farmers. A survey by Appropriate Technology Uganda (ATU) in Eastern Uganda for example, revealed that poor farmers did not plant groundnuts despite their high profitability in comparison to other crops due to the risk associated with their production (Jelliffe et al., 2018).

2.4 Theoretical Framework

This study was guided by the Social Capital Theory as enunciated by Coleman (1990). The concept of social capital entered academic debates through the works of Bourdieu (1986) and Coleman (1988) then was later popularized by Robert D. Putnam (1993). Through Putnam's work, the concept gained the attention of researchers and policy makers while it grew popular among social scientists (Bhandari & Yasunobu, 2017).Over the years the concept has been defined differently by different scholars. Coleman (1990) defined social capital by its function terming it a productive resource that facilitates production and makes possible the achievement of certain ends that would be impossible in its absence. Putnam (1993) defined social capital as features of social organization such as trust, norms and networks which can improve the efficiency of society by facilitating coordinated action. Fukuyama (1995) on the other hand defined social capital simply as the existence of a certain set of informal values or norms shared among members of a group that permit cooperation among them. In recent times however, the growing interest and studies on the concept in explaining social and economic outcomes have resulted in the agreement on the conceptualization of the major components of the social capital concept to include trust, norms, and informal networks with the belief that social relations are valuable resources (Bhandari &

Yasunobu, 2017). According to Coleman (1990) and of interest to this study, social capital is a combination of several entities such as obligations, expectations, trust, and information flows within a social network.

The social capital theory is founded on the premise that individuals are embedded in a network of social relations that influence their decisions and actions. These social networks are made up of patterns of friendship, advice, communication, or support that exist among members of a social system (Thuo et al., 2014). Coleman (1990) sees social networks as the means by which collective capital can be maintained and reinforced. Social capital has three different forms; reciprocity (including trust), social structure capability for information flow and norms which are enforced by sanction (Coleman, 1990). Nahapiet and Ghoshal (1998) cited in (Balijepally et al., 2004) in their conceptualization of the social capital concept argue it to have a relational analytical dimension. The relational dimension is described as personal relations developed among individuals out of respect or friendship that's built overtime from past interactions. The relations are means to an end as are used to fulfill social motives such as approval, sociability and prestige. This dimension has its own components identified as trust and trustworthiness, norms and sanctions, obligations and expectations, identity, and identification.

Trust according to the relational dimension, indicates one's willingness to be vulnerable to another party arising from belief in good intent, concern, competence, capability, reliability, and perceived openness of the exchange partners (Balijepally et al., 2004). For the realization of economic benefits, social capital can complement or substitute other forms of resources such as the reduction of transaction costs. This is because norms, obligations, and trust, immanent in social capital serve to reduce opportunistic behavior and in extension time and money used in monitoring such behavior (Balijepally et al., 2004). Following the reviewed literature, the theory has largely been

used in studies seeking an understanding of the relationship between social networks, collective action, and economic development.

2.4.1Relevance of the theory to the study

This theory becomes very relevant to the study in that it explains the concept of social networks from which trust emanates. In the theory, two forms of trust are explained; generalized, that's between unknown members of a social network; and specific trust, shared between friends, relatives and other people who have knowledge of one another that influence decision making and actions of people. This means that the theory has been instrumental in explaining how members of the farming communities in Northern and Eastern Uganda choose the seeds to trust and plant and the sources that they believe and rely on for good quality seeds. The theory also explains the aspect of risk aversion which is focal to the farmers whose interaction with the seed suppliers is largely informal and as the theory explains, only trust can regulate such interactions for formal means of management like government policies may not necessarily apply. The theory also explains aspects of information sharing and access which forms a large part of the study as the study posited that farmers have informational beliefs around groundnuts seeds which form the basis of a seed and seed source being trusted and eventually adopted.

2.4.2Conceptual Framework

Having expressed the importance of crop improvement to agricultural development and identified the underdevelopment of the seed supply chain in the delivery of the improved seed varieties, this framework is a diagrammatic conceptualization of the problem at hand as shown in Figure 1 below.

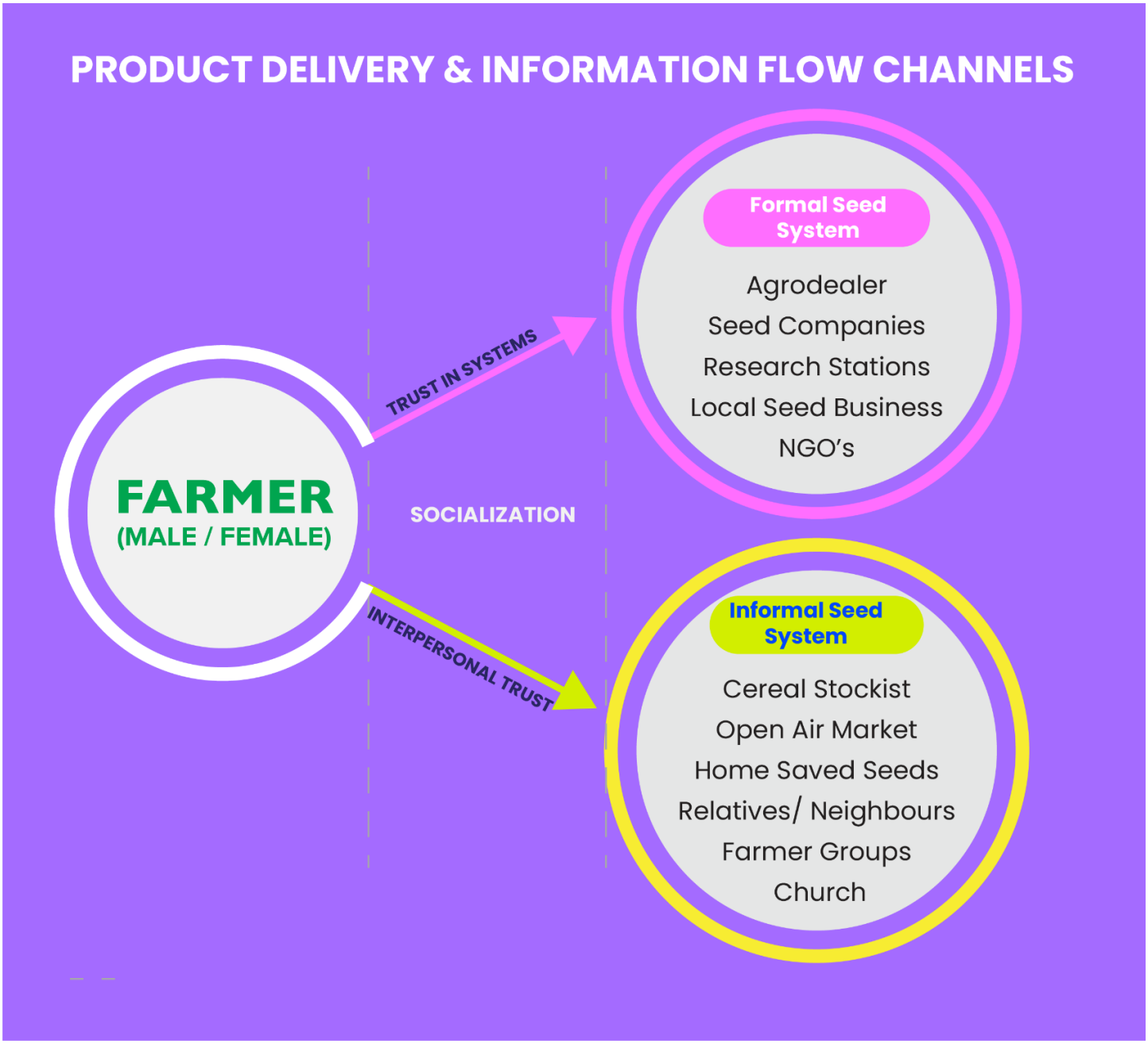

Figure 1: Conceptual framework on product delivery and information flow channels.

Source: Adopted and modified from (CBCC, 2018)

A seed system can be defined as the various channels through which seeds are disseminated and accessed which could be formal or informal (Rodier & Struik, 2018). Farmers source seed from both the formal and informal sources while guided by trust that is developed through socialization. The informal seed system encompasses farmers selecting their crops or varieties, saving their own seeds from their harvest and locally exchanging or trading seeds through their social networks and local markets based on environmental suitability and preferences. The formal seed system on the other hand is a deliberately constructed system that involves a chain of activities leading to certified seed of verified varieties which are released through public and private organizations following strict quality control (Devkota et al, 2015; FAO, 2019).

To adopt seeds from research organizations, the seed systems team must believe in their reliability of producing seeds or grain of optimal physical, physiological, genetic as well as seed health qualities and that these will be taken up in the market for their motivation is economic gain. The farmer must in turn trust the seed delivery channels both the formal/certified seed system (trust in systems) and informal sources (interpersonal trust) to deliver high quality reliable seeds that after verification through his/her own process of assessment(s) he adopts and plants. This is the same with the information that is shared among the farmers themselves and between farmers and the other actors along the value chain. The farmer's process of assessment for seed quality is informed by his/her descriptive beliefs which refer to what the farmer is able to observe before they make a decision to adopt the seed or not. On the other hand, the process of selecting a source is informed by informational beliefs that involve credible information flows on seed from the source to the farmer as well as the reputation of a source among the farmers. Similarly, sources are vetted on the basis of inferential beliefs which are hinged on past experience, specifically success of past interactions.

In summary, this chapter is a detailed review of existing body of works on the study areas including, quality trait preferences among male and female farmers, crop quality descriptions, gender seed and information sourcing behavior, risk aversion among male and female farmers in farming communities, a theoretical frame in which the work is anchored and a conceptualization of the thesis.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology that guided the study. These are; the study design, study site, study population, sample size, sampling procedure, methods of data collection, data analysis and the ethical considerations of the study.

3.2 Study site

This study was conducted in four districts of Northern and Eastern Uganda.[1] These regions according to Ubos (2006), sometimes experience relatively high temperatures exceeding 30^0C. The regions are also characterized by light, loose and sandy loams in which groundnut is produced (Okello et al., 2013). The most popular varieties being the traditional varieties of red Valencia type that are of a very mixed nature that are mainly large seeded; and small seeded varieties such as red beauty (Okello et al., 2010). The Eastern region is mainly inhabited by the *Iteso* and *Basoga* ethnic groups while the Northern region is mainly inhabited by the *Langi* and *Acholi* (Ubos, 2006). Being the two leading groundnut producing regions (Okello et al., 2010; Okello et al., 2018), they were selected as they provided insights into the cultural practices of the Ugandan people. This is founded on Mugisha et al. (2014) study, which indicates that groundnuts production forms part of the Northern and Eastern Uganda people's culture.

Specifically, two districts were picked from each region; Dokolo and Nwoya to the North; Serere and Kumi picked from the East. Dokolo is located 1° 55′ 0″ N, 33° 10′ 0″ E and covers a total land area of 1,072.8 Km^2. Nwoya is located 02°38′N 32°00′E and covers a total land area of 4,736.2 km^2 and Serere District on the other hand is located 01°30′N 33°33′E and covers a total land area of 1,965.4 km^2. While Kumi District covers a total land area of 1,074.6 km^2 and is located 01°30′N

[1] This study is an anthropological dimension of a larger study within ICRISAT's (International crop research institute for the semi-arid tropics) Grain legume and dryland cereals (GLDC) program, where the researcher is currently attached.

33°57′E. These districts were picked as they are the food baskets of the country and ecological zones which support the growth of Groundnuts as the crop of interest to the study. Further, the togetherness of communities in these regions presented a unique opportunity to get insights on the socio-cultural aspects as well as gendered perspectives into seed systems used for seed delivery and information flow.

Map of the study area

This is a map of Uganda showing the Northern and Eastern regions where the study was conducted. The four districts are shaded in distinct colors (Dokolo, Nwoya, Serere and Kumi).

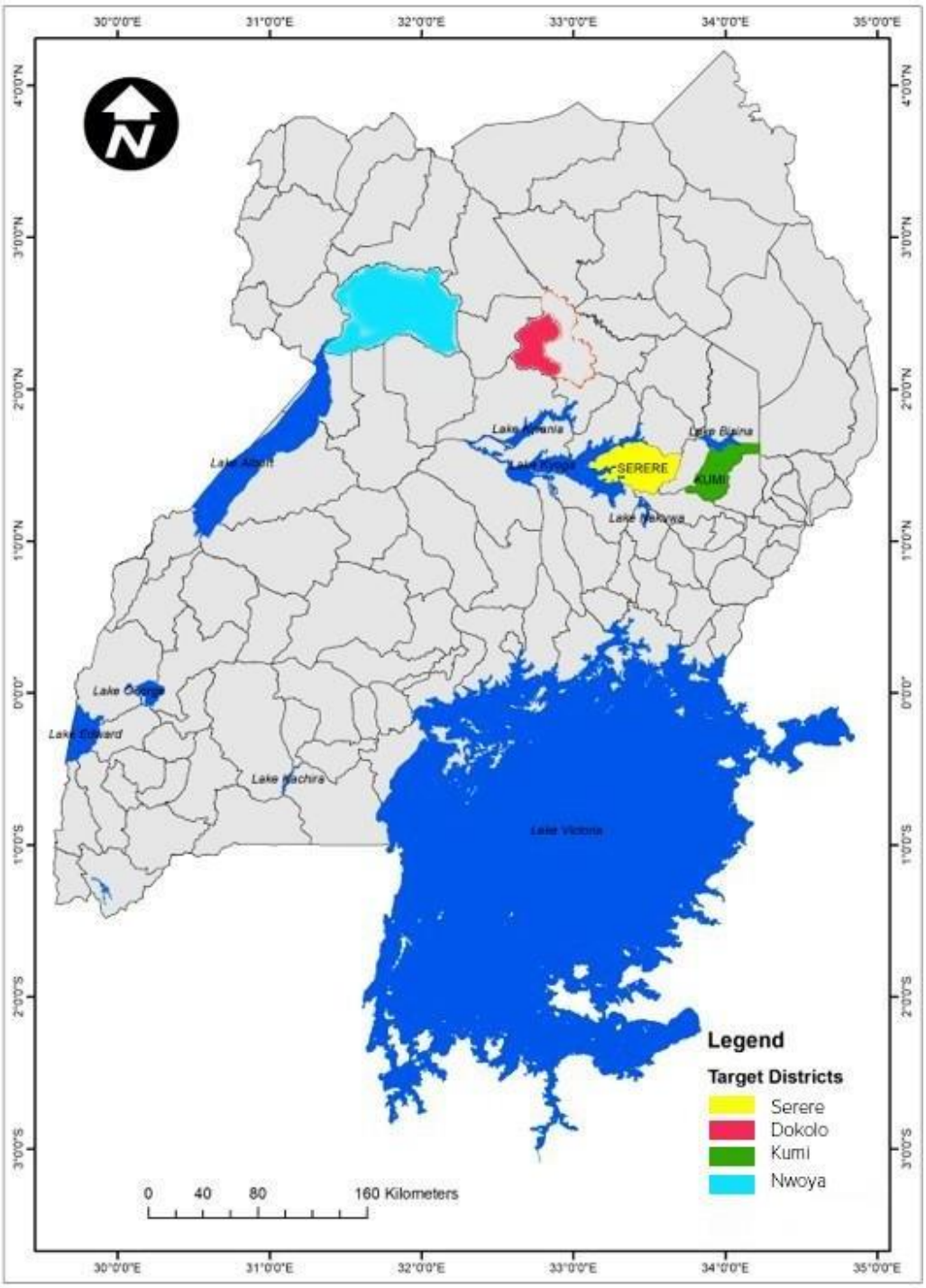

Figure 2: A map of the study areas

Source: Uganda Bureau of Statistics (UBOS), (2014)

3.3 Study Design

This was a descriptive study that describes the desired characteristics of a sample of small holder groundnut farmers from North and East Uganda with regard to the role trust plays in their seed selection and sourcing behavior (Omair, 2015). It offers a detailed and organized description of the seed selection and sourcing process, quality of the data utilized, the systemic and standard methods of data collection used and for this particular section, the strategy/design through which these data were obtained (Zangirolami-Raimundo et al., 2018).

The study employed the cross-sectional descriptive research design to investigate the contribution of trust to farmers' seed selection and sourcing behavior. According to Zangirolami-Raimundo et al. (2018) the design, aims to obtain reliable data that make generation of robust conclusions and the creation of hypotheses that could be investigated with new research possible. Omair (2015) states that the design offers an opportunity for the generalization of findings because it utilizes a representative sample that can speak for the larger population.

The main characteristic of this design is that the observation of variables whether cases or individuals is performed in a single moment when the researcher is conducting his or her research and not their evolution over time (Zangirolami-Raimundo et al., 2018). Therefore, this study set out to answer questions on how farmers assess quality of groundnut seed and why they choose one seed source as opposed to the other. The results and discussions offered were as of the time when the study was conducted but can be generalized across different places with similar cultural practices and social networks.

The data was collected in two parts within a month. The study started by pre-testing the instruments and making the necessary adjustments within the first week in Tororo district found in the Eastern region of Uganda, specifically the Tororo East sub-county with male and female farmers who were

members of the Tororo district farmers association. The pretest phase involved three main activities; first the familiarization of the research team with the tools, second was testing of the tools through application with the farmer association group in the field and third a feedback session addressing any arising issues on the research tools and adjustments where necessary. The group was chosen as it works closely with the breeding program at NARO-NASSARI focusing on demonstration of improved groundnut varieties and seed multiplication. This was followed by a survey of the sampled farmers that were envisaged to be a total of 385 groundnuts producing farmers living in Kumi, Serere, Dokolo and Nwoya. The second part of the study involved conducting Focus Group Discussions among male and female participants.

3.4 Study population and unit of analysis

The study included all the groundnut farmers living in the Kumi, Serere, Nwoya and Dokolo Districts. The unit of analysis was an individual male or female farmer within these districts. The sample population was obtained from a stratified simple random sampling of the male and female farmers. An inclusion and exclusion criterion was adopted where farmers had to have grown groundnuts in the two seasons preceding the study (long rains and short rains 2017/2018) and living in the purposively selected districts. The sample size was set at 385 farmers based on Cochran (1963:75) sampling model as cited by Israel (2003).

3.5 Sample size and sampling procedure

Purposive sampling was used in selecting the two regions leading in groundnuts production which according to Okello et al. (2018) are Eastern and Northern Uganda. Eastern Uganda has remained relatively peaceful over the years while the North was destabilized by wars such as the *Kony* war that has seen many interventions take hold in the communities in the North (Okello et al., 2018). The districts were thus selected purposively to include those with (Dokolo and Nwoya) and without

(Serere and Kumi) interventions. At the village level, the farmers were selected using simple random sampling to ensure representativeness of the population. The sample had been determined using Cochran (1963:75) sampling formula as follows:

$$n_0 = \frac{^2 pq}{e^2} \quad \text{.....1}$$

Where;

n_o = the sample size

Z = confidence interval

p = the estimated proportion of an attribute present in the population

q = 1-p

e = level of precision

Given that the variability in the proportion of the total population in these regions is unknown, the study assumed p= .5 (maximum variability). The study desired 95% confidence level and ±5% precision. Therefore, the resulting sample size was;

$$n_o = \frac{(1.96^2)(\quad)(}{(.5^2)} = 385$$

Once this number was determined the spin-pen technique was used where from the community center to the left only female farmers were picked while to the right only male farmers were sampled. Once a household was selected we only spoke to an adult self-reporting to participate in groundnut farming. However, due to the inclusion/exclusion criteria that was used to only include farmers who had grown any of ICRISAT's mandate crops (sorghum, finger millet, pigeon peas and groundnuts) in the last two seasons preceding the study, the final number that was included in

the study for groundnut farmers was 286.

The qualitative process on the other hand involved 8 focus groups. Four of the groups were from the Eastern region where two male and female groups were selected from both districts (Serere and Kumi). The male and female FGD groups were selected to investigate if there were differences in seed selection and sourcing behavior for communities near the agricultural research center, NaSARRI, represented by the Serere respondents and those further from the research center that were found in Kumi. The other four groups were a male and female groups from both Dokolo and Nwoya representing the Northern region which also sought to tease out differences between communities engaged with the breeding activities and those that were not. In the FGDs, discussants were selected based on their availability. These discussants had to be male and female farmers that had planted the groundnut crop in the last two seasons preceding the household survey and living in the study sites. Purposive sampling was used to select participants based on the same inclusion and exclusion criterion as was applied for the survey respondents.

3.6 Methods of data collection

3.6.1 Survey

A survey questionnaire (Appendix II) was used to collect information from both male and female respondents at the household level. There were 286 semi structured questionnaires administered at the household level to male and female adults self-reporting on groundnut farming. Some of the key pointers in the survey to quality selection included taste, color of the seed coat, size, and weight among others while key pointers to trust included interpersonal relationships among farmers and their sources, information flow between farmers and the sources as well as success of past engagements with the said sources.

3.6.2 Focus Group Discussions

A total of (8) FGDs were conducted, (4) from the Eastern region and (4) in the North. There were two focus group discussions conducted in each district one being male and the other female. The distribution of the participants in the groups was as follows; Serere (12 female and 10 male participants), Kumi (11 female and 9 male participants), Dokolo (10 female and 11 male participants), and Nwoya (11 female and 12 male participants). The groups were homogenous based on the gender and expected knowledge levels on the subject matter i.e, farmers seed sourcing and selection behavior Vis-a vis trust. The discussions were guided by a focus group discussion guide (Appendix III). Issues ranging from the different types of seed sources preferred by male and female farmers, their level of trust and why, what trust is based on and differences, if any, between men's/women's networks vis a vis trust were teased out during these FGDs.

3.7 Data processing and analysis

The quantitative information from the survey was analyzed using SPSS to establish emerging patterns. This was then presented using frequencies, graphical illustrations, and percentage tables. In the study, all data that was collected through FGDs was transcribed, translated and coded for analysis. Qualitative data transcription, translation and analysis was carried out concurrently with data collection. The study adopted an explanatory approach with verbatim quotes from the transcripts being used to present information based on the study objectives.

3.8 Ethical considerations

This study strictly adhered to the ethical guidelines of social science research. Upon reaching the houses and being granted the permission to proceed, respondents were taken through the consent form detailing that their participation was voluntary, and they were at liberty to leave at any point

of their choosing should they decide not to continue. Their participation was explained would not have any direct benefits other than a provision of local food for the individuals who participated in the study. The Anonymity and confidentiality clauses were well laid out and explained to the respondents as well to ensure that their identity was not disclosed at any point of report writing or results sharing. The study also endeavored to make sure that no harm came to the participants because of their participation in any of the study's processes. Utmost integrity was maintained in the field to ensure that no harm came to the discipline from the study such that other researchers from our field can at later dates also have the opportunity to conduct their research in these regions. In the report writing phase, anonymity has been ensured and no identifiers have been used that could lead to the identification of any of the respondents or the FGD participants. Attempts will be made through the local contacts of the research institution to provide the necessary feedback to the participants as well as the scientists involved in the seeds research. Some aspects of the research have already been part of an international conference and have been disseminated among the scientific community. The report will also be available at the University of Nairobi repository and libraries as well as the ICRISAT resources centre in Nairobi.

Chapter three provides a detailed discussion of how this research was conducted. This is in regard to the study design, study site, study population, sample size, sampling procedure, methods of data collection, data analysis and the ethical considerations of the study.

CHAPTER FOUR: TRUST, QUALITY SEED SELECTION AND SOURCING

4.1 Introduction

This chapter presents and discusses results on the role of Trust in quality groundnut seed selection and sourcing. The presentation has been carried out along the following sub-areas; the role trust plays in shaping farmer preferences for good quality groundnut seed attributes and trusted seed sources including reasons why they are the most trusted. Trust, which is central to this study, is presented in two main dimensions; interpersonal trust among farmers and their informal networks and trust in systems that manifests between farmers and their formal seed sources.

4.2 Socio demographic characteristics of the study population

Although this study envisaged to engage a sample size of 385 farmers as determined using the Cochran (1963:75) sampling formula, the study was only able to reach out to 286 farmers growing or having grown groundnuts in the last two seasons preceding the study. These were made up of 117 (40.9%) male groundnut farmers and 169 (59.1%) female groundnut farmers as shown in table 1 below;

Table 1: Socio-demographic characteristics of farmers

Socio-demographic Characteristics			
Variable		**Male (n=117)**	**Female (n=169)**
Sex of the Farmer (%)		40.9	59.1
Farmer's Average Age		47.5	42.9
Education level (%)	Never gone to school	2.6	11.2
	Primary Level	61.5	51.5
	Secondary O'level	25.6	26
	Secondary A'level	0.9	4.8
	Certificate/Diploma college	7.7	5.9
	University	1.7	0.6
Average household land covered by Groundnuts (ha)		1.2	1.1
Purpose for Growing Groundnuts (%)	Commercial	4.3	6.5
	Subsistence	21.4	24.3
	Semi-commercial	74.4	69.2

These male or female farmers were adults in a household, whether a husband, wife, singles and/or adult children engaged in the farming of a household. The female farmers were on average in their early forties (42.9 years on average) while the male farmers were in their late forties at 47.5 years on average. The age from the focus group discussions didn't seem to affect how the farmers selected seed or the sources that they chose to go to. A majority of the sampled farmers (61.5% male and 51.5% female) had completed at least the first 7 years of formal education. A small proportion of 2.6% male and 11.2% female farmers had never gone to school while a sizeable number had gone beyond secondary school. As with the age of the farmer, the education levels did not affect how the farmers perceived quality attributes in their seed selection nor the type of sources they sought for seeds.

The farmers who were interviewed indicated that farming is practiced on family plots with the different crops that they farm being allocated a certain portion and activities divided along gender lines as shown on table 2 below. The female farmers reported allocating 1.1 hectares of the household land to groundnut production while their male counterparts reported allocating 1.2 hectares of the household land to groundnuts production. As will be discussed in greater details later on this chapter, the purpose for which a farmer grew groundnuts, whether subsistence, commercial or semi-commercial was a determinant of the type of seed which they selected to grow, for example, there's a preference for tasty and red in color varieties of groundnuts which are grown for household consumption. A good proportion (74.4 percent male and 69.2 percent female) of the farmers, had groundnuts grown for semi-commercial purposes where produce was mainly for subsistence purposes but was occasionally sold to cater for other household needs such as other food products that they did not produce. Subsistence groundnuts production was the second most popular reason given at 21.4% for male and 24.3% female farmers. A very small proportion of the

sample indicated growing groundnuts for purely commercial purposes (4.3% male farmers and 6.5% female farmers).

4.3 Gender assigned roles in the different Groundnuts production stages

In the sampled communities as has been mentioned, farming is a household practice and activities within it are shared according to the rules laid down and sanctioned by the community on division of labour which is along gender lines as shown on table 2;

Table 2: Decision making and management across groundnuts production levels

Stage of Groundnuts crop	Who mainly decides at this stage (%)			Who mainly manages at this stage (%)		
	Female	Male	Joint	Female	Male	Joint
Choice of seed to plant	28.7	35.0	36.3	30.4	23.1	46.5
Choice of land to plant	21.7	42.7	35.6	23.4	29.4	47.2
Weeding for groundnuts	30.8	16.1	53.1	29.7	6.6	63.6
Harvesting the groundnuts	28.7	17.5	53.8	30.4	5.9	63.6
Storage for the next season	44.8	17.1	38.1	45.5	8.0	46.5
Processing for household use	50.0	17.1	32.9	49.0	5.9	45.1
Processing for the market	43.4	20.6	36.0	44.8	9.4	45.8
Marketing of produce	28.3	33.9	37.8	30.8	24.1	45.1
Keeping the cash from sales	48.3	24.8	26.9	46.2	16.1	37.8

When asked during the survey, who the main decision maker was for activities at each stage of the groundnuts production, farmers indicated that; decisions on the choice of seed to plant, weeding for groundnuts, harvesting, and the marketing of groundnuts are made jointly between male and female farmers within the household at 36.3%, 53.1%, 53.8% and 37.8% respectively.

The focus group discussions however, brought with it certain cultural nuisances on land ownership, for example the male group from Serere district where land is owned by men brought in certain dynamics. They are the ones who inherit land from their parents with a few exceptions where some parents may also decide to give their daughters land. This is still under unique circumstances such as where their daughters are married to a family that does not own land that they could give their

son to help sustain his family or in cases where the father of the girl has vast tracks of land. This explains why during the survey, decision making on the piece of land on which to plant was shown to fall on the man's shoulder at 42.7%.

Part of a girl's socialization process in these farming communities involves her being taught of the several indigenous knowledge systems around her farm life such as in seed/grain storage and management. Through a female FGD in Kumi district we learnt how girls are for instance taught how to use lantana leaves or neem tree leaves to ward off pests from their stored seeds/grains. This kind of know how instilled in them from a very young age makes them experts that by the time they get their own homes, the seed storage activities are left to them. During the survey, the key decision makers for the storage of seeds to be used for the following season were shown to be women at 44.8%. The processing or apportioning of the produce whether for household use (50%) or for the market (43.4%) was also left to the women. They also get to keep the cash realized from the sales of the groundnuts produce according to 48.3% of the respondents in line with explanations offered in the Kumi male group discussions that women are expected to maintain and run a household using these money while the men handle the other more commercial crops such as sorghum.

> *"It is the role of women to maintain and ensure that everything is running smoothly at the household level. They proceeds from the groundnut sales are managed by the women while the men are allowed to handle other commercial crops such as sorghum"*

When it came to the actual performance of the activities on each stage, farmers were asked who mainly manages the listed activities as on the table 2 above. Responses to this still showed that to 46.5% of the respondents, a joint decision was made on the selection of the seed that they chose to plant, however more women (30.4%) than men (23.1%) in households where the management was not done jointly engaged in the selection process. Inputs from the FGDs such as a male FGD from Dokolo, showed that this was because the groundnut crop was largely subsistence, meant for

household consumption and when occasionally sold it was so as to cater for minor household needs which was an arena of the women. So while men would help in the marketing of the groundnuts the proceeds would be given to the woman as the house manager.

> *"You know the groundnut farming is majorly for subsistence consumption and is therefore, regarded as a crop in the complete domain of women. It is their responsibility to determine how they use the proceeds from the sales too"*

*D*ue to the patriarchal nature of the communities, men were the ones who owned and controlled land, to 47.2% of the respondents, the management of the land where they planted their crops was a joint activity but men (29.4%) more than women (23.4%) handled land. During a female focus group discussion in Kumi it was reported that when a woman gets married, it is up to her husband to show her where to practice farming as he owns the land and activities such as ploughing were done by the men as it requires a lot of energy. More women (29.7%) than men (6.6%) offered labour during weeding and harvesting (30.4% women and 5.9% men).

> *"There is generally a gendered division of labour and men are expected to undertake the difficult tasks such as ploughing virgin lands. They are also the owners of land and we as women have use rights that we acquire at marriage"*

Male FGDs in Dokolo and Nwoya showed that, male farmers do not like weeding for or harvesting groundnuts as the activities are very labour intensive and claiming that these activities require the patience of a woman. They for instance discussed how one first uproots the crop leaves it in the garden and later comes to collect after it has dried unlike the other crops such as sorghum which one harvests and transports home on the same day. Women (45.5%) also handled seed storage for the next season due to their unique skills in indigenous knowledge passed down across generations from mothers to their daughters. Processing for the household (49%) as well as for the market (44.8%) were also female dominated and included sorting, drying, bagging among others. The marketing of produce was also mostly done by women (30.8%) who also kept proceeds (46.2%) gained from sales.

"Generally, we as men find the work in the groundnut production too tedious. Take for instance harvesting, you first uproot the plant then leave it there to dry and then come back to pick them later. Look at that process, it is suitable for women. After all, most of the proceeds is controlled by them"

4.4 The role of Trust in Farmer preferences of good quality Groundnut seed attributes

During the household survey, farmers were asked through an open ended question to list three of what characterizes good quality seed attributes according to them. The sampled farmers indicated trusting the skills that they had acquired over time to identify their desired good quality and also relied on interpersonal trust between them and their informal networks to make the best seed choices. They assessed groundnut quality on the basis of; what they were able to see, feel through touch and taste; whatever information their friends, neighbors, relatives and the cereal stockists around them gave regarding the particular seed type and; their own experience of using the seeds in the past and the benefits that accrued to them from its use. These assessment criteria were very similar to those described by the perceived quality model that was enunciated in Urrea (2015) and summed up as descriptive beliefs, informational beliefs and inferential beliefs respectively. Good quality groundnut attributes were such an essential consideration for the farmers that despite their tough economic backgrounds they (94% male and 91.1% female) indicated their willingness to purchase seeds at a higher price in as long as it fitted their desired quality attributes. The question 'would you be willing to buy seeds at a high price if it was of the quality you want (yes/no)?' was asked to the farmers and their responses were as shown in figure 3 below

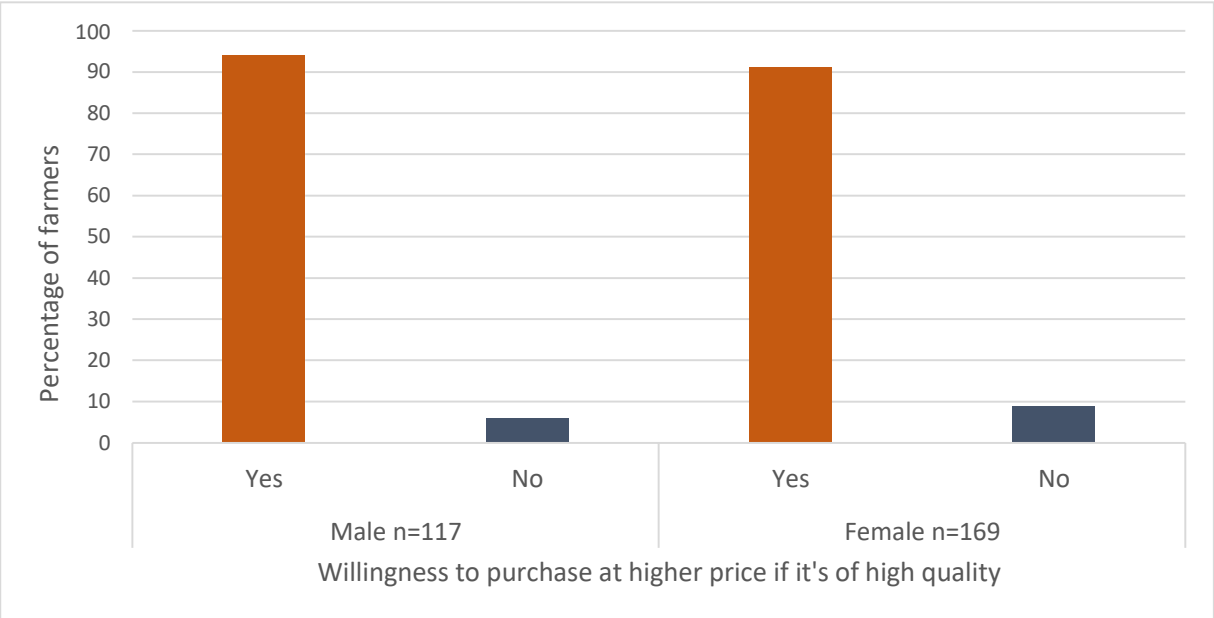

Figure 3: Farmers' willingness to purchase seeds at a higher price against their preferred quality standard

Responses to the open ended question 'what are the attributes of good quality seed according to you (what characterizes good seed quality)?' as presented in table 3 below show a similarity to FAO (2011) categorization of quality; Physical attributes, physiological attributes, genetic attributes and seed health as shown in table 3 below:

Seed Attribute		**Farmer Preference by gender (%)**	
		Male n=117	**Female n=169**
Physical Attributes	Taste	0	100
	Color of seed coat	52.6	47.4
	Size	46.2	53.9
	Weight	100	0
	Easy to shell	50.0	50.0
	Easy to weed	0	100
	No visible damage	31.8	68.2
	Pure seed with no other seed mixed	25.0	75.0
Physiological Attributes	Early Maturing	40.0	60.0
	Ability to Germinate	87.5	12.5
Genetic Attributes	High yielding	42.5	57.5
	Disease Resistance	27.6	72.4
	Drought Tolerance	33.3	66.7
Seed Health	Healthy Seed	100	0
	Seed from a trusted source	0	100

Table 3: Farmer-preferred groundnut seed attributes

4.4.1 Physical Attributes

In the survey, female farmers (100%) identified taste among the most important quality attribute while men made no mention of it. However, during the focus group discussions, through probing male farmers indicated considering taste an important quality attribute though they mostly associated it to markets with the explanation that their women took care of sourcing for the tasty groundnuts for sauces at home.

> *"Etesot that is local, is sweet for pasting and already has market and does not need a lot of management like the new varieties"* (Male FGD, Kumi District).
>
> *"Also serenut is tasty and has a lot of oil and many people like it in the market and they say it matures fast"* (Male FGD, Serere District).

Female farmers' selection of taste was attributed to the fact that this is a food aspect which falls under the domain of women, who in the East and Northern regions of Uganda are in charge of family nutrition. The women use groundnuts to make pasted sauce for most of their foods, they also serve roasted groundnuts to their families and at times groundnuts are consumed raw straight from their shells. This therefore makes taste a critical attribute to them.

> *"The old seeds that we used to get as gifts from our mothers when we were getting married for example 'etesot' are very tasty so we still grow this one because that is the one we still keep to plant next season .....When I go to the market, I choose 'etesot' because it is sweet for vegetables"* (Female FGD, Serere District).
>
> *"Serenut is tasty, has a lot of oil and a short gestation period"* (Female FGD, Kumi District).
>
> *"The groundnuts that we get here is locally called 'olukuluku' because it is so tasty and also interprets good luck when you are given by your mother to go plant in your farm*" (Female FGD, Dokolo district).

This is however not to say that all female farmers do not have markets as an end goal to their production. Some women from Bugondo sub-county of Serere district for example indicated that they grow popular varieties such as *'etesot', 'erudu'* and *'igola'* because they are very marketable.

The survey indicated that 52.6% of the male farmers and 47.4% of the female farmers used seed color as an indicator of good quality. Discussions in the focus groups enlisted an explanation on how in particular color shows good quality; female farmers from the Northern region specifically Dokolo districts reported assessing quality of groundnuts through color, for them, white and red groundnuts varieties usually gave them high yields and would mature very fast. Male FGD respondents from Kanyum sub-county of Kumi district also assess quality on the basis of color reporting that the red groundnuts are early maturing and disease resistant.

About 46.2% of male and 53.9% of the female farmers from both the North and East mentioned size as a good quality seed attribute for groundnuts. Male farmers from Amwoma sub-county of Dokolo District as well as those from Bugondo sub-county of Serere, indicated that groundnut seeds of good quality are of reasonably big size because that is what people look for when buying. Their female counterparts from Anaka sub-county of Nwoya District reported that a good groundnut seed is one that is dry and big in size as this gives them more food for little amounts of groundnuts used. Among female farmers of Bugondo sub-county in Serere District, small sized groundnuts are of bad quality as they take a long time to mature and at times do not germinate at all when planted.

> *"Size is a key ingredient in determining a good seed. The big sizes are good since they give good yields when planted. They never fail to germinate like the small seeds that disappoint you"* (Excerpt from Female FGD in Nwoya District).

Weight was a good quality in groundnuts according to 100% of the male farmers, this attribute was however not mentioned among the surveyed female farmers. This was because weight only became an issue of consideration when it came to the sale of groundnuts which most men did as opposed to women. Particularly, male farmers from Ongino sub-county in Kumi District spoke of a variety that had been introduced in 2017 that attracted everyone's attention at the markets which they nicknamed 'Boss' due to its profits margins. The variety was very high yielding as well and the only problem they had with it was the weight, they indicated that it was very light which meant that to get a kilo, one had to part with a lot of their produce. The female farmers in this region however, complained that the variety made a hollow sound when being chewed and was not as tasty as they would have wanted it to be for their sauces. This made them plant the '*etesot*' variety and red beauty on small portions of their land for home consumption as the men produced on the larger sections for sale.

The ease of shelling was reported as a good quality attribute by both the men (50%) and women (50%) equally. The ease of weeding however was more pronounced among the women (100%) than the men due to the fact that women were the labour providers during weeding of groundnuts. They therefore, prefer the seeds that require minimum effort in weeding so that it leaves them time to be able to engage in their other reproductive duties such as the caring of children and family nutrition.

Women (68.2%) more than men (31.7%) prefered groundnut seeds without visible damage. The seeds that are broken or have holes on them are considered damaged and they are believed to not germinate once planted. Pure seeds with no other seeds mixed was a preference of 75% female farmers and to 25% male farmers. To the women farmers, this is an important aspects as they are in charge of the post-harvest processing processes including sorting of seeds.

4.4.2 Physiological Attributes

The early maturing attribute of seeds was to both male (40%) and female farmers (60%) a critical attribute during their consideration of what to select for planting. This being a quality attribute[2] farmers were not able to assess for this particular attribute at the point of purchase. Therefore, they relied on other aspects such as the physical attributes that they could observe. For instance, g-nut seeds of a variety locally known as '*erudu*' that is red in color was to female FGD participants from Bugondo sub-county of Serere District known to be early maturing at about 3 months and was therefore, highly sourced. Female farmers from Koch Goma sub-county of Nwoya district also used color as a quality cue (proxy) for the early maturity quality attribute where they choose to plant the red groundnuts locally called *'okwara'*.

The importance of early maturing seeds during the focus group discussions was explained using the standing tradition of *evening* marriage among the communities in both the North and the East. The day a woman is married, she would be brought into the groom's compound in the evening.

She is expected to go and rest the night of her wedding and wake up at dawn the following day ready to assume the duties of both a wife and a daughter in-law, the greatest of which is to ensure the family's food provision and security. An exercise set out by her mother in-law would then be the first thing she contends with when she wakes up. The bride would wake up to a basket of grains including groundnuts, a grinder and a broom outside of her house.

She is expected to use the broom to clean the entire compound before the whole family woke up and then go to a selected place to grind and pound the grains for a meal, which she would then prepare for the family to eat when they woke up. These tasks are a representation of the activities

[2] Quality attributes are the functional and psychological benefits or consequences provided by the product that represent what the product is perceived as doing or providing for the consumer but are unobservable prior to consumption

she engages in her food production, preparing the garden, planting, weeding e.t.c. up to the time she harvests. The mother in-law would then asses her work on the basis of her speed and how reliable she is at the tasks given. The family would sit and wait for her checking the time it would take her to "save them from hunger".

The element of time on how fast she would accomplish all her tasks then becomes very significant and spills over to her food production strategies. Once the mother in-law and the rest of the family have been satisfied with her after these first day activities, she is then entrusted with the role of agricultural production which also has to be done in a timely manner as the activities of that day. Early maturing seeds then become critical to her being able to live up to the expectations of the family. The exercise on this first day of marriage is symbolic to the newly-wed's agricultural practice in her new home. It's a means of assessing her ability to produce food for the family and assure the family of her reliability of being able to select seeds which can mature early and be sure to always have food for the family.

The handing over of the production duties to her by the mother-in-law is thus an expression of confidence in her ability to select seeds that would always mature early and ensure the family's food security at the earliest as signified by the time when the family wakes up expecting to find food prepared by her. To aid in this transition, the mother to the girl gifts her carefully selected seeds of early maturing varieties of critical grains and legumes to take with her to her new home.

> *"According to the tradition of the lango, the variety of groundnuts given is called olukuluku because it matures faster. Culturally, she is given this variety from her mother at home to start her new home that needs some food immediately so she can be independent"* (Female FGD, Dokolo District).

Moreover, the attribute of early maturity holds an important concept to the men and women of the *Iteso, Basoga*, *Lango and Acholi* communities of the East and the North due to the environments

they find themselves. They are based in the drylands which face prolonged periods of drought. The earlier a seed type matures therefore, the better it is for them to realize any meaningful harvests.

Closely associated with this is the ability to germinate quality attribute which was preferred by 87.5% male and 12.5% female farmers. As explained in the previous paragraph, the communities live in arid and semi-arid areas where food security is under constant threat. Farmers, therefore try to select seeds that will not fail to germinate when planted. Since they cannot readily tell which seed will not germinate, they check for seeds that do not have any physical damage on them or have holes from attacks by pests.

4.4.3 Genetic Attributes

About 42.5% male and 57.5% female of the farmers preferred groundnut varieties that are high yielding. When a farmer is prioritizing what to plant as they start off their production, groundnuts are top among the crops that they choose to plant. This is due to the important attribute of high yielding forming a basis for ensuring household food security. Female farmers from Koch Goma sub-county in Nwoya for example explained that they grow *lamaido* and *kwara* because both of these yield very highly and are resistant to both pests and diseases. Male farmers from Bata sub-county of Dokolo district as well as some male farmers from Ongino sub-county in Kumi district, weighed in on the relevance of high yielding varieties by explaining that when farmers manage to get such seeds, they tend to re-use them for up to five years without replacing due to their high yielding capacity.

The survey indicated that disease and pest resistance (27.6% male and 72.4% female farmers) were preferences for both the North and East regions. Female and male farmers from Serere and Kumi districts pointed out that in the last two seasons preceding this study, they were losing their crops to a pest they locally referred to as *ekurutu*. This made them lose almost all their crops which

adversely threatened their food security making the disease and pest resistance an important attribute. The necessity to ensure that seeds were pest and disease resistant got male farmers from Koch Goma sub-county in Nwoya to practice a form of garden separation for any new seeds that they may get from different sources from their own saved seeds to ensure that the new seeds are resistant. Discussions with male farmers from Amwoma sub-county in Dokolo also showed that farmers prefer the *olukuluku* variety of g-nuts due to its disease and pest resistance traits. Some female farmers from Koch Goma sub-county in Nwoya district on the other hand reported a preference for *lamaido* for the same trait.

Drought tolerance reported by 33.3% male and 66.7% female farmers was also a highly sort after attribute.

> *"The variety of groundnuts grown in our region is olukuluku because of its resistance to drought and has good yields once it is grown and this variety is also delicious"* (Female FGD, Dokolo District).

4.4.4 Seed Health

Only male farmers (100%) mentioned seed health as an important quality attribute for g-nuts. During the focus group discussions, male farmers from Bugondo sub-county of Serere district described this as the overall good appearance of the seed that makes it look healthy.

Other than the aforementioned groundnuts quality attributes, female farmers (100%) considered seeds from sources that they trusted to be of good quality.

> *"The seeds that I get from my mother are the best quality, this is because I know that she wants to help me so I trust what she selects for me. I also think that seeds from my true friends that I trust are of the right quality so I would plant them in my garden"* (Female FGD, Serere District).

4.5 Groundnut seed sourcing among male and female farmers

Farmers have different ways of sourcing for preferred groundnut seeds from different sources. Although there are many sources at the disposal of farmers, some are more trusted than others, in fact from figure 4 below, both male (91.5%) and female (90.5%) farmers indicated their willingness to purchase groundnut seeds at higher prices if they came from the sources they trusted as compared to sources that they did not trust. This is critical in keeping with the fact that these are small holder farmers from poor backgrounds.

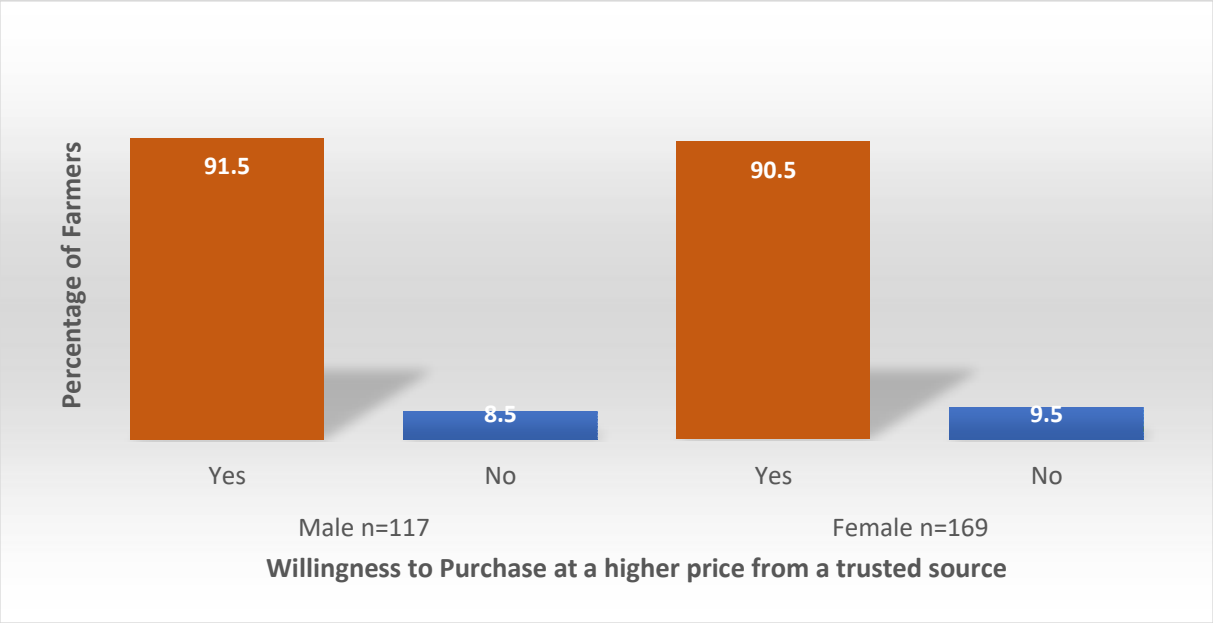

Figure 4: Farmers' willingness to purchase seeds at higher prices against trusted sources

The farmers either gift, borrow, save their own, give in-kind payment or buy seeds from sources such as neighbors, relatives, farmer groups, research stations, NGOs, churches, open air markets, cereal stockists and agro-dealers as demonstrated in figure 5 below. To be able to assess whether seed sourcing was different along gender lines, the data was separated among male and female farmers. Further, there was need to see if seed sourcing behavior was the same for the farmers in the North and those in the East of Uganda. This is because there are program interventions by different actors in the North region after the Kony war which most times avail relief seeds to local communities. Additionally, the NaSSARI research station is located in the East and was thus anticipated that proximity to the research station would make the farmers' sourcing behavior different. The interactions between farmers and the different sources of seed available to them as well as the role trust plays in them are discussed below;

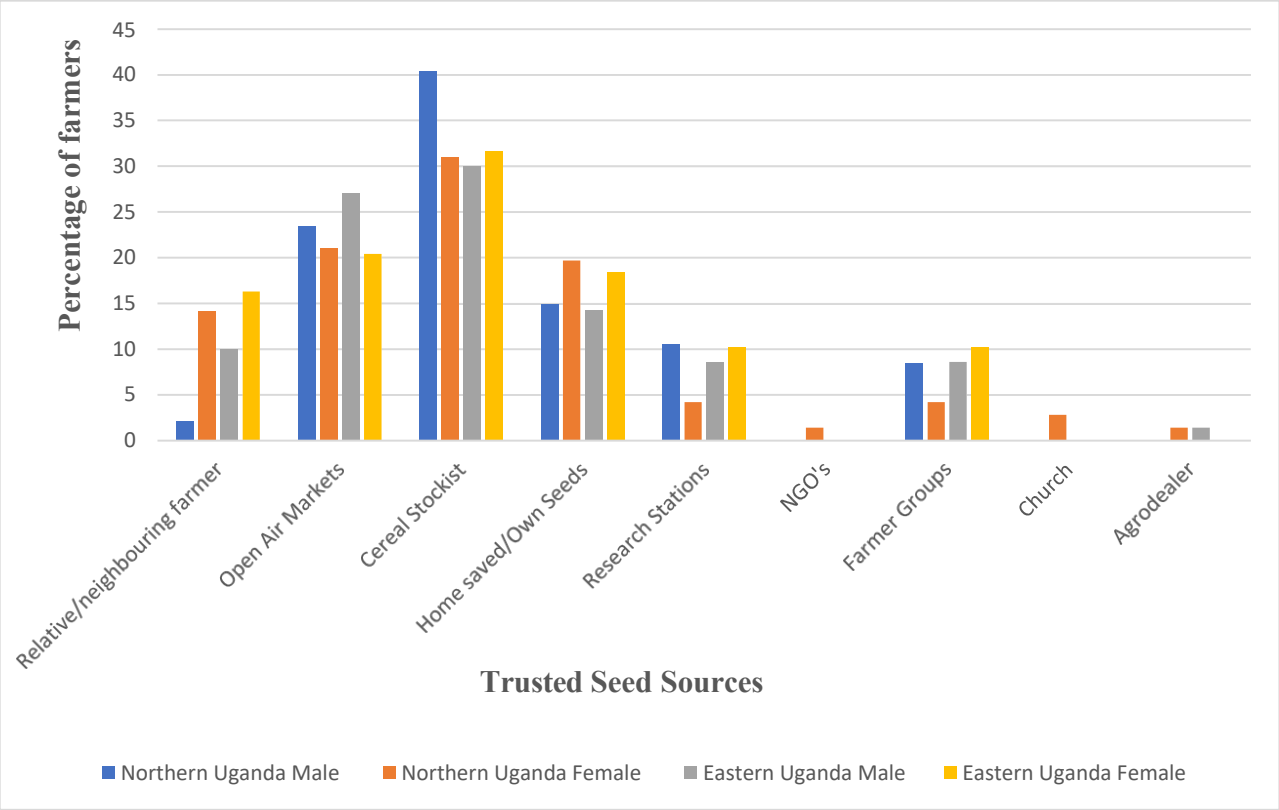

Figure 5: Farmers' Trusted seed sources

4.5.1 Cereal stockist

Cereal stockists ranked highest as the most trusted groundnut seed sources; 40.4% of the sampled male farmers from the North, 31% of the Northern female farmers, 30% of the Eastern male farmers and 31.6% of the Eastern female farmers preferred this option. This is contrary to most studies which find that most (about 70 to 80%) of the seeds planted in Africa are home saved seeds (Haluska et al., 2019). Female farmers from Bugondo sub-county, Serere district described how they purchase their seeds from their local cereal stockist. These are business people who run grain aggregation shops in the rural local centers. They buy produce from farmers and sell to bigger aggregators from the urban centers as well as to farmers in times of shortage. Farmers after harvest sell most if not all their produce to the cereal stockist to be able to cater for their other needs

around the house and then buy grains from the stockists in the following planting season that they then use as seed. The stockists sell the grains to farmers on credit as they have established relationships with local farmers in their area. This is paid for in either of two ways; in cash within a certain amount of time or; with farmers produce at the end of a season depending on the agreement made at the point of purchase. Since cereal stockists buy from farmers within one or two villages around them, they are trusted by the farmers to have good quality groundnuts that are adapted to their local environment.

Their relationship does not start and end with them being business people who offer credit to farmers but goes beyond buyer-seller interaction, for they act as farmers' information sources as well.

Female and male farmers from Serere and Kumi districts for instance spoke highly of particular cereal stockists who take their time to attend agricultural meetings and survey the markets and bring the information they gather back to their farmers such as varieties that are marketable, new varieties introduced to their areas and best agronomic practices that will ensure that the farmers reap the most benefits off the seeds they plant. Additionally, when cereal stockists sell grain to the farmers who use it as seed, they offer an assurance that if it does not do well, they at times replace the grain for the farmers at no extra cost. They also act as market links for the farmers by bringing the larger aggregators to buy groundnuts from farmers when they do not have the capacity to buy all the farmer's produce.

According to the male farmers in Bugondo sub-county, Serere district, cereal stockists also go around the villages buying produce from farmers which is very helpful especially for mothers and wives constrained for time to take their produce to the shopping centers due to competing chores at home. Over time the farmers have grown to have confidence in the cereal stockists and start

relying on them to get the best quality groundnuts seeds.

> *"The cereal stockits are not only sellers of products we need, they have become the critical extension officers providing advise to farmers, connecting them to markets and bringing on board new ideas since they travel more than the farmers. They have become part of family and very reliable sources of information"* (Excerpt from Female FGD in Nwoya)

4.5.2 Open air markets

Open air markets were the trusted seed sources for 23.4% male farmers and 21.1% female farmers from the North, as well as 27.1% male farmers and 20.4% female farmers from the East. Male farmers from Anaka sub-county in Nwoya district indicated that they go for casual labour such as the making of bricks to earn wages which they use to support their wives to buy seeds from the open-air market. The open-air markets which have specific set days of the week in each region are trusted seed sources due to the opportunity they offer the farmers to assess the seeds at the point of purchase. This is to say that the seeds that are sold in the markets are mostly in open sacks from several sellers and the farmers can go around assessing and gathering information for the seeds that they wish to purchase. They perform checks such as scooping a few shelled seeds and looking for any holes or damages on the groundnut seeds, for the unshelled seeds they shell a couple and can check the ease of shelling, the size of the seeds within, as well as the number of seeds per pod, they also move around checking for the right color, and they also taste the different varieties.

To female farmers from Bugondo sub-county in Serere district, the market is also considered a reliable seed source because there are several sellers, and one is always sure they will not lack a wide variety of groundnut seeds at the market. This includes varieties that give them an opportunity to resolve some of the problems they may be facing such as the aforementioned pest problems in the Eastern region of Uganda. When trading, the sellers also offer a lot of information to their buyers as a competitive advantage to attract more farmers. They are also believed to have new varieties which are resistant to pests and disease, mature quickly and yield very highly. The only problem

is that some of the sellers in the market are not regulars and only appear on market days. They may also be seasonal and this does not encourage the development of enduring relationship.

4.5.3 Home saved/own seeds

About 23.4% male farmers and 21.1% female farmers from the North as well as 27.1% male and 20.4% female farmers from the East keep their own seeds after harvest for planting in the next season. This home saving of own seeds method is considered the most trusted by the farmers because they believe they can trust their quality maintenance techniques ensuring that they still reap meaningful harvests. Additionally, there is a cultural attachment to seeds received from parents as a gift, that are maintained carefully.

> *'The issue of groundnuts and sim sim is important to the culture in that they grew up seeing those seeds being cherished by their parents and that is why it is still cherished up to now'* (Female FGD, Nwoya district).

> *"During the war, when we went into camps, our women saved some seeds that they cherish from their mothers and they started planting them in the camp and they shared with the ones that did not have because it is for the maintenance and continuation of our culture"* (Male FGD, Nwoya district).

Female farmers from Bugondo sub-county, Serere district also described the act of saving the seeds they received from their parents who in turn received them from their grandparents. Reasons given were that in the experience of the generations before them, the seeds give them good outputs are disease resistant, they produce sweet products and are early maturing. This, therefore gives the farmers now the confidence that the seeds will do as well for them as they have for the generations before them.

4.5.4 Relative/Neighboring farmer

To 16.3% female farmers as well as 10% male farmers from the East and 14.1% female and 2.1%

male farmers from the North, relatives and neighbors are regarded as the most trusted seed sources. Following discussions with farmers from both regions, it was evident that seed gifting during marriage is a cultural event that has been practiced since the times of their forefathers. According to male farmers from Kanyum sub-county, Kumi district for instance, when a girl is getting married, she receives a basket from her mother on the day she leaves home to her husband's house where she goes to make her new home. The basket contains seeds such as groundnuts, simsim and bambaranuts which are all mixed together with the '*amuria'* grass, as this is handed to her, words of blessings are spoken to her to bless her new life. The essence of the grass was explained as a symbol for bountiful harvest, the *'amuria'* grass grows and spreads very quickly and as it does so, should any seeds that she puts in the ground.

The gifting of seeds by parents as per male farmers from Bugondo sub-county, Serere district is a sign that the parents have officially allowed their daughter to get married and the ancestors are pleased and have blessed the marriage. It is also done as a way of thanking the girl for her services to her family up until she gets married and as a form of support for her as she moves to her new independent life.

In the North, groundnuts and simsim are considered cultural crops to the communities which are passed down from parents to their children whose duty then becomes to save the seeds over time through given indigenous knowledge systems that have seen farmers maintain varieties for up to 15 years without replacing them.

> *"The issue of groundnuts and simsim is important to the culture that we grew up in. We grew up getting the seeds to these crops from our parents and that is why they are cherished up to now. The varieties we got are the once especially very resistant to pests"* (Excerpts from female FGD, Nwoya district).

Walking into the home of her in-laws with seeds from her home, a girl has a sense of pride since she is not looked upon in shame, this is because the number of seeds one brings or not is used as a

form of measure for poverty levels of one's background as was explained by farmers from Kanyum sub-county, Kumi district. Some female farmers from Ongino sub-county, Kumi district agreed with this view and further indicated that if a girl is not given seeds from her home, some in-laws send her back home to go collect seeds for the planting season. Some farmers from this district however, explained that some mother in-laws are good to their daughters and in case they did not receive seeds, they gift them to empower them in their early farming careers. Some families go as far as gifting the groom seeds as a way to ready him to receive his bride and help her build their food base.

In giving their daughters in-law seeds, they also ensure that she does not go around the neighborhood borrowing seeds, a practice that is considered shameful and dangerous in the sense that people's business may be known as one socializes with those that they are borrowing seeds from. In fact, there is a practice among female farmers from Bata sub-county in Dokolo where mothers in law give their daughters in law vegetables such as *'boyo'*, amaranthus seeds and cabbage as they grow very fast and require a lot of tending to as a way of keeping the girl busy in the home and giving her food for the family, so she does not go out of the home to borrow.

Value is thus placed on the seeds due to what they represent to the community and trust runs this network of social relations among farmers around the 'transaction'- seed. In case both families do not have seeds to share with their children as they transit into married life or there's need to supplement what is given, then the married couple turns to their friends for support. According to some male and female farmers from Nwoya district, neighbors borrow seeds from each other in cases where a farmer does not have seeds. Borrowing may also be because they need seeds of varieties that they may not have. Female farmers of the Bata sub-county, Dokolo districts described borrowed seeds being trusted on the basis of word of mouth of the giver as the farmer receiving

the seeds relies on the assurance given by their friends. Trust is also based on the farmer being able to assess the quality of the seeds using the quality cues often embedded in the physical attributes as discussed previously. In addition, the farmers from Kyere sub-county in Serere district mentioned trusting the neighbors as a source because they can easily come across and see how well or not the seeds are doing on the neighbor's fields before planting it themselves.

Most times, farmers borrow seeds from the model farmers in their neighborhood due to their ability to afford seeds to spare. Female farmers from Bata sub-county in Dokolo district also explained that the model farmers at times pay them using seeds when they offer labour on their farms during harvest instead of payment in monetary terms. These Model farmers according to male farmers from Bata sub-county in Dokolo, also act as information sources and their advice on; which seeds are resistant to drought, pests as well as diseases; which seeds have good yields; and the proper garden maintenance practices, is most times trusted as they are respected for their success in farming. Some female farmers from Koch Goma sub-county in Nwoya district however, disagreed with this view when they indicated that neighbors are not trusted seed sources.

> *'sometimes I fear the person giving the seed because some people here in Acholi clan give seeds that will not germinate because they don't really want you to be in their level….. other times we do not fear the person who gives but rather fear how the seeds are stored, for example, some people store their seeds in cold places and no matter how clean the seed is and not damaged with holes, it will end up not growing'* (Female FGD, Nwoya district).

The farmers in a bid to negate the risk of receiving seeds that will not do well in their farms whether from their relatives, friends or neighbors have the garden separation practice. Here, a farmer apportions their land in that if they have 1hectare dedicated to the production of g-nuts in a season for example, three quarters are used to plant the varieties that they trust while one quarter (locally referred to as a *katara*) is used to plant seeds received from a different source that they have not used before. The idea is to be able to assess the quality and ensure that the seed does not cause

harm such as spread a disease or pests to their older varieties.

> *"Sometimes if a farmer has a big garden of four 'katara' in two she may decide to plant her own local seeds and in the other two portions she uses for the other seed variety she received from her friends or bought in market. Some new varieties have a long maturity period like 'igola' g-nuts which takes a period of one year"* (Male FGD, Serere district).
>
> *'If we have seeds from our neighbors, we do not plant the seeds together because we would like to know the maturity period of the seeds and also see if the seed is resistant to pests and can do well in our soil especially in these times that the climate here is changing'* (Male FGD, Dokolo district).

4.5.5 Farmer Groups

About 8.5% male and 4.2% female farmers in the North as well as 8.6% male and 10.2% female farmers from the East indicated that the most trusted groundnut seed sources are farmer groups. According to male farmers from Dokolo district and female farmers from Serere, farmers on the basis of the friendships they have and an appreciation to one's workmanship in the farm, come together to form either of two labour groups (*Eleja* and *Aleya*) which they use for different purposes. *Eleja* is a farmer labour group arrangement in which a group of about 10 to 30 farmers come together and offer hired labour to farmers within their region for pay. This may be in the form of cash, at approximately 1.39 dollars per day per portion (*katara)*, or at times in the form of seeds as agreed upon by the labourer and the employer. Here, male, and female laborers are identified from organized groups known to offer labour and through walk-ins to homesteads that have farm work. In the Northern region, specifically Dokolo district, the male farmers indicated that in these groups there is a chairperson who heads the group and ensures that they are contracted by farmers looking for labour. Payment is then done to him/her and then shared by the group either at the end of day or at times at the end of the season where the farmers provide labour throughout from ploughing, planting, weeding, and harvesting and then they are paid all at the end of the

season.

The other form of labour organization discussed was the *Aleya* arrangement which runs on a moral economy. It refers to locally organized farmer groups composed of farmer friends who assist each other in farm work on a rotational basis without any money exchanging hands. This is majorly used in cases where a farmer may not be able to pay hired labour. The sense here is that the 10 or 15 farmers who have come together provide labour in each of the member's farm in a rotational basis such that in the first three days of, for instance ploughing, all the 15 members work on the farm of farmer number 1 the next three days are spent on farmer 2 and the rotation continues to the last farmer 15. The groups run purely on the trust among its members in that even after one's land has been worked on whether during ploughing, planting, weeding, or harvesting they will still offer their labour to the other members without fail and at the highest level of integrity.

Through these organized labour provisioning strategies, rural farmers have a platform for germplasm/seed exchange. This is to say that in the *Aleya* and *Eleja*, farmers can obtain different types of seed varieties from each other. Female farmers from Bugondo sub-county, Serere district indicated that in the farmer groups that they join they usually compare the seeds they have with each other and exchange those of superior qualities. They also exchange ideas and information on seed access and utilization. From time to time, NGOs and other agricultural development organizations have been known to use these set-up groups to deliver improved seed varieties to the farmers.

The farmer groups according to male farmers from Anaka sub-county in Nwoya also avail the opportunity for seed loans to farmers as the members of the groups at times borrow from each other an amount of seed at the beginning of a planting season which they then repay in terms of seeds after their harvest.

> *"The Aleya and Eleja principles operate on the basis of trust, friendship and neighbourliness. It has proven very useful not only in seed loaning and collective farm*

activities but also in other areas of social life. We have literally become family" (Excerpts from a Female FGD in Dokolo).

4.5.6 Research stations

Some (10.6%) male and (4.2%) female farmers in the North as well as 8.6% male and 10.2% female farmers from the East identified research stations as trusted seed sources. Female farmers from Serere district in the focus group discussions indicated that they get seeds from NaSSARI where the breeders use their land for pilot trials, and they get to keep the produce after offering their land for the research demonstrations under the guidance of the breeders. They indicated trusting the seeds they get because they come from experts who are with them every step of the way to ensure all agronomic practices including row planting are followed and maximum yield realized.

> *"You know, we are guided by scientific research and the seeds we get from the station have been tested. We believe in them and since our farms are used for demonstration at times, we benefit form the experiments. They yileds are good and if adopted, we could improve our production"* (Excerpt from an FGD in the East).

Male farmers from the North also mentioned receiving seeds from breeders from the research station and guidance on how to plant them. However, they lamented that the row planting of the groundnuts resulted in extra work during weeding as the spaces left in between plants gave room for weed growth and thus preferred local varieties that they could broadcast especially because they only saw groundnuts as a subsistent crop.

4.5.7 Agro dealer

Some 1.4% female farmers from the North and 1.4% male farmers from the East indicated that Agro dealers are their most trusted seed sources. There was an admission from a small number of male farmers in the discussions from Kumi district that indicated sourcing their seeds from agro dealers because they always stock varieties from big seed companies and these are therefore, thought to be of good quality.

"Some of the agro dealers stock seeds from the major companies who are known for quality. We therefore, at times use them when we need varieties and seeds of superior quality" (Excerpt from Male FGD, Kumi district).

4.5.8 NGOs

To 1.4% of the sampled female farmers from the Northern region, NGOs were a trusted seed source. Although in the survey, male farmers did not mention NGOs as a trusted seed source, in the focus group discussions, some male farmers from Bata sub-county, Dokolo district indicated that NGOs are highly trusted because of years of dealing with them and they have always delivered high quality seeds to the farmers. Organizations such as the World Food Program (WFP), Caritas and Nusaf were also mentioned by male farmers from Anaka sub-county in Nwoya as reliable seed sources for good quality groundnut seeds which they have grown to trust from years of mutual engagement. The mentioned NGOs have for a long time provided seeds to the farmers as part of their food security objectives.

4.5.9 Church

The survey enlisted the church as a trusted seed source to 2.8% of the female farmers in Northern Uganda. In the discussion, this was explained in the sense that after the war(s), most people who wished to help and had the means would go to church with seeds as donations for their fellow members. Male farmers in Kyere sub-county, Serere district also explained that farmers carry their seeds to church and collect them together to assist those who may not have any to ensure that they have a food base for the next season. Some people also use seeds as tithe which the church then uses to help the members that they know are in need. The provision of seeds by the church is part of its social responsibility and Biblical calling to help the needy in society. This only happens to church members and it could also be because the churches have been known to provide sanctuary for people who are displaced by war.

Chapter four has generally discussed the different sources of seeds and the level of trust placed on each source by male and female farmers. The trusted seed sources is not only engendered but regional and depends to some extent on the experiences of the people in the diverse regions. Those in the North where wars have been the order of the day, different institutions have emerged to provide emergency services that have included the development of agriculture through the provision of seeds to needy farmers.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This final chapter contains the summary of the findings in line with the specific objectives, draws conclusions from this work and give recommendations to targeted actors.

5.2. Summary

This study set out to explore the contribution of Trust in quality seed selection and sourcing for groundnuts among smallholder farmers in Northern and Eastern Uganda. This was conducted among 286 farmers (40.9% male and 59.1% female) within the survey and an additional 86 farmers who participated in 8 FGDs in a qualitative process. The study documents the role trust plays on male and female farmers' preferences of quality attributes for groundnuts. The identified preferred attributes includes taste, color, size, ease of weeding, weight, purity, ease of shelling, early maturity, ability to germinate, high yields, resistance to diseases, drought tolerance, and healthy seeds which were generally grouped into; physical, physiological, genetic, and seed health attributes. At the onset, there was an assumption that male and female farmers would have different trait/attribute preferences. This has been observed to be the case in certain doamins. Most male farmers tended to lean towards attributes that were in the production and marketing hub while most of the female farmers were more concerned with attributes that affected the production and use/food security hub.

However, the trait preferences among the farmers were not mutually exclusive because for instance, despite most women, as has been demonstrated in the previous chapter, being more interested in groundnut qualities that fed to their need to provide food security for their families, there were some who were also interested in making profits off their groundnuts produce crossing over to the marketing hub. The study thus notes that the preferences of both men and women are not generalizable but rather dependent on the circumstances and needs of the farmers.

It was further noted that while farmers understand the attributes that work for them for their different needs, at the point of purchase, they do not have assurances of the seeds working out the way they hope and expect since the attributes are not tangible or obvious to the naked eye or feel. Culture was thus seen to play a crucial role in the seed selection process beginning from the time of socialization. Girls are taught by their mothers how to select seeds which is meant to help them fulfil their role of family nutrition. They are taught to select the seeds that give high yields for food security and early maturing varieties to navigate their arid lands among others.

Seed as a component of culture is thus passed down from parents to their children and its maintenance rewarded through social prestige while loss is treated with shame. Therefore, through learnt and lived experiences, farmers have over the years designed ways through which they can assess quality at this point of purchase. These assessment techniques of quality are as described by Urrea et al. (2015) with the perceived quality approach in which quality judgements are dependent on the perceptions, needs and goals of the consumer in which case quality cues that are observable prior to consumption (descriptive beliefs) are used at the point of purchase to make a choice of the seed type.

The preferred attributes under the physical category (taste, color, weight, lack of visible damage, size) were the quality cues that were used to infer quality for the attributes within the genetic (yields, disease resistance and drought tolerance) and physiological (early maturity and ability to germinate) categories which could only be assessed after a farmer had selected and planted the seed. Further, farmer assessments before making quality judgements were seen as elements of risk aversion due to the adverse consequences that would go with choosing poor-quality seed. The outcome of this would be a threat to their household food security and in effect their survival.

The next step thus required a vetting of the sources of their selected seed type, an arena

demonstrated to run on trust, a feature of social organization, which is characteristic of a farmer's social capital as enunciated in the social capital theory by Coleman (1990). Specifically, trust was established to be of two forms: trust for the seed system and interpersonal trust which exists between farmers and their informal networks.

The study started at the point of assumption that the male and female farmers who would be interviewed would have different seed sourcing behavior. The investigation enlisted a list of nine groundnut seed sources for both male and female farmers who were trusted for different reasons and at different levels by both the male and female farmers: cereal stockists, open air markets, home saved seeds, relatives/neighboring farmers, farmer groups, research stations, churches, NGOs and agro-dealers. A source proved to be trustworthy to a farmer through either having dealt with the farmer in the past thus building the confidence of the farmer on their reliability (inferential beliefs) or through the provision of information on the groundnut seeds (informational beliefs) which the farmers seemed to take to account after observation of how well those offering the information were themselves performing as farmers and in most instances both.

The overall situation is that groundnut farmers mainly sourced their seeds from their informal social networks except for research stations, NGOs and agro-dealers. The most trusted seed source for farmers from both the East and North of Uganda was cereal stockists followed by relatives and neighbors.

5.3 Conclusion

Seed selection was on the basis of quality cues that were trusted indicators of providing the benefits farmers sought while adopting as well as past experiences male and female farmers had with a given seed variety. On the other hand, trust for a source was based on the relationship farmers had with their seed networks, the information these provide as well as past experiences farmers may have dealing with any given seed source.

This study contributes to the body of limited knowledge on gendered trust in seed selection and sourcing among farming communities. The centrality of culture in the formation of quality beliefs for seed selection is also showcased implying the necessity for the inclusion of indigenous sensibilities and priorities to any breeding programs that target adoption of new varieties.

A clear establishment of how cereal stockists, as the major source of seed for male and female farmers in both the Northern and Eastern region of Uganda, manage to inspire and maintain trust among male and female farmers over the years has been made, giving breeding programs the possibility to learn from this. The most important anthropological take home from this exercise is the centrality of indigenous knowledge and how it intertwines with established scientific realities to determine people's behavior patterns. Any form of scientific innovation in the agricultural domain or in any other arena must take cognizance of the emic perspectives and ensure that there is buy ins for it to be successful.

5.4 Recommendations

Since this study has established that the seed selection and sourcing process is culturally engrained and runs through trust. It is the recommendation of this study to breeding institutions such as NARO in Uganda and ICRISAT in Kenya to strengthen farmer-researcher collaborations for efficient variety development of groundnut seeds which will be adopted at better rates by the farmers as they will consider their perceptions, needs and goals. Further, to any interventionists seeking to establish and sustain an effective quality seed delivery mechanism to farmers within the study areas, the study recommends the inclusion of cereal stockists as a major outlet through whom activities such as trainings on how to handle and maintain quality can be channeled. This would be essential in the push towards better adoption rates for certified improved groundnut varieties that breeding institutions and the different other stakeholders are in the business of developing. Farmers on the other hand, could also greatly benefit from trainings on the necessity of adopting improved seed varieties and being given information on where to source these varieties from. In addition, the aspirations of the farmers and the engendered division of labour and the value for each crop must be considered more closely.

REFERENCES

Adam, R. I., Badstue, L., & Sindi, K. (2018). The dynamics of smallholder farmers' acquisition and distribution of sweetpotato vines in the Lake Victoria Zone Region, Tanzania. *Food Security*, *10*(2), 339–350. Available at: https://doi.org/10.1007/s12571-018-0776-5

Agyekumhene, C., de Vries, J. R., van Paassen, A., Macnaghten, P., Schut, M., & Bregt, A. K. (2018). The role of ICTs in improving smallholder maize farming livelihoods: the mediation of trust in value chain financing.

Ayinde, O. E., Abduolaye, T., Olaoye, G., & Akangbe, J. A. (2013). Gender and Innovation in Agriculture: A Case Study of Farmers' Varietal Preference of Drought Tolerant Maize in Southern Guinea Savannah Region of Nigeria. *Albanian Journal of Agricultural Sciences*, *12*(4), 617–625. Available at: http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=92952662&lang=es&site=ehost-live&scope=site

Asrat, S., Yesuf, M., Carlsson, F., & Wale, E. (2009). *Environment for Development Farmers' Preferences for Crop Variety Traits*. Environment for Development Discussion Paper Series, (July).

Badstue, L. B., Bellon, M. R., Juárez, X., Manuel, I., & Solano, A. M. (2002). *Social Relations and Seed Transactions among Smallscale Maize Farmers in the Central Valleys of Oaxaca, Mexico*. Available at: http://ageconsearch.umn.edu/bitstream/46551/2/wp020002.

Balijepally, V., Mahapatra, R., Nerur, S., & Mahapatra, R. (2004). *Social Capital: A Theoretical Lens for IS Research*. AMCIS 2004 Proceedings, (187), 1585–1592. Available at: http://aisel.aisnet.org/amcis2004%0Ahttp://aisel.aisnet.org/amcis2004

Batt, P. J. (2003). Building Trust in the Filipino Seed Potato Industry. *Journal of International Food & Agribusiness Marketing*, 13(4), 23–41. Available at: https://doi.org/10.1300/j047v13n04_03

Bhandari, H., & Yasunobu, K. (2017). What Is Social Capital ? A Comprehensive Review of the Concept What is Social Capital ? A Comprehensive Review of the Concept. (June 2009). https://doi.org/10.1163/156853109X436847

Bhattacherjee, A. (2012). Introduction to Research, Social Science Research: Principles, Methods, and Practices. In *University of South Florida*. https://doi.org/10.1351/pac198961091657

CBCC. (2018). *G-Seed Intervention Model_G-Seed Intervention Model*.

Ceccarelli, S., Guimarães, E. P., & Weltzien, E. (2009). Plant breeding and farmer participation. Food and Agriculture Organization of the United Nations, Rome, Italy.

Coleman, James. (1990). Foundations of Social Theory. Cambridge, MA: Harvard University Press.

Cochran, W. W., & Lord Jr, R. D. (1963). A radio-tracking system for wild animals. The

Journal of Wildlife Management, 9-24.

Coomes, O. T., McGuire, S. J., Garine, E., Caillon, S., McKey, D., Demeulenaere, E., ... & Wencélius, J. (2015). Farmer seed networks make a limited contribution to agriculture? Four common misconceptions. Food Policy, 56, 41-50.

Croft, M. M., Marshall, M. I., Odendo, M., Ndinya, C., Ondego, N. N., Obura, P., & Hallett, S. G. (2018). Formal and Informal Seed Systems in Kenya: Supporting Indigenous Vegetable Seed Quality. *Journal of Development Studies,* 54(4), 758–775. Available at: https://doi.org/10.1080/00220388.2017.1308487

De Hoop, T., & Van Kempen, L. (2012). How does Trust Matter for Cash Crop Adoption? Evidence from the Indian Himalaya.".

Derwisch, S., Kopainsky, B., &Troeger, K. (2011). *The Management of Trust for Stimulating the Adoption of Improved Maize Seed in Malawi.* In 29th international conference of the system dynamics society.

Devkota, R., & Initiatives, L. (2015). *Farmers' seed networks and agrobiodiversity conservation for sustainable food security: A case from the mid-hills*... (July).

Didagbe, Y. O., Houngnandan, P., Dedehouanou, H., Sina, H., Bello, D. O., Toukourou, F., & Baba-Moussa, L. (2015). Characterization of the Peanut Production Systems in their main Agro- Ecological Regions in Benin. *European Scientific Journal*, *11*(33), 242–261.

FAO. (2011). *Seed and Seed Quality: Technical Information for FAO Emergency Staff.* Rome, Italy: FAO Seed and Plant Genetic Resources Service. Available at:

http://www.fao.org/fileadmin/templates/tc/tce/pdf/Appendix_14_Seed_and_Seed_Quality_for_Emg.pdf

FAO (2019). *What are seed systems?* Available at: www.fao.org/agriculture/crops/thematic-sitemap/theme/compendium/tools-guidelines/what-are-seed-systems/en/ Date Accessed: 2019-05-09.

Foster, A.D. and Rosenzweig, M.R. (2010). Microeconomics of Technology adoption. *Annual Review of economics 2:395-424.*

Fukuyama, F. (1995). *Social capital and the global economy. Foreign Aff., 74, 89.*

Haan. S. De (2009). *Potato diversity at height: Multiple dimensions of farmer-driven in-situ conservation in the Andes*. Wageningen: Wageningen University, ISBN: 978-90-8585-331-2.

Hoang, L. A., Castella, J. C., & Novosad, P. (2006). Social networks and information access: Implications for agricultural extension in a rice farming community in northern Vietnam. Agriculture and human Values, 23(4), 513-527.

Israel, G. D. (2003). Strategies for Determining Sample Size. *University of Florida IFAS Extension*, *5*. Available at: https://doi.org/10.1016/j.envpol.2016.06.04

Jelliffe, J. L., Bravo-Ureta, B. E., Deom, C. M., & Okello, D. K. (2018). Adoption of high yielding groundnut varieties: The sustainability of a farmer-led multiplication-dissemination program in Eastern Uganda. *Sustainability (Switzerland)*, *10*(5). Available at: https://doi.org/10.3390/su10051597

Kassie, M., B. Shiferaw, and G. Muricho. (2011). *Agricultural technology, crop income and poverty alleviation in Uganda.* World Development 39: 1784–1795.

Kidula N., N. Okoko, B.E. Bravo-Ureta, M. Thuo, and L. Wasilwa. (2010). *A preliminary analysis of yield differences in groundnuts between research and non-research farmers in Kenya.* In Paper Presented at the 12th KARI Biennial Scientific Conference, 8–12 November (2010), Nairobi, Kenya.

Kirimi, P. M. K. (2013). *Assessment of women smallholder sorghum farmers access to agricultural information in Mwingi Central District,Kitui County ,Kenya.*

Kopainsky, B., & Derwisch, S. (2009). *Model-based exploration of strategies for fostering adoption of improved seed in West Africa.* In Proceedings 27th international conference of the system dynamics society, Albuquerque.

Lamb, J.N.; Moore, K.M.; Norton, J.; Omondi, E.C.; Laker-Ojok, R.; Sikuku, D.N.; Ashilenje, D.S.; Odera, J. (2016). A social networks approach for strengthening participation in technology innovation: Lessons learnt from the Mount Elgon region of Kenya and Uganda. *Int. J. Agric. Sustain* 14, 65–81.

Lewicki, R.L., Tomlinson, E.C., Gillespie, N. (2006). Models of interpersonal trust development: theoretical approaches, empirical evidence, and future directions. *Journal of Management* 32, 991–1022.

Li, X., Hess, T. J., &Valacich, J. S. (2008). Why do we trust new technology? A study of initial trust formation with organizational information systems. *The Journal of Strategic Information Systems,* 17(1), 39-71.

Li, A., B.E. Bravo-Ureta, D.K. Okello, C.M. Deom, and N. Puppala. (2013). *Groundnut production and climatic variability: Evidence from Uganda*. Zwick Center Working Paper 17. Storrs, CT: University of Connecticut.

McGuire, S. (2000). Targeted Seed Aid and Seed-System Interventions : *East*.

McGuire, S., & Sperling, L. (2016). Seed systems smallholder farmers use. Food Security, 8(1), 179-195.

Moschini, G., & Henessy, D. A. (2001). Uncertainty, Risk Aversion, and Risk Management for Agricultural Producers, w: Handbook of Agricultural Economic Development Centre.

Mugisha, J., Lwasa, S., & Mausch ICRISAT, K. (2014). *Socioeconomics Discussion Paper Series Value chain analysis and mapping for groundnuts in Uganda*. (14).

Nicholas Haluska, Eva Weltzien, A. K., & Anja Christinck, Wellington Mulinge, F. R. (2019). *PARI Policy Brief No 15 SEED SYSTEM DEVELOPMENT: FERTILE GROUNDS IN SUB-SAHARAN AFRICA Identifying Options for Sustainable Development*. (15), 1–4.

Nooteboom, B. (2007). *Social capital, institutions and trust. Review of Social Economy*, 65(1), 29–53. Available at: https://doi.org/10.1080/00346760601132154

Ntare, B.R., A.T. Diallo, J. Ndjeunga, and F. Waliyar. (2008). *Groundnut seed production manual.* Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics (ICRISAT).

Obisesan, A. (2014). Gender Differences In Technology Adoption And Welfare Impact Among Nigerian Farming Households. *IDEAS Working Paper Series from RePEc; St. Louis*, (58920). Available at:https://search-proquest-com.kuleuven.ezproxy.kuleuven.be/docview/1700391295?rfr_id=info%3Axri%2Fsid%3Ap rimo

Okello, D. K., Monyo, E., Deom, C. M., Ininda, J., &Oloka, H. K. (2013). *Groundnuts production guide for Uganda: Recommended practices for farmers.* Entebbe: National Agricultural Research Organisation.

Okello, D.K., M. Biruma, and C.M. Deom. (2010). Overview of groundnuts research in Uganda: Past, present and future. *African Journal of Biotechnology* 9(39): 6448–6459.

Okoko, N., N. Kidula, F. Muriithi, G. O. Rachier, M. Shiluli, M. Okelo, M. Odendo, F. Simtowe and R. Kanda. (2010). *Understanding the potential of groundnuts in Kenya*. KARI-Kisii, Compiled Report. 54 pp.

Omair, A. (2015). Selecting the appropriate study design for your research: Descriptive study designs. Journal of Health Specialties, 3(3), 153. https://doi.org/10.4103/1658-600x.159892

Otieno, G., López Noriega, I., & Reynolds, T. W. (2016). Smallholder access to quality and diverse seed in Uganda: Implications for food security. *Biodiversity International*, (Table 1).

Pautasso, M., Aistara, G., Barnaud, A., Caillon, S., Clouvel, P., Coomes, O.T., Delêtre, M., Demeulenaere, E., Santis, P.D., Döring, T., Eloy, L., Emperaire, L., Garine, E., Goldringer, I., Jarvis, D., Joly, H.I., Leclerc, C., Louafi, S., Martin, P., Massol, F., McGuire, S., McKey, D., Padoch, C., Soler, C., Thomas, M., &Tramontini, S. (2013). *Seed exchange networks for agrobiodiversity conservation: A review. Agronomy for Sustainable Development*, 33(1), 151–175.

Placide, R., Shimelis, H., Laing, M., & Gahakwa, D. (2015). Farmers' perceptions, production and productivity constraints, preferences, and breeding priorities of sweetpotato in Rwanda. *HortScience*, *50*(1), 36–43.

Putnam, R. (1993). The prosperous community: Social capital and public life. The american prospect, 13(Spring), Vol. 4. Available online: http://www. prospect. org/print/vol/13 (accessed 7 April 2003).

Rodier, C., & Struik, P. C. (2018). *Nodal farmers' motivations for exchanging sorghum seeds in northwestern Ethiopia*. Sustainability (Switzerland), 10(10), 1–15. Available at: https://doi.org/10.3390/su10103708

Scarpetta, S., & Tressel, T. (2004). *Boosting Productivity via Innovation and Adoption of New Technologies: Any Role for Labor Market Institutions*. World Bank Policy Research, Working Paper No 3273, pp. 1–31.

Setimela, P. S., & Kosina, P. (2006). *strategies for strengthening and scaling up community-based seed production.Mexico, D.F.; CIMMYT*.

Steenkamp, E M. (1990). Conceptual Model of the Quality Perception Process.

Shimeles, A., Verdier-chouchane, A., & Boly, A. (2018). *Building a Resilient and Sustainable Agriculture in Sub-Saharan Africa*. Available at: https://doi.org/10.1007/978-3-319-76222-7

Thuo, M.; Bell, A.A.; Bravo-Ureta, B.E.; Lachaud, M.A.; Okello, D.K.; Okoko, E.N.; Kidula, N.L.; Deom, C.M.; Puppala, N. (2014). *Effects of social network factors on information acquisition and adoption of improved groundnut varieties: The case of Uganda and Kenya. Agric*. Hum. Values 31, 339–353.

Thuo, M.; Bell, A.A.; Bravo-Ureta, B.E.; Okello, D.K.; Okoko, E.N.; Kidula, N.L.; Deom, C.M.;

Puppala, N. (2013). *Social Network Structures among Groundnut Farmers*. J. Agric. Educ. Ext. 19, 339–359.

Turner. (2018). *The Wiley-Blackwell Encyclopedia of Social Theory*. In Telos (Vol. 17, pp. 2125–2127).

Uganda Bureau of Statistics (UBoS) (2006). *Uganda Census of Agriculture*. Volume 4, Crop Production.

Uganda Bureau of Statistics (UBOS). (2014). *National Census Report*. *1*, 2–3. https://doi.org/10.1017/CBO9781107415324.004

Urrea-Hernandez, C., Almekinders, C. J. M., & Van Dam, Y. K. (2015). Understanding perceptions of potato seed quality among small-scale farmers in Peruvian highlands. NJAS-*Wageningen Journal of Life Sciences*, (76) 21-28.

Vasilaky, K. (2013). Female social networks and farmer training: can randomized information exchange improve outcomes?. American Journal of Agricultural Economics, 95(2), 376-383.

Verter, N. (2017). *The performance of groundnut products in the world: a case of peanut pyramid in Nigeria*. (March).

Zangirolami-Raimundo, J., Echeimberg, J. de O., & Leone, C. (2018). Research methodology topics: Cross-sectional studies. Journal of Human Growth and Development, 28(3), 356–360. https://doi.org/10.7322/jhgd.152198

Appendices

Appendix I: Informed Consent Form for the survey

My name is Gitundu Rachel Njeri, a master's student in Development Anthropology at the University of Nairobi. I am carrying out a study on the contribution of Trust to groundnuts seed selection and sourcing in Uganda. You have been requested to participate in this study as a respondent to a survey. Information provided for this study will remain strictly confidential. You are requested not to write your name anywhere in the questionnaire and there is no right or wrong answer in this study.

Your participation is completely voluntary and withdrawal when you do not wish to continue participating is allowed with no consequences, but your experiences could be very helpful to enhance the adoption of improved quality groundnuts for the eventual improved productivity of these regions. Responding to this questionnaire will take approximately forty five minutes to complete. Do you agree to participate in this study?

Please sign here as evidence of your informed consent.

Sign Date

Thank you for your cooperation.

Appendix II: Consent form for the participation in FGDs

My name is Gitundu Rachel Njeri, a master's student in Development Anthropology at the University of Nairobi. I am carrying out a study on the contribution of Trust to groundnuts seed selection and sourcing in Uganda. You have been requested to participate in this study as a discussant in a FGD. Information provided for this study will remain strictly confidential. You are requested not to use your name during this discussion and there is no right or wrong answer in this study rather we seek to hear everyone's opinion. There will be no direct benefits to the respondents, but refreshments will be offered. For all participants who will be uprooted from their homes to the central meetings points of the discussion a reimbursement of 5,000 Uganda shilling will be offered to facilitate their movement.

Your participation is completely voluntary and withdrawal when you do not wish to continue participating is allowed with no consequences, but your experiences could be very helpful to enhance the adoption of improved quality groundnuts for the eventual improved productivity of these regions. Participating in this group discussion will take approximately thirty minutes to complete. Do you agree to participate in this study?

Please sign here as evidence of your informed consent.

Sign Date

Thank you for your cooperation.

Appendix III: Survey Questionnaire

Socio-Demographics

1. What is the highest Education level of the farmer?
2. What is the Farmer's age?
3. Total land covered by groundnuts per season?

Groundnuts seed and production

4. Is groundnuts grown for commercial or subsistence purposes?
5. Who has the main responsibility about the groundnuts crop at the stages described below?

Stage of Groundnuts crop	**Who mainly decides at this stage**	**Who mainly manages groundnuts**	**Any Remarks**
Choice of groundnuts seed to plant			
Choice of land to plant groundnuts of			
Weeding for the groundnuts			
Harvesting the groundnuts			
Storage of the groundnuts seed for the next season			
Processing of the groundnuts seed for household use			
Processing of the groundnuts seed for the market			
Marketing of the groundnuts produce			
Keeping the cash from the groundnuts sold			

Groundnuts Seed sourcing; seed choice, sources and traits farmer likes

6. From who/where did you get to know about this variety?
7. Who in your household accessed the seed for this variety?
8. What traits/characteristics did you like about this variety?
9. What are the primary sources of this variety?
10. Under what arrangements do you get this variety?
11. In case you lose the seed of this variety due to drought/flooding etc, what would be the most important source for this variety? Kindly indicate why the source mentioned above is the most important.
12. What are the attributes of quality g-nuts seed according to you? (what characterizes good seed quality for g-nuts?)
13. If this crop's seed package has a label which tells you the name of the variety, the name of the seed, instructions on spacing and date of harvesting, what does that communicate to you about the quality of the seed?
14. Would you be willing to purchase seed as a higher price as long as it's of the quality you want (high quality)? Yes/No
15. What are your most trusted seed sources? Why?
16. Would you be willing to purchase seed at a higher price as long as it's from a source you do trust? Yes/No

Appendix III: Focus Group Discussion Guide

Introduce the interview and ask questions guided by the list of questions below. Probe where necessary.

1. Which groundnut varieties do farmers plant?
2. What seed sources do different types of farmers trust (internal &external sources)? And, why? What inspires trust?
3. What is trust based on? Why do they trust? - Attributes (performance, sprout-ability, resistance, colour, size)? -sources (personal experience/observation/reputation/word of mouth)
4. What characterizes good seed quality for groundnuts? Are there specific crop traits farmers look for?
5. How does a male or female farmer assess the quality of seeds he/she receives from her sources?
6. Where do female and male farmers get information about groundnut production (info sources and flows – how does new info come to a community? Role of intermediaries – important gender angle here etc) Why these sources?
7. After the harvest of g-nuts how and by whom are produce utilization decisions made?
8. Assuming there was a skirmish and farmers lost their seeds, where would male and female farmers get replacements? what are the most important kinds of relationships to g-nuts farmers and why?